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The cover photograph is scanning electro-micrograph of adrenalin. It is reproduced with the kind permission of the National High Magnetic Field Laboratory, Florida State University.

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EDITORIAL



We are now over a decade into the new millennium whether you believe it started on the 1st of January 2000 or the 1st of January 2001!! We are now producing the 6th volume of the relaunched SAAD Digest. It hardly seems any time since the Editorial Board was formed and we set out on our first meetings.

I am delighted with the progress that has been made and the number and quality of submissions that we receive. I hope that you will enjoy reading the varied contributions that are enclosed.

During 2010 we have seen the Consultation and (hopefully) publication of the NICE guidelines on paediatric sedation. SAAD was a stakeholder and as such responded to the consultation. The process was delayed by the general election in May, but the consultation period ended in July 2010. I presented a summary of some of our main concerns at the annual symposium in September. At that symposium we were fortunate to have the chairman of the committee, Mike Sury, and Kathleen De Mott, a research fellow of the NICE Guideline Programme who works at the National Clinical Guideline Centre, present the draft document to us. Indeed we were the first external organisation that they had presented to. As I write this editorial in October, the final version of the NICE document is still not available, but I am hopeful that our response will have produced some positive changes in the final document.

The Board of Trustees, via a small working group, published an editorial in the British Dental Journal in August last year.¹ The subject of the editorial was the (mis)use of temazepam in dentistry. We had become aware of a number of practitioners who were using sedative doses of temazepam, but referring to the technique as “anxiolysis”. This seemed designed to muddy the waters and was of concern as those practicing this technique had neither the training nor the facilities required for the practice of intravenous conscious sedation – something in direct conflict with current dental guidance.

The working group has also produced a response to the draft of the intended learning outcomes for dental

professions as the Board of Trustees were very concerned regarding the wording of the sections related to pain and anxiety control.

Another area of activity for SAAD is the Intercollegiate Advisory Committee for Sedation in Dentistry. There is an abstract of the report of this committee included in the conference report. Currently four SAAD members are serving on this committee – two representing the Faculty of General Dental Practice and two representing the Faculty of Dental Surgery of the Royal College of Surgeons of England. The committee is currently working on developing a syllabus and piloting a course in alternative (or advanced) sedation techniques. The group has the potential to advance this area which has been an area of significant need for a number of years. As you will see from the abstract of the presentation, the committee has members from both the Dental Faculties of all the Royal Colleges and from the Royal College of Anaesthetists. It represents a golden opportunity for both professions to work together for the common good – namely improving the service available to patients.

In November 2010 the SAAD faculty ran a pilot course for Dental Hygienists and Therapists to train them in the administration of Inhalation Sedation. The General Dental Council's latest Scope of Practice document allows appropriately trained Hygienists and Therapists to administer Inhalation Sedation as an operator/sedationist. The results of this pilot course will be reported at the Annual Symposium. Unfortunately the deadlines for submission of the material for this edition of Digest do not allow us to evaluate and report the course.

SAAD remains an active and vibrant Society working to advance pain and anxiety control in dentistry.

I hope you enjoy this edition of Digest and if you feel moved to write for us, we will be happy to receive your contributions!

Happy New Year.

Nigel Robb

1. Oral Temazepam Causing Anxiety
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WHAT'S NEW WITH PHENTOLAMINE MESYLATE: A REVERSAL AGENT FOR LOCAL ANAESTHESIA?

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Abstract

Phentolamine mesylate (OraVerse), a nonselective α -adrenergic blocking drug, is the first therapeutic agent marketed for the reversal of soft-tissue anaesthesia and the associated functional deficits resulting from an intraoral submucosal injection of a local anaesthetic containing a vasoconstrictor. In clinical trials, phentolamine injected in doses of 0.2 to 0.8 mg (0.5 to 2 cartridges), as determined by patient age and volume of local anaesthetic administered, significantly hastened the return of normal soft-tissue sensation in adults and children 6 years of age and older. Median lip recovery times were reduced by 75 to 85 minutes. Functional deficits, such as drooling and difficulty in drinking, smiling, or talking — and subjects' perception of altered

function or appearance — were consistently resolved by the time sensation to touch had returned to normal. Adverse effects of phentolamine injected in approved doses for reversal of local anaesthesia in patients ranging in age from 4 to 92 years were similar in incidence to those of sham injections, and no serious adverse events caused by such use were reported. The clinical use of phentolamine is viewed favorably by dentists who have administered the drug and by patients who have received it. Optimal use may require some modifications of the technique described in the package insert; cost of the agent may be influencing its widespread adoption into clinical practice.



Figure 1. Phentolamine mesylate (OraVerse, Courtesy Novalar Pharmaceuticals, Inc.)

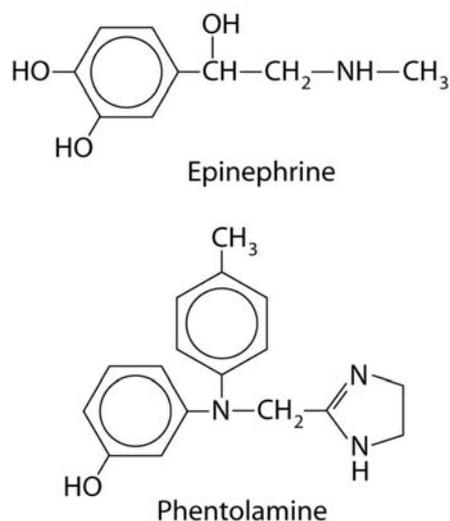


Figure 2. Structural formulas of epinephrine and phentolamine.

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Phentolamine mesylate, in the form of OraVerse (Novalar Pharmaceuticals, San Diego, USA) represents a new therapeutic class of drugs in dentistry intended to reverse soft-tissue anaesthesia after nonsurgical dental procedures (e.g., restorative or deep scaling/root planing procedures). As shown in Figure 1, OraVerse is manufactured in 1.7 mL dental cartridges, each of which contains 0.4 mg active drug. This review describes the development of phentolamine as a dental drug, its pharmacologic characteristics, and how it may be used in clinical practice to improve patient care.

Background

Phentolamine is an old drug. It was first approved by the United States Food and Drug Administration (FDA) in 1952 under the trade name of Regitine and is currently indicated for the diagnosis of pheochromocytoma, the prevention or control of hypertensive episodes associated with that tumour, and the prevention or treatment of dermal necrosis following the intravenous administration or extravasation of norepinephrine. Phentolamine is a nonselective α -adrenergic receptor antagonist that competitively inhibits the ability of sympathomimetic amines like norepinephrine and epinephrine to stimulate vascular contraction. Figure 2 depicts the structural formulas of epinephrine and phentolamine.

As is the case with most competitive antagonists, phentolamine shares a structural similarity with the agonist epinephrine but includes bulky side chains that are presumed to permit receptor binding yet prevent receptor activation.

The pathway leading to the use of phentolamine as a local anaesthesia “reversal” agent began with a trip to the dentist. Dr. Eckard Weber, an inventor, specialist in creating companies pursuing innovative drug therapies, and former professor of pharmacology at the University of California, Irvine, wondered why patients were constrained to remain numb for hours after each dental appointment. Although the notion of using phentolamine after local anaesthesia to hasten the return of normal sensation had been contemplated at least twice previously, Weber was the first to take action. In 2000 he co-founded Novalar Pharmaceuticals with the expressed purpose of developing phentolamine for dental use.

Clinical Development and Pharmacology

Early proof-of-concept and dose-ranging studies¹ supported by Novalar confirmed that the intraoral administration of dilute solutions of phentolamine could hasten the return to normal sensation of soft tissues (lips,

Table 1. Time to recovery of normal lip sensation

Location	Anaesthetic	Phentolamine		Placebo		Treatment Difference (%)
		n	Median	n	Median	
Maxilla	Lidocaine/epinephrine	7	35.0	8	150.0	115.0 (76)
	Articaine/epinephrine	8	92.5	7	185.0	92.5 (50)
	Prilocaine/epinephrine	7	35.0	6	113.0	78.0 (69)
	Mepivacaine/levonordefrin	9	55.0	9	152.0	97.0 (64)
	All anaesthetics*	31	50.0	30	155.5	105.5 (68)
Mandible	Lidocaine/epinephrine	8	67.5	7	130.0	62.5 (48)
	Articaine/epinephrine	7	135.0	8	160.0	25.0 (16)
	Prilocaine/epinephrine	6	55.0	7	135.0	80.0 (59)
	Mepivacaine/levonordefrin	9	120.0	9	190.0	70.0 (37)
	All anaesthetics*	30	101.0	31	150.0	49.0 (33)
Combined	Treatment Group Total*	61	70.0	61	155.0	85.0 (55)

Modified from Laviola et al.² Median times and treatment differences are in minutes (and percent difference).

*Significantly different (log-rank test $P < 0.0001$) for comparison between phentolamine and placebo.

chin, tongue) after 2% lidocaine with 1:100,000 epinephrine was administered by supraperiosteal or nerve block injection. These investigations also established the dose of 0.4 mg to reverse the effects of a single cartridge of local anaesthetic and the use of subject palpation of affected soft tissues (upper lip for maxillary injections; lower lip, chin, and tongue for mandibular injections) as an accurate, sensitive detector of soft-tissue anaesthesia and its reversal.

The next study, a phase 2 multicenter clinical trial, examined the reversal effect of phentolamine administered at the end of dental procedures in which local anaesthesia was required intraoperatively but not postoperatively for pain relief.² In addition to lidocaine with epinephrine, vasoconstrictor-containing formulations of articaine, mepivacaine, and prilocaine were tested. If a second cartridge of local anaesthetic was required to achieve adequate pain control, two doses of phentolamine (or placebo) were used as well. Table 1 displays the principal efficacy findings of this study with regard to lip sensation.

This study demonstrated that phentolamine was effective in reversing soft-tissue anaesthesia caused by all tested local anaesthetic/vasoconstrictor formulations. The observed effect, however, was much smaller when articaine with epinephrine was used for inferior alveolar nerve blockade (a reduction in median duration of only 25 minutes or 16%). This result was ascribed to the natural variation inherent in small group samples, a conclusion supported by a subsequent larger trial³ in which phentolamine reduced the median duration of lower lip numbness after articaine/epinephrine by 48%, second only to the 54% reduction observed after lidocaine/epinephrine.

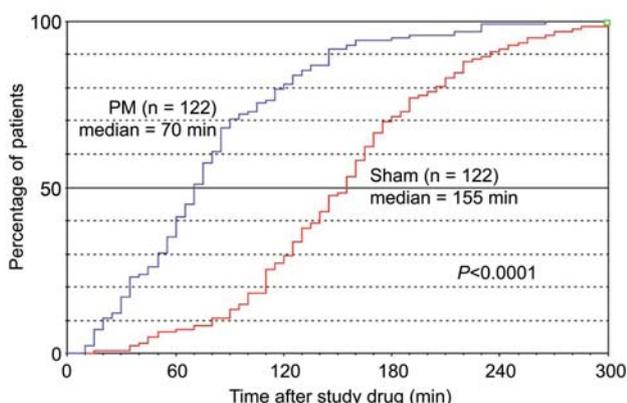


Figure 3. Percentage of adult and adolescent patients with normal lower lip sensation after phentolamine mesylate (PM) or sham injection. (Modified from Hersh et al.³)

The FDA mandates that a minimum of two “pivotal” phase 3 clinical trials involving several hundred patients be completed in order to provide sufficient efficacy and safety data for the evaluation of new therapeutic agents. In the case of phentolamine, the FDA also required that the “clinical meaningfulness” of a reduction in soft-tissue numbness be demonstrated. Accordingly, Novalar developed and validated a Soft-Tissue Anaesthesia Recovery (STAR) questionnaire to assess patients’ concerns about drooling, speaking clearly, biting the lip, tongue or cheek, or having an altered facial appearance or sensation after being anesthetized for dental treatment. A Functional Assessment Battery (FAB) was also developed to address FDA concerns that patients might regain normal soft-tissue sensitivity and yet have remaining motor deficits that could prove embarrassing (drooling, altered appearance or speech) or dangerous (motor deficits increasing the likelihood for accidental bite injury). Thus, the efficacy of phentolamine in reversing local anaesthesia was measured in three domains: sensory (palpation), psychologic (STAR), and motor (FAB).

Figure 3 illustrates the influence of phentolamine versus sham injection on recovery of lower lip sensation after mandibular injection of the same local anaesthetic formulations used in phase 2.³ Similar efficacies were observed for reversal of tongue anaesthesia and, after maxillary injections tested in a separate phase 3 study, in the upper lip. There was no evidence that any functional deficit or concern as identified in the FAB and STAR instruments lasted beyond the complete return of soft-tissue sensation.

A companion phase 2 trial extended the soft-tissue findings in children down to age 6.⁴ As shown in Figure 4,

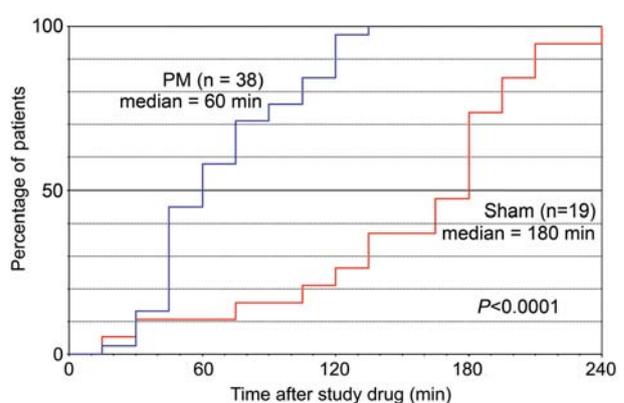


Figure 4. Percentage of children patients with normal lower lip sensation after phentolamine mesylate (PM) or sham injection. (Data from Novalar and Taveres et al.⁴)

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the reversal of lip anaesthesia (in this case only lidocaine with epinephrine was used) was more marked in the mandible than in adults, whereas the effect in the maxilla was less (not shown), yielding a combined median reduction of 75 minutes.

Safety measures in all of these studies included the recording of vital signs at regular intervals, periodic assessments of pain at the injection and operative sites, the need for analgesic medications, visual assessments of the oral cavity, and reports of adverse events. No serious or severe adverse effects were noted during any of the studies nor were there any significant differences in vital signs, pain, or adverse events between phentolamine and sham-treated subjects.

One serious adverse event has been reported to the FDA since phentolamine was marketed in March 2009 for reversal of soft-tissue anaesthesia.⁵ A dental student who was administered Akinosi mandibular block injections by another dental student for local anaesthesia and phentolamine reversal developed a hematoma that subsequently became infected and required hospitalization. It is not clear if this reaction was actually caused by the phentolamine. In aggregate, the safety data suggest that phentolamine injected for pain relief is essentially non-toxic in recommended doses.

Pharmacokinetic studies in adults⁶ and children¹ support a low adverse potential of phentolamine used for reversal of local anaesthesia. In recommended doses, the peak plasma concentrations of phentolamine are estimated to be about 100 times lower than those achieved in adults with medical doses of the drug infused intravenously.⁷ This difference explains the relative lack of cardiovascular effects with submucosal phentolamine.

Clinical Use

According to Rafique and colleagues,⁸ 86% of patients receiving local anaesthesia for dentistry report moderate dislike of postoperative numbness, and 14% report high dislike. In addition to the physical discomfort, some patients withdraw from public life while affected, refrain from eating (often appropriately) and drinking, or accidentally injure themselves by biting their lip or tongue. As a consequence, they may delay dental care or even refuse local anaesthesia altogether. The only patient concern not addressed by the clinical development program for phentolamine was the drug's potential for

reducing the incidence of self-inflicted soft-tissue injury. According to a survey by College et al.⁹ lip biting after inferior alveolar nerve block occurs at the following rates in children: under 4 years, 18%; 4 to 7 years, 16%; 8 to 11 years, 13%; and over 12 years, 7%. It is likely, but not certain, that these rates would fall in concert with the phentolamine-induced decrease in postprocedural numbness. Because the FDA has not approved the use of phentolamine reversal for children below 6 years of age, and safety data only extend down to children 4 years of age and 15 kg in weight, a study of young children is a pressing need to extend the benefit of phentolamine reversal to this important age group.

Another issue of clinical relevance is the use of a 1:1 cartridge-dosing ratio. The notion that the volume of phentolamine injected should equal the amount of local anaesthetic administered was originally based on the assumption that phentolamine works by competitively blocking the injected vasoconstrictor. The actual mechanism probably derives more from the ability of phentolamine to block the actions of endogenously released norepinephrine and increase local blood flow. This conclusion is based on (1) studies^{10,11} showing that submucosal epinephrine is absorbed quickly from oral tissues and would be mostly gone by the time phentolamine is injected, and (2) the pharmacokinetic data⁶ indicating that phentolamine increases the systemic absorption of local anaesthetic remaining in tissues at the time of injection. If this mechanism is correct, there should be no need to give more than one dose of phentolamine per local anaesthetic injection site regardless of the number of local anaesthetic cartridges used there. Following this strategy would reduce the amount of phentolamine used and allow more local anaesthetic injections to be reversed without exceeding the maximum recommended dose of two cartridges. The proposed mechanism also suggests that local anaesthetics without vasoconstrictors should be effectively reversed by phentolamine.

The official prescribing information¹² calls for phentolamine to be injected "following the dental procedure". A better strategy may be to administer the phentolamine earlier in the appointment when strong local anaesthesia is no longer required. For an operative procedure, this time would generally be when the tooth preparation is finished but before the restorative material has been placed. Both Figures 3 and 4 document a latency period of at least 5 minutes between the time phentolamine is injected and the patient first begins to achieve normal sensation. This lag time affords insurance

against a premature return to normal sensitivity if the phentolamine is injected as suggested here.

A final issue of consideration is cost. Depending on the amount and frequency of purchase, the price per cartridge of phentolamine is about \$10 to \$12. This amount may exceed what the typical dentist might wish to pay. On the other hand, some of the 4500 dentists who have ordered phentolamine use it as a marketing strategy to demonstrate their special concern for patient comfort. Both patients and dentists report satisfaction in the reversal of soft-tissue anaesthesia afforded by phentolamine.¹³

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COMPARISON BETWEEN TWO REGIONAL ANAESTHESIA TECHNIQUES PERFORMED BY INEXPERIENCED OPERATORS: THE GOW-GATES BLOCK VERSUS THE KENNETH REED BLOCK

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Abstract

Aim The aim was to compare the efficacy of Kenneth Reed and Gow-Gates inferior alveolar nerve blocks when performed by an inexperienced operator.

Methods A group of 60 patients was randomised into two groups. One group had the Kenneth Reed technique used to administer an inferior alveolar nerve block whilst the other received the Gow-Gates technique. The efficacy of nerve block produced was evaluated both clinically and by electric pulp tester. MRI examination was undertaken to determine the spread of local anaesthetic.

Results There were no significant differences in success rate of anaesthesia between groups. The failure rate for the Gow-Gates technique was 16.6%, whilst the failure rate for the Kenneth Reed technique was 23.3%. Time to onset was less with the Kenneth Reed technique. MRI examination showed the solution was more widely distributed after the Kenneth Reed block had been used.

Conclusions Our research has demonstrated that the Kenneth Reed technique is equally effective at producing anaesthesia of the inferior alveolar nerve.

Compared with conventional techniques there is a lower incidence of positive aspiration and potential for lower morbidity as the local anaesthetic is deposited further from the neurovascular bundle than when deposited near the mandibular foramen as in most conventional Inferior Alveolar Nerve Block techniques.

Introduction

Dentists believe that inferior alveolar nerve block (IANB) injections are more difficult than other local anaesthetic injections. The reasons for the difficulty in performing IANB are variability of the position of the mandibular foramen, the presence of accessory innervation, and vagueness of the location of the injection point. Accordingly a number of different IANB techniques have been described. Gaum and Moon¹, Malamed², Mariuzzi et al.³ and Takasugi et al.⁴ have suggested techniques where the point of injection is the intersection of the coronoid notch and the mandibular occlusal plane. Quinn⁵ has suggested the internal oblique line as the point for injection, while in the Gow-Gates⁶ technique there are both extra and intraoral landmarks.

The angle of needle insertion relative to the occlusal plane varies greatly according to the technique used. In the conventional technique the angle of needle insertion relative to the sagittal plane is greater than in the “anterior” technique described by Takasugi et al.⁴ and in the “medial” technique described by Mariuzzi³, while in the techniques described by Gaum and Moon¹ and Quinn⁵ the angle of insertion is almost parallel to the mandibular ramus.

Finally, in the conventional technique the target is the mandibular foramen, while in the anterior technique the target is within the pterygomandibular space posterior to the lower tendon of the temporalis muscle and in the medial techniques the target is the surface of the mandibular ramus posterior to the lower tendon of the temporalis muscle.

This research compared the Gow-Gates technique with a technique which aims to place local anaesthetic solution at a point in the pterygomandibular space equidistant between the targets for a conventional IANB and for the Gow-Gates block. This technique is easy to perform and was described by Kenneth Reed⁷. In this technique the target for the tip of the needle is the medial surface of the neck of the condyle and requires an injection point similar to the common mandibular block techniques.

Materials and Methods

The patients

After institutional ethical approval, the research was carried out on 60 patients who were randomised into two equal groups who were to undergo outpatient oral

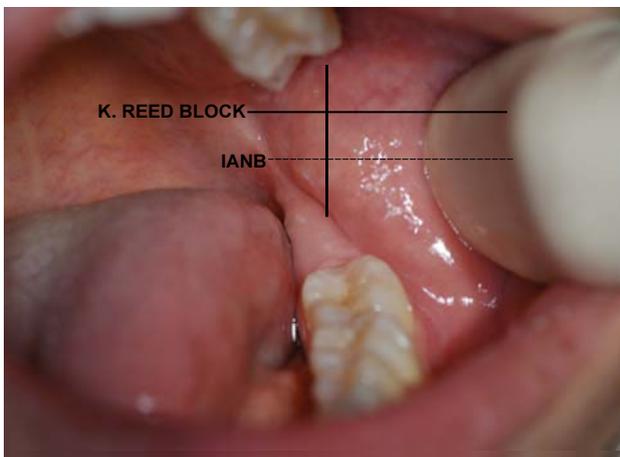


Figure 1.
The injection point for the Kenneth Reed Inferior Alveolar Nerve Block.

surgical procedures on molar or premolar teeth on the same side of the mandible. The following details were recorded: age, sex, weight, height and American Society of Anaesthesiologists⁸ classification. Anxiety was assessed using the Corah Dental Anxiety Scale (Corah et al.⁹). Patients who had elevated levels of anxiety received premedication consisting of clordemethyldiazepam (2mg orally) 20 minutes before treatment. The patients were invited to participate in a telephone interview the evening after treatment.

Technique of anaesthesia

After giving informed consent, group 1 were treated using the Gow-Gates mandibular block technique as described by Kafalias et al.¹⁰. In order for a right-handed operator to give a Gow-Gates Block on the right side, the operator must position themselves at 8 o'clock relative to the patient and at the 11 o'clock position to administer a block on the left hand side. A volume of 3.2ml of local anaesthetic was used with a 25-gauge 3.5cm needle.

The second group were treated using the IANB as described by Kenneth Reed⁷. The point of injection for this block is similar to that used for the many IANB blocks. The difference is in height of the needle, in that it is positioned 20mm above the occlusal plane of the contralateral mandibular premolar teeth. The point of injection is found at the intersection of two imaginary planes: a. The first is horizontal and crosses the coronoid notch and the condylar process. It is parallel to the occlusal plane passing above the bisector of the finger nail resting on the coronoid notch. A second plane is identified parallel to the first and is 10mm above the first level.

b. An imaginary vertical line is drawn between the posterior third and the anterior two-thirds distance between the coronoid notch and the posterior margin of the ramus of the mandible; alternatively it corresponds to the pterygomandibular raphe. The point of insertion of the needle is the intersection of this vertical line with the second imaginary plane described about 10mm above the first. (Figure 1)

The target area

The target is the pterygomandibular space at the level of the condylar process where the inferior alveolar nerve passes between the ramus of the mandible and the medial pterygoid muscle approximately 10mm above the lingula. Keeping the thumb (or index finger) on the

coronoid notch the sequence for the injection is: a) following application of topical anaesthesia introduce the syringe from the opposite side 20mm above the mandibular occlusal plane over the premolars. b) penetrate the tissue slowly until the bony surface of the medial aspect of the ramus is contacted at a point 60% of the mesiodistal length of the ramus. c) withdraw the needle 1mm, aspirate, and inject 1.6ml of local anaesthetic over 90–120 seconds. d) slowly withdraw the needle. Wait 5–7 minutes before commencing treatment. In order to be given effectively this injection requires the use of a self-aspirating syringe.

Evaluation of the nerve block during and after anaesthesia

Using time 0 as the end of the injection, the course of symptoms was recorded as follows: a) the start of tingling of the lower lip; b) the time for onset of local anaesthesia; c) duration of surgery; d) discomfort during the block reported by the patient on a Visual Analogue Scale where 0 = no pain and 10 = the maximum possible pain; e) the need to give rescue anaesthesia.

During injection the presence of a positive aspiration was recorded. Every 60 seconds from the time 0 the presence of a response to electrical stimulation in the teeth was recorded in the first premolar and molar teeth using an electric pulp tester. The intensity of current tolerated was recorded until the maximum intensity (64mA) did not produce a response.

At the start of surgery the efficacy of the block was assessed following the classification of Dobbs and De Vier¹¹: grade A = completely effective; grade B = persistence of some sensation, but without need to provide additional analgesia; grade C = insufficient anaesthesia with the need for additional local anaesthesia. All patients with grade C received intraligamental anaesthesia, a buccal block or conventional IAN block as appropriate.

Telephone interview

The evening after surgery every patient was interviewed by telephone to ascertain the time that anaesthesia had worn off; how the intensity of pain during the administration of local anaesthesia compared with their previous experience; if they had experienced no, mild or extreme pain during treatment; and patient satisfaction with the local anaesthetic technique.

MRI examination

The spread of local anaesthetic solution from the target of the two blocks was assessed using magnetic resonance scanning in coronal and axial planes. An Inversion Recovery Scan capable of exaggerating the contrast by rendering injected liquids extremely white and the rest of the tissue as black as possible was used. A series of 19 scans of 5mm slices with a gap between each of 0.5mm were taken from the top of the mandibular condyle to the inferior border of the mandible. The most important slices for the identification of the spread of the local anaesthetic solution for each technique were identified. During the Kenneth Reed block one cartridge containing 1.8ml of 3% mepivacaine was injected while during the Gow-Gates block two cartridges containing 1.8ml of 3% mepivacaine were injected. Immediately following injection of local anaesthetic the MRI examination was undertaken.

Statistical analysis

The data is expressed as mean \pm standard deviation. Differences between groups were assessed using analysis of variance or the χ^2 with Yates correction. The values of current were analysed according to time using linear regression in patients from both groups who tolerated the maximum possible current generated by the pulp tester without sensation and for the patients from both groups who were not able to tolerate the maximum current despite having “completely effective” anaesthesia. In all cases the level of significance was $p < 0.05$.

Results

The patients

Table 1 illustrates the biographic, physical and psychological data of the patients. There is no significant difference between groups.

Data relating to the surgery and to the administration of local anaesthesia

Table 2 illustrates the data regarding the type of surgery and administration of local anaesthesia. There was no significant difference between groups. The intensity of pain caused during the block and the time to the onset of paraesthesia of the lower lip were similar.

Evaluation of the block

The incidence of failure was similar between the groups:

Table 1 Physical, social and psychological characteristics of patients

	Group 1 Gow-Gates	Group 2 K Reed
Number of patients	30	30
Age (years)	42.4 ± 21.6	50.3 ± 19.3
Weight (kg)	67.4 ± 14.4	69.3 ± 11.2
Height (cm)	168.0 ± 8.9	169.1 ± 11.2
Sex (M/F)	12/13	14/11
ASA (1/2)	27/3	26/4
CDAS (points)	8.9 ± 3.2	9.4 ± 3.9
Previous LA experience Y/N	24/6	28/2

ASA: American Society of Anesthesiologists, CDAS: Corah Dental Anxiety Scale

Table 2. Type of treatment and effect of LA (Mean ± Standard Deviation)

	Group 1 Gow-Gates	Group 2 K Reed
Number of Patients	30	30
Type of treatment		
Extraction	14	16
Fillings	5	3
Root treatment	4	4
Pulpotomy	4	4
Devitalisation	2	3
Pain (VAS)	2.2 ± 1.6	2.2 ± 1.9
Start of Paraesthesia (min)	2.7 ± 0.9	2.8 ± 1.0
Positive aspiration Y/N	2/28	0/30
Efficacy (A/B/C)	23; 2; 5	23; 0; 7
Duration of surgery (min)	30.4 ± 22.9	26.7 ± 22.7
Mepivacaine 3% (ml)	3.2	1.6
Adjunctive anaesthesia used		
Intraligamental (n)	5	5
Buccal nerve block (n)	0	1
Conventional IAN block (n)	0	1

VAS: Visual Analogue Score; IAN: Inferior Alveolar Nerve;

16.6% of patients treated with the Gow-Gates and 23.3% of patients treated with the Kenneth Reed technique. The evaluation of the clinical effect of the two blocks did not produce the same result as produced by the pulp tester. With the Gow-Gates technique 6.6% (2 patients) did not have complete abolition of sensation at the maximum stimulation from the electric pulp tester, while in the Kenneth Reed technique the result was 10.0% (3 patients). Figure 2 illustrates the linear regression of the increasing values of current tolerated by the patients up to the maximum produced by the pulp tester compared with time for the Gow-Gates

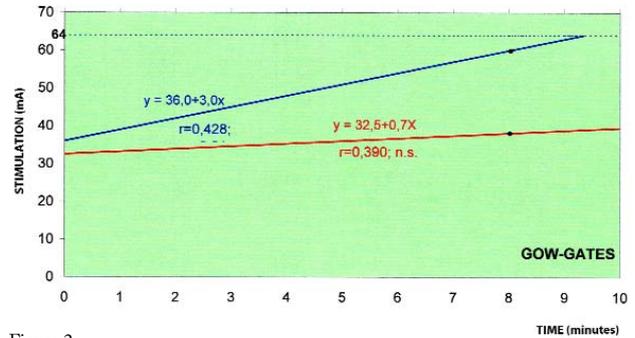


Figure 2. Linear Regression comparing the current tolerated from the pulp tester over time for patients treated with the Gow-Gates Inferior Alveolar Nerve Block Injection.

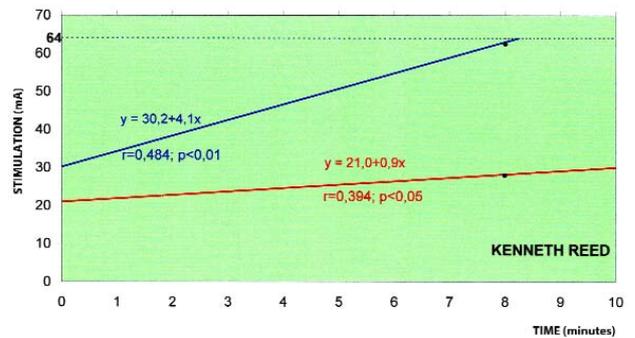


Figure 3. Linear Regression comparing the current tolerated from the pulp tester over time for patients treated with the Kenneth Reed Inferior Alveolar Nerve Block Injection.

technique ($y = 36.0 + 4.1x$; $r = 0.428$; $p < 0.01$). Figure 3 illustrates the linear regression of the increasing values of current tolerated by the patients up to the maximum produced by the pulp tester compared with time for the Kenneth Reed technique ($y = 30.2 + 4.1x$; $r = 0.484$; $p < 0.01$). In the patients treated with the Gow-Gates technique the slope of the straight line was less ($bx = 3.0$) compared with the Kenneth Reed technique ($bx = 4.1$) indicating that, at the times investigated, patients treated with the latter technique tolerated greater changes in current. These results indicate that the speed of onset of the block is more rapid with the Kenneth Reed technique. Figures 2 & 3 also illustrate the linear regression of the values of current as a function of time tolerated by the patients who continued to feel the current from the pulp tester 10 minutes after the injection of local anaesthesia where the block was not entirely successful. In the cases treated with the Gow-Gates technique the values were $y = 32.5 + 0.7x$; $r = 0.390$ (not significant) and in the cases treated with the Kenneth Reed technique $y = 21.0 + 0.9x$; $r = 0.394$; ($p < 0.05$). In these patients the ineffective local anaesthesia was successfully treated with intraligamental injections.

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Telephone interview

Table 3. Telephone interview. Mean \pm Standard deviation. * $p < 0.05$; ** $p < 0.01$

	Group 1 Gow-Gates	Group 2 K Reed
Number of patients	30	30
Duration of anaesthesia (min)	249.2 \pm 44.4	192.6 \pm 38.9**
Pain of injection		
Less painful	0	6*
Same discomfort	20	20
More painful	10	2*
Intraoperative pain		
None	25	25
A little	5	5
Great pain	0	0
Satisfaction		
Dissatisfied	0	0
Neither satisfied nor dissatisfied	0	0
Satisfied	29	26
Totally satisfied	1	4

Table 3 gives the results of the telephone interviews, which showed that the duration of postoperative analgesia was greater in the patients treated with the Gow-Gates technique. The result was highly statistically significant ($F = 26.6$; $p < 0.01$). Patients who had previous experience of a range of different local anaesthetic techniques reported that there was less pain during the Kenneth Reed injection than previously experienced. The result was statistically significant ($\chi^2 = 4.2$; $p < 0.05$). The patients also confirmed that during the injection using the Gow-Gates technique there was greater level of pain than previously experienced. The result was statistically significant ($\chi^2 = 5.1$; $p < 0.05$).

MRI examination

The Gow-Gates and Kenneth Reed blocks were evaluated in 2 healthy volunteers injected with 1.6 and 3.2ml of local anaesthetic respectively. The injection for the Gow-Gates block resulted in the distribution of the local anaesthetic solution from the base of the mandibular condyle (fig 4), surrounding the lateral pterygoid muscle and travelling to the pterygomandibular space between the medial aspect of the ramus and both the lateral and medial pterygoid muscle (fig 5) without going below medial pterygoid muscle (fig 6). The distribution with the Kenneth Reed

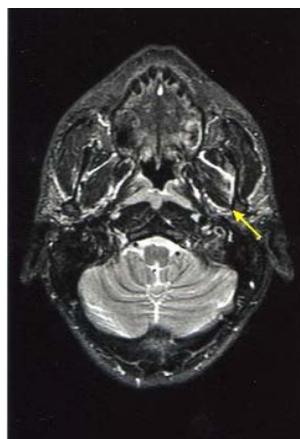


Figure 4. MRI examination (axial view) showing local anaesthetic solution at the base of the mandibular condyle following Gow-Gates Inferior Alveolar Nerve Block Injection.

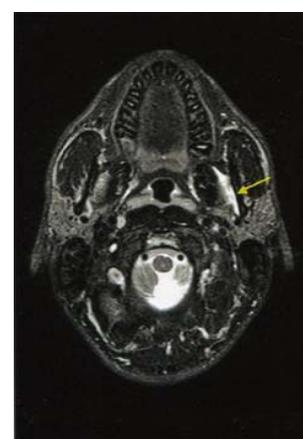


Figure 5. MRI examination (axial view) showing local anaesthetic solution in the space between the medial surface of the Ramus of the Mandible and the Medial and Lateral Pterygoid Muscles following Gow-Gates Inferior Alveolar Nerve Block Injection.



Figure 6. MRI examination (coronal view) showing local anaesthetic solution does not spread inferior to the Lateral Pterygoid Muscle following Gow-Gates Inferior Alveolar Nerve Block Injection.

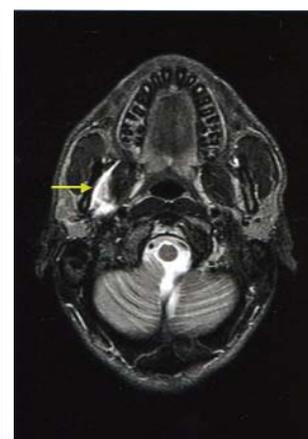


Figure 7. MRI examination (axial view), showing the local anaesthetic solution is filling the pterygoid space between the mandible and the pterygoid muscles following the Kenneth Reed Inferior Alveolar Nerve Block Injection.

block was in the pterygomandibular space between the medial aspect of the ramus of the mandible and the medial and lateral pterygoid muscles (fig 7). The spread of the liquid was from the base of the condylar process cranially, to the submandibular region inferiorly, surrounding the medial pterygoid muscle near its insertion into the mandible (fig 8). A small amount of the solution is found in the submandibular space next to the ganglion of the same name (fig 9).



Figure 8. MRI examination (axial view), showing the local anaesthetic solution extending from the base of the mandibular condyle, to the sub-mandibular space, surrounding the medial pterygoid muscle, near its mandibular insertion following the Kenneth Reed Inferior Alveolar Nerve Block Injection.

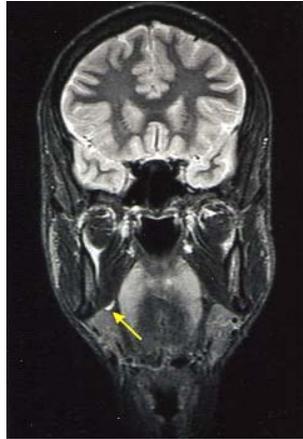


Figure 9. MRI examination (coronal view) showing a small amount of the local anaesthetic solution has spread to the submandibular space following the Kenneth Reed Inferior Alveolar Nerve Block Injection.

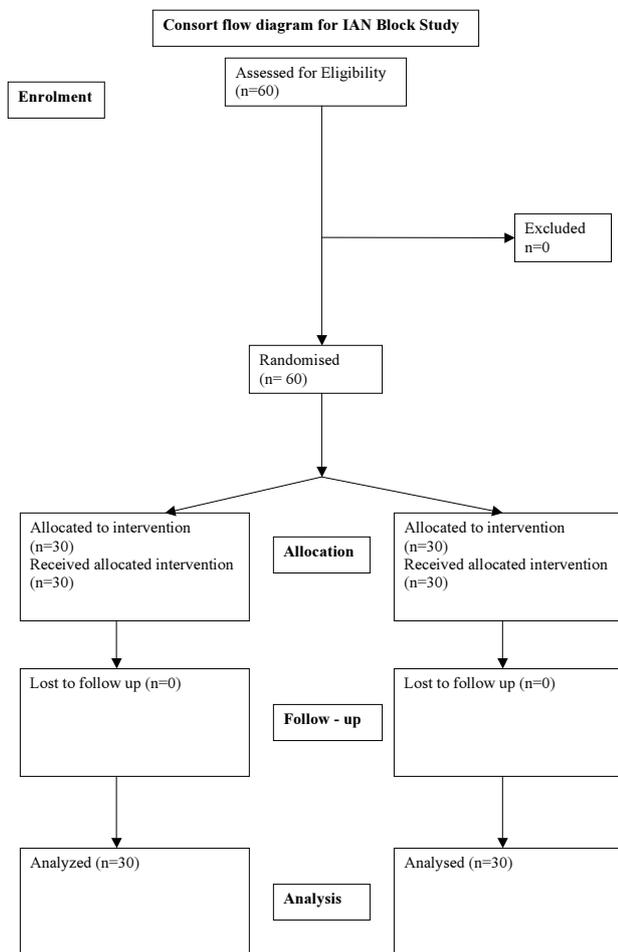
Discussion

In this study the features of the anaesthesia after the injection of local anaesthetic using the Gow-Gates block, where the solution is deposited laterally to the neck of the condyle with the mouth wide open¹², with the anaesthesia obtained after the injection of local anaesthetic following the Kenneth Reed block, where the anaesthetic is injected at the base of the condylar process, were compared. The aim was to test whether the latter injection could be used as an alternative to the Gow-Gates block. In the Kenneth Reed technique the local anaesthetic is deposited at the point where the inferior alveolar nerve leaves the lateral pterygoid muscle to turn laterally and inferiorly together with the sphenomandibular ligament and reaches the mandibular foramen. There are some differences between the techniques because in the latter technique the injection starts in the vicinity of the mandibular foramen, much lower with respect to the condyle where the point of reference is the mandibular occlusal plane and the coronoid notch, while in the Gow-Gates technique both intraoral and extraoral landmarks are used.

The mandibular occlusal plane is not a reliable guide for identifying the mandibular foramen. Bremer¹³ found that the height of the lingula above the mandibular occlusal plane varied between 1 and 19mm, while

Jorgensen and Hayden¹⁴ found that the plane that passes across the lowest point of the anterior border of the ramus, parallel to the occlusal plane, is not a reliable guide to aid location of the superior part of the lingula. It has been suggested that the lower the local anaesthetic solution is injected relative to the coronoid notch the closer it is to the nerve. Many authors have written that the result of the block is not assured by correct execution of the technique due to variability of the position of the mandibular foramen. Using the Kenneth Reed technique may be a solution as the height of the injection point is always greater than 19mm above the occlusal plane. The injection of local anaesthetic at the base of the condylar process during the Kenneth Reed technique assures that it reaches the mandibular foramen as part of the solution spreads through the pterygomandibular space. The injection of the local anaesthetic at the base of the condylar process is assured by the penetration of the needle into the pterygomandibular depression between the lower tendon of the temporalis muscle and the anterior margin of the medial pterygoid muscle at a point that is further cranial than the conventional technique¹⁵. The local anaesthetic can thus spread through the pterygomandibular space anteriorly and inferiorly to block the lingual nerve, as has been demonstrated by the MRI examination carried out in our study, helped by the presence of the fascial compartment between the pterygoid muscles, which assures the spread of the local anaesthetic solution to the mandibular foramen¹⁶. In our study we did not see puncture of maxillary arteries or veins during the Kenneth Reed block, which is a possible complication of conventional techniques¹⁷ or a positive aspiration due to puncture of alveolar blood vessels. In contrast during the Gow-Gates technique two cases of positive aspiration were seen suggesting that the needle tip was too low and too far medial¹⁸, which immediately resolved after correct placement of the needle tip.

The results obtained in our study demonstrate a significant overlap between the Gow-Gates and the Kenneth Reed techniques as far as the inferior alveolar nerve block is concerned. This was due to the type of treatment given where anaesthesia of the buccal nerve was not checked. The Gow-Gates block is believed to produce anaesthesia of the inferior alveolar, buccal and lingual nerves as a consequence of blocking the nerve trunk above their origins¹⁹, whereas others²⁰ suggest that anaesthesia of the buccal and lingual nerves results mainly from the anterior and inferior diffusion of the



anaesthetic in the pterygomandibular space, as it is demonstrated anatomically that the block of the buccal nerve is prevented by the medial pterygoid muscle when the Gow-Gates block is used¹⁷. The radiological results in our study for the Gow-Gates block demonstrated that the local anaesthetic could spread to the base of the pterygomandibular space beyond the lower border of the lateral pterygoid muscle, and this could lead to the buccal nerve being blocked in the pterygomandibular space.

There is less discomfort with the Kenneth Reed technique when compared with previous experience. The decreased discomfort with this technique is difficult to explain. Montagnese et al.²¹, in a study comparing the Gow-Gates technique with the conventional techniques, demonstrated that 40% of patients with the conventional techniques did not complain of pain and 50% of patients treated with Gow-Gates complained of discomfort. Many factors can influence the response of the patient including anxiety, female sex²², the greater

number of injections for the Gow-Gates technique in our study and the techniques used.

More interesting is the result that a shorter duration of block was observed in patients treated with the Kenneth Reed technique. This result is consistent with the smaller volume of local anaesthetic injected compared with that required with the Gow-Gates block²⁰ and with the greater diffusion of the local anaesthetic from the site of the injection with the Gow-Gates technique and finally the larger diffusion of the liquid in the pterygomandibular space after the Kenneth Reed technique as was demonstrated on the radiological images where the liquid was seen to extend from to the submandibular ganglion to the lower border of the lateral pterygoid muscle.

Finally our research has demonstrated that in a small percentage of patients there was an inconsistency between the results obtained by pulp testing and the clinical effectiveness of the local anaesthesia. In these patients the maximum current from the pulp tester could not be tolerated, but the patients reported “completely effective” anaesthesia. There were 2 patients in the Gow-Gates group and 3 patients in the Kenneth Reed group who reported this finding.

In these patients a positive correlation was found between the intensity of current and time indicating that establishment of the complete nerve block took longer. Sisk²³ found that the time for induction of anaesthesia of 10 minutes from injection was significantly greater after blocks with the Gow-Gates technique compared with conventional methods. Our results confirmed those in the literature that establishment of complete anaesthesia corresponded with a line of regression indicating an average time of 9.3 minutes after injection for the Gow-Gates technique and 8.2 minutes for Kenneth Reed. The slower speed of onset for the Kenneth Reed technique compared with other studies using conventional techniques is most likely due to the local anaesthetic being injected at a site more distant from the mandibular foramen, such that it takes a longer time for diffusion through the surrounding tissues to the nerve tissue.

Conclusions

Our research has demonstrated that the Kenneth Reed technique, using a different injection point and target,

is equally effective at producing anaesthesia of the inferior alveolar nerve. Compared with conventional techniques there is a lower incidence of positive aspiration and the potential for lower morbidity due to the greater distance between the point of injection of the local anaesthetic and the neurovascular bundle than at the level of the mandibular foramen which is the target for most conventional IANB techniques.

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THE SAFETY AND EFFICACY OF USING A CONCENTRATED INTRANASAL MIDAZOLAM FORMULATION FOR PAEDIATRIC DENTAL SEDATION

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Aim

To add to the evidence base for safe and effective paediatric conscious sedation techniques in primary dental care.

Objective

To consider the safety and effectiveness of an alternative sedation technique for facilitating dental treatment in anxious children, thereby avoiding dental general anaesthetic.

Setting

Leagrave Dental Sedation Clinic. A primary care-based general and referral clinic for anxious patients, special care dentistry and oral surgery.

Subjects, materials and methods

This is a prospective service evaluation of 114 selected anxious children requiring invasive dental treatment. Each child was administered 0.25mg/kg intranasal midazolam using a concentrated 40mg/ml midazolam (INM) in 2% lignocaine solution.

Main outcome measures

Successful completion of intended dental treatment with a child who is co-operative and who meets the UK accepted definition of conscious sedation.

Results

57% of the children found the administration of the new formulation acceptable. Of the 114 patients who received INM, 104 completed the treatment (91%). The 10 children who could not complete the treatment with INM were converted to intravenous sedation and treatment was completed successfully at the same appointment. During treatment there was no

desaturation and only one patient desaturated briefly in the recovery area. Parents rated the technique acceptable in 76% of cases and would have the procedure repeated in 83% of cases. Parents rated this technique as having 8,3 out of 10 with only 5 parents awarding a score of less than 7 out of 10. Side effects included blurred vision, sneezing, headaches, restlessness with one patient having post-operative nausea and vomiting.

Conclusion

In selected cases intranasal sedation provides a safe and effective alternative for dental GA in short invasive procedures limited to one or two quadrants in children. Other techniques, e.g. oral and intravenous sedation, appear to have a much higher acceptability of administration. This technique may be useful if inhalation sedation, oral sedation or intravenous sedation is considered and the child is still unco-operative, either as a technique on its own or to facilitate cannulation for intravenous sedation. It is recommended that this technique should only be used by dentists skilled in intravenous paediatric sedation with midazolam with the appropriate staff training and equipment at their disposal.

Introduction

A technique using 0.2mg/kg intranasal midazolam (INM) and titrated nitrous oxide has been shown to be effective and safe in paediatric dental treatment¹. This is a simple, effective technique requiring very little patient co-operation. This technique, however, was found to be unacceptable in children and caused crying, coughing and spluttering in 50% of children during administration of the drug. This was due to the pH of 3.3 causing a stinging sensation and the volume of the drug, the

surplus of which ran down the back of the nasopharynx and had an unpleasant bitter taste. Recommendations were made to try a more concentrated formula or use one which had some way of anaesthetising the nasal mucosa so that the stinging sensation was not as obvious. For the last eight years (since 2002) a small volume (0.5ml ampoule) of concentrated midazolam (40mg/ml with 20mg lignocaine/ml) has been available as a result of work carried out at the Pharmacy Production Department, St Thomas' Hospital. The preparation is administered intranasally in the form of a fine aerosol providing anxiolysis and sedation thereby enabling dental treatment to be provided. The original aim of this technique and also the current use of intranasal midazolam is primarily to allow cannulation to be achieved and additional intravenous sedative drugs to be administered as required. This has resulted in the provision of dental treatment for a range of adults with difficult management problems such as severe learning disability and challenging behaviour². It was hoped that this concentrated formulation of midazolam with the local anaesthetic alone (without the use of additional intravenous midazolam) would be an acceptable and a safe technique in children.

In the UK evidence of the use of alternative sedation techniques is lacking, although more reports have recently been received using intravenous routes^{3,4} in children. It is essential that anxious children should have available both non-pharmacological and pharmacological techniques to facilitate invasive dental procedures and help with separation anxiety and also to prevent post-operative psychological and behavioural problems.

Midazolam has been used by intravenous, oral, rectal, buccal and intramuscular routes. Disadvantages of these routes include anxiety about 'the needle', lack of titration ability, variation in uptake and effect (oral), slow onset, and obvious unpleasant taste (oral and transmucosal-buccal). Intranasal administration may present a viable, acceptable option of administering sedative drugs. This route has the advantage of rapid absorption of the drug directly into the systematic circulation, from an area of rich blood supply, without the disadvantage of passing through the portal circulation.

Method

Service evaluation design

Anxious paediatric patients were referred to the Leagrave Dental Sedation Clinic for treatment under sedation.

This was an evaluation of a technique currently used at the clinic as part of a range of techniques including inhalational, oral and parenteral techniques. Patients' age ranged from 2 to 15 years and were ASA 1 or ASA 2 without any recent history of upper respiratory tract infections.

Dental treatment required was uncomplicated and treatment was limited to one or two quadrants and usually involved extractions, restorations or a mixture of these treatments.

A letter of invitation along with an explanation was sent to the patients with an appointment for the procedure. Parents were required to confirm their appointments by telephone and discuss any concerns that they might have. Parents had the opportunity to cancel the appointment or insist on IV sedation or a referral for general anaesthetic appointment if they thought that their child had behaviour management problems and would not cope with the intranasal sedation. The first 114 patients receiving intranasal midazolam took part in the evaluation.

An information leaflet was given to the parents explaining the technique, the significance of the technique and the advantages of the technique for their child. Information was also given regarding the off-licence use of midazolam and consent obtained for the procedure.

Data Collection

Data was collected from 114 cases of anxious children who fitted into our criteria using a standardised proforma. Data items were recorded including: age, gender, weight, ASA status and level of anxiety (using a 5-point modified Venham scale). Levels of co-operation were determined by using a 4-point scale where 0 is no co-operation, 1 = sit on chair but no oral examination possible, 2 = sit in chair and permit an oral examination with difficulty, 3 fully co-operative. The following values were also recorded: intraoperative sedation dose, dental treatment, pulse rate and oxygen saturation, levels of movement, crying, level of sedation and ease of operator providing dental treatment. The child's reaction to the administration of the midazolam was recorded either as acceptable or not acceptable if there was crying, shouting or severe coughing or sneezing. Treatment duration as well as duration of recovery was measured as well as any side-effects during recovery. Dental treatment was carried out while the patient was continually monitored both clinically and by pulse oximeter. The ODA/ recovery

nurse acted as independent assessor and monitored and recorded all necessary data. To determine the quality of sedation, a 4-point crying scale was used, a movement scale and a 5-point depth of sedation scale was used. An Ellis' 5-point scoring system was used to assess patients behaviour and ease of dental treatment carried out. Recordings of oxygen saturation and heart rate were recorded at 5-minute intervals. After treatment the patient was transferred to the recovery room where the recovery nurse gave parents verbal and written post-operative instructions and assessed the patient for discharge.

A stamped and self-addressed envelope enclosing a questionnaire was given to the parents to give us feedback on side effects and sedation levels during the journey home and over 24 hours post-operatively and then to subjectively rate the sedation out of 10.

Clinical Procedure

0.25mg/kg intranasal midazolam was administered via a 1ml insulin syringe with a MAD (Mucosal Atomisation Device; Wolfe Tory Medical Inc., Salt Lake City, Ut, USA). During the 5 to 10 minute wait for anxiolysis and sedation to occur, topical bubble-gum-flavoured benzocaine 20% gel was applied to the buccal mucosae prior to infiltration with a 4% articaine 1:200 000 solution. The planned procedure for dental treatment was carried out and following completion of this the patient was transferred to the recovery room where the recovery nurse gave parents verbal and written post-operative instructions and assessed the patient for discharge. This was assessed using the Aldrete scale, and patients were recovered and discharged into the care of their parents. This factor determined the rate of success. Patients who were unco-operative following intranasal sedation were converted to intravenous sedation and treatment completed using this technique. A stamped and self-addressed envelope enclosing a questionnaire was given to the parents to give us feedback on side effects and sedation levels during the journey home and over 24 hours post-operatively and then to subjectively rate the sedation out of 10. This would hopefully facilitate that the questionnaire would then be returned to the clinic soon after the patient had been assessed for 24 hours after the procedure.

Intravenous access through cannulation of each child was not carried out as it was considered that the skill and experience of the operator would enable this to be effected should the need arise.

Results

Patients

A total of 114 children were included in the service evaluation with 56 (49%) girls and 58 (51%) boys ranging from 2 to 15 years of age (median = 5.5 SD = 2.25). Body weight ranged from 12 to 56kg (median = 21 SD = 7, 59kg). ASA 1 accounted for 103 children while ASA 2 group (11) was almost entirely children with well controlled asthma.

Figure 1. Pre-operative anxiety

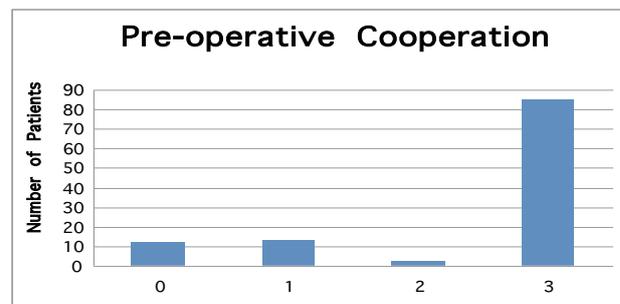
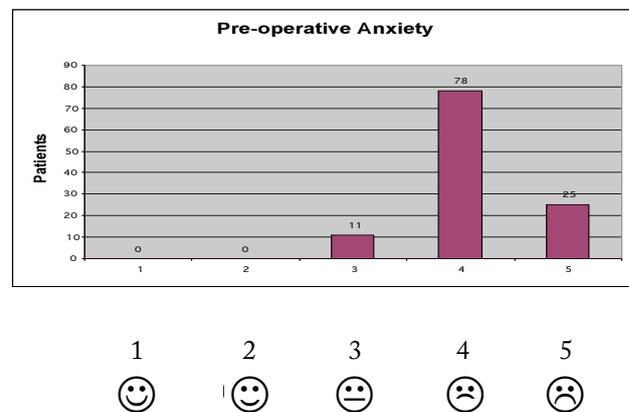


Figure 2. Pre-operative co-operation **Patient co-operation** was assessed:

- 0 = No co-operation at all – would not sit in the dental chair.
- 1 = Patient would sit in the chair but would not allow an intraoral examination with a mirror.
- 2 = Would sit in the chair and allow a brief intraoral examination.
- 3 = The patient sat in the chair, allowed intraoral examination – very co-operative.

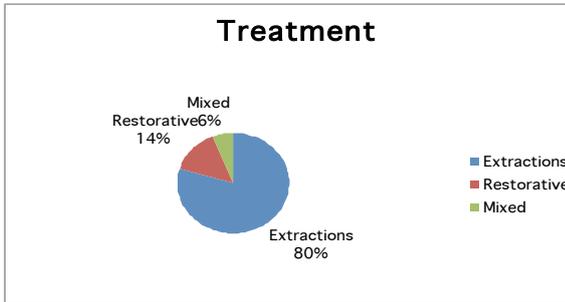


Figure 3. Dental treatment

61 children had at least one extraction with 6 having at least one restoration, 22 having 2 extractions and 3 having 3 extractions.

Sedation

A dose of 0.25mg/kg was administered intranasally.

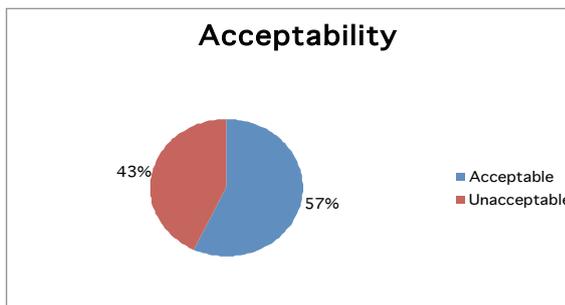


Figure 4. Acceptability of IN administration

Following the administration of intranasal midazolam crying, coughing and sneezing were common reactions.

The average duration of treatment was 10 minutes with duration of treatment ranging from 5 minutes to 15 minutes from injecting local anaesthetic to completion of treatment.

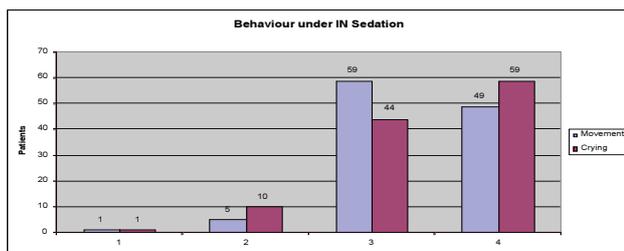


Figure 5. Behaviour under sedation

Movement:

- Violent movement that interrupts treatment 1
- Continuous movement that makes treatment difficult 2
- Controllable movement that does not interfere with treatment 3
- No movement 4

Crying

- Hysterical crying that interrupts treatment 1
- Continuous, persistent crying that makes treatment difficult 2
- Intermittent, mild crying that does not interfere with treatment 3
- No crying 4

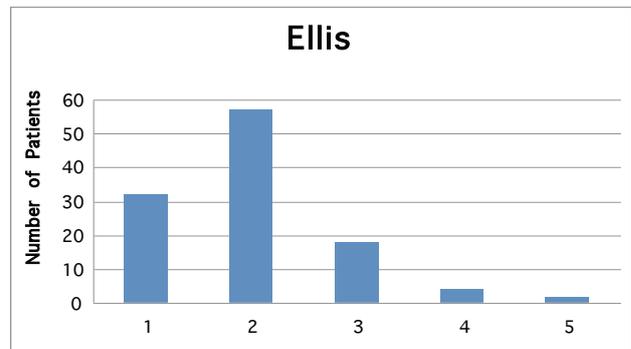


Figure 6. Ease of carrying out dental treatment under sedation

Ellis score

Ellis scoring system used to grade behavioural characteristics of patients under IN sedation.

- 1 = No uninvited limb movement. Total co-operation – no restlessness.
- 2 = Small amount of uninvited limb movement. Still total co-operation and no restlessness
- 3 = More uninvited limb movement. Small degree of restlessness and anxiety. Patient less co-operative. Still able to perform all dental procedures.
- 4 = Considerable degree of limb movement. Perhaps unhelpful head movements. Poor co-operation . Patient quite restless and anxious. Able to perform only basic dentistry. Advanced delicate work not possible.
- 5 = Restless, anxiety and limb movements severe. Impossible to perform any dentistry.

Efficacy

The technique appeared to be successful in 91% of cases.

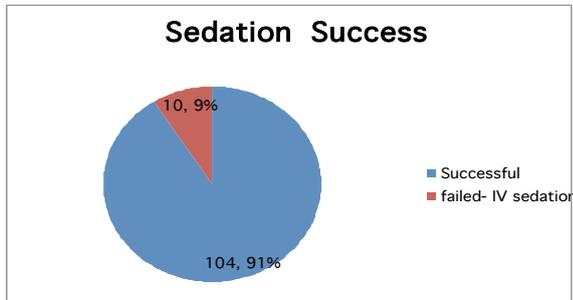


Figure 7. Efficacy of IN sedation

Safety

The technique was safe with no intra-operative desaturation and all cases met the definition of conscious sedation, with the majority of the patients bordering on anxiety. There was, however, one patient who had transiently desaturated well into recovery and was managed by giving an oxygen mask which corrected the complication.

Acceptability

From a patient point of view it was 57% successful with crying, coughing and sneezing common reactions. Parents who witnessed the procedure rated this technique as 76% acceptable with 83% of parents wanting the procedure repeated in the future. A disappointing 37 out of the 104 successful completed cases returned their questionnaires. Of those respondents parents rated this technique as having 8.3 out of 10 with only 5 parents awarding a score of less than 7 out of 10.

Recovery

The average time spent in recovery was 24 minutes with a range from 10 minutes to 85 minutes. Sneezing was the most common complication in recovery experienced by 24 children, 11 patients experienced crying with 3 exhibiting restlessness and 2 children wet themselves.

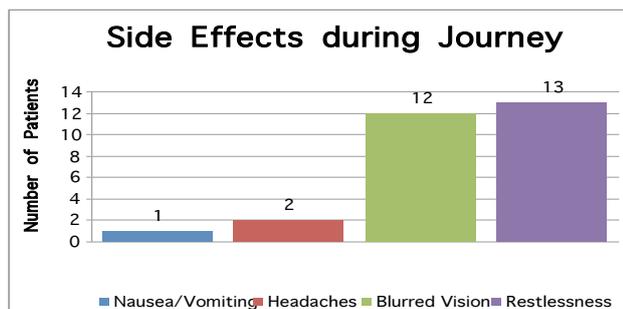


Figure 8. Side effects during journey

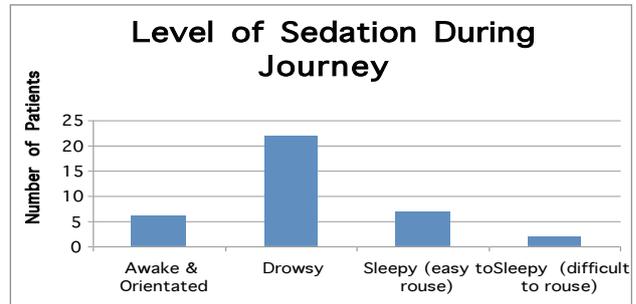


Figure 9. Level of sedation during journey home.

Side effects such as blurred vision, hiccups, restlessness, nausea and vomiting and headaches all occurred, the majority of which resolved within 4 hours with all resolving within 8 hours after leaving the clinic.

Discussion

This service evaluation was carried out following recommendations of a previous study carried out by the author¹ and following the increased popularity of in IN sedation of the concentrated formulation of midazolam (40mg/ml) in adults and in patients with disabilities². Although the previous study used 0.2mg/kg of a 5mg/ml solution with the addition of titrated nitrous oxide in oxygen for sedation, it was felt that the slight increased concentration would afford a better level of sedation as nitrous oxide was not used in this study. This dose was found to be successful in children requiring extractions and simple surgical procedures⁵.

The 1ml syringe used had 0.1ml graduations. For a 20kg child the difference between a 0.2 mg/kg and 0.25mg/kg dose is a volume of 0.025ml, (0.1ml vs. 0.125ml respectively) a very small quantity and doses delivered intranasally may not consistently be as accurate as hoped as it is estimated that the 'dead space' of the syringe and mucosal atomisation device would be approximately 0.1 ml. This small, but significant amount of drug may explain the wide variability in success and failure of this technique, especially if the child sneezed shortly after administration of the drug. In addition, it may also explain the wide variance in the recovery times and the reported (by the parents) level of sedation of the children during the journey home where 2 children were very sleepy.

In a study comparing the differences between INM drops and INM spray⁶ it was concluded that in young children the spray administration of INM produced

significantly less aversive behaviour than administering drops but the effectiveness of the technique was not influenced by the differences in administration of the INM.

The effects of INM were consistent with other reports of rapid onset⁷ (5-15 minutes) and a short duration of effect (40 – 60 minutes).

Midazolam is not licensed for intranasal use in the UK. The 40mg/ml IN solution of midazolam and 20mg/ml lignocaine was used. The conditions for off-licence use are, firstly and most importantly, that the clinician can justify its clinical need. The clinician must be able to support his or her actions in using this preparation by the fact that its use is in the interests of the patient. The clinician must also be able to demonstrate a knowledge and understanding of the available evidence relating to this concentrated preparation including the disadvantages as well as its advantages. Written consent must be also provided by the parent and or patient including the fact that the preparation is used off-licence.

43% of children found it an unacceptable route of administration by exhibiting crying, coughing, sneezing or combative behaviour. This was due to an unpleasant burning sensation plus a bitter taste, which has made this technique less than optimal. The burning sensation was thought to be due to the acidic pH of 3.3 of the IN midazolam which sensitised peripheral pain receptors in the distribution of the trigeminal nerve supply to the nasal mucosa⁸. Despite the stinging sensation of the irritant midazolam solution, 57% of children tolerated the administering of the drug while the other 43% found it unacceptable. This negative behaviour range varies in the literature from rare to 100% of patients⁹. An immediate burning sensation was described by some patients; this persisted for about 5 minutes. This was accompanied by mild to moderate inflammation of the nasal mucosa that persisted for up to 1 hour after the administration of the INM. Due to the small quantity of drug involved, very few children complained of a bitter taste when compared to a previous study¹. Despite the lignocaine in the preparation, the stinging sensation was still apparent as the lignocaine is not in contact with the mucosa long enough to exert its effect before the midazolam had caused irritation to the mucosa. In a recent study¹⁰ it was found that 0.5mg/kg oral midazolam had good acceptability and was effective and safe in children for dental procedures in the hospital.

Many of the patients were treated with active decay and often had draining sinuses in their mouths due to long standing infections. INM produces useful anterograde amnesia which may be beneficial to young children undergoing unpleasant dental procedures.

During the treatment there was no desaturation (less than 5% drop in SaO₂ from baseline) and the patients were always in verbal contact using 0.25mg/kg dose of INM. Another study reported similar results using double the dose (0.5mg/kg INM) for dental treatment, although this group of 3-5 year-olds were all treated in a Pedi-wrap¹¹. In another study 3 doses were used for INM in 2-5 year- old children; 0.3mg/kg, 0.4mg/kg and 0.5 mg/kg. In both studies there was no desaturation with vital signs within physiological limits and there were no significant adverse effects either with or without fasting¹². With the higher doses treatment time was prolonged to about 60 minutes.

Although there was a degree of movement and crying in some of the cases, most of the time it did not impact on treatment. Crying was mainly limited to the immediate post-administration period of the INM.

Patients were recovered in the recovery room and all were assessed for discharge. There was wide variation for the duration of recovery and the thoughts for this were previously discussed and human variation may also be applicable here. Another factor is that all children were starved for 2 hours for clear drinks and 4 hours for foods; some parents had not given their children any food or drink for more than 12 hours and some of these children took longer to recover and were given glucose drinks in recovery after the procedure to help them recover. One patient was nauseous and vomited on the way home in the car. Blurred vision due to the muscle relaxant effects of midazolam on the eye muscles, restlessness and headaches were common post-operative side-effects which did not persist for longer than 4 hours post-operatively.

Although 10 patients were not co-operative enough to have treatment with INM, these patients were all cannulated by the author and their treatment was completed using IV sedation. Parents were invited to stay in the surgery for the duration of the procedure. It was felt that separation anxiety could be reduced and societal attitudes have changed towards increased parental participation during the child's dental experience. Although 76% of parents rated this technique as

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acceptable, this must be treated with caution as there was only a 36% response rate to the questionnaire, but for those who did respond, 83% would have this form of sedation again in the future.

Conclusions

This technique is a safe and effective way of providing paediatric dental treatment to a selected population of anxious patients and thereby avoids the need for dental general anaesthesia.

One drawback with the technique is that it was not an acceptable technique in 43% of children. Other techniques, e.g. oral and intravenous sedation, appear to have a much higher acceptability of administration. This technique may be useful if inhalation sedation, oral sedation or intravenous sedation is considered and the child is still unco-operative, either as a technique on its own or to facilitate cannulation for intravenous sedation.

Accurate dosage with this concentrated formulation may be a problem with this technique in small children.

Conscious sedation for children should only be undertaken by teams that have training and experience in the case selection, behavioural management and administration of sedation for that age group. Clinicians who are considering the use of the technique as described in this paper must be competent in cannulating children should the reversal agent (Flumazenil) be required at any stage of the process. The team involved must be able to cope with any adverse respiratory events in the appropriate environment.

It is important to remember that the use of sedative drugs in children enhances the coping strategy of the child at that visit, but it is not a substitute for behavioural techniques. It is important to interact with the child and not pass on the responsibility to the drug.

Intranasal midazolam is effective for modifying behaviour in mild to moderately anxious children so that unpleasant dental procedures may be carried out. For more invasive or prolonged procedures, or in more challenging patients, the addition of another stronger sedative or analgesic is recommended to facilitate treatment.

Suggestions for further research

Using intranasal ketamine¹³ to provide effective analgesia and sedation to young unco-operative children for dental treatment.

Thanks

To the nurses at Legrave Dental Sedation Clinic who helped with the management of the patients and collating the forms. To Dr Graham Manley for his expert comments and advice in using this technique. To the staff at the pharmacy of St Thomas' Hospital for their co-operation and preparation of the product. To Mr Marcel Mester who helped with the processing and statistical assistance with the project. To SAAD for their generous research grant to help fund the project.

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Cognitive Behavioural Therapy for people with dental fear and anxiety: A toolkit

A unique collaboration between SAAD and the King's College London Dental Institute Health Psychology Service has resulted in the publication of a guide to Cognitive Behavioural Techniques for people with dental fear and anxiety. Essentially the toolkit is aimed at dental healthcare professionals who wish to work with people with dental fear, combining effective and proven cognitive behavioural techniques with pharmacological management approaches.

The toolkit comprises

- An overview of Cognitive Behavioural Therapy
- A review and bibliography of relevant literature including reviews of effectiveness
- A guide to typical CBT sessions for individuals with high levels of dental anxiety
- Example behavioural experiments
- Homework tasks
- Assessment materials for patients
- Guidance on producing written materials for patients
- Resources for graded exposure
- Resources for challenging common 'unhelpful beliefs'
- A guide to evaluation including assessment scales.

Photocopyable resources and links to video and sound materials to support CBT are included. Copies of the toolkit are available from SAAD at a discounted rate of £20 for members. Details on page 87.

We also plan to develop training courses in Cognitive Behavioural Techniques for dental anxiety, based on this toolkit, in the New Year.

ADVANCED PAEDIATRIC CONSCIOUS SEDATION: AN ALTERNATIVE TO DENTAL GENERAL ANAESTHETIC IN THE UK

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Abstract

Background. Child dental anxiety is widespread, and it is not always possible to treat children using traditional methods such as behavioural management, local anaesthesia and even relative analgesia. In such cases a dental general anaesthetic (DGA) is the only option available to facilitate dental treatment in anxious children.

Aim. This study describes an advanced conscious sedation protocol which allows invasive treatment to be carried out in anxious children. It incorporates the use of titrated intravenous midazolam and fentanyl and inhalation agents, sevoflurane and nitrous oxide/oxygen, which is administered by a Consultant Anaesthetist. The aim is to produce an evidence-based study which can offer a sedation technique as a safe and effective alternative to a DGA.

Study Design. Retrospective audit.

Method. 267 clinical records were audited retrospectively from a specialist sedation-based clinic, for children aged 5-15 years old. The subjects all underwent invasive dental procedures with this technique between August and November 2008 as an alternative to a DGA.

Results. 262/267 (98%) of the subjects were treated safely and successfully and without the loss of verbal communication using this technique. This included many treatments requiring four quadrant dentistry, with both restorations and extractions as necessary being carried out in one visit. 5 subjects (2%) did not tolerate treatment and had to be referred for a DGA. No

medical emergencies occurred.

Conclusions. Based on the evidence for this group of patients, this advanced conscious sedation technique, offers a safe and effective alternative to DGA. This technique must be carried out in an appropriate environment by an appropriately trained and experienced team who are able to comply with the recommendations for "alternative" sedation techniques.

Introduction and Background

Dental anxiety in children is widespread and the problem of treating extremely anxious children, other than by a hospital admission for a DGA, is an area which has seen progressive research [Averley et al., 2004a]. Many new techniques researched include the use of oral and transmucosal benzodiazepines, intravenous propofol, inhaled sevoflurane, and ketamine, all of which are considered to be acceptable for anxiety management in children [Averley et al., 2004a; Gilchrist et al., 2007; Hosey, 2002; Mikhael et al., 2007; Millar et al., 2007; Wilson et al., 2006; Wilson et al., 2007].

This audit was carried out at Queensway Anxiety Management Clinic (QAMC) in Billingham, Teesside UK. It is a clinic which provides a unique, specialist, dental referral centre for children and adults who cannot be managed in normal general practice with behavioral and local anaesthetic techniques alone. Treatment here is

carried out by a professional team of 12 dentists, each having postgraduate training/qualifications in conscious sedation. This is in conjunction with six consultant anaesthetists who provide full-time management and cover for patients, six days a week. QAMC delivers dental care for more than 8000 children and adults per year [Averley et al., 2004b], using a range of sedation techniques which are each specific to the individual and their needs. These techniques range from simple Relative Analgesia (RA) using inhaled nitrous oxide/oxygen in combination with local anaesthesia (LA), to a more complex procedure of advanced conscious sedation, which incorporates inhalation and intravenous techniques.

Dental practitioners who are both appropriately trained and experienced in conscious sedation assess patients in line with current Standards for Conscious Sedation in Dentistry guidelines [SDAC, 2003], and the Standards for Conscious Sedation in Dentistry: alternative techniques guidance [Standing Committee on Sedation for Dentistry, 2007]. Following these guidelines, as a first line of management, inhalation sedation with nitrous oxide (RA) is offered to both adults and children. If this treatment does not meet the requirement of the individual then adults and children over 16 years old are offered treatment with intravenous midazolam as a lone sedative, or with the possibility of additional RA to help decrease their anxiety. For the more anxious or unco-operative children (generally under 16 years of age) where experience dictates that they would not be able to tolerate treatment under RA, or for those who have previously failed RA, then these children are offered an alternative to DGA and are invited to be treated using advanced conscious sedation techniques. Express written consent is gained and these children are sedated in line with current guidelines [SDAC, 2003; Standing Committee on Sedation for Dentistry, 2007] and treated using a combination of titrated intravenous midazolam and fentanyl, with the addition of inhaled sevoflurane (0.3%) and nitrous oxide (40%). These drugs are administered by a specialist trained consultant anaesthetist in conjunction with a dedicated team who carry out all necessary dental treatment, generally in one visit. This audit was implemented to assess the success of the outcomes with this sedation technique, in the treatment of anxious paediatric dental patients as an alternative treatment method to DGA.

Materials and Methods

The combination of intravenous midazolam and fentanyl is not a new technique for use in paediatric care in the

hospital environment [Mamula and Markowitz, 2004; Sury, 2004;]. From this concept, an anxiety management technique for treating paediatric dental patients was developed for use at QAMC by the consultant anaesthetists and dental teams, which also included the addition of inhalation sevoflurane and nitrous oxide/oxygen.

Audit Design

The design of this audit is retrospective and was achieved by extracting quantitative data from patient record cards and extrapolating it onto data collection sheets over a three-month period commencing from 1st August 2008.

Population and sample

Exclusions for Audit	Number (n = 420)	% of records inspected
Refused nasal hood	7	1.7%
Not required age	58	18.6%
Failed to attend appointment	40	9.5%
Cancelled	11	2.6%
Attending second treatment session	17	4%
Total exclusions	153	36.4%
Total inclusions	267	63.6%
Total records viewed	420	

Table 1: Total number of clinical records inspected and the percentage of exclusions.

In total, 420 clinical records were inspected between 1st August 2008 and 31st October 2008, producing 267 viable inclusions for the audit. (Table 1)

Inclusion criteria for study data collection:

- Children deemed to be ASA (American Society of Anesthesiology) I – II for treatment.
- Children aged 5-15 years old who will agree to sit in the dental chair at assessment and are able to tolerate an examination.
- Children, who when assessed by dentists experienced in the management of anxious

children, were unable to accept treatment under LA alone or in combination with RA.

- Children deemed to have an adequate degree of comprehension and understanding regarding the treatment (if necessary with the support of an interpreter).
- Children deemed to be able to accept breathing through a nasal hood and able to have EMLA® (lidocaine and prilocaine) topical anaesthetic cream applied to the dorsum of the hand.

Exclusion criteria for study data collection:

- Children ASA III or above for treatment.
- Children with hypersensitivity to benzodiazepines, sevoflurane, nitrous oxide, LA or fentanyl.
- Children aged below 5 years old, or 15 years old or above.
- Children who had refused the nasal hood, or who would not sit in the dental chair prior to, or at the start of treatment on the day. This would have resulted in non-cannulation with no intravenous drugs being given, and treatment therefore being abandoned.
- Children who had failed to attend (FTA) or who had cancelled their appointments.
- Children who were on their second visit for the same course of treatment and had experienced fentanyl before.
- Children who had no record of drug increments in their clinical notes.

Sedation technique

The patient is assessed for treatment in line with current sedation guidelines [SDAC, 2003; Standing Committee on Sedation for Dentistry, 2007], which includes a full medical history and weight measurement. Valid written consent is then gained by the legal parent/guardian for the treatment of the patient and fasting instructions and attendance instructions are given both in written form and verbally to the parent/guardian, who will also be acting as their supervisor. An appointment is made and topical anaesthetic cream (EMLA® cream) is given to the patient to apply before their appointment. This cream is applied to the dorsum of the hand an hour before treatment is due to commence to prevent pain upon intravenous catheter insertion. Once the patient is in the chair a correctly fitting MATRX M® scavenging nasal hood is placed on the child and 0.3% sevoflurane and 40% nitrous oxide is inhaled for approximately two

minutes at a flow rate of 6 litres/minute. This is to help settle the patient's anxiety and to allow cannulation to take place. After successful cannulation has been obtained by the anaesthetist, fentanyl is added intravenously (0.5µg /kg) followed by 0.5mg of midazolam per minute. The midazolam is titrated by the anaesthetist to a clinical end point where the patient is sedated to an appropriate level to allow treatment to commence. The patient is always able to maintain verbal contact in accordance with current UK General Dental Council requirements [GDC, 2005]. A Drager-Julian anaesthetic machine, manufactured in 1998, is used to administer the inhalation sedation agents and also monitor oxygen saturation, blood pressure and other tracings (see below). The nasal hoods used had been specially adapted to incorporate a probe to measure fractional inspired and end-tidal, oxygen, carbon dioxide, nitrous oxide and sevoflurane. The anaesthetist continually monitored oxygen saturation, heart rate, blood pressure, capnography, fractional inspired sevoflurane and end-tidal sevoflurane on a written record sheet. These variables were recorded every five minutes, along with the increments of drugs and the outcome of the treatment for each patient.

Data Collection

The parameters recorded were: age, weight, sex, drug dosage regime and outcome of the treatment. A non-successful outcome was deemed as the child having accepted cannulation and titration of drugs, but being too unco-operative to complete treatment successfully. If treatment was abandoned at this stage then the procedure was classed as a failure with an unsuccessful outcome recorded, and the patient referred for a DGA. All data from the clinical records was recorded onto a data collection sheet using the patients' clinical number only to allow for complete confidentiality. Data was then entered into a Microsoft® Excel® spreadsheet for analysis.

Analytic strategy

The main outcome measurement for the audit was to establish whether the use of this advanced conscious sedation technique was safe, successful and met without incidence. Using a Microsoft® Excel® spreadsheet, results were drawn up giving percentages, means and standard deviations. A chi-squared test was undertaken to compare the successful completion of dental treatment using this technique against a previous study that omitted fentanyl.

Results

Primary Outcome Measurements	n	%	SD	(+/-)
male	140	52%		
female	127	48%		
age (years)			8.8	(2.7)
weight (kg)			33.4	(15.4)
mean dose midazolam (mg)			1.8	(1.1)
mean dose fentanyl (μg)			33.2	(13.7)

Table 2: Summary of results for audit population.

Gender

267 children classed by the American Society of Anesthesiology grading for ASA grades I and II were included in the audit. Amongst these children the gender was approximately even with 52% being male and 48% being female. (Table 2).

Age

The age in years of population treated (Table 2) shows a mean of 8.8 (+/-2.7).

Weight

The weight in kg of the population treated (Table 2) shows a range between 15 and 97, with a mean of 33.4 (+/-15.4).

Intravenous midazolam dosage

The mean dosage of intravenous midazolam (mg) given per individual for treatment (Table 2) was 1.8 (+/-1.1).

Intravenous fentanyl dosage

The range of intravenous fentanyl (μg) given to the population (Table 2) is between 12.5 and 85 with a mean of 33.2 (+/-13.7).

Primary outcome measures

The primary outcome measures (Table 3) show that 98% (262/267) of children successfully completed their treatment with this advanced conscious sedation technique.

Comparison of Success Rate

Treatment Outcome	n	%
Success count within population	261	97.8
Failure count within population	6	2.2
Total count within population	267	100

Table 3: Success rate of completion of treatment for audit population.

Comparison of previous studies.

A comparison of studies carried out at the same centre (Table 4) shows that 98% (262/267) of children successfully completed their treatment with the addition of fentanyl, compared with 93% (249/267) of children with the omission of fentanyl [Averley et al., 2004a]. This was shown to be statistically significant (P = 0.012).

Comparison of Success Rate

Primary Outcome of Group Cross-tabulation

	2004	2008	TOTAL
Success count	249	261	510
% within group	93.3	97.8	95.5
Failure count	18	6	24
% within group	6.7	2.2	4.5
Total count	267	267	534
% within group	100	100	100

Chi- square
the difference between groups was significantly different at 5% level:

$$\text{chi} = 6.282$$

$$p = 0.012 \quad (p < 0.05)$$

Table 4: Comparison of success rate of completion of treatment between 2004 (without fentanyl) and 2007 (with fentanyl) sedation technique studies.

Complications

All children included in the audit were responsive to verbal commands once sedated and throughout the duration of the treatment and during recovery. No child lost consciousness and no adverse events were encountered during treatment that required emergency medical intervention or hospitalisation. Of post-operative complications recorded, three children suffered from post-operative vomiting and were given an anti-emetic (ondansetron). A further child, who was feeling dizzy and disorientated after treatment, was reversed with flumazenil to aid recovery. The clinical records taken showed that all children remained well saturated with no patient falling below 95% oxygen saturation during treatment or in recovery. The children were discharged to their supervisors once they had satisfactorily completed a series of subjective tests for recovery and were judged by the anaesthetist/dentist to be clinically recovered.

Discussion

The advanced conscious sedation technique that has been described and analysed in this study is not in common use in the UK and is not used for every child needing dental treatment at QAMC. The advanced conscious sedation technique is used once it has been established that the patient will not accept conventional behavioural with local anaesthetic or RA for their dental treatment. Without this advanced conscious sedation technique, the only other option open for treatment of these children is via a DGA. Subsequently, it is clinically vital to acquire further knowledge about the safety and success of the conscious sedation techniques used, in order to protect these patients who may be offered this option for their treatment. It is also important to ensure that the conscious sedation techniques being developed and being used fit with current UK guidance on conscious sedation [SDAC, 2003; Standing Committee on Sedation for Dentistry, 2007].

Whilst this audit is necessary to evaluate current practice at QAMC, it cannot adequately assess the full frequency of possible adverse events which may occur outside a specialist setting. It is very encouraging, however, that the results presented show clearly that the administration of intravenous fentanyl and midazolam, along with the gaseous inhalation of sevoflurane and nitrous oxide resulted in a very safe and comprehensive success rate of treatment in these children, whose only other option was a DGA. This was statistically more so when compared against a previous study carried out in the same centre in 2004, using only intravenous midazolam, sevoflurane and nitrous oxide/oxygen. It also recorded that a high proportion of these procedures carried out were to address multiple carious lesions, generally in four quadrants and requiring extractions and/or restorations. The clinical significance is that when this technique is delivered in a specialist care setting with the involvement of consultant anaesthetists and specially trained dental teams, then this technique is shown to be both safe and effective, while also reducing the dependency on dental general anaesthesia for children. Following this, it is still important that further studies and controlled trials are undertaken in order to supplement and support the results from this audit especially when safety is paramount. Adverse events recorded that only 4 children out of 267 children treated (1.5%) required the attention of the consultant anaesthetist during recovery. None of these children

ever lost consciousness or experienced a drop in their oxygen saturation, but it still highlights that best practice for advanced sedation is one that should be carried out in a dedicated environment with the necessary collection of training, equipment and personnel to deal with any medical emergencies that may occur. Subsequently, it is a remit of QAMC that the whole dental team is efficient and well rehearsed in the management of medical emergencies with an up-to-date emergency protocol which is evidence-based, clear and easy to follow. Therefore it must be mandatory that further postgraduate training be undertaken to ensure that this advanced sedation technique remains safe and does not result in the fateful consequences of DGA which occurred in dental practice. However, there is still a place for DGA in dentistry, as children are extremely unpredictable and for some, treatment with conscious sedation will still fail.

Conclusion

The evidence from this audit concludes that by adhering strictly to the SDAC Alternatives Techniques guidance [Standing Committee on Sedation for Dentistry, 2007], advanced paediatric conscious sedation utilizing multiple intravenous and inhalational sedative agents can, and does, work extremely well for patients at QAMC, and is a very effective and safe alternative to DGA. To establish the safety and efficacy of alternative sedation techniques in practice, we would like to encourage those involved with alternative sedation techniques to carry out research in their techniques and to publish their findings.

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SAAD RESEARCH GRANT

SAAD offers a research grant to aid research in pain and anxiety control in dentistry. The award is open to all postgraduates with an interest in pain and anxiety control in dentistry. Individual applications for sums up to £5,000 will be considered. There is the possibility of funding more than one project up to the annual limit. Consideration will be given to applications for pump-priming funds to enable more major projects to be commenced, as well as completely funding projects as appropriate. Priority will be given to research (rather than audit projects). Ethical approval (if available) and indications of support from other interested parties such as drug companies or Health Trusts should be included. If funding is sought prior to the obtaining of ethical approval, SAAD's support will be contingent on this being obtained.

So if you are doing a diploma dissertation, an MSc dissertation, a PhD thesis or research because you want an answer to a question you have then let us help fund your work.

In the first instance, interest in applying for the grant should be registered with the Secretary at derek@debuse.co.uk. Please include your name and contact details along with a summary of your proposal. Applicants may find SAAD's Research Toolkit useful. A more detailed protocol will be requested after initial consideration.

Over the past few years SAAD research grants have been awarded to assist the development of a computerised package to reduce anxiety, support the development of a cognitive behavioural manual and to investigate the efficacy of intra-nasal midazolam in children.

Some SAAD ideas about the questions we need answers to.

- Is dentistry carried out under sedation delivered more cost-effective compared to general anaesthesia?
- Is fasting required for advanced sedation techniques?
- What are the safety and efficacy profiles of sedation techniques in current practice?
- Is patient-controlled sedation with propofol feasible in adolescents and children?
- Can an assessment tool be developed to help support an indication for sedation in children and adults? ■

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A COMPARISON OF SEVOFLURANE AND NITROUS OXIDE FOR ADULT CONSCIOUS SEDATION: A PILOT STUDY

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Aim

To compare sevoflurane and nitrous oxide as methods of inhalation sedation for anxious adult dental patients.

Method

Fifteen ASA 1 and 2 anxious dental patients were recruited from the patient population of the Department of Sedation and Special Care Dentistry as a pilot project constituting part of an MSc in Sedation and Special Care within the Department of Sedation and Special Care Dentistry at Guy's Hospital. The pilot was a randomised clinical cross-over trial involving patients requiring two similar items of dental treatment consistent with the predetermined inclusion and exclusion criteria. A pre-treatment questionnaire based on the Modified Dental Anxiety Scale was completed before participation. Each patient then attended for two treatment visits. Using simple randomisation, patients were assigned to one of two groups, which determined the sedative agent (sevoflurane/oxygen or nitrous oxide/oxygen) to be used at the first treatment session. The patient was not informed which agent they were to receive. Pulse and oxygen saturation were continuously monitored and documented at 5 minute intervals, along with blood pressure, throughout the sedation period. At the second treatment visit, a similar dental procedure was carried out using the alternative sedative agent. The same operator-sedationist was used throughout the trial.

Verbal contact was maintained with the patient throughout the procedure. At the completion of treatment, the patient received 100% oxygen for five

minutes. Patients remained in the recovery area for a further 15 minutes and when fully recovered completed a post-sedation questionnaire.

Results

The fifteen patients recruited to the trial had a mean Modified Dental Anxiety Scale score of 19 out of 25 (range 10–25) where 19 indicates a strong likelihood of dental phobia. The age range of participants was 17–58. The gender distribution was 8 female and 7 male. The Wilcoxon signed-rank matched pairs test was used for statistical analysis along with a correlation analysis using the Spearman correlation method. The majority of patients involved in the trial preferred nitrous oxide/oxygen. This may be due to the euphoric properties of nitrous oxide. Adequate anxiolysis for dental treatment was obtained with both agents. No statistically significant difference was noted for blood pressure, pulse rate or oxygen saturation when the agents were compared. Throughout the sedation with sevoflurane, oxygen saturation remained within 4% of pre-sedation values. The mean concentration of sevoflurane administered was 0.74% (range 0.3–1) and 49.4% (range 20–68) for nitrous oxide. A significant proportion of the patients felt that nitrous oxide helped with their anxiety to a greater extent than sevoflurane ($p = 0.048$). Fourteen out of fifteen patients stated they would be willing to have either agent again for their dental treatment. There was no operator preference.

Conclusion

From the data obtained during this trial and the small population examined, it was not possible to conclusively

MSc PROJECT ABSTRACT

establish a preference for either agent. However, from this small amount of data, there was a trend towards patient preference for nitrous oxide. With regard to the physiological effect of the agents, there were no significant differences between nitrous oxide and sevoflurane as inhalation agents for dental sedation. The operator found that both agents alleviated patients' anxiety sufficiently to allow dental treatment to proceed.

Although in the UK sevoflurane is only licensed as an anaesthetic drug, clinically, sevoflurane is an acceptable agent for inhalation sedation when used as an adjunct to treat anxious dental adults. It is also used successfully when administered concurrently with nitrous oxide for sedation in many specialist sedation practices. However, in light of recent concerns regarding the safety of chronic nitrous oxide exposure and its damaging effects on the environment, sevoflurane when used for dental sedation would seem to be a viable alternative to single agent nitrous oxide sedation. Using sevoflurane as an

alternative sedative agent does have greater financial implications for practitioners. The agent is more expensive than nitrous oxide and, due to the narrower margin of safety, requires more specialist monitoring equipment and specialist training for dental practitioners wishing to use this technique as an operator sedationist. These factors may make the routine use of sevoflurane, as an alternative agent, prohibitive.

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FACILITATION OF THE PROVISION OF INHALATIONAL SEDATION

A PILOT SCHEME FOR SAAD MEMBERS

SAAD Council has recently approved a scheme to loan inhalational sedation and scavenging systems for a six-month trial period to SAAD members.

The two successful applicants will have the opportunity to purchase the systems at the end of the trial period.

Details of the scheme and application forms are available from the SAAD website, www.saad.org.uk or **Derek Debuse**, Hon. Secretary SAAD, **contact details:** SAADoffice@btinternet.com, **tel:** 01302 846149.

A CLINICIAN GUIDE TO PATIENTS AFRAID OF DENTAL INJECTIONS AND NUMBNESS

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Abstract

Fears of dental injections remain a clinical problem often requiring cognitive behavioural psychology counselling and sedation in order to carry out needed dental treatment. This study, based on a national survey in Australia, compared patient concerns about numbness caused by local anaesthesia and fears of the injection itself. It also examined associations between dental fearfulness and avoidance associated with patient self-reported negative experiences and treatment need. Clinical advice on how to approach such patients is offered.

Relatively high levels of dental anxiety and fear have been reported in several industrialised Western societies (McGrath & Bedi, 2004; Armfield, Spencer & Stewart, 2006; Lahti et al., 2007; Enkling, Marwinski & Jöhren, 2006). In the UK, almost one in three adults consider themselves to always be anxious about going to the dentist (Nuttall et al., 2001). Of concern is that this dental fear may be passed on to the children of anxious adults (Nuttall, Gilbert & Morris, 2008), leading to an inter-generational perpetuation of the problem. There is considerable evidence that dental fear is related to poorer oral health, reduced dental attendance and increased treatment stress for the attending dentist.

There are many aspects of going to a dentist that might elicit feelings of apprehension, concern or anxiety in prospective patients (Liddell & Gosse, 1998; Oosterink, de Jongh & Aartman, 2008). One of the most commonly reported concerns relates to receiving injections. Indeed, fear of needles and the treatment of injection fear has been an important focus of a research in the UK (Boyle, Newton & Milgrom, 2010). Needle fear, in particular, is a major issue given that the delivery of local anaesthesia via injection is the central plank of pain relief techniques in dentistry (Malamed, 2009) and dentists as well as patients often avoid difficult injections as a consequence, resulting in poor pain control.

A less well described anxiety of receiving dental treatment is fear of numbness associated with the dental injection (Morse & Cohen, 1983). Certainly, many dentists believe that their patients avoid local anaesthesia because of a wish to avoid the disturbing effects of numbness (Moore et al., 1998). Milgrom et al. (1997) found that fears about the numbness associated with receiving local anaesthesia significantly differentiated avoiders and non-avoiders of dental treatment. However, these concerns appeared to be much less common than those concerning the perceived pain of injections and fear of bodily injury resulting from the injection (Milgrom et al., 1997; Kaako et al., 1998). Consistent with these findings, whereas 43% of English patients asked to imagine undergoing future third molar surgery expressed concerns primarily about pain, only 6% of patients indicated concern about numbness as their worst fear

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(Earl, 1994). More recently, a study of Dutch people found that the feeling of numbness from the anaesthesia was rated as the 41st most feared dental stimulus out of a list of 67 possible stimuli, and that only 1.5% of the general population regarded numbness as extremely anxiety provoking (Oosterink, de Jongh & Aartman, 2008). However, it is important for a clinician to differentiate between those who dislike the sensation of temporary numbness versus those who may worry that it may never wear off. Such problem thinking can be an issue irrespective of whether a patient overcomes the fear of needles with sedation or not. A large number of patients dislike the sensation of numbness enough for manufacturers to respond with a partial antidote in alpha adrenergic receptor antagonist phentolamine mesylate (OraVerse® Sanofi-Aventis, Hersh & Lindemeyer, 2010). Approval of this agent, which shortens the length of soft tissue anaesthesia after inferior alveolar block, is pending in the UK and other European countries. In other cases, dentists resort to using local anaesthetics without vasoconstrictors to shorten the period of anaesthesia (Fiset, Getz, Milgrom & Weinstein, 1989).

While the association between dental fear and fear of injections has received considerable attention, the relationship between dental fear and numbness has received less attention. In particular, the nature of the associations between dental fear and avoidance and anxiety over numbness has not been studied. There has also been no research into whether or not concerns over numbness are independent of injection concerns. Finally, the association between fear of numbness and injections and dental avoidance and treatment needs has not been investigated.

This study, based on survey work in Australia, aimed to compare patient concerns about numbness caused by receiving anaesthesia to that of anxiety over the receipt of needles and injections. Associations with dental fear and avoidance as well as negative experiences and treatment needs were also explored.

Methods

Sampling and participants

The study was nested within the larger 2008 National Dental Telephone Interview Survey (NDTIS), a computer-assisted telephone interview (CATI) study of a representative sample of the Australian population.

Interviewees were asked a number of questions regarding the use of dental services, self-reported oral health and socio-demographic details including income and eligibility for public dental care. Upon completing the CATI, interviewees aged 18+ years were asked if they would be interested in participating in a further questionnaire study. The 'National Dental Anxiety and Fear Survey' questionnaire was sent to a random sample of available adults completing the NDTIS. The questionnaire package contained an information letter, and a 4-page questionnaire with questions on dental fear and perceptions of going to the dentist. Onethousand and eighty-four adults were mailed the questionnaire and 71.7% responded.

Materials

The study used the dental anxiety and fear module (IDAF-4C) and the stimulus module (IDAF-S) of the Index of Dental Anxiety and Fear (IDAF-4C+) (Armfield, 2010). The IDAF-4C contains eight questions, with two items each relating to the cognitive, physiological, emotional and behavioural components of dental fear. Possible item responses range from 'Disagree' (1) to 'Strongly agree' (5) and the mean was used to obtain a total score on the IDAF-4C. The IDAF-S contains 10 items, with possible responses ranging from 'Not at all' (1) to 'Very much' (5). Items related to several of the most common concerns about going to the dentist and included anxiety concerning needles and injections as well as anxiety concerning numbness.

Study participants were also asked to indicate whether or not they had had various negative experiences when visiting a dentist. The question was "Have you ever had any of the following experiences when visiting a dentist?" with the experiences being "intense or sharp pain", "considerable discomfort", "felt like gagging", "fainted or felt light-headed" and "personal problem with the dentist". Participants ticked boxes to indicate if they had had one of the five experiences or ticked the "None of these" box if none of the experiences were applicable. Additional information, including the participant's age and gender, was obtained from the NDTIS CATI. Need for treatment was determined if a person indicated that they needed a filling, an extraction, gum treatment, or a dental crown or bridge.

People were also asked to indicate their total household income in one of 12 possible categories which were here collapsed into four groupings: <\$30,000, \$30,000-\$60,000, \$60,001-\$90,000 and >\$90,000.

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Possible categories for highest level of educational attainment were Year 10, Year 12, Certificate/diploma (graduate diploma and graduate certificate level, advanced diploma and diploma level, certificate level), Undergraduate (bachelor degree level) and Postgraduate. Finally, participants were asked on whether or not they “avoid visiting the dentist or...visit the dentist less often than you believe you need to” (responses: “yes”/“no”) and, if they did avoid dental visiting, whether this was a result of fear or anxiety.

Statistical analyses

Weighting of the data was used to account for differing sampling probabilities due to the sampling design and to adjust the age and gender characteristics for each sampling stratum across all states and territories to 2008 population estimates made available by the Australia Bureau of Statistics Census.

The distributions of response scores were provided for numbness and needle/injection anxiety as well as for aversive experiences at the dentist. Response frequencies for both injection and numbness anxiety were compared. The association between needle/injection anxiety and numbness anxiety and dental fear was tested using Pearson *r* correlations and logistic regression analyses. The association between treatment need, dental avoidance and the experiences of pain, fainting and extreme discomfort and the anxiety relating to needles/injections and numbness was assessed using logistic binary regression analyses. Fainting and painful experiences were included in the analyses due to their potential relevance to injection and needle anxiety, while the experience of extreme discomfort was included due to its possible relevance to numbness anxiety. SPSS (Chicago, Ill) version 17 was used for statistical analyses and all results reported using weighted data unless stated otherwise.

Ethics

Ethics approval for the NDTIS 2008 was obtained from the Australian Institute of Health and Welfare while ethical clearance was obtained for the nested questionnaire-based dental fear study from the University of Adelaide Human Research and Ethics Committee. No financial or other incentive was provided for participation in the study and participants were informed that the information provided would be confidential and the results anonymous.

Results

The mean dental fear score reported by this Australian adult survey population was 1.87 (95% CI = 1.81–1.93) where 1 = not at all and 5 = very much. About one in seven (14.6%, 95% CI = 11.8–17.9) of the weighted sample scored at or above the mid-point of 3 on the IDAF-4C and 20.6% (95% CI = 17.1–24.5) had a score at or above 2.5. Twelve percent (*n* = 130) of participants reported avoiding treatment because of fear while 29.5% (*n* = 319) reported needing treatment (filling, extraction, gum treatment or crown) beyond a routine preventive visit. The distributions of responses for numbness anxiety and needle and injections anxiety are shown in Figure 1.

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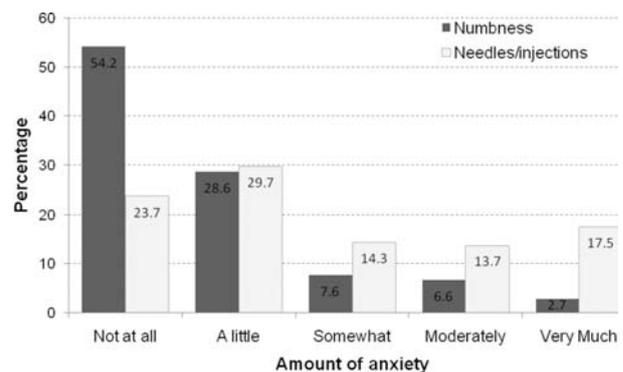


Figure 1. Percentage of people with different amounts of anxiety concerning numbness and needles/injections

Anxiety over numbness caused by anaesthetic was reported less frequently than anxiety over needles or injections. Approximately 54% of people (*n* = 585) indicated that they were not anxious in relation to numbness while only 24% of the sample (*n* = 260) rated themselves as not at all anxious in relation to needles or injections.

The experience of aversive events ranged from a high of 47.8% of people (*n* = 518) who had experienced considerable discomfort when going to the dentist down to 3.9% of people (*n* = 42) who had experienced a personal problem with the dentist. Other common experiences were intense or sharp pain (44.2%, *n* = 479) and feeling like gagging (24.5%, *n* = 266) while 8.8% of participants (*n* = 95) had fainted or felt light-headed. People with greater anxiety in relation to needles/injections or numbness were significantly more likely to have had each of the aversive experiences (Table 1).

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Table 1. Association between anxiety over numbness and anxiety over needles or injections and self-reports of previous treatment pain, discomfort, gagging, fainting or interpersonal problem with the dentist.

Previous Experience	n	Anxiety of needles/injections					Anxiety of numbness				
		1 (Not at all)	2	3	4	5 (Very much)	1 (Not at all)	2	3	4	5 (Very much)
Pain	475	41.1	45.5	41.5	53.5	79.3	29.3	42.6	48.4	54.7	57.4
Discomfort	514	39.2	51.1	57.3	78.9	82.8	28.4	38.4	64.5	60.5	68.4
Gagging	263	19.1	26.7	33.7	32.4	62.1	16.4	17.9	32.9	27.2	38.4
Fainting	95	4.6	9.4	16.9	25.4	23.3	1.2	6.9	14.2	12.2	15.3
Problem with dentist	42	2.9	3.2	9.6	9.9	0.0	2.0	3.1	5.8	5.4	5.3

When fears were dichotomized at “not at all fearful” versus any fear, the odds that a survey participant who had any fear of injections was also fearful of numbness was 6.90 (95% CI = 4.78,9.96). The correlation between anxiety in relation to numbness and anxiety over injections and needles was high ($r = 0.50$, $p < 0.001$) with being afraid of injections explaining about 25% of the variation in being anxious about numbness. The nature of the association is shown more clearly in Table 2. When the fear responses were dichotomized at “very much” versus other categories, participants who were very much anxious of numbness were for the most part (89%) very anxious of injections. However, the opposite was not the case with only 13.7% of people who were

very much afraid of needles or injections also being very much afraid of numbness. Indeed, of those participants in the survey who were very afraid of needles or injections, just over one quarter (26.3%) indicated that they were not at all anxious about the feeling of numbness.

Both anxiety concerning numbness and needles/injections were significantly associated with dental fear, with Pearson r correlations being 0.46 and 0.58 ($p < 0.001$), respectively. The odds of high dental fear (IDAF-4C score ≥ 3) were statistically significant for both injection/needle anxiety (OR = 2.55, 95% CI = 2.20, 2.97) and numbness anxiety (OR = 2.30, 95% CI

Table 2. Association between anxiety over numbness and anxiety over needles or injections

Numbness Anxiety	Needles /injections Anxiety									
	Not at all (1)		A little		Somewhat		Moderately		Very Much (5)	
	n	%	n	%	n	%	n	%	n	%
Not at all (1)	217	37.5	196	33.9	63	10.9	53	9.2	50	8.6
A little	35	11.3	107	34.6	64	20.7	54	17.5	49	15.9
Somewhat	1	1.2	12	14.5	19	22.9	21	25.3	30	36.1
Moderately	3	4.2	5	7.0	9	12.7	19	26.8	35	49.3
Very Much (5)	0	0.0	0	0.0	0	0.0	3	10.3	26	89.7

n= 1,071

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= 1.98, 2.66). People who indicated that they avoided going to the dentist due to their level of dental fear also had significantly more anxiety concerning both numbness and needles/injections (Figure 2). In addition, there was a significant association between fear of numbness and perceived treatment need, OR = 1.22 (95% CI = 1.08, 1.38), $p = 0.001$. However, the association between fear of needles and perceived treatment need was not significant, OR = 1.08 (95% CI = 0.99, 1.19), $p = 0.085$.

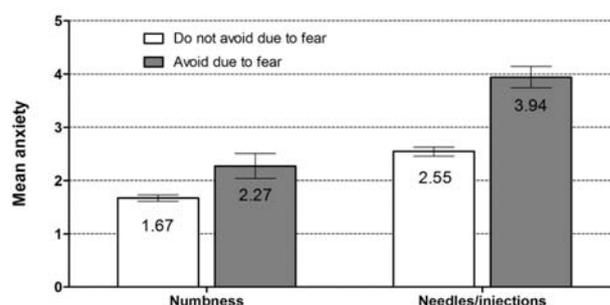


Figure 2. Anxiety concerning numbness and needles/injections

Table 3 provides a side-by-side comparison of the multivariate analysis of the relative impact of perceived need for treatment, self-reported fainting experience,

Table 3. Binary logistic regression models showing the impact of age, gender, income, treatment need, fainting experience and pain experience on Needle Injection Anxiety and Numbness Anxiety

	Needle Injection Anxiety [‡]			Numbness Anxiety [‡]		
	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>B</i>	<i>SE</i>	<i>OR</i>
Age						
15–39 (Ref.)	1.0			1.0		
40–59	-0.131	0.162	0.878	0.113	0.202	1.120
60+	-0.414	0.220	0.661	-0.119	0.286	0.888
Gender						
Male (Ref.)	1.0			1.0		
Female	0.852***	0.142	2.344	0.328	0.179	1.388
Income						
<\$40,000 (Ref.)	1.0			1.0		
\$40,000–\$79,999	-0.083	0.206	0.920	-0.181	0.261	0.835
≥\$80,000	-0.118	0.211	0.889	0.138	0.259	1.148
Treatment need ^{‡‡}	0.073	0.156	1.076	0.182	0.192	1.200
Experienced fainting	1.136***	0.279	3.114	1.256***	0.250	3.512
Experienced pain	0.305*	0.152	1.357	-0.210	0.194	0.811
Experienced discomfort	1.168***	0.151	3.217	1.126***	0.205	3.083

[‡] Dichotomised as 'Not at all', 'A little' or 'Somewhat' afraid versus 'Moderately' or 'Very much' afraid

^{‡‡} no treatment required versus any treatment (filling, extraction, gum, crown and bridge) required

* $p < 0.05$; *** $p < 0.001$

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and self-reported previous painful dental treatment on anxiety after adjusting for age, gender, and income. The two fears share in common that respondents who reported a previous fainting experience were more likely to be afraid of injections (OR = 3.114, 95% CI = 1.803, 5.378) and also be afraid of numbness (OR = 3.512, 95% CI = 2.153, 5.731) relative to those not reporting a fainting experience. The experience of extreme discomfort was also significantly associated with both fear of needles or injections (OR = 3.217, 95% CI = 2.391, 4.328) and fear of numbness (OR = 3.083, 95% CI = 2.063, 4.608). In contrast, those with a previous self-reported painful experience were more likely to be afraid of injections (OR = 1.357, 95% CI = 1.008, 1.828) but not of numbness.

Respondents who avoided attending the dentist and who also self-reported treatment needs were 3.1 times more likely to be afraid of injections (OR = 3.104, 95% CI = 1.727, 5.581) and 10.9 times more likely to be afraid of numbness (OR = 10.882, 95% CI = 4.457, 26.571). Those who were afraid of both injections and numbness at a clinically significant level (either 'Moderately' or 'Very much' afraid) were 3.6 times more likely to avoid treatment (OR = 3.640, 95% CI = 2.411, 5.495) and 1.7 times more likely to say they needed treatment because of their fear (OR = 1.683, 95% CI = 1.189, 2.382) than those who were not afraid.

Clinical Implications

About one quarter of patients in this representative survey of Australian patients had some fear of intraoral injections and one half expressed at least some concern about numbness. Such problems can lead to treatment avoidance or irregular attendance. Many of these patients are referred for sedation (Boyle, Newton & Milgrom, 2009). Among those seeking help to overcome fears through sedation and/or counselling psychology (Boyle, Newton & Milgrom, 2010), these problems are likely seen in everyday practice. For the patient who is primarily concerned with the injection, behavioural and pharmacological calming strategies that help overcome the cognitive and physiological upset, the use of topical anaesthetics, and slow injection are usually very successful.

Some of those who are afraid of numbness merely dislike the sensation. Careful explanation of the trade-

off between excellent pain control and minimizing the use of local is often enough to deal with these "goers but haters". For sedated patients in this category, the use of an alpha antagonist may be worth considering in the future. However, phentolamine mesylate is expensive and its use may be hard to justify in generalist practice except under unusual circumstances.

On the other hand, there is a subgroup of fearful patients who interpret prolonged soft tissue numbness as a distressing portent of physiological damage that may even be life threatening (Fiset et al., 1985). Note the relationship between a history of fainting and fears of injections and numbness. As with fainters, instructing such a patient to relax may precipitate a medical emergency. Prior to the treatment session, these patients need a careful explanation of the safety of local anaesthesia and should be monitored post-operatively in the surgery rather than be released to home immediately after the completion of the procedure. Such patients often are reassured when the monitoring includes routine blood pressure and heart rate. A follow-up telephone call to check that the numbness has worn off and to provide continuing reassurance is very helpful. Nevertheless, it is extremely hard to modify the deeply-held views of many of these patients and they will often regard a successful treatment as a one-off event and need the same careful preparation for care in the future. Such patients should be kept on short recall intervals irrespective of whether they need restorative care.

Acknowledgements

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2010 CONFERENCE

DENTAL SEDATION: NEW GUIDANCE AND BEST PRACTICE SAAD ANNUAL CONFERENCE 2010

Peter Walker

On the 17th May the National Institute of Health and Clinical Excellence (NICE) released new guidance for consultation on sedation in children and young adults. As the title hints at, to say the scope and conclusion would be vast is an understatement; 317 pages later is a document looking at the majority of clinical practice in both medical and dental fields. So when someone in SAAD had the great idea to have a day to review the guidance it was met with a positive response. This led to the above title for SAAD's annual conference and the themes for the day's programme.



After a no-fuss registration at the Royal Society of Medicine the day commenced with a warm welcome from one of the conference's organisers, Diana Terry, who chaired the morning sitting, along with an introduction from SAAD's president, Dr Nigel Robb. When it was quite clear where the fire exits were situated Nigel introduced the first speaker of the day, Kathleen De Mott, one of the researchers involved in the NICE guidance. Kathleen then led the audience through



the principles behind creating the paediatric sedation guidance. I don't know how she managed to review so many different journal articles, but thankfully she managed it and demonstrated the evidence-based foundations of the guidance.



Diana Terry, Immediate Past President chaired the morning session

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Nigel Robb, SAAD's President presents Ian Alberts with the Drummond-Jackson Essay Prize

The following speaker was Dr Mike Sury. Mike's background was in paediatric anaesthetics and he chaired the NICE committee. He spoke through the scope and findings (although some controversial points) he emphasised all conclusions were evidence-based as much as possible. The talk was very interesting and relevant because its overall message was safe sedation. However, I was not sure what was more challenging for Mike, questions from the floor or battling with his corrupt PowerPoint presentation.



Andrew Wickenden, Membership Secretary chairs the afternoon session



Jennifer Lange, winner of the SAAD Essay Prize for Dental Nurses

Lastly, to sum up Dr Nigel Robb presented SAAD's response to the guidance. There was a total of 47 discrepancy points raised! However the presentation highlighted important conflicting issues which SAAD felt needed addressing in the draft guidance. We look forward to seeing the final version in December 2010. After a heated Q+A session and recess, Diana Terry introduced the next speaker of the morning, Suzanne Scott. Suzanne gave an excellent presentation introducing the development of a new cognitive behavioural therapy (CBT) package. In summary it is a comprehensive CBT tool kit to help guide dentist and patient through a structured psychological approach for anxiety management. With the added benefit of a discount for SAAD members!

Judith Husband was the next speaker on stage. Hopefully I will never see Judith as a patient in her surgery because she has been working for the prison service for the last 11 years. Judith took the audience through the highs and lows of working in and with a

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The Cardiac Services Stand

prison service. She also voiced her hopes for the service in the future.

After an advertisement by our Hon. Treasurer, Stephen Jones who promoted the successful inhalation machine loan scheme, awards were presented. These were given to Jennifer Lange, who won the Dental Nurse's Essay Prize and Ian Alberts who won the Drummond Jackson Essay Prize. Then we were all let loose for lunch. It was the first time I had been offered a broccoli and apricot curry but after initial doubts I was extremely impressed. I was also impressed with the well co-ordinated service by Royal Society's staff.

The next session after lunch was chaired by Andrew Wickenden who helped organise the day with Diana Terry. Andrew had the honour of introducing the speaker from Wrexham Maelar Hospital, Aruni Sen. Aruni is a consultant in emergency medicine and gave a hilarious account of his sedation and trauma experience in the department. He managed to easily keep everyone's attention after a heavy lunch but I was slightly concerned



The McKesson Stand

that some people's lunch might have made a reappearance due to some of Aruni's gory slides!

Veteran speaker David Craig then took the stage to explain the role and purpose of the new Intercollegiate Committee on future guidance in sedation. He showed the exciting ideas and scope for future training in advanced techniques used by the final speaker of the day, Michael Wood. Mike gave an excellent example of paediatric sedation techniques that he uses to demonstrate the sedation techniques mentioned in the guidance which NICELY wound up the day.

Now we can look forward to next year's conference which is planning to explore the future scope and training of advanced sedation techniques

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SAAD TRUSTEES' STUDENT AWARD 2010 - SOME PERSONAL EXPERIENCES

Each year the Trustees of SAAD invite each dental school in the UK to nominate two senior students to attend the Annual Meeting in London at a very reduced rate. The Trustees' intention was to make soon-to-be qualified students more aware of SAAD and its activities and further their developing interests in conscious sedation. This year Barts and The London School of Medicine and Dentistry was represented by Puvneet Ahuja and Mustafa Sattar. They wrote the short summary which follows of their experiences on the day.

'We thought the SAAD conference was a great chance to learn about current advances in the field of pain control. We found the lectures fun and exciting with so many prominent guest speakers, and felt we obtained a really useful insight into some of the challenges faced today by dentists. We would definitely recommend future years of students to put themselves forward for this Award, as we found the day a great experience, which all levels of undergraduates would appreciate and benefit from.'



Puvneet Ahuja and Mustafa Sattar. Students from Bart's and the London School of Medicine and Dentistry

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DENTAL SEDATION: NEW GUIDANCE AND BEST PRACTICE SAAD AUTUMN CONFERENCE ABSTRACTS

25 SEPTEMBER 2010

NICE GUIDELINES FROM NICE PERSPECTIVE

Kathleen De Mott

Research fellow in the NICE guideline programme

The National Institute for Health and Clinical Excellence (NICE) provides guidance, sets quality standards and manages a national database to improve people's health and prevent and treat ill health. Clinical guidance for paediatric sedation is to be published in December, 2010. This guidance includes recommendations which relate to dental sedation for children. The NICE guideline development process was outlined in this presentation with specific reference to the Paediatric Sedation guidance. A definition and description of NICE guidance was provided. The process of guideline development was described, using examples from Paediatric Sedation. This process ranges from development of the guideline scope with stakeholder involvement, to identifying the key clinical questions for review. The medical evidence is then searched and reviewed using a rigorous system called GRADE to quality assess the literature and to perform meta-analysis when appropriate. Evidence statements are generated and

subsequently the guideline development group uses these summary statements to make recommendations for treatment. All NICE guidance is subject to a final public consultation period. Each consultation comment is answered and after internal sign-off the guideline is published. A quick reference guide for clinicians, as well as information for the public, is produced in conjunction with the guideline development group and made available after publication. An implementation package is also developed and key priorities for implementation are identified. In the case of Paediatric Sedation the development of a nationally accredited multidisciplinary course for sedation practitioners was highlighted and the dental profession was asked to participate in this goal. ■

CLINICAL PERSPECTIVE OF NICE GUIDANCE

Mike Sury

*Consultant Anaesthetist, GOSH
Chairman of NICE GDG on Paediatric Sedation*

The National Institute for Health and Clinical Excellence ('NICE') has commissioned the development of a clinical guideline on "Sedation for Diagnostic and Therapeutic Procedures in Children and Young People". The scope was agreed by stakeholders – in broad terms it says "give guidance on the use of effective and safe sedation" and "what training should be recommended?".

The guideline development group (GDG) had 11 clinical members of whom two were dentists. Clinical questions were agreed to cover the scope. Published evidence was sought to answer these questions. Where evidence was unavailable consensus of opinion was given. The guideline took two years to develop and was submitted for consultation in May 2010. It covers the following main themes:



Kathleen De Mott

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Mike Sury

- Pre-sedation assessment, communication, patient information and consent
- Fasting
- Psychological preparation
- Personnel and training
- Clinical environment and monitoring
- Drugs and techniques (midazolam, k, chloral hydrate, triclofos sodium, nitrous oxide, sevoflurane and isoflurane, propofol, opioids)

Some of these will influence the delivery of dental sedation in the UK. ■

SAAD VIEWPOINT ON NICE GUIDANCE

*Nigel D Robb
President SAAD*

SAAD registered itself as a stakeholder for the NICE Paediatric Sedation Consultation process, and as such we responded to the consultation in the summer.

The process was that all Board of Trustees members were invited to comment, and all members of SAAD were notified via the 2010 newsletter and asked for comments. As Chairman of the Scottish Dental Clinical Effectiveness Programme Committee on Sedation I had been involved in producing a response to the consultation. That response was circulated to the board for information to assist our response.

SAAD has had a long history of involvement with the production of guidelines and guidance documents for the

profession. As a society we have always welcomed anything that will improve the safety and efficacy of patient management, is clear, concise, unambiguous and does not reduce availability of service.

The response the Board of Trustees submitted to the consultation process covered over 40 points. This presentation covers the main issues. Any member who wishes to see the whole response is invited to contact the Executive Secretary by email for a copy.

The main areas of concern for the Trustees were as follows: -

- Evidence cited. Neither of the Cochrane reviews on Sedation in Dentistry were referenced and some of the papers that were included in the Cochrane reviews were not included in the NICE document. The question was how a reference could be acceptable to Cochrane but not to NICE?
- The age range was too wide. In dental guidance individuals over the age of 12 were considered suitable to be managed as adults. Patients under 2 years presented significantly different management problems to those over 2, and thus it was difficult to have a “one size fits all” set of recommendations.
- Definition of sedation. The response from SAAD was that the “dental definition” of sedation was appropriate for our needs. Extending the definition to responds to “verbal contact and/or mild physical stimulation” was unhelpful as it accepted a deeper level of sedation than we currently accept and also has the potential for confusion. Response or lack of it to verbal command is absolute. The gradation from mild to moderate physical stimulation is open to interpretation, and could lead to deeper than desirable levels of sedation being used.
- Categorisation of techniques. In the categorisation of techniques oral sedation is included in the minimal group whilst IV is included in the moderate group. In dentistry oral sedation is used to produce moderate sedation. The logical extrapolation of the NICE recommendations is that oral requires less training than moderate sedation – something that is totally contradictory to established dental guidance.
- Fasting as for GA is recommended. This was recommended despite the fact that there was no evidence to support this. In fact one of the studies quoted indicated that those who were starved required higher doses of sedative and took longer

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Nigel Robb

to recover than those who were not starved. This recommendation was also indicated as an area for future research. This seems mutually contradictory.

- Propofol. The use of propofol was recommended for anaesthetists in hospital. This appears to be at odds with much currently published research, current practice and current Department of Health Guidance in other areas.

The Guidelines Development Group have had a huge and very difficult task trying to find recommendations that would cover such a wide age range and different clinical settings. A number of the recommendations clearly are totally consistent with current dental thinking. These include: -

- The recognition that not all children can be managed with Inhalation Sedation and that other techniques are also needed.
- Training is important and should have one standard for all providing sedation.
- Patient assessment is vital.
- Patient mentoring is important.
- Recognition and management of complications must be taught.

SAAD looks forward to seeing what changes have been made in response to the consultation process. There has been significant progress with the production of this consultation document, and the problems primarily relate to the age range considered and the definition of sedation employed in the document. ■



Aruni Sen

PROCEDURAL SEDATION: WHO IS THE SLEEP FAIRY?

Aruni Sen

Honorary Senior Lecturer for Cardiff & Manchester Medical Schools

Sedation is carried out by clinicians from many specialties towards diverse purposes. The popular terminology of conscious sedation makes way for confusion about its implication and risks. Correct terminology of “procedural sedation” with clear understanding of its levels would make for safer practices.

Various drugs are in use. The clinician needs to know the drugs, their therapeutic nuances and use them wisely for maximum clinical benefit and lowest complication rate. Complications and adverse reactions are rare but expected with procedural sedation. One must be aware of these and retain relevant skills and equipment to deal with them. Nasal capnography would be particularly useful in avoiding undetected respiratory depression. All clinicians involved in sedation must be adequately trained in both the sedation itself and treatment of its possible complications.

With the above conditions, sedation need not be limited to one area or specialty of practice. ■

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COGNITIVE BEHAVIOUR THERAPY TOOLKIT

Suzanne Scott

*Lecturer in Health Psychology,
King's College London Dental Institute.*

A large proportion of adults in the United Kingdom are fearful of visiting the dentist, with many adults delaying seeking help for a painful dental condition as a result of their dental fear. The prevalence of dental anxiety has not changed markedly in the last 30 years, even though dentistry now uses more modern and less painful technology. Fear and anxiety lead to avoidance of dental treatment which in turn leads to poorer oral health.

In October 2008 the Department of Sedation and Special Care Dentistry at Guy's and St Thomas' NHS Foundation Trust launched the King's College London Dental Institute Health Psychology Service for Adults with Dental Anxiety. The remit of this service was to provide Cognitive Behavioural Therapy for individuals with dental phobia. Cognitive Behavioural Therapy is a psychological approach to the treatment of extreme fear which is based on techniques of challenging unhelpful thoughts associated with fear, in combination with behaviour therapy such as with graded exposure to the feared object. Meta-analysis of previously published studies suggests that the techniques are highly effective in the treatment of dental fear.

The King's College London Health Psychology Service team have developed specific resources for use with the patients who attend the service including worksheets, homework tasks, computerized graded exposure packages, template referral letters and structured session guides. In collaboration with the Society for the Advancement of Anaesthesia in Dentistry, the King's College London Health Psychology Service team have collated these resources into a toolkit that also includes an overview of cognitive behavioural therapy, a bibliography of relevant literature, guidance on producing written materials for patients, and guidance on evaluating services. The toolkit is now being produced for service providers wishing to set up similar services. Many of the resources can also be used by the dental team as stand-alone techniques in the day-to-day management of anxious patients. Future work will involve assessing the long-term efficacy of the Health Psychology Service and provision of training in cognitive behaviour therapy techniques for dental professionals.

For further details please email suzanne.scott@kcl.ac.uk ■
The CBT toolkit is now available from SAAD, details on page 87.

ANXIOUS OR AVOIDING? THE CHALLENGE OF PROVIDING DENTAL CARE IN PRISON

Judith Husband

Vice Chair, BDA Executive Board

Prison dentistry may seem to be an irrelevant niche but it impacts significantly on the patients most in need of dental care and oral health education.

Prisons vary considerably; some have individuals in open, relatively relaxed conditions whilst others are of the highest level of security with the most dangerous individuals deemed a significant risk to society or the state. I have worked in five establishments ranging from A to D category open. All prisons are similar in that the individuals they are responsible for need dental care and in our society have rights to access that care.

Now in my tenth year of providing care in prisons the nature of the work and contracting processes have changed dramatically.

Over the past two years a considerable amount of work has been undertaken by the profession and Department of Health to provide commissioning guidance to contracting organisations together with the publication of the Dentists with Special Interest framework for prison dentistry. The future, however, is uncertain with doubts over how prison dentistry will sit within the new NHS structure.

In Bullingdon Prison we have built the dental service around the needs of our patients and the constraints of the prison regime, a delicate balance. Our mission statement underpins this –

"We will be a patient-centred, responsive and innovative service that is totally committed to preventative care and personal responsibility."

Prisoners' health behaviour is distinctly different to the general population with as many as 78% being smokers

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Judith Husband

and 83% having used illicit drugs. The majority of prisoners come from lower socioeconomic groups with fewer educational qualifications, thus being less likely to use services available in the community.

The document “Choosing better oral health” emphasises the need to move away from the traditional approach of treating people to a preventive approach involving fewer interventions.

It is against this background that it becomes more urgent to expose the prison population to an environment which will encourage healthier choices.

A debate has been ongoing for many years with respect to “an appropriate range of dental services”; to date there is no common agreement across the prison dental care providers, interpretation is variable and in some cases contentious.

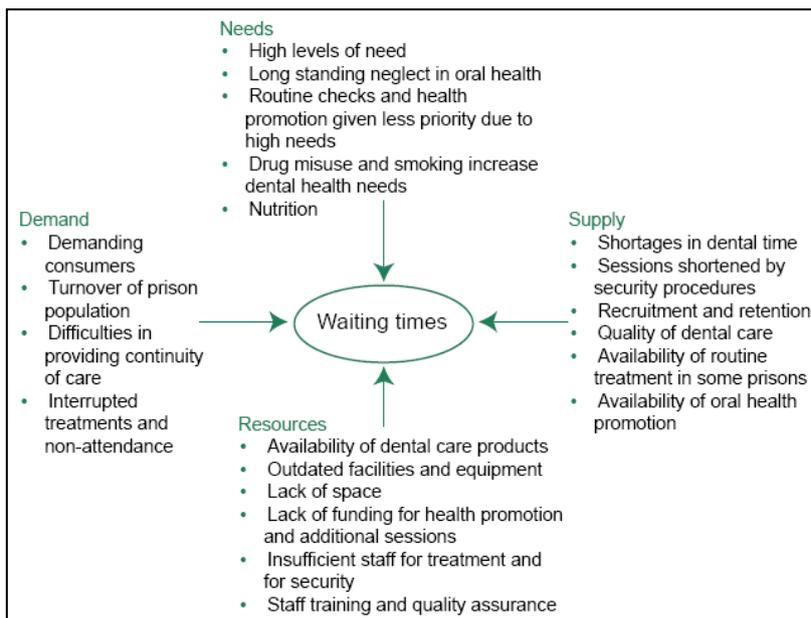
“The amount of untreated dental disease amongst all prisoners is approximately four times greater than the level found in the general population coming from similar backgrounds.”

Marshall et al., 2000

The dental health needs of prisoners differ significantly from those of the general population. We are faced with high numbers of emergency and urgent cases, increased levels of dental neglect, high rates of substance misuse and underlying poor nutrition.

Prisoners vary in their ability and motivation to take care of their own oral health, often entering prison with a previously chaotic lifestyle. Recently we have seen a growing number of detainees who are foreign nationals and all prisons have disproportionately higher levels of people with learning disabilities and mental health problems.

The demand for dental care in prisons is increasing, in my personal view significantly since the introduction of the 2006 GDS contract. The prison population in England and Wales continues to grow. High turnover of prisoners in some institutions can act as a barrier to effective dental care and there are often conflicting



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demands for ‘unrealistic’ or ‘inappropriate’ treatments ranging from opiate-seeking behaviour to cosmetic dentistry requests.

Reforming prison dental services in England; a guide to good practice; (OPM 2005) describes the challenges in all prisons.

Prison dentists have to contend with a myriad of competing demands; a range of skills, additional to those needed in general practice are required and hence the DwSI framework.

Security is the key area and often directly impacts on the actual clinical time available for dentists to treat patients. It is also of great concern when escorting prisoners to appointments outside the secure environment – it is a very real absconding opportunity.

Prisons recognise the importance of promoting oral health, although not all of them have the necessary resources or capacity. Effective health promotion interventions, for example increased fluoride intake, need to be championed by dental teams and supported through innovative commissioning.

Dental teams have an ethical and legal responsibility to raise concerns and ultimately refuse to undertake prison work if the clinical standards and facilities fall short of minimum national recommendations. Naturally HTM 01-05 is proving very interesting with most prisons unable to comply with best practice guidance.

Moving to the patients’ perspective when prisoners are offered dental care uptake and requests are very high. Our service is routinely exceeding six hundred requests each quarter, demonstrating a clear perceived need amongst the population.

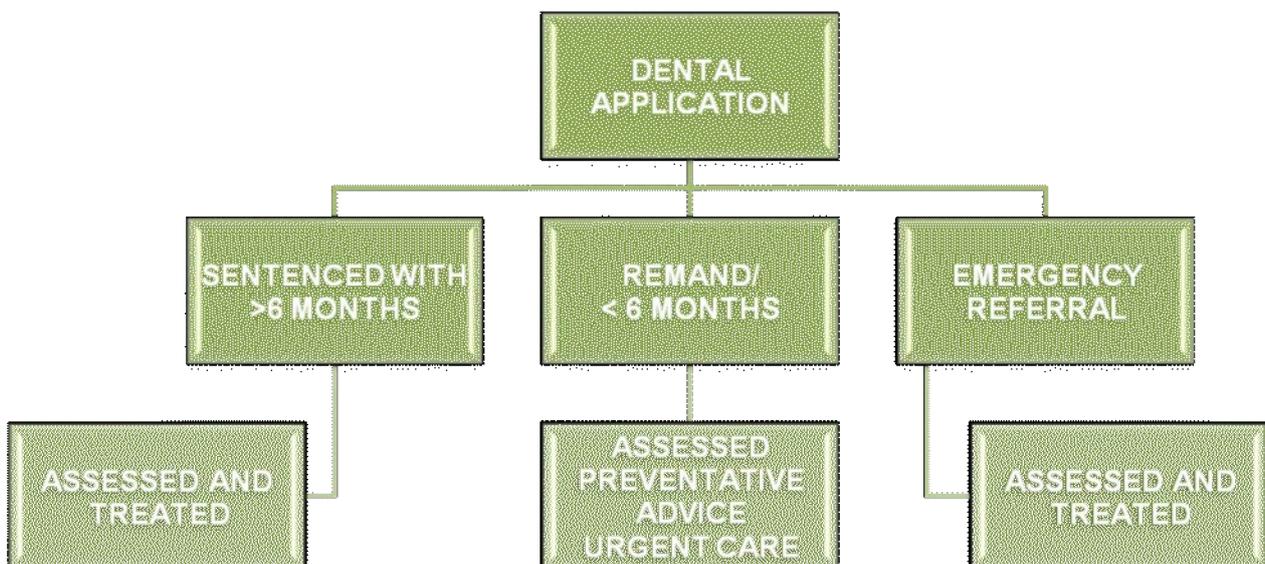
Unfortunately many do not apply, or present only with extra oral facial swelling and severe pain. To complicate matters further most patients will exaggerate symptoms in a bid to “jump” the waiting list.

The care we provide is based on 2003 Department of Health guidance. This pragmatically suggested a three-hour clinical session for every 250 prisoners. There was no real evidence base for this and prison populations vary significantly, stable units needing a different service to short- term and remand establishments.

Dentistry is a significant factor for general health. This is recognised as having a positive effect on future risk of reoffending – dentistry can contribute to society in far-reaching ways.

Prison presents a unique opportunity to introduce and reinforce simple but significant healthy choice messages, and release pressure on services in the community.

Health inequalities present an opportunity to raise the profile of dentistry and importance of our profession. With government spending reviews and the wider economic climate far from settled it is paramount that dentistry is recognised as an essential service with



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significant contribution to health and society.

Most individuals are anxious about receiving dental care. In our society it is acceptable to cite fear as a reason for avoidance or non-compliance, yet we see a huge growth in cosmetic dentistry. Perhaps the real reason for avoidance is not just anxiety but perception of need and personal prioritisation?

Many patients request “to be knocked out” the majority are happy to receive care using local anaesthesia, sometimes after lengthy behavioural therapy but generally using persuasion and investing time to allay concerns.

Prisons have escort costs borne by the PCT, each referral externally drains further the financial resources available for patient care.

All prisons cancel a significant number of appointments with external providers; short notice cancellations due to staffing levels and emergency referrals taking priority is a significant risk and potential cost to external providers.

And finally we have a rise in demand if a service deemed attractive becomes widely available demand soars.

Do we really need sedation?

Sometimes we are fulfilling our patients' expectations and previous experience. Returning to my service mission statement there needs to be personal responsibility and ownership of oral health – we should not make our patients dependent on medical interventions.

In situations of patient distress and severe infection administration of local anaesthesia can be difficult but it is the responsibility of dentists to ensure their skills and techniques are of a high standard and not use referrals to avoid difficult clinical situations.

The success of behavioural therapies is well documented for dental anxiety and phobia, external factors impact upon our commitment to use these skills. Our profession has the opportunity to improve the lives of patients immeasurably; enable them to take control, overcome life-long held fears but contracting systems driven by UDAs and short term measures fail to encourage and reward attempts to gain genuine long-term health outcomes.

Working with mental health teams and psychiatrists presents opportunities for providing dentistry as part of an integrated health pathway, an exciting area of potential development.

I would like to share with you a glimpse of my perfect world.

Adequate provision of care with prevention programmes. Experienced prison dental teams supported by DwSI – prisons.

Partnership working within prisons and post release.

Most importantly, streamlined referral pathways; some patients will always need sedation and general anaesthesia.

We are a small profession providing a vital service in widely variable locations and with diverse populations of patients. We often share those patients, sometimes only for a brief time, but make our contribution to improve all our patients' lives. ■

THE FUTURE OF SEDATION - RCS VIEWPOINT

David Craig

Intercollegiate Advisory Committee for Sedation in Dentistry

The Intercollegiate Advisory Committee for Sedation in Dentistry was established in May 2010 and continues the work initiated by the Standing Committee on Sedation in Dentistry. The IACSD provides a forum for collaboration between the Faculty of Dental Surgery of the Royal College of Surgeons of England, the Royal College of Anaesthetists and the Faculty of General Dental Practice (UK) (FGDP) along with the Dental Faculties of Royal College of Surgeons of Edinburgh, the Royal College of Physicians and Surgeons of Glasgow and the Royal College of Surgeons in Ireland.

Functions

To set standards for the use of conscious sedation in dentistry

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To promote the highest standards of practice for conscious sedation in dentistry

To encourage and assist the development of high quality undergraduate training and assessment in conscious sedation

To encourage and assist the development of nationally agreed standards for high quality postgraduate training and assessment for conscious sedation in dentistry

To act as a resource for consultation by healthcare professionals, trainers and organisations

To work towards the development of:

- a nationally agreed curriculum
- a national standard for postgraduate qualifications
- national accreditation of training programmes
- accreditation of trainers
- accreditation of workplace-based environments

Membership

Dr Janice Fiske	Faculty of Dental Surgery, RCS Eng (Chair)
Dr Mike Blayney	Royal College of Anaesthetists
Dr Sanjay Chopra	Faculty of General Dental Practice (UK)
Dr Mary Clarke	Royal College of Surgeons in Ireland (Obs)
Dr David Craig	Faculty of Dental Surgery, RCS Eng
Dr Chris Holden	Faculty of General Dental Practice (UK)
Dr Lesley Longman	Faculty of Dental Surgery, RCS Edinburgh
Dr Avril Neilson	Faculty of Dental Surgery, RCPS Glasgow
Dr John Peacock	Royal College of Anaesthetists
Dr Nigel Robb	Faculty of Dental Surgery, RCS Eng

Dr Anna-Maria Rollin Royal College of Anaesthetists

Dr Naresh Sharma Faculty of General Dental
Practice (UK)

Lay representative TBA

Topics discussed to date

- Inaugural meeting 17 May 2010
- Membership & Terms of Reference agreed
- Review of all current guidance for dental and medical sedationists
- Draft training curriculum for **advanced** (alternative) sedation techniques in dentistry
- Response to NICE guidance on Sedation in Children and Young People
- Review of new RCoA curriculum on conscious sedation for anaesthetists in training
- CPD requirements for dental and medical sedationists
- Oral temazepam sedation/pre-medication
- Dental therapists/hygienists training in inhalation sedation

Priorities

1. Training programme specification for advanced sedation techniques
2. Pilot course and evaluation
3. Recommendations on CPD for dental and medical sedationists

IMPACT OF NICE ON PRACTICE

Michael Wood

THE IMPACT OF NICE PAEDIATRIC SEDATION GUIDELINES ON DENTAL SEDATION PRACTICE

Using data available from the old Dental Practitioners Board I attempted to identify the scale of sedation usage within the NHS general dental practices in primary care.

Between 2000 and 2006 there was a steady increase in the use of advanced sedation techniques in children, i.e.

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techniques in children below 12 years of age other than inhalation sedation with nitrous oxide and oxygen, and for children above this age techniques other than inhalational sedation with nitrous oxide, oral or transmucosal sedation or intravenous sedation using midazolam only. At the start of the new contract on 1 April 2006 this data was no longer recorded. In addition to the +/- 50 000 paediatric alternative sedations in the general dental services, there are more carried out within the salaried services, hospital dental services and also under private contract with relatively few reported serious untoward incidents and no mortality.

Looking briefly at the current literature available it seems that different expert teams around the country are using a few techniques to achieve success in paediatric sedation. Inhalation techniques used involve the use of sevoflurane and oxygen alone or with the addition of nitrous oxide, midazolam and/or fentanyl. Oral, intranasal and other transmucosal techniques usually involve using midazolam alone. Intravenous drugs used include midazolam, fentanyl (or alfentanyl), ketamine and/or propofol combinations. As NICE noted there are few high class studies available on this subject.

Having carried out various sedation practice assessments, having communicated with various specialist sedationists (and having been an expert witness at the GDC) it has become apparent that for advanced conscious sedation in children propofol and ketamine are frequently used. NICE has only recommended (in the draft guidelines) that these drugs only be recommended for deep sedation.

Clinical audits at the Legrave Dental Sedation Clinic stretching back to 2000 show that children have been safely managed with conscious sedation using drugs including midazolam, ketamine and propofol. The author has provided over 8 000 sedations as operator-sedationist in children at this facility over the past 10 years. There were 404 cases involving IV midazolam and ketamine. Evidence of more than 535 cases and side-effect profiles were presented where ketamine alone given intravenously is titrated in 0.25mg/kg increments where the children remain responsive to verbal command. Ketamine and propofol (ketofol) titrated could also give a conscious sedation and 397 cases were presented here.



Carole Boyle, President-Elect introduces Michael Wood

Using bispectral monitoring of consciousness, we see that patients were always kept in the zone of conscious sedation using anaesthetic dose. The author thought that with careful titration the risk of loss of consciousness was large enough to warrant them being used by specialist sedationists in the appropriate setting as part of an experienced team.

Unfortunately time did not permit the sharing of video footage of the various sedation techniques – this would have been clear evidence to the efficacy of these techniques in dentistry. Images of the type of dentistry and the premises were shared with the audience and traditional default referrals for general anaesthesia, e.g. surgical extraction or exposure of palatally impacted canines were challenged by using these anaesthetic drugs in subanaesthetic doses for conscious sedation.

The take-home message for sedationists was to publish their data and become part of academic institution research projects to validate their sedation techniques for them to be accepted by NICE. ■

2010 CONFERENCE

SAAD AGM



Steve Jones, Hon Treasurer,
Nigel Robb, President and
Francis Collier,
Hon Assistant Secretary

The Annual General Meeting of SAAD was held on 25th September 2010, at the end of the Annual Conference, which had been both very successful and well attended.

Following the adoption of the minutes of the last AGM (2009), the President (Dr Nigel Robb) reported upon his first year in office. He reported that a response had been submitted to the NICE Consultation on the Paediatric Sedation Guidelines, and that the Board had established a small working group to allow a more rapid response to arising issues than was possible through discussions at the three meetings each year. The first output from this group was the editorial on temazepam which was published in the BDJ this summer, and this group is preparing a response to the GDC consultation on Outcomes for Registration. The GDC's document on Scope of Practice, which indicates that hygienists and therapists may deliver inhalation sedation with nitrous oxide and oxygen, has led to the decision by the Board to develop and pilot a course for DCPs to become operator sedationists using this technique. Dr Robb alluded to the fact that the work of SAAD relies heavily upon the members of the Board of Trustees.

The Secretary's report (Dr Derek Debus) was delivered by the Assistant Secretary (Dr Francis Collier). He was able to report on the good relationship we enjoy with AAGBI, and the administrative support provided there by Zoe and Busola. He reported that there has been a variety of interesting correspondence, including some enquiries about dental therapists providing inhalation

sedation. Much of the correspondence comes through email. The death of a life member, Dr Gordon Holmes, was reported.

The Treasurer's report (Dr Stephen Jones) concluded that the previous 12-month period was characterized as one in which SAAD delivered its planned programme of activities whilst living within its means despite the difficult economic conditions. Our accountants, Silver Levene, have commented on how well run SAAD is, and on the strength of our assets that ensure our ability to discharge the various charitable activities with which SAAD is involved.

Dr Christopher Holden was due to retire from the Board by rotation. Two colleagues were nominated for the position on the Board: Dr Bill Hamlin (proposed by Dr Diana Terry and seconded by Dr Francis Collier) and Dr Christopher Holden (proposed by Dr Anita Patel and seconded by Dr Michael Wood) stood for election. A ballot of the members returned Dr Holden to the Board. Dr Hamlin was thanked for his support for SAAD and his continued work on the Digest. Dr Diana Terry retired from her role as Immediate Past President.

Fiona Wraith, the Executive Secretary, was thanked for her support and hard work throughout the year by members of the Board.

Francis I Collier
Assistant Honorary Secretary SAAD

SAAD NATIONAL COURSE

SAAD NATIONAL COURSE IN CONSCIOUS SEDATION FROM THE DELEGATE'S PERSPECTIVE

Seema Yousef

Dentist

I consider myself very fortunate that sedation was part of my undergraduate training since it gave me the confidence to continue sedating patients in general practice. I qualified in 1995 from Guy's Hospital and am now one of six partners running a busy dental practice in Lewes, East Sussex.

As with all treatments we carry out, the regulations and techniques are constantly being revised. Therefore with sedation, I have always kept up to date attending SAAD courses regularly within the five year cycle; not only because it is a requirement but also because it is a thoroughly enjoyable weekend.

For me, the course refreshes my knowledge and skills and provides me with the reassurance that I am following the correct guidelines in my general practice but I also find that I come away highly motivated wanting to further my knowledge in advanced sedation techniques, possibly to enrol in a postgraduate course such as the diploma. I have attended three SAAD courses now and every time I find that there is such a wide spectrum of practitioners on the course; from general practitioners to those working in the community and those in the hospital environment.

There is plenty of time to be sociable and to meet new people. One gentleman I spoke to informed me that since he carries out sedation regularly in his practice, he had been on several one-day courses which he felt offered a good introduction into the subject for someone with no experience at all but the SAAD course is the gold standard and is a 'must' for those who want to come away feeling confident and well equipped with the necessary knowledge to deal with the potential complications and pitfalls of sedation.

Another lady had travelled from Germany to be on the course. Her experience was in inhalational sedation as

she worked in the paedodontic department in Berlin and her reason for attending the course was that she wanted to expand her knowledge and skills in order to introduce intravenous sedation into the hospital as they were currently limited to the use of relative analgesia.

For those who are new to sedation, the course is well structured in a clear, logical manner and at the right pace. It starts with the basics (which we often forget) guiding you through step by step with the reasons why we sedate patients to the different case studies, identifying any complications and how they were managed. There is a strong practical element to the course which is invaluable. The study groups are small and the tutors are kind, attentive and always very approachable. It makes all the difference since learning the theory is only one aspect but actually having the hands-on experience is vital.

The tutors are always happy to help and very understanding, no question or mistake is too simple as they are highly experienced and so are aware of the difficulties of sedation and therefore put you at ease.

There is a video demonstration which is particularly useful in that it demonstrates the procedure on an actual patient from the introductory history-taking to the recovery stage. It is good at showing the effects of sedation if you are not familiar with the procedure. The cannulation practical is always popular with dentists and nurses.

The idea of an experienced sedationist local to your area available as a mentor is excellent not only for practitioners new to sedation but also for those who may need to ask advice if unsure about a particular case.

This is a course I would highly recommend to anyone keen to start sedation as it does actually prepare you for

SAAD NATIONAL COURSE



Jacqui Crosthwaite, Seema Yusef and Amanda Marchant

it. The course content is relevant to all practitioners of varying experience but most importantly it gives you the confidence and motivation and an introduction to the skills required. The tutors are very experienced and from various specialities, mostly from dentistry but not all. They are all carrying out sedation routinely and therefore whatever your background there is a tutor relevant to your field. The lecture notes compliment the course well and are useful as a source of reference for the future.

**From Amanda Marchant
Dental Nurse**

Initially I was a little nervous about the content of the course; however, having worked alongside Seema Yousef for the last ten months, I felt I had a good introduction to the subject.

Since the introduction of CPD, the number of courses available to DCPs is vast and sometimes the choices are

daunting. I felt after attending the SAAD course, I had definitely gained a large amount of knowledge and confidence to help me when assisting sedations.

**From Jacqui Crosthwaite
Dental Nurse**

We went on the SAAD course to refresh and update ourselves on the various sedation techniques. Although initially we were all nervous, the course tutors soon put us at ease. They were without exception friendly and approachable. They explained the subject matter in easy to understand terms. Also, the other nurses on the course were helpful and willing to share their experiences.

I thought the course was well put together and I came away feeling confident about sedation techniques and hopefully better equipped to assist. There was a lot to take in but it was done in such a relaxed and friendly manner. I enjoyed the practical parts of the course, especially the cannulation! ■

SECRETARY'S CORRESPONDENCE

Derek Debus

Q. Can a VT (VDP) attend the SAAD course?

A. Yes, there is no restriction on VTs attending independently run courses. There is a restriction on them attending Section 63 courses, where the study days would be viewed as their funded postgraduate education. Even graduates from Dental Schools that teach conscious sedation would benefit from the reinforcement of what was taught at the undergraduate level. As would VDPs working in a practice that uses sedation to gain valuable clinical experience and to start filling in the sedation logbook to add to their undergraduate experience.

Q. Does the SAAD course result in competence in conscious sedation?

A. No, the SAAD course provides a Certificate of Attendance only. Competence is gained after having completed supervised clinical practice recorded in a logbook. The normal amount to reach competence would be 20 administrations of intravenous sedation, 10 administrations of inhalation sedation and 5 assessments. Further details can be found in the DSTG publication Training in Conscious Sedation for Dentistry <http://www.dstg.co.uk/documents>

Q. Can patients with a BMI of > 30 be sedated in general practice?

A. The BMI figure is not of much use in assessing obese patients for sedation.

The decision is based upon

- o Actual weight. Dental chairs are designed for weights up to 23 stones.
- o Airway. Is it likely to be compromised by weight on diaphragm, double chin, the "buffalo hump" on the back of the neck?
- o In the case of an emergency can the patient be resuscitated in situ or safely transported to hospital?

These decisions are taken by observation rather than measurement. The necessity of making this decision is as important for patients treated without sedation as it is for those treated with sedation.

Q. How many Anexate ampoules should a sedation practice have?

A. Most practices use it only in an emergency situation (oversedation leading to respiratory arrest). Happily this is a very rare scenario. It is wise to keep at least two...one to use, and one as a backup in case you drop the first one.

Q. Do I need to have a defibrillator if I practice sedation?

A. No, it is not mandatory, although some practices have one. Sedated patients are no more likely to suffer cardiac arrest than non-sedated ones. The recommendations of the Resuscitation Council published in 2006 suggested that all dental practices should have an AED as part of their emergency equipment.

Q. Can SAAD provide protocols for sedation?

A. No, every practice is different and protocols need to be drawn up individually in a "bespoke" fashion. The starting point for this procedure must be the "Standing Dental Advisory Committee. Conscious Sedation in the Provision of Dental Care". This document can be downloaded from the SAAD website. Those practicing in Scotland should refer to the Scottish Dental Clinical Effectiveness Programme Guidelines on Conscious Sedation published in 2006.

Q. Can therapists/hygienists provide inhalation sedation unsupervised?

A. Yes. The GDC "Scope of Practice" indicates that they can, after having had appropriate training. SAAD has produced a curriculum and will be running a pilot course in November (now full). If successful and the demand is there, further courses may be held in 2011. Supervision of clinical cases must be available at their place of work. ■

THE INTERCOLLEGIATE ADVISORY COMMITTEE FOR SEDATION IN DENTISTRY

The inaugural meeting of the Intercollegiate Advisory Committee for Sedation in Dentistry took place on the 17th May 2010 at the Royal College of Anaesthetists (RCoA). The committee has membership from the RCoA, the Faculty of General Dental Practice (FGDP), the Dental Faculty Boards of the Royal Colleges of Edinburgh, England and Glasgow as well as lay representation and an observer from the Royal College of Surgeons in Ireland.

The Committee's aim is to set standards for the practice of conscious sedation in dentistry in the United Kingdom and has patient safety and access to care at its heart. It is currently reviewing the guidance available on training in standard conscious sedation techniques, as well as developing a curriculum for training in the use of alternative conscious sedation techniques. It will be

collaborating with specialist societies such as the Dental Sedation Teachers' Group (DSTG), the Association of Dental Anaesthetists (ADA), the Society for the Advancement of Anaesthesia in Dentistry (SAAD) and the British Society for Disability and Oral Health (BSDH) to achieve its aim.

Further information can be obtained from Eleanor Coen (email ecoen@rcseng.ac.uk).

Members of the Intercollegiate Advisory Committee for Sedation in Dentistry (from left to right in the back row – Nigel Robb (RCS Eng), John Peacock (RCoA), Mike Blayney (RCoA) and Anna-Maria Rollin (RCoA), and in the front row – David Craig (RCS Eng), Chris Holden (FGDP), Janice Fiske (Chair) (RCS Eng), Naresh Sharma (FGDP), Lesley Longman (RCS Edin), and Sanjay Chopra (FGDP). ■



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A VISIT TO CESTRADENT MCKESSON; PROVIDING INHALED SEDATION FOR DENTISTRY SINCE 1938

Diana Terry

Candidates on the National Sedation Courses, delegates to the SAAD Annual Scientific Congress and those visiting the SAAD website, will be aware that in 2010 inhalational sedation is an important part of the dental sedation service.

Members will probably have met Pauline Martinez at SAAD events, where the McKesson apparatus is displayed, used for training and is instrumental in the SAAD RA Loan scheme. SAAD has had a long association with Cestrudent McKesson, who have supported our education programmes with the loan of apparatus for the National Courses, trade stands at our conferences and the discounted machines purchased for the RA loan scheme. Our members who purchase machines from Cestrudent benefit from access to expert local UK service and maintenance.

In spring 2010, I visited the premises of Cestrudent McKesson, to describe to the members the business and people behind the organisation, which has worked with SAAD to provide reliable and safe training in inhalational sedation for dentists. I was made very welcome by Pauline Martinez, and Gerry Swann, who



Gerry Swann

were proud to show us around the workshop, and introduce the dedicated specialist staff. The company is a real family business, demonstrating all that is best in design, innovation, expert engineering and a loyal and committed workforce. Based in Chesterfield, Derbyshire, the company is the last totally British engineering company making specialist equipment for RA with an additional business in surgery design.



McKesson 'Easor' Apparatus for self-administration of analgesia during dentistry



McKesson Model A machine, developed in 1910



The current McKesson Relative Analgesia machine

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Who are the people behind this enterprise? Mr Gerry Swann is the Managing Director, who, at over 80, is still a driving force to be reckoned with. Gerry has spent a lifetime in dental technology and engineering, developing, patenting and innovating medical equipment for dental use. Pauline Martinez, his daughter, manages the “front of house”, service and exhibitions. Pauline trained as a teacher, went on a placement in Spain and met her husband, but soon found her skills were needed in the family firm and she has been here ever since. Her husband Chimo is the production and factory Manager, with Nigel Swann, the Company Secretary in accounts.



Pauline Martinez



Nigel Swann

The premises are spotless, with each of the 7 employees determined to produce the apparatus to the highest standards, monitoring and tracking every machine and providing lifetime care. Dentists purchasing McKesson RA machines can be reassured as to the high standard and attention to detail when machines are returned for service and maintenance. We saw engineers David Brown and David Wylds at work, making the latest design with parts designed and manufactured on site.

Every machine that leaves the factory is carefully tracked throughout its working life, and I was able to see records going back to 1938.

The history of machines for the dental use of nitrous oxide, was developed from the McKesson machine of 1910 in the United States. In 1938, the second world war meant that the UK had to establish a local manufacturing business, and in 1977 the rights to McKesson UK were bought. Initially intermittent flow machines were produced, the Simplor being known as

the “motorbike and sidecar” and the reader is directed to the History of Anaesthesia Society and the Thackray Medical Museum, Leeds for further details; thacraymuseum.org

The current model is MC1 RA, and we saw how the blocks and components are produced by hand, with most parts specifically designed and manufactured on site. The machines have been designed, and patented by Gerry Swann, to meet the changing requirement of safety and function needed by the dental profession for their patients. Thanks to people like Gerry and his team, UK dental teams can have access to reliable and safe machines for inhalation sedation, and training from SAAD. In 1993 Gerry designed a checklist for new machines going into clinical use and was therefore 15 years ahead of the much publicised WHO surgical safety checklist!

The unification of Europe has produced challenges for the dental profession, as the use of nitrous oxide is subject to different regulations in the member nations. Gerry is still busy advising and designing apparatus which meets the standards and requirements of each nation where nitrous oxide can be used for dental sedation.

Mr Gerry Swann writes “I would like to thank SAAD for all the mutual co-operation we have enjoyed from the



David Brown

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Factory Production

very early days of the association. I would like to mention my special gratitude to the late Gerry Holden for his guidance and support from the very beginning and to Christopher Holden for his continued friendship.” Members will recall that both Gerry and Christopher have served as Presidents of SAAD, making the organisation the force it is today.

SAAD is fortunate to have an excellent working relationship with Cestrudent McKesson, to provide SAAD members with the opportunity to offer their patients inhalation sedation. I would like to thank Gerry Swann, Pauline and Chimo for making me so welcome and we wish them well. ■



Assembled RA Machine Heads

STANLEY L DRUMMOND-JACKSON PIONEER OF INTRAVENOUS ANAESTHESIA IN DENTISTRY

This article was first published in the Proceedings of the History of Anaesthesia Society and is reproduced here with their kind permission

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Abstract

Stanley Lithgow Drummond-Jackson was born in Northumberland and qualified from Edinburgh University Dental School in 1931. Even in the early stages of his practice he devoted his energies to the problem of pain control in dentistry, publishing his first paper in 1935.

In the early 20th century most dental anaesthetics were inhalational with nitrous oxide, ether, ethyl chloride and chloroform. The introduction of intravenous hexobarbitone in 1931 led to bold and enthusiastic researchers like Drummond-Jackson to pioneer its use in dental practice. He published his major work on intravenous hexobarbitone in 1952.

In 1957, Drummond-Jackson and a group of colleagues formed the now well-known organisation called 'Society for the Advancement of Anaesthesia in Dentistry' or SAAD. SAAD has grown from a group of 40 to over 4000 members worldwide.

In 1969, the BMJ published an article condemning Drummond-Jackson's technique of intermittent intravenous methohexitone. At his personal expense,

Drummond-Jackson brought a libel action against the BMJ and authors of this paper. There were no winners as the case was settled after 38 days and earned the reputation for being the longest and most expensive libel case in the history of the London Courts.

Despite this setback the founder of SAAD devoted the last days of his life in research, teaching and abolishing fear and pain in dentistry. He gained international reputation as a teacher in dental anaesthesia and was honoured with fellowships and awards. He died in 1975 at the age of 66.

In the early 1900s dental anaesthesia was only inhalational with mainly nitrous oxide on one hand and ether, ethyl chloride and chloroform on the other. Induction was at times stormy and prolonged and recovery was delayed¹. The synthesis of barbiturates, especially intravenous hexobarbitone (1931), thiopentone (1932) and methohexitone (1959) opened new avenues for dental anaesthesia. Modern anaesthesia owes a lot to early pioneers, many of them being dentists and Drummond-Jackson was among them¹.

Early Career

Stanley Lithgow Drummond-Jackson (DJ to his friends and colleagues) was born in Gosforth, Northumberland

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in 1909. He was the son of a dentist and was educated at Barnard Castle School and subsequently at Edinburgh University Dental School where he graduated with an LDS in 1931¹. He started dental practice in Huddersfield and was fortunate to find a Guy-Ross machine and also a trained assistant at that practice³.



Drummond-Jackson (reproduced with kind permission from SAAD)

Introduction to IV hexobarbitone

Fortunately for DJ one of his patients was the representative of Bayer for Northern England and was able to obtain Evipan (hexobarbitone)³. When DJ used intravenous anaesthesia he was convinced that this technique would successfully overcome fear and pain in dentistry⁴. In the next seven years, DJ recorded over 8000 cases using intravenous hexobarbitone. He reported his work as early as 1935 in the Dental Cosmos⁵.

World War II and book on dental practice

In 1939, DJ married Ruth Julia Graves, daughter of John George Graves, a wealthy Sheffield businessman and philanthropist who donated the Graves Art Gallery, Graves Park and many other properties to the city⁶. In the same year he moved his practice in Harley Street and

commuted weekly to his home in Sheffield. This period of married bliss was short lived as World War II broke out and the young DJ enlisted in the Royal Army Dental Corps⁶.



Captain S L Drummond-Jackson⁶

He served with the 51st Highland Division as an anaesthetist in a field ambulance unit⁶. After being evacuated at Dunkirk, he was injured in a parachute jump exercise and discharged from active service in 1945. A disappointed Captain Drummond-Jackson returned to find his surgery at Harley Street damaged in the bombing. He then moved his practice to 53 Wimpole Street. Unable to find any guidance on practice management he did his own research and published his first book on Dental Practice Management in 1948⁵.



53 Wimpole Street, London at present

Book on IV anaesthesia and training films

He gained a good reputation for his skills and expertise both in intravenous anaesthesia and dentistry. His patients came from all walks of life but mostly of high social standing, one of them being the Antarctic explorer Sir Vivian Fuchs, who received a large number of anaesthetics and later gave evidence on DJ's behalf. DJ was well ahead of his time and published his major work 'Intravenous Anaesthesia in Dentistry' in 1952³³. In 1955, he set up a study group with likeminded dentists and anaesthetists who met at 53 Wimpole Street⁶. Dr Henry Mandiwall, consultant oral surgeon and also a professional film maker, recorded DJ in a series of training films on venepuncture and intravenous techniques. The excellent quality of the demonstration films prompted the British Medical Association and American Dental Association to adopt them in their training courses⁶.

SAAD

In 1957, DJ and his group of enthusiasts formalised the group and formed the Society for the Advancement of Anaesthesia in Dentistry (SAAD). The organisation became involved in clinical anaesthesia in the UK and gave new momentum to the teaching of intravenous anaesthesia^{3,6}. In 1959, the first teaching course took place at 53 Wimpole Street. These courses became very popular and dentists from as far as Australia, New Zealand and the United States of America attended. Some anaesthetists and dentists disapproved of SAAD's teaching of intravenous methohexitone and regarded members as ignorant. However, despite all opposition SAAD grew and by 1967 its membership had increased to 2000^{6,7}.

Goldman report on deaths under dental anaesthesia
Early in 1958, Dr Victor Goldman's report in the British Dental Journal of 'Deaths Under Anaesthesia in the Dental Surgery'⁸ sparked a lot of controversy and media attention. Dr Goldman, a staunch inhalational dental anaesthetist, was biased against intravenous anaesthesia. His report triggered a wave of claims and counterclaims published in the British Dental Journal by supporters and opponents to the intravenous anaesthesia technique⁹.

Ministry of Health investigation of dental anaesthesia
The focus on intravenous dental anaesthesia alarmed the establishment and a Joint subcommittee was appointed to investigate the safety of dental anaesthesia. Their report in 1967 with Mr Rodney Smith (Chief Dental

Officer) and Professor William Mushin as a member raised concerns regarding the practice of intravenous anaesthesia in the dental surgery by single-operator anaesthetists¹⁰. The committee recommended the presence of a second person, preferably an anaesthetist, during intravenous anaesthesia but no such restriction was placed on the inhalation technique. Through campaigning by DJ and SAAD members the report was unanimously rejected by the British Dental Association (BDA) at their annual meeting.

Birmingham study

To give a scientific platform to the same report, Professor Robinson's group from Birmingham did a trial with intravenous anaesthesia on thirty patients. Their results were reported in a paper 'Physiological Responses to Intermittent Methohexitone for Conservative Dentistry' in the British Medical Journal (BMJ) in May 1969, along with the editorial article in the same issue^{11,12}. The technique of intravenous methohexitone anaesthesia promoted by DJ was condemned in both articles. His claims regarding the benefits of his technique being only chemical hypnosis, preserving laryngeal reflexes with no respiratory or cardiovascular adverse effects were questioned¹. It was also widely reported in the lay press. DJ was ridiculed and his technique considered dangerous^{10,11}.

Libel action by Drummond-Jackson

DJ asked the British Medical Journal to withdraw their statements in both articles or face charges of libel. The editor of the BMJ, Dr Martin Ware, refused and DJ sued the authors of the article and the BMJ for libel that same year. DJ hoped to establish that his technique was not followed to the letter and the experiments bordered on the dangerous by altering the intermittent methohexitone technique. Secondly, the article made false claims and inferences which tarnished his reputation. Thirdly, none of the investigations were reliable and DJ declared their results were fabricated^{13,14}.

The law, however, moves very slowly and it was only in June 1972 that the case came to the Court of Appeal after Lord Denning had ruled in DJ's favour that there was a case for libel, defeating the appeal of the defendants that there was no cause for libel^{14,15,16,17,18}. DJ set out to prove that there were numerous discrepancies in the defendants' research and their results were flawed^{19,20,21}. This made their conclusions condemning intravenous methohexitone anaesthesia malicious, engineered to conform to the belief that his methods

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were bordering on dangerous and life-threatening. For 38 days the plaintiffs' team, including Sir Robert Mackintosh and other well-established anaesthetists and dentists, gave evidence but to no avail^{22, 23, 24}. Due to complicated medical aspects even the judge, Lord Ackner, couldn't see how or when it would end²⁵.

The Birmingham research articles results were, however, exposed by the evidence in court as being adjusted¹⁰. In January 1971, however, Professor Thornton's research on the same subject involving 600 anaesthetics in a robust study corroborated their results. On the second day of the trial, the defendants were allowed to use Professor Thornton's records. His evidence could have been decisive in favour of the defence and, if he had known, DJ would not have resorted to the legal route to redress his grievance.

In October 1972, what was then the longest and most expensive libel case in British legal history ended in a settlement^{26, 27, 28}. Both parties compromised: DJ accepted the research was genuine and without malice, and conceded the *BMJ*'s right to publish research, while the defendants recognised DJ as a skilled dental surgeon of integrity. The insurance paid the legal fees for the defendants but DJ lost his savings⁶.

Unfortunately the libel action deepened the distrust between the two factions which continued despite the support of many reputable anaesthetists who were members of SAAD. It took SAAD almost a decade to heal the rift⁶.

Honours and death

DJ was a tireless worker for the independence of dentists and the promotion of the SAAD organisation for education of dentists. His desire to make dentistry more pleasant, without pain and fear, was his mission in life^{4,5,6}. His passion for relieving pain and fear in the dental chair became the motto of SAAD: "Dolore, Vincto Timore Victo" which translates loosely as "Abolish pain to conquer fear".

He was honoured by Fellowships of international bodies and was in demand for lectures worldwide. In 1968 he was awarded the prestigious Heidbrink prize by the American Dental Society of Anesthesiology.^{5,6}

He died unexpectedly in December 1975 aged 66 of a myocardial infarction. Tributes poured in from all over the world⁴. The Times also printed a glowing obituary³¹.

The *BMJ*, still embarrassed by the libel case, never forgave DJ and printed a small one-paragraph obituary³².

DJ was a fearless fighter for his cause. He fought for better undergraduate teaching in dental anaesthesia. He fought for independence of dentists. He fought for his convictions and took on the establishment. Peter Sykes aptly summarised DJ's life: 'I was ever a fighter, so – one fight more, the best and last' – Robert Browning⁶.

Acknowledgements

Dr Derek Debuse, Dr Ian Brett, Dr Douglas Pike and Ms Fiona Wraith (SAAD), Melanie Parker and Helen Nield (British Dental Association), Iris Millis (AAGBI), Dr Adrian Padfield (information on Dr Thornton), Miss Smita Bhowmik LLM (information on Law Reports), Lothian Health Services Archives (Records of Dental Training), City of Westminster Archives (genealogical advice), BMA Library (original *BMJs*), Dr Chris Newson (preparation of manuscript) and as always Dr David Zuck for his encouragement.

Note on the training films

During research for this paper we discovered that the Wellcome Library has a collection of DJ's archive material. **Following completion of this research, SAAD donated funds to the Wellcome Library for cataloguing and digitisation of SAAD archive work. This is currently work in progress. Further enquiries regarding the archive material can be made to Angela Saward, Curator of Movie, Image and Sound Section, Wellcome Library.** email a.saward@wellcome.ac.uk

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THE ASSOCIATION OF DENTAL ANAESTHETISTS ANNUAL SCIENTIFIC MEETING

12 November 2010
The King's Fund, London

Bill Hamlin

Eighty delegates attended the meeting. The meeting was opened by the present chairman of the society Dr D. Terry. After welcoming all she introduced the first speaker.

APA Guidelines for Paediatric Dental Anaesthesia.

Dr L. Adewale.

Dr Adewale started by saying that what she was about to present was almost the final draft but not the final document. She went through the levels of evidence used in the guidelines and then described each of the recommendations the committee had made together with the relevant evidence level.

And Yet More Guidelines...Progress or Illusions.

Dr M. Brickler.

Dr Brickler had been asked to give a response to the APA guidelines when it was assumed that these would have been published by the meeting date. He explained that delays meant he was commenting on a draft and therefore some of his comments may not be pertinent to the final document. He briefly covered the history of dental anaesthesia and its demise following legislation in the 90s. His argument was that there is no safer form of anaesthesia with a mortality of 1:400,000 against 1:185,000 for all anaesthesia quoted by RCoA. He quoted cases showing sedation was not completely safe. He then looked at the proposed APA guidelines saying that 75% of their evidence base is only expert opinion and if adopted some benefits would be negligible and some may even be deleterious to safety. He cited particularly monitoring of blood pressure and intravenous cannulation, both of which he proposed were unnecessary during the very brief anaesthesia used in simple exodontias.

There followed a very lively discussion with strong feelings on both sides of the argument.

NICE Guidance to Help Improve the Standards of Paediatric Sedation. Dr M. Sury.

Dr Sury, chairman of this guideline group, introduced us to the NICE guideline procedure and the composition of the guideline group. He talked about the areas covered by the document which would be published in the next few weeks. It covered drugs and techniques including multi-drug techniques to cover the different levels of sedation used in the dental chair in the emergency department and for endoscopy. Most importantly and a new thing for NICE it covered recommendations for teaching and training to be competent in sedation. Dr Sury finished with a question and answer session.

The King's Fund provided an excellent lunch.

The afternoon session covered patients with obstructive sleep apnoea and obesity. There was then a session with three free papers.

Obstructive Sleep Apnoea Commoner Than You Think. Dr D. Dawson.

Dr Dawson started by describing the physiology of sleep apnoea and its classification. This included the Epworth scoring system. He described the symptoms experienced, and I think that with the sleepiness after lunch many of the audience felt they had the symptoms of mild sleep apnoea. He went on to describe treatment with nocturnal CPAP and the general improvement in health this gave. With relevance to dental sedation he made us aware that people with OSA were often particularly sensitive to sedatives and midazolam should be used with care.

Obesity and Sedation or General Anaesthesia.

Dr H. Blanchard.

Obesity is increasing now 23% of people in Britain are obese with 1% morbidly obese. In America 8% are morbidly obese. BMI is a good estimate of obesity but carries little correlation to potential problems. Hip-waist ratio reflects truncal obesity better. Dr Blanchard stressed the importance of planning and suitable equipment including pillows and supports to optimise the patient's position for intubation. These patients needed a good pre-visit communication between surgeon and anaesthetic team to ensure a proper surgical and anaesthetic plan. Positioning on waking was mentioned to cover the increased risk of regurgitation and reflux.

The free paper session had the following presentations.

Responsibilities in Conscious Sedation Whose Line is it?

Ms S. Winigaratne.

Ms Winigaratne presented a review of GDC and GMC

verdicts on cases which had come before them relating to dental sedation.

Upper Airway Obstruction Complicating Inferior Alveolar Nerve Block in a Patient with Muscular Dystrophy.

Dr W. Huda.

Dr Huda presented a case where a 40-year-old male had developed airway difficulties requiring intubation following an inferior alveolar nerve block.

The Effect of NPSA Rapid Response Report 2008/RRR011 on Sedation for Oral Surgery.

Ms G. Umar.

Ms Umar presented her audit of midazolam dosage following the withdrawal of midazolam with a greater concentration than 1mg/ml. This had resulted in a peak use of 5mg, one ampoule, and a reduction in patient satisfaction. ■

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DSTG ANNUAL SYMPOSIUM

14 and 15 May 2010
Trinity College, Dublin

Clare Ola

This year's DSTG annual symposium 'Who, What and Where' was held in Baile Átha Cliath (Dublin) in the heart of stunning Trinity College. The symposium was well attended despite the best efforts of Eyjafjallajökull, our Icelandic volcanic nemesis, which inevitably did deter some people. There were plenty of attractions on offer, all the more attractive because of the glorious sunshine. On the Friday delegates were treated to a meander across campus to have lunch in an impressive 18th century dining hall. The conference package included a free ticket to see the famous Book of Kells. Trinity College Library, a legal deposit library, is legally entitled to a copy of every book published in Great Britain and Ireland and consequently receives over 100,000 new items every year. However, the Book of Kells remains the library's most famous book: a lavishly decorated Latin copy of the four gospels, produced in the early 9th century. It has been at Trinity College since 1661 and is kept in the Old Library, the main chamber of which is the famous Long Room, containing 200,000 of the Library's oldest and rarest volumes.

This year's symposium followed the successful one and a half days format of the previous 2 years and at the end of the first day delegates were all invited to a tour of Dublin Dental School and Hospital (DDSH). The hospital's refurbishment was completed in 1998 and the striking architecture and interior are still immaculate today. We were able to enjoy the numerous works of art on display and reminded of how different Dublin is to a UK dental school and hospital. The artwork ranges from portraits of the architect of the Hospital and the first Dean of the School and Hospital dating from around 1897 when the hospital originally opened, to a piece commissioned in 1998: Wave Shadow by Vivienne Roche. This is a soothing reflection of the waters beside her home in West Cork constructed in bronze and glass to reflect and soften the lines of the architecture. Also on display are a range of works by established artists, Phelim Egan, Sean McSweeney, Charles Tyrell and others.

We were all warmly welcomed to Dublin and the symposium was opened by Professor June Nunn. The first scientific session was chaired by Mr David Ryan, Consultant in Oral and Maxillofacial Surgery at DDSH. This was entitled *Sedation and the Irish Perspective and Primary Care Developments in the UK*. The first five speakers of the session gave us an overview of the 'Who, What and Where' of sedation education in Ireland from a variety of perspectives. The first speaker was Dr Mary Clarke, the Honorary Secretary of DSTG and Specialist Oral Surgeon/Lecturer in Conscious Sedation at DDSH, speaking on *Sedation Teaching in Ireland: The Postgraduate Diploma in Conscious Sedation*. Mary Clarke explained that Irish sedation guidelines are non-negotiable: those clinicians carrying out sedations must have postgraduate education, however, exactly what form this postgraduate education ought to take is not defined. She gave an overview of the recently introduced Irish postgraduate diploma, which covers both theoretical principles and the clinical practice of sedation. The course was advertised to all Irish registered dentists as an 18-month, part-time, self-funded course costing 6000. It is split into seven modules and comprises of 11 didactic days, 20 clinical sessions (15 intravenous sedation and 5 inhalation sedation) and self-directed learning. Mentors and clinical supervisors must have a Masters qualification or equivalent and were recruited from oral surgery and special needs, with no current restorative input.

Candidates complete assignments including a literature dissertation project, a self-appraisal portfolio, oral presentations and discussions and a professional practice log book recording clinical practice of at least 40 patients in the dental hospital or associated clinics. The final examination of the course consists of multiple choice questions, short answer questions and three thirty-minute vivas covering sedation and techniques, medical emergencies and the papers covered in the literature dissertation paper. The first cohort had six candidates, four of whom passed, one deferred and one withdrew. Currently the second cohort has eight participants. The

first cohort was a learning experience for the organisers as well as the candidates and changes have been implanted for the second cohort of eight candidates, for example each participant is assigned an individual mentor and there is a greater emphasis on continuous assessment and a modified final exam.

Next we were given an overview of undergraduate and NCHD conscious sedation experience in DDSH by Dr Breda Martin, a Junior House Officer who qualified in 2009. The Irish Dental Council's guidelines for undergraduate teaching in conscious sedation were outlined and Dr Martin explained that the undergraduate curriculum for conscious sedation at DDSH is largely problem-based learning, supplemented by a series of lectures in the final year covering: ASA classification, upper limb applied anatomy, pharmacology, physiology, pre/intra/post operative monitoring, BLS and CPR. Students must complete a log book of clinical experience including IV cannulation, midazolam administration, emergency flumazenil administration, inhalation sedation, oral sedation and experience in a theatre environment.

Dr Martin explained that DDSH JHOs have a nine-week oral surgery placement during which they have experience of treating more complex patients and become competent at cannulation. As a recent graduate Dr Martin outlined her recommendations relating to the Who, What and Where of conscious sedation teaching: to increase the clinical experience of undergraduates, although the difficulties were acknowledged; to continue the undergraduate log book for use as a JHO and SHO; increased exposure to inhalation sedation segregated from the paediatric dentistry department and IV cannulation during medical emergency training.

Dr Gillian Smith was the next speaker, a Senior House Officer at DDSH outlining the conscious sedation element of her current position. As an SHO she has gained experience in inhalation, oral and intravenous sedation in a variety of settings, working with more complex patients than those seen by JHOs. A specific example is a clinic run in the National Haemophilia Centre. Many of these patients have had negative experiences of dental treatment, some having contributed to the identification of their haemophilia, and dental phobias are common. The provision of sedation services for comprehensive dental treatment increases the accessibility for the patients and allows SHOs their first operator-sedationist experiences.

Dr Smith is currently taking the Postgraduate Diploma in Conscious Sedation and is using her experience as an SHO to complete her log book. She gave further details of the constituent modules of the diploma: applied biology and physiology; literature appraisal; clinical skills; medical emergencies (including ACLS); IV conscious sedation; other conscious sedation; and legislation, ethics and governance. The professional portfolio contains a personal development plan, evidence of continuous professional development, in-course results, mentor meetings, three 2000-word essays, 500-word case reports, 30-minute oral presentations and a 15,000-word dissertation.

We then had the pleasure of a lively presentation from Dr Caoimhin MacGiolla Phadraig regarding *Sedation Training and the Professional Doctorate Programme*. He is currently on the D.Dent.CH taught doctorate programme in special care dentistry. These programmes are available in all areas of dentistry and comprise of didactic teaching and clinical experience. There is no specific examination in conscious sedation but have integrated training throughout the programme to learn to carry out intravenous sedation in a 'practice setting'. Dr Phadraig explained the patients he sees and develops tailored treatment plans for: ASA I-III, phobic patients and those with neurological/intellectual/developmental disabilities. He demonstrated the range of conscious sedation techniques he uses for various patients with a series of entertaining case presentations.

This was followed by Dr Siobhan Stapleton, a Senior Dental Surgeon with a special-needs patient base working for the Health Service Executive, giving a presentation on the *Postgraduate Diploma and Forward Down the Road*. Dr Stapleton explained the barriers she had found in her working life prior to undertaking further sedation training: long waiting lists for GA, restricted theatre space, risks with repeated GAs, and frustration of patients and their parents and carers. She therefore undertook training in inhalation sedation in 2007 and was in the first cohort for the postgraduate diploma in conscious sedation at DDSH. Since taking the diploma she has experienced the benefits of increased treatment options for patients and increased team working, as well as personal benefits including increased confidence, ACLS training and greater skills in sourcing and critiquing journal articles and presentation skills. Dr Stapleton gave specific examples of techniques she learnt during the diploma which she believes could not be

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learnt from books, including strapping down the IV line, human tourniquets, oral sedation pre-medication, and consent and assent. Dr Stapleton commented on her hopes for the future with the use of her diploma: running a successful sedation unit that accepts referrals, carries out regular audits, is involved with mentoring students and keeps up-to-date with advances in conscious sedation.

Mary Clarke then took the microphone again to discuss the restrictions faced in the provision of the postgraduate diploma in conscious sedation in Ireland including the Dental Council restrictions prohibiting the use of IV sedation for those aged 12-18 and multidrug sedation. Other limitations highlighted were the current economic climate; the unforeseen difference in the amount of self-directed learning expected by candidates and teachers; lack of appeal to the University because there is no research element and lack of experience available as operator-sedationist due to lack of restorative input. Dr Clarke's expectations for future provision of training in conscious sedation at DDSH are: the provision of lead-in training, reduction to a twelve-month duration of the diploma, extension to Masters' level by addition of research and the provision of ongoing CPD.

The final presentation in the first scientific session was from Mr Michael Allen, GDP and Lecturer in Sedation UDH Cardiff and Postgraduate Tutor for South East Wales, and Mrs Naomi Jones, GDP and OMFS Staff Grade UDH Cardiff: *Oral Surgery and Sedation in Primary Care – A Pilot Service*. Mr Allen and Mrs Jones gave a background to the provision of their service providing conscious sedation for oral surgery procedures in a primary care setting in South East Wales. In 1996 there was no research regarding the cost effectiveness of oral surgery provided in primary care rather than in a hospital setting. The most recent research is from 2000 regarding referral patterns and from 2002 regarding costs of oral surgery services. Following NHS Dentistry Options for Change, PCTs/PCOs were charged with assessing local needs; however there has been no research into referral trends or costs since the 2006 Agenda for Change and contract changes were implemented. From 2006 Dentists with Special Interests (DwSI) have provided an NHS service complimentary to the hospital service to offer a patient-centred service with improved access, increased patient choice and shortened waiting times.

Mr Allen already had an established conscious sedation referral centre and was approached by the PCO to establish a pilot service for providing conscious sedation for oral surgery in a primary care setting, at which time Mrs Jones became involved with the service. Advice was offered from a Dental Public Health Consultant who had observed a similar, successful service in Oxford regarding types of referrals to accept (exclusion of suspicious lesions) and that a supervising consultant ought to sign off the GDC list of competencies for the surgeon providing the treatment. The local GDPs were sent an explanatory letter and referral criteria, and the pilot began. The pilot service was commissioned for 24 cases per month, recording the time between receiving the referral and discharge of the patient. An audit was completed of 322 referrals with positive results: mode waiting time of three weeks for those receiving treatment under local anaesthetic alone and of five weeks for those receiving conscious sedation. There was a very low rate of surgical and post-operative complications and an extremely high patient satisfaction: 98.2% of those patients questioned agreed/strongly agreed with positive statements regarding aspects of the service. It is estimated that this has saved the PCO £¹/₄ million per year. However, despite this undoubted success, there is some uncertainty regarding the future of the service due to fiscal tightening.

The second scientific session was chaired by Dr Chris Bell, an Associate Specialist in Oral and Maxillofacial Surgery at Bristol Dental Hospital. This session was entitled *Alternative Techniques – Who, What and Where*. Dr Bell introduced the first speaker of the session, Consultant in Special Care Dentistry from Liverpool University Dental Hospital, Mrs Avril Macpherson, speaking on *The Dental Team and Alternative Sedation Techniques – the Training Conundrum?*

Mrs Macpherson began with an overview of the 'Standards for Conscious Sedation in Dentistry: Alternative Techniques' report from the Standing Committee on Sedation in Dentistry. She presented a review of the relevant literature for alternative conscious sedation techniques. Although there have been numerous publications showing a range of techniques to be safe and efficacious, they have been based on small samples of heterogeneous patients, with a variety of different treatments being carried out and results have been recorded in ways which make it difficult to draw comparisons. Therefore a Cochrane review in 2005 was

not able to produce a meta-analysis of alternative techniques for conscious sedation in children and in 2006 the Scottish Dental Clinical Effectiveness Programme found that it was not possible to make evidence-based decisions.

SAAD have issued advice to make future research homogeneous and therefore transferable including use of standard research tools such as anxiety scales, level of consciousness and drop in oxygen saturation rather than the lowest recorded value. Future guidance around conscious sedation and alternative techniques will be expected from NICE who will issue a guideline publication around *Sedation for Diagnostic and Therapeutic Procedures in Children and Young People* and possibly the Intercollegiate Advisory Committee for Sedation in Dentistry.

Mrs Macpherson went on to discuss current and future training of clinicians in the use of alternative techniques of conscious sedation under the framework of Who, What and Where. Who will be trained: it was suggested that all clinicians ought to have documented experience in standard techniques before training to use alternative techniques. It is unlikely that all specialists will need to be trained in their use and it could become an 'opt-in' module of training. What will the training involve: she outlined the need for a curriculum with clear learning outcomes for dental sedationists and the second appropriately trained person, and necessary standardisation with other relevant curriculae including the speciality training curriculum for special care dentistry and the certificate in dental sedation nursing. The assessment methods chosen will need to be blueprinted on the curriculum, and systems put in place for commissioning and delivering continuous professional development and consideration of the need for revalidation. Where will the training be carried out: Mrs Macpherson suggested training ought to be carried out by a panel of experts such as our anaesthetic colleagues, mainly in a hands-on clinical setting. However, training will need to be via 'blended learning' using self-directed learning, small groups, clinical skill teaching, work-based experience and the use of simulators. The advantages of teaching and learning in a simulated environment include a safe environment, reproducible experiences, crisis management skills and it assists reflective practice through feedback. Simulations used need to be high fidelity, interactive and responsive to ensure optimum training outcomes. Mrs Macpherson acknowledged the

difficulties that are likely to be faced, including competing priorities, the opportunistic nature of clinical cases, the 'teacher intense' training required, consent issues, risk management, quality assurance processes and bureaucracy.

The morning session concluded with a presentation from Dr Michael Blayney, Consultant Anaesthetist at Noble's Isle of Man Hospital, on *Thoughts of Training – Securing the Future of Sedation in Dentistry*. Dr Blayney began with a reminder of levels of conscious sedation, why we use it and the systemic risks involved. He explained that alternative techniques have a theoretically increased potential of adverse effects and a narrower margin of safety than standard techniques. The evidence for the safety of procedural sedation are small and underpowered and from only one institution, and a review of the literature and guidelines from other medical specialities were presented. The prime cause for adverse effects of conscious sedation appears to be respiratory depression, which is not appreciated by inexperienced practitioners, however adverse effects are seen even with trained, experienced practitioners. This highlights the need for defining the competencies required to safely deliver care; notably in skills required to manage complications including advanced airway management. Dr Blayney explained about the lack of formal postgraduate training in conscious sedation for anaesthetists and described the role of the new competency-based curriculum that includes mandatory training in conscious sedation for anaesthetic trainees from August 2010. There will also be an optional extra module in conscious sedation for dentistry.

Dr Blayney explained that to secure the future of sedation in dentistry we need to formulate national guidelines on both standard and alternative techniques and define the techniques, competencies, training and assessments required by the profession for the safe and appropriate delivery of drugs and management of complications.

The afternoon scientific session was chaired by Dr Alison Dougall, on the subject of *Sedation: Adolescence and Paedodontic Research and Teaching in Ireland and Sweden*. The first speaker was Mr Andrew Norris, an Oral Surgeon working in private practice in Dublin, presenting his study to determine if IV conscious sedation is an acceptable and effective method to achieve sedation in a 10-16 age group. The research was on 54

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subjects having slow titrated IV midazolam (average 4mg / 0.07mg/kg) for surgical procedures carried out in practice. Results included only 5 participants having oxygen saturation drop to 95% or under, mostly during recovery; 12 subjects becoming restless throughout treatment, mostly during LA administration and no difference in treatment outcome whether one or more quadrants were treated. A low complication rate was recorded, encouraging for the safety profile for IV conscious sedation in this age group. Patients' anxiety levels were higher for surgery than for routine dentistry pre-operatively, but post-operative anxiety regarding surgery had greatly reduced. A negative finding was that the sedation may be less effective for those already irritated or restless, for example if you 'lose' them during local anaesthetic administration, the sedationist-operator is unlikely to regain control. He concluded that IV conscious sedation for adolescents is effective at enabling treatment completion, well accepted and can therefore be used as a successful adjunct to behaviour management.

The second speaker in this session was Dr Boel Jensen, a senior lecturer in Paediatric Dentistry for the Public Dental Service in Gothenburg, Sweden, with a very interesting insight into *The Use of Midazolam Sedation in Paediatric Dentistry in Scandinavia*. Dr Jensen initially explained that the teaching of sedation for undergraduate students is only as part of paediatric and orthodontic teaching, and they have opportunities to observe, but not carry out, inhalation sedation, oral and rectal sedation and general anaesthetic sessions, but no IV sedation. They are also provided with one and a half days teaching on procedural sedation in their final year. Students are then recommended to initially collaborate with a dentist experienced in sedation.

In practice in Sweden oral/rectal midazolam is the first choice of drug for pre-co-operative children (1 to 5 years) as they cannot comply with inhalation sedation. This is provided for those children ASA I or II, weighing >10kg, with a mild to moderate treatment need. If children require more treatment than a GA is preferred. The parents are asked to ensure that the child has a meal two hours before attendance.

The recommended doses are determined by anaesthesiologists and therefore vary between regions. Dr Jensen works within the regime of a single dose (no titration) oral midazolam 0.4-0.5mg/kg or rectal midazolam 0.3mg/kg. Oral is the preferred route, although this requires co-operation and has around a

20-minute response time. Therefore those aged under 3 years usually receive rectal sedation, with an average response time of 10 minutes.

In Sweden no use of monitoring is employed throughout treatment, although patients are always kept for at least 60 minutes following administration of sedation and the parents are asked not to let the child sleep for another 60 minutes following discharge.

Dr Jensen estimates that around 10% of her treatments with sedation are unsuccessful and are abandoned, and that repeated treatment sessions may decrease the acceptance of treatment.

Dr Lesley Longman, Chairman of DSTG and Senior Lecturer/Honorary Consultant in Special Care and Restorative Dentistry at Liverpool University Dental Hospital, chaired the final session of the first day with three free papers.

Thayalan Kandiah a Specialist Registrar in Paediatric Dentistry at University College London, Eastman Dental Institute, presented a paper on *Paediatric Dental Conscious Sedation Utilising Intravenous (IV) Midazolam*. Coauthors were P Anand and PF Ashley.

The aims of the study were to characterise new service provision within the Paediatric Dental department and examine compliance with locally-derived gold standards. A retrospective audit was carried out of adolescent patients who underwent treatment utilising midazolam IV conscious sedation. Data was collated through audit recording forms reflecting agreed local gold standards.

All adolescent patients who underwent sedation utilising IV midazolam were included. The mean age of those treated was 14 years with the majority of the patients being female (64%). Of those who had B.M.I recorded the mean value was 21.09. 90% of those treated were A.S.A grade I. Surgical expose and bond accounted for 30% of the cases with orthodontic extractions accounting for 20%. Mean dose of midazolam used was 3.0mg with the maximum and minimum doses being 5mg and 2mg respectively. The average duration of treatment recorded was 24.4 mins. All planned treatment was carried out and Anexate® was never used. 53% of cases had no recorded B.M.I.

The authors concluded that the majority of current practices adhere to the set gold standards. Improvements are required in recording all agreed data sets reflecting

agreed local gold standards. Midazolam offers a safe and effective alternative to treatment of adolescent patients who would otherwise have required dental general anaesthesia.

Gezala Umar from King's College Hospital Dental School presented a topical audit entitled *The Effect of the Rapid Response Report (NPSA/2008/RRR011) on the sedation practice of the Oral Surgery department*. Coauthors were Cathy Bryant and JP Rood. The purpose of this study was to audit:

1. The dose range of IV midazolam administered for oral surgery sedation.
2. The investigation of the effect of the Rapid Response Report (December 2008) on midazolam dose administered.

In December 2008 (following the RRR publication) an audit was undertaken to examine the dose of 10mg/5ml midazolam administered to patients in the Oral Surgery department of King's College Hospital. The audit was repeated when the lower strength midazolam (5mg/5ml) had been introduced, and concerns had been raised that patients were less adequately sedated. As a result of our findings changes were put in place and the audit repeated.

Results

1. 61% received midazolam at a dose >5mg when 10mg/5ml was used.
2. When 5mg/5ml was introduced only 42% received a dose greater than 5mg.
3. When 10mg/10ml was introduced, 76% received a dose greater than 5mg.

The authors concluded that clinicians seem reluctant to open a second vial of midazolam when obliged to use the low strength midazolam. Insisting that 10mg of the drug is drawn up in a 10ml syringe at the start of treatment resulted in the pattern of doses administered to patients similar to when the high strength midazolam was used.

Angela Magee and Vicky Kewley from the School of Dentistry, University of Central Lancashire (UCLan) described a new model of undergraduate dental education. The Graduate Entry BDS course at UCLan commenced in September 2007 and the first cohort of students are now coming to the end of the 3rd year of a

4-year course. The curriculum delivered, and the degree awarded, is that of the University of Liverpool. However, the School is unique in that academic (after first year) and clinical modules are delivered in four remote Dental Education Centres each of which is attached to a Primary Care Centre.

The course has been delivered by multi-centre video conferencing, clinical tutorials, IV clinical skills course and clinical sessions.

The Conscious Sedation course, whilst following the Liverpool curriculum, has had to be designed and developed to adapt to conditions that not only vary between Dental Education Centres but are very different from those in a traditional University Dental Hospital setting.

This concluded the first day of the symposium and all the delegates enjoyed an evening reception at Dublin Dental School and Hospital where drink, canapés and friendly conversation were in abundance. Most people seemed to have energy left to explore some of the city's hospitality.

The second day of the symposium was opened by Dr Chris Dickinson, Consultant in Sedation and Special Care Dentistry at Guy's and St Thomas' NHS Foundation Trust. He introduced the first speaker, Dr Alison Dougall, Consultant and Lecturer in Medically Compromised Patients at Dublin Dental School and Hospital, on *Management of Anxiety Related to Abuse*. Dr Dougall began her presentation with shocking statistics from research. One in seven children are abused; one in three girls will be sexually assaulted by the age of 18; 30% of girls and 7.4% of boys in Ireland experience non-physical sexual abuse. Abuse is known to be under-reported and incidence is increased in those with disabilities, most notably those with sensory disturbances. The effects of abuse which may impact on the care dentists provide include feeling out of control, disempowerment, ignoring feelings of pain and pleasure and a disconnection of mind from body. A hypervigilance to danger and chronic mistrust lead to difficult relationships, especially with those in authority or those seen to be nurturing or caring.

Abuse often leads to feelings of guilt or a need to control and therefore possible consequences include: anxiety, depression, eating disorders, obesity, self-harm and suicide, hypersensitivity to pain, atypical and chronic

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pains, panic attacks, phobias and body dysmorphic syndrome. Coping strategies can also lead to compulsive behaviours, substance abuse and addiction.

A literature review suggested that we often work unknowingly with victims of abuse, as around 20% of females seeking dental care may have experienced childhood sex abuse. Only 50% of people with dental phobias have ever had a traumatic dental experience and therefore multiple pathways must exist to acquiring dental phobias. There are two significant predictors of phobias: horrific dental experience and being a victim of a traumatic crime e.g. rape or sexual abuse. Abuse involving the oral cavity is the highest predictor of dental fear; of people who had undergone forced oral sex 94% suffered severe dental anxiety.

A bad dental experience can lead to a feeling of re-experiencing trauma, similar to post traumatic stress disorders (PTSD). A large proportion of those who experienced childhood sexual abuse (CSA) have PTSD flashbacks, precipitated by an experience which reminds them of the abuse. Another large group suffer from dissociation symptoms, an alteration or disturbance in consciousness which was a coping mechanism during CSA, demonstrated by the potent quote "Laying still, screaming silently". Dr Dougall asked us all to be mindful in recognising seemingly unreasonable or awkward requests may be individual coping mechanisms. Phobias are often linked to having experienced a panic attack following which the dentist was insensitive or behaviours of the dental team were perceived as negative leading to feelings of failure and humiliation. The response of the team when the first experience of PTSD occurs is key for their future care.

Adult survivors of CSA frequently do not disclose their history and it may present in various ways including irrational, unexplained fear; being uncomfortable in close proximity; gagging; oral or self-neglect; irregular attendance or late cancellations; obesity or eating disorders. Strategies Dr Dougall recommended for successfully treating these patients include establishing a rapport but on a fine line, as paternalistic approaches do not work. Sharing control, recognising particular individual difficulties, flexibility in problem solving and responding appropriately and sensitively were all cited as strategies for success. Particular examples were given such as using a semi-reclined position and allowing the patient to lay back in their own time; allowing the

patient to keep one foot on the floor; providing a mirror so that the patient can observe what is happening in reality; ongoing affirmation of permission; use of a stop signal and provision of a cover so that they feel less exposed. Some patients have reported sensory triggers such as 'the gloves smell like condoms' and the sound of gloves being put on. Many patients feel vulnerable being alone with a relative stranger so to allow them to bring a trusted chaperone may make them more at ease. Patients have 'good' and 'bad' days: on 'bad' days they will be hypersensitive to triggers and likely to fail to attend appointments. Patients ought to be encouraged to attend on 'good' days and therefore flexibility in appointments is necessary.

CSA is often a contraindication to the use of conscious sedation and may be linked to a history of drug abuse, lack of control, or lack of chaperone.

Survivors often do not disclose their past experiences until a rapport is built, but most would like their dentist to know. Advice was given on appropriate responses if a patient discloses CSA including telling the person 'sorry this has happened to you', asking if they have someone to talk to, reassure that they are safe in this environment, and ask what could be done to make things easier for them. Dr Dougall advised against asking direct questions, encouraging initial disclosure, reacting negatively, ignoring the disclosure or attempting to perform psychotherapy. Many patients are immediately referred to a specialist upon disclosure but this is counter-productive as the patient then feels abandoned, guilty and embarrassed that they have caused a problem. Dr Dougall concluded by recommending the inclusion of this topic in the teaching of anxiety and behaviour management in the undergraduate curriculum.

The following speaker was Dr Shelagh Thompson, Senior Lecturer/Honorary Consultant in Conscious Sedation and Special Care Dentistry at the School of Dentistry, Cardiff University, speaking on *Obesity – The Ever Increasing Challenge for the Future*. Dr Thompson began with statistics regarding obesity: 66% of adults in the UK are overweight or obese, 22% of men and 23% of women in the UK are obese. Obesity is highest in the most deprived areas of the UK. Obesity levels are rising worldwide including an increased prevalence in developing countries. 20% of children in the EU are overweight. 'Growing up in Ireland' in 2009 showed that

in 1990 6% of teenage boys were overweight, which had risen to 19% by 2008.

The current BMI classification of obesity is BMI >30. However, the risk stratification can be improved by using waist circumference: >40" in males and >35" in females increases the risk of obesity-related comorbidities. The main aetiology of obesity is lifestyle choice: eating, alcohol consumption and lack of physical exercise. Less than 1% can be attributed to, among others, hypothyroidism, Prader Willi syndrome and Cushing's disease. NICE has issued a clinical guideline relating to obesity (number 43) which estimates obesity decreases life expectancy by nine years. The World Health Organisation European Action Plan advises improvements via environment, empowerment and encouragement.

Dr Thompson went on to explain the bariatric unit recently installed in Cardiff's School of Dentistry and the rationale behind it. In 2007 the HSE risk assessment and process planning for bariatric patient handling pathways was carried out during which it was found that 40-70% of trusts did not have a bariatric policy. The policy ought to take into account the patient, buildings, vehicles, communication, organisation and equipment (including clinical, furniture and manual handling). The bariatric unit needed to be installed on the ground floor following risk assessment of evacuation in an emergency. Tissue death can occur in as little as two hours over unrelieved pressure points therefore it is vital to have the correct equipment, well designed rooms and well trained and available staff. The ergonomics must be designed with consideration to both the patient and the clinicians. The chair chosen by this unit was a bariatric wheelchair and wheelchair tipping platform as these could support a greater weight than a traditional dental chair. However there has been a bariatric chair released onto the market which can hold up to 71 stones of weight. Other bariatric considerations included a hoist with the highest maximum weight limit of 40kg and a heavy duty toilet surround to increase the safe load of a toilet from 20 to 70 stones.

Relating to dental treatment and sedation there are a great number of extra considerations required for bariatric patients, although the principles of good care are the same as for every other patient group. The Resuscitation Council has issued guidelines related to resuscitation of morbidly obese patients including techniques and

equipment required. The propensity to desaturate faster and decreased reliability of pulse oximeters ought to be taken into account. They will require the use of longer needles to obtain correct positioning of IM and IV administration. The pharmacokinetics and drug doses will be altered. Many of this patient group will have an altered oropharyngeal anatomy with reduction of neck extension and oral opening. The lung capacity of these patients may be greatly reduced and fatty infiltration of muscles often leads to sleep apnoea and a propensity to develop acute pulmonary oedema. Dr Thompson gave the delegates advice for considerations during dental treatment including care on long procedures, the use of a rubber dam and a semi-supine position and supplemental oxygen administration even when treatment is being carried out under local anaesthetic alone. Further considerations for the use of conscious sedation are: the availability and careful sizing of airway adjuncts; consideration of the use of capnography; continuous assessment of ventilation; difficulty in obtaining intravenous access may require ultrasound guidance; the need for larger cuffs to obtain accurate blood pressure readings and consider increased pre-operative starvation due to increased risks of hiatus hernia, reflux and aspiration.

The final speaker in this session was Dr Denise Faulks to give delegates an insight into Conscious Sedation in France – re-inventing the wheel? Dr Faulks qualified from the United Medical and Dental Schools of Guy's and St Thomas', London, UK, in 1995. She then worked at Guy's Hospital and the Aberdeen Royal Infirmary before joining Martine Hennequin at the Sedation and Special Care Unit of the University Hospital of Clermont Ferrand, France. The unit provides comprehensive care for adults and children with special needs. Denise is also a member of the 'Impairment, disability and disadvantage in oral health' research group of the University of the Auvergne. This group has been instrumental in the development of conscious sedation in France. Dr Faulks began by giving an overview of dentistry in France, where there are no hygienists or therapists and only two thirds of dentists employ a qualified dental assistant. There is no community dental service and the only recognised speciality is orthodontics. Prior to 1996 Special Care Dentistry was unrecognised, there was little use or teaching of conscious sedation and the only drug available to dentists was Entonox 50% nitrous oxide – oxygen premix, which was then excluded for use by

DSTG REPORT

dentists in 1996. Research was necessary for the continuation and expansion of conscious sedation and included measures of effectiveness, tolerance and pollution. The study was carried out over one year with the use of 50% nitrous oxide administered through a nasal or facial mask with passive evacuation and no re-oxygenation following treatment. They found a success rate of 93.2% and 6.2% experiencing an adverse effect and no severe adverse effects. When restricted to those with an intellectual disability there was a 91.4% success rate and a 10.1% adverse reaction rate. It was also found that over three years behaviour was significantly improved over repeat sedation sessions with 94.8% success. Pollution was measured continually in the surgery and the mean value of exposure was 32-60ppm nitrous oxide, compared to international norms of 50-100ppm. A double blind, randomised, prospective clinical trial comparing re-oxygenation with oxygen to medical air found no significant difference. A systematic review of the use of 50% nitrous oxide revealed its use to be extremely safe, with a clinically significant adverse effect rate of 1:1000 and a significant adverse reaction in just 3:10,000 cases. It was therefore concluded that the use of this premix is a safe and effective tool for public health.

The training of dentists through a postgraduate course in inhalation conscious sedation was set up and evaluated. The success rates of competent supervised practitioners was 89.6% and of competent independent practitioners 93.6%. The minimum postgraduate training requirements have been determined by the National Scientific Committee to be four half-day sessions and the pre-requisite of being trained in medical emergencies – the diploma in inhalation sedation. Unfortunately this has not been heeded by the French Dental Council, who does not require clinical practice. On a brighter note, however, in 2002 the use of nitrous oxide was licensed in hospital dentistry, and in 2009 the licence was extended to include non-hospital dentists.

The current research being carried out by the team is into the use of midazolam for conscious sedation rectally or orally. This is still only being carried out in one unit and have so far treated 403 patients aged 18 months to 66 years with a success rate of 90%, but these results are unpublished to date.

The group has also set up a diploma in conscious sedation for dentists which is a one-year course. The pre-requisites are to be trained in managing medical emergencies and to have completed the diploma in inhalation sedation. The course consists of thirty days of clinical experience and eight days of formal teaching: two on midazolam, two on CPR and medical emergencies, two on specific patient groups and clinical decision making and two with the 'SimMan' simulator with specific sedation scenarios.

The future of conscious sedation in France will include gaining recognition, furthering and expanding training and the incorporation of dental care professionals.

The final presentation was from Damian Broderick reviewing the literature regarding drug interactions with midazolam with the following drugs: Ketoconazole; Fluconazole; Posaconazole; Erythromycin; Clarithromycin; Roxithromycin; Squinavir; Diltiazem (Calcium Channel Blocker); Rifampicin; Carbamazepine and Efavirenz. He concluded that, although these drugs do have interactions with midazolam, the interactions are limited and for a single dose of midazolam the clinical effect of the drug is limited. He highlighted the need for further studies looking at clinical implications of these drug interactions.

This concluded the 2010 Annual Symposium, a successful and informative meeting. Sincere thanks were extended to Mary Clarke and her local organising team of dentists and sedation nurses. The next annual symposium will be in Liverpool, next to the rejuvenated water front, on Tuesday 10th May 2011. ■



Bill Hamlin



Michael Wood

A COMPARISON OF SNAP II AND BISPECTRAL INDEX MONITORING IN PATIENTS UNDERGOING SEDATION.

S. R. Springman et al. Anaesthesia Vol 65, 8 Aug 2010. 815–820.

Summary.

The SNAP II is a single lead electroencephalogram that displays a SNAP index. This is a derived value based on high and low frequency EEG signals. Much current research uses a bispectral index (BIS) monitor. This study looks at the simultaneous readings of both monitors in 51 patients undergoing sedation for surgery.

Traditionally clinical signs and verbal responses have been used to assess comfort and depth of sedation. This repetitive activity may become intrusive to patients and distracting to surgeons and sedationists. The level of sedation can also be scored on a number of scales, e.g. OASS, Ramsay and Richmond agitation scales. Electronic monitors have been developed primarily to look at depth of anaesthesia, probably the best known being the BIS monitor. The utility of these monitors in clinical practice is debated with widely ranging claims of usefulness during general anaesthesia. There is now a growing interest in their utility during light-to-moderate sedation.

The BIS monitor is presently the most widely studied. SNAP II is a newer small single-lead device which

displays a SNAP index. This is a derived value based on an algorithm using both high (80–420 Hz), and low (0–18 Hz) EEG signals. The BIS system uses the low frequency and a higher frequency of 70–110 Hz.

Methods.

51 ASA 1 adults undergoing surgery under sedation with local anaesthesia were recruited. As this study was a comparison between the two monitors no restriction was placed on sedation drugs used. These included midazolam, ketamine, fentanyl, hydromorphone and propofol. Both monitors were attached to all patients. The sedationists used a clinical assessment of sedation level and were blinded to the sedation scores shown on both monitors. These scores were displayed numerically on both monitors and the scale is 0–100.

Results.

7 patients were excluded because of incomplete data. The BIS values always seem lower than the same minute SNAP II by an average of 20 points, (variation 10–60). The differences oscillate in a random fashion around a constant value, albeit slightly different on a patient-to-patient basis, with no discernable pattern.

Discussion.

There is a simple indication that the two monitors track EEG changes in a similar way. Questions still remain over the utility of these monitors. Electronic sedation monitoring can often be challenging due to patient

variability in response to medications. These monitors may be useful in patients who are difficult to assess clinically, e.g. those with special needs or where continuous checking by verbal contact is disruptive to the procedure.

The two monitors do not use the same data but appear to capture the same cerebral activity patterns. Our data does not support the use of one monitor over the other. There is some indication from other papers that the sedation drug used may alter the BIS number; our study did not look at these changes or the possible changes to the SNAP reading.

Further work is needed in electronic assessment of sedation level.

SEDATION FOR OOCYTE RETRIEVAL USING TARGET CONTROLLED INFUSION OF PROPOFOL AND INCREMENTAL ALFENTANIL DELIVERED BY NON-ANAESTHETISTS.

J. A. Edwards et al. Anaesthesia 65 No 5, May 2010 453–461.

This article was chosen as comparator for those performing conscious sedation for dentistry. Possible useful and relevant protocols in Appendix 2. Editorial in this issue plus later letter.

Summary.

Sedation is recommended for oocyte retrieval. This paper presents the process of setting up a non-anaesthetist delivered service, the development of safety systems and audit data collected to assure quality effectiveness and safety.

This service was covered by a non-consultant career-grade anaesthetist. On his resignation no replacement could be found and the Health Authority was unwilling to increase funding to allow a consultant to be appointed. It was therefore decided to develop a system using non-medical health care professionals.

Two sedationists were recruited, one an operating department practitioner and one a theatre sister. Training was designed to cover knowledge and skills necessary for the post. Theory was taught on a one-to-one basis with 12 one-hour sessions* subsequently tested by formal written assessment in short-answer question format. Both sedationists scored over 90%.

The practical skills were taught in theatre. This involved observation of a consultant performing target-controlled sedation by propofol infusion according to protocol* for one week, followed by 50 cases under direct supervision. Subsequent sedation was performed as per protocol under remote supervision.

Sedationists had to continue to demonstrate their competence at rescue airway management by managing 10 elective airways with manual ventilation by facemask and by inserting 10 LMAs per month under anaesthetic supervision.

Patients assessment for suitability for sedation was performed using a screening sheet*. If problems were highlighted then the patient was referred to a consultant anaesthetist. Anaesthetic assistance if required was via a rapid paging system checked before each session.

Patients arrived fasted and were seen by the sedationist. Sedation was by protocol with propofol and alfentanil, where propofol was contra-indicated then incremental midazolam was used with alfentanil again by protocol*. Monitoring was with ECG, non-invasive blood pressure, pulse oximetry and expired CO₂. 4L/min O₂ was given by face mask.

Results.

All patients' data was recorded in the sedationist's log books, total 4342 patients. There were two periods of formal prospective audit looking at a full data set for 260 of these patients. There was no episode of oxygen desaturation in the series. One patient had a transient apnoea but recovered spontaneously without desaturation and one patient demonstrated a sensitivity to alfentanil with very short apnoeic episodes following injection.

Unplanned anaesthetic assistance was required on 15 occasions, an incidence of 3.5 per 1000 cases: six times when patients became disinhibited or unco-operative during sedation, four times to assist with venous access, three times to assist with surgical bleeding, and once each for anaphylactic reaction to diclofenac, intraoperative ectopic beats on ECG, severe post op pain, and severe post op nausea.

Discussion.

We have demonstrated that conscious sedation using propofol and alfentanil provided by non-medical sedationists can be safe and effective. During the entire

series only two minor airway problems occurred; both were dealt with safely and were within the competencies of the sedationists. This equates with an incidence of 0.5/1000 cases. This compares favourably with those reported by doctors, 4.1/1000 for GPs and 2.6/1000 for anaesthetists.

Medical advice was required in 7.5% cases in the first 18 months but this has improved with time and experience to 0.6%.

The protocol was devised by the lead consultant and it may seem elaborate. It was chosen because of the lead consultant's background in propofol sedation research, and based on simple pharmacokinetic and dynamic principles used every day in anaesthesia. Propofol was chosen over midazolam because of its superior anxiolysis and quicker recovery profile. A target-controlled infusion was used as this requires fewer interventions per case when compared to intermittent bolus techniques. The starting target was set to cause a low likelihood of oversedation and thereafter titrated to the patients response.

The future may bring patient-controlled propofol sedation, this seems clinically effective in small studies. However, they are not ready for clinical use as despite recent refinements they can still cause oversedation if deliberately stressed.

* Protocol in appendix

LETTER: SEDATION BY NON-ANAESTHETISTS AN UNACCEPTABLE RISK?

D. Hunter Anaesthesia 2010. 65 1044

Dr Edwards et al. are to be applauded for their efforts to provide a sedation service delivered by non-anaesthetists. However, most anaesthetists would consider sedation more challenging than general anaesthesia and data would bear this out. Quine et al.'s paper of 1995 showed a mortality following gastroscopy directly related to the sedation of 1/6000. Mortality from general anaesthesia is approximately 1/100,000. Are patients sedated by non-anaesthetists told at consent that their risk of death is approximately 15x that under general anaesthetic?

It is important to remember the rule of three when attempting to calculate mortality in a group where no mortality has occurred. Risk = 3/no. of observations(1). Thus Edwards' group can be 95% confident that their mortality is no greater than 1/1447. No better than Quine in 1995. The low mortality risk for general anaesthesia of 1/100,000 is yet to be achieved by any sedation series. I believe the minimum training for the use of anaesthetic induction agents for sedation should remain in the Royal College of Anaesthetists' Fellowship examination.

1. Ho A. M. Neuraxial blockade and haematoma in cardiac surgery. Estimating the risk of a rare adverse event that has not yet occurred. *Chest* 2000 117 551-5.

SAFE SEDATION – WHO SHOULD DO IT?

Dr M Blaney.

*Royal College of Anaesthetists.
College Bulletin 63 Sept 2010. 39-41.*

Moderate sedation equates to conscious sedation, the drugs used should carry a margin of safety wide enough to render loss of consciousness unlikely. This end point is clearly defined and the wide margins of safety stipulated.

The Hazards.

Drug-induced depression of consciousness is accompanied by depression of other physiological systems. With conscious sedation, airway and cardiovascular function are normally well maintained. Deeper sedation is accompanied by clinically significant ventilatory depression and the likelihood of adverse events increases, which if not managed may lead to a poor outcome.

The nature of the procedure is also important; many sedative drugs have no analgesic properties. Pain control requires specific analgesic agents. This may be with local anaesthesia, e.g. dental work or may need systemic analgesia, e.g. colonoscopy. Hence combinations of sedatives and opiates may be required.

Safe sedation requires knowledge of each drug's profile; drugs in combination may possess synergistic effects and may be difficult to titrate. Benzodiazepines may be up to

eight times more potent following the administration of an opioid. Safety margins may be narrowed increasing the likelihood for airway intervention. It remains questionable whether multiple drug techniques possess the wide safety margin specified by the UK definition of conscious sedation.

Quine in 1995 showed a mortality of 1:6000 with sedation for gastrointestinal endoscopy. 1/3 of these were attributed to the sedation practice. This included inadequate pre-assessment, lack of training, poor monitoring and excessive benzodiazepine use, particularly in the elderly and frail. Multiple drug techniques and the use of flumazenil were especially linked with poor outcomes.

In 2001 the Academy of Royal Colleges published guidance aimed at improving standards of training and practice. Stating safety would be optimised only if practitioners use defined methods of sedation with formal training. In 2003 the British Society of Gastroenterologists commented there had been no improvement on the mortality found by Quine, and that this was due to the almost total lack of structured training.

In 2004 NCEPOD published "Scoping our practice". This review again showed problems with sedation techniques even with those who had been on a training course. The recommendation was that all sedationists should have formal training and assessment.

2008 saw the National Patient Safety Agency publish a report highlighting 498 midazolam safety incidents. Again the report highlighted poor patient assessment and poor training, the risks of multiple concentrations of midazolam being available and the reliance on flumazenil for treating overdoses.

America.

There are two large American studies of paediatric sedation reviewing 35,000 cases. There were no deaths, one cardiac arrest and one case of aspiration but 1:200 patients required airway intervention of some form sometimes including intubation. A larger study looking at propofol sedation in children gave an incidence of 1:65 for airway intervention, no deaths, two cardiac arrests and four aspirations. In 2006 the American Society of Anaesthetists looked at closed claims for sedation. 121 claims were analysed, respiratory depression being the most common, 75% of those experiencing injury related

to sedation had received a combination of drugs. Again inexperience and inadequate training were cited.

Ensuring safe practice.

Sedation and general anaesthesia are a continuum. The possession of appropriate competencies is critical to preventing adverse events becoming poor outcomes. All practitioners should be competent to deal with a situation where sedation becomes deeper than intended. There is a need to define appropriate sedation techniques and the necessary competencies training and assessment for their safe use. Multiple drug techniques in particular warrant additional training.

As experts in the use of anaesthetic drugs and management of the unconscious patient, it seems reasonable that anaesthetists should be qualified to provide sedation services and teach sedation. However, few have received formal training in the use of sedation techniques, sedation not having previously been included in the anaesthetic curriculum.

The New Curriculum.

From August 2010 sedation will be included in the Royal College of Anaesthetists' training curriculum. This will ensure future trainees are better qualified to provide safe and appropriate sedation for patients under their care.

ADVANCES IN UNDERSTANDING THE ACTIONS OF NITROUS OXIDE

Emmanouil DE, Quock RM. Anesth Prog 54:9-18. 2007

Nitrous oxide (N₂O) has been used for well over 150 years for clinical dentistry for its analgesic and anxiolytic and anaesthetic properties. Recent studies have clarified the analgesic mechanisms, but the anxiolytic and anaesthetic mechanisms remain less clear. This article reviews the latest information on the proposed modes of action for these clinical effects of N₂O.

N₂O has multiple mechanisms of action that underlie its varied pharmacological properties. Current research indicates that the analgesic effect of N₂O appears to be initiated by stimulated neuronal release of endogenous opioid peptides, with subsequent activation of opioid

receptor and descending GABA and noradrenergic pathways that modulate nociceptive processing at spinal level.

The anxiolytic effect of N₂O involves activation of the GABAA receptor through the benzodiazepine binding site, although whether N₂O acts directly or indirectly upon the latter targets remains uncertain. The anxiolytic pathway that is stimulated includes a segment that involves a sequence of 3 key enzymes, NOS, soluble guanylyl cyclase, and PKG.

The anaesthetic effect of N₂O appears to be caused by inhibition of NMDA glutamate receptors and removing its excitatory influence in the nervous system.

ORAL SEDATION FOR DENTAL TREATMENT IN YOUNG CHILDREN IN A HOSPITAL SETTING

L. Lourenço-Matharu¹ & G. J. Roberts²

British Dental Journal 209, E12 (2010)

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Subject Categories: Anaesthesia and sedation | Paediatric dentistry | Sedation

Provides information on the safety of oral sedation in clinical paediatric dentistry.

Provides information on the efficacy of oral sedation when providing care to children.

Demonstrates the broad range of procedures in young children who would otherwise have had general anaesthesia.

Abstract

Introduction Conscious sedation for young children is a rapidly developing area of clinical activity. Many studies have shown positive results using oral midazolam on children. These case series investigated oral midazolam conscious sedation as an alternative to general anaesthesia in a clinical service setting.

Objective

The purpose of this work was to determine the safety and efficacy of oral midazolam for conscious sedation in children undergoing dental treatment.

Methods

Patients were selected by colleagues for treatment under oral sedation. The main general criteria were weight below 36 kilos and ASA I, II, or III. Midazolam 0.5 mg/kg was administered orally. A pulse oximeter was applied to a finger to monitor vital signs and the Houpt scale was used to assess behaviour.

Results

A total of 510 children aged between 13 months and 11 years were included. The behaviour of 379 (74%) was excellent or very good. The pulse rate and peripheral oxygenation were within the normal range for all patients. The main adverse effects were diplopia and post-sedation dysphoria.

Conclusions

Oral midazolam is a safe and effective method of sedation although some children were agitated and distressed either during or after treatment. Parents need to be warned about this.

THE EFFICACY AND SAFETY OF ARTICAINES VERSUS LIGNOCAINE IN DENTAL TREATMENTS: A META-ANALYSIS.

Katyal V.

J Dent. 2010 Apr;38(4):307-17. Epub 2009 Dec 16.

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Abstract

Objectives:

Although articaine has been recommended for providing an improved local anaesthetic effect in patients presenting for dental treatments, a relevant meta-analysis has been lacking. Despite articaine's popularity, there is contradictory evidence to support the claims. The aim of this systematic review was to compare the efficacy and safety of articaine with lignocaine in maxillary and mandibular infiltrations and block anaesthesia in patients presenting for routine dental treatments.

Data Sources:

The following databases were searched: Cochrane

Central, Medline, Embase, and ProQuest Health and Medical Complete. In addition, the metaRegister of the controlled trials database was searched to identify dissertations and ongoing or unpublished trials, and the Australian division of Septodont (the manufacturer of articaine and lignocaine) was contacted. The bibliographies of identified articles were also searched.

Study Selection:

Inclusion was limited to: (1) randomized controlled trials in patients requiring non-complex routine dental treatments; (2) interventions comparing 4% articaine (1:100,000 epinephrine) with 2% lignocaine (1:100,000 epinephrine) for maxillary and mandibular infiltrations and block anaesthesia; and (3) with principal outcome measures of anaesthetic success, post-injection adverse events or post-injection pain. Trial quality was evaluated by assessing randomization, allocation concealment, blinding, intention to treat analyses and how losses to follow up were addressed. Treatment effects were combined by meta-analysis using the random effects method.

Results:

Articaine is more likely than lignocaine to achieve an anaesthetic success in the posterior first molar area with a relative risk for success at 1.31 (95% CI 1.12–1.54, $P = 0.0009$). There is no difference in post-injection adverse events between articaine and lignocaine with a relative risk of 1.05 (95% CI 0.66–1.65, $P = 0.85$). However, articaine injection results in a higher pain score, as measured by Visual Analogue Scale, than lignocaine at the injection site after anaesthetic reversal with a weighted mean difference of 6.49 (95% CI 0.02–12.96, $P = 0.05$) decreasing to 1.10 (95% CI 0.18–2.02, $P = 0.02$) on the third day after injection.

Conclusion:

The results of this systematic review provide support for the argument that articaine is more effective than lignocaine in providing anaesthetic success in the first molar region for routine dental procedures. In addition, both drugs appear to have similar adverse effect profiles. The clinical impact of articaine's higher post-injection pain scores than lignocaine is negligible. Hence, articaine is a superior anaesthetic to lignocaine for use in routine dental procedures. Use in children under four years of age is not recommended, since no data exists to support such usage.

MANAGEMENT OF AIRWAY AND RESPIRATORY COMPLICATIONS DURING SEDATION

Michael Wood

Adapted from: Management of Complications during Moderate and Deep Sedation: Respiratory and Cardiovascular Considerations.

*Daniel E Becker and Daniel A Haas
Anesth Prog 54: 59–69 2007.*

There is increased risk of complications when sedating patients who are already medically compromised. By providing an adequate pre-operative assessment by careful intra-operative monitoring and the titration of drugs to the appropriate end-point, most significant untoward events can be avoided. We sedationists must be adequately trained to manage untoward events when they occur.

PRIMARY ASSESSMENT AND OXYGENATION

The management of any medical emergency should begin with a primary assessment with emphasis on the ABC – Airway, Breathing and Circulation – taught on Basic Life Support Courses. Prior to this it is important to check whether the patient is conscious by giving a 'shake and shout' to check whether there is any response. In the sedation setting it is unlikely that this emergency will occur in front of a single member of staff, although a medical emergency may occur in the waiting room or recovery room where help should be summoned from other staff members.

Initial priority should be given to the **airway** as breathing cannot be assessed if there is an obstruction present. The head should be tilted back and the chin lifted and the oro-pharynx examined for any foreign material. Most likely causes are the tongue flopping back on the posterior pharyngeal wall, debris e.g. fragments of tooth or crowns, water, vomitus, laryngospasm or laryngeal oedema. If the patient is unconscious, a jaw thrust in addition to the head-tilt, chin-lift procedure may be required to open the airway.

Next check for **Breathing** or ventilation. Ask the conscious patient to take a slow deep breath. If the patient is unconscious you should 'look, listen and feel' for ventilatory effort and airflow. An easy way is to lower your head with your ear close to the mouth of the patient

while observing whether the patient is making respiratory effort by looking at the chest. If this is still in doubt, one can auscultate the apices of both lungs for breath sounds. The most likely causes are drug induced respiratory depression, obstruction or bronchospasm. The carotid pulse can be palpated (**Circulation**) simultaneously or following this assessment. While this assessment is being carried out other team members may record pulse rate and haemoglobin oxygen saturation (SaO₂) by pulse oximeter (which confirms the presence of a radial pulse) and also the blood pressure at frequent intervals. Possible findings include bradycardia, tachycardia, hypotension or hypertension.

SUPPLEMENTAL OXYGENATION

An enriched oxygen concentration is indicated for patients who are spontaneously breathing, regardless of their level of consciousness. This will improve the oxygen content within the patient's functional residual capacity and delay hypoxemia should apnoea or obstruction develop. An oxygen source, a regulator, tubing and either a nasal cannula or a mask is required. Most practices will have an E sized cylinder and the recommendation is that these should be replaced or has a back-up when the cylinder oxygen pressure falls below 1000psi.

Approximate time usage for E size cylinder of oxygen can be worked out using the formula:

$$0.3\text{psi}/\text{flow rate (l/min)} = \text{time remaining in minutes}$$

E size cylinder at 1000psi delivering 10l/min oxygen = approximately 33 minutes remaining.

The nasal cannula is ideal for delivering supplemental oxygen to conscious patients who may be frightened of the mask or where the mask may interfere access to dental treatment. Each litre per minute of oxygen provided via cannula increases the percentage oxygen inspired (FIO₂) by approximately 4% above room air (FIO₂ = 21 + 4 x l/min). This formula is not applicable to masks. Flow rates above 4l/min become uncomfortable, but delivering 37% oxygen should be adequate supplementation for most situations when the patient is breathing.

The non-rebreather mask with a reservoir may be appropriate to deliver high oxygen concentrations to unconscious, breathing patients. When using any mask

the flow rate should be a minimum of 6l/min to avoid feelings of suffocation. Provided that this mask has a reservoir, this flow rate will deliver an oxygen concentration of approximately 60% and each additional l/min will increase the FIO₂ by approximately 5%. Theoretically non-rebreathing masks can deliver 100% if they fit snugly on the patient's face and the only source of gas being inhaled is derived from oxygen into the mask-reservoir system. In actual practice, disposable rebreathing masks can deliver FIO₂ of 60–80%. Previous concern regarding oxygen supplementation depressing hypoxemic drive in patients with chronic obstructive pulmonary disease (COPD) is no longer considered valid. Current thinking is to provide whatever concentration is required to maintain the SaO₂ on the pulse oximeter > 90%. Generally nasal cannula will suffice.

POSITIVE PRESSURE VENTILATION

The patient with apnoea is usually unconscious and will require positive pressure ventilation (PPV). Bag-mask-valve (BVM) devices with reservoirs can provide 90–95% oxygen concentrations but the operator needs special skills to attain these percentages of oxygen delivery in an unconscious patient. Proper head position, effective mask seal and bag compression are skills which must be developed if they are to be used effectively. These can be used on BLS courses and practiced on manikins. If ventilation remains difficult the use of airway adjuncts are indicated.

Oropharyngeal airways, e.g. Guedel airways, improve airway patency by keeping the mouth open and preventing the base of the tongue flopping back against the posterior pharyngeal wall. One can suction secretions through the lumen of this airway. It is important to use the correct size for the patient – a measurement is made from the corner of the mouth to the ear and the appropriate corresponding size airway is selected. It is inserted upside-down in the mouth and when the tip hits the palate, it is rotated down around the back of the tongue. When attempting to ventilate a patient with apnoea, a reasonable stepped approach is to attempt ventilation with BMV alone, followed, if necessary, by insertion of an oropharyngeal airway. If there is no improvement, consider advanced airway adjuncts like insertion of a laryngeal mask airway (LMA) or if the operator has the necessary skills and equipment, tracheal intubation.

Although intubation is the 'gold standard' its use is largely limited to anaesthetists and those trained in advance airway management. LMA is second best because it is reasonably effective and relatively easy to insert. Training on simulation manikins or live patients in theatre is still necessary to achieve competence in an emergency situation. The LMA fits over the larynx. The apex of the mask is inserted in the mouth, advanced towards the uvula, and continued through the natural bend of the oropharynx until it comes to rest over the pyriform fossa at the glottis. At this point the cuff around the mask is inflated with enough air to create a relatively airtight seal. The mask from the BMV is removed and the bag is directly attached to the tube's standard 15mm connector of the LMA. Ventilation is confirmed by auscultation of breath sound in the axillae and/or lung apices subsequent to squeezing the bag.

RESPIRATORY COMPLICATIONS

Management of Respiratory Depression

Generally the use of sedation reduces fear and anxiety in dental patients with less stress on the cardiovascular system and less chance of vasovagal reactions occurring. The two most significant risks introduced by sedation are respiratory depression i.e. hypoventilation and airway obstruction. Respiratory depression may present as a decrease in depth and/or rate of ventilation and is attributed to depression of respiratory control centres, which normally trigger breathing as CO₂ levels rise in the blood slightly above the normal threshold. All sedatives, opioids and anaesthetic agents (inhalational and intravenous) have the potential to depress central hypercapnic and/or peripheral hypoxemic drives, but the risk is minimal in conscious sedation, provided one uses conventional and titrated doses and the patient is monitored appropriately. Nevertheless, one must be thoroughly skilled in managing respiratory depression in the event it should occur.

During sustained hypoventilation or obstruction the SaO₂ may drop below 90% and trigger the alarm. The first reaction is to check whether the finger probe is still positioned correctly on the finger and the patient is encouraged to take big breaths by shouting quite firmly and then to observe the patient making respiratory effort. This may be followed by clearing the airway with suction apparatus and repositioning the head and jaw. Oxygen may be supplemented or PPV may be administered.

Management of respiratory depression should be managed with standard airway support as explained above. Pharmacologic reversal of the sedative agents is indicated whenever a dentist is faced with an unconscious patient, since airway complications such as laryngospasm, airway obstruction, aspiration, etc. may result in apnoea or failure to respond adequately to oxygen supplementation and attempts at positive pressure ventilation. Among the sedative drugs, the opioids are the most powerful respiratory depressants. If an opioid was included in the drug regimen for sedation, the drug naloxone (Narcan) should be the first reversal drug administered. It can be titrated intravenously 0.1–0.4mg every 3–5 minutes. Careful titration in no more than 0.1mg increments is advised for any patient susceptible to cardiac irritability or hypertension. The recommended maximum dose is 0.8mg, followed by a search for other causes if the response is inadequate. Naloxone should not be administered to a patient with a current history of opioid dependence, e.g. heroin user or patient using methadone, unless the event is life-threatening and other interventions have been futile.

Midazolam (and other benzodiazepines) can be reversed using the specific antagonist, flumazenil (Anexate). It can be titrated in 0.2–1mg IV increments every 2–3minutes, depending on the perceived urgency of the emergency treatment. Flumazenil should not be administered to patients having a history of benzodiazepine dependence, a seizure disorder managed by benzodiazepine or evidence of tricyclic anti-depressant overdose.

Management of Airway Obstruction

Airway obstruction must be distinguished from respiratory depression. Although obstruction may result in hypoventilation, the patient's actual drive to ventilate (breathe) may or may not be obtunded. Upper airway obstruction may be attributed to anatomical structures or foreign material, both of which were addressed previously. If these procedures fail to establish patency, pathological causes of obstruction must be considered, namely laryngospasm or laryngeal oedema.

Laryngospasm is a reflex closure or spasm of the glottic muscles. In conscious sedation it is transient and is followed by a cough to clear the foreign material or secretions that irritated the tissues of the larynx and triggered the spasm. If the patient is over sedated, the patient may not be able to clear the irritating material,

and therefore the laryngospasm can be dangerously prolonged. It occurs more frequently in children and in patients who are smokers. Most often, the patient is unconscious and one can observe see-saw breathing as the patient attempts to breathe against the obstruction. Rather than the upper abdomen and the chest rising simultaneously during attempts to breathe, these movements will alternate due to laryngospasm or any other airway obstruction. The airway should be suctioned followed by a forceful jaw thrust to open the airway, and the BMV forcefully applied to get a tight seal on the face. In most cases the spasm will relax following sustained pressure using a BMV, but hypoxemia may result if the spasm does not resolve quickly, particularly if supplemental oxygen was not used prior to the spasm. Gentle continuous pressure from the bag should be applied until ventilations are successful. Pharmacologic reversal of sedative agents is indicated for the sedationist if a patient becomes unconscious or if laryngospasm is diagnosed. Once the patient has regained consciousness, the laryngeal spasm should resolve following vigorous coughing. Failing this, and severe hypoxemia develops, a small dose of neuromuscular blocker, e.g. IV succinylcholine (0.1–0.2mg/kg), should suffice and should support the continued PPV using a BMV. Succinylcholine is generally only administered by anaesthetists.

Laryngeal oedema is among the constellation of events associated with major allergic (anaphylactoid) reactions. The swelling of the laryngeal mucosa, as well as neighbouring pharyngeal mucosa and tongue, may accompany anaphylactoid reactions and will generally present as stridor or high-pitched crowing sounds during ventilation. The conscious patient will grasp the throat and will complain of throat tightness or tongue swelling. Management will consist of the administration of adrenaline which 'decongests' the mucosa via vasoconstriction. It may be administered via different routes and doses. The most common dose is 0.3mg IM, but in severe cases 0.5mg IM may be indicated. Intravenous titration of 0.1mg increments are reserved for the most severe or refractory episodes.

Bronchospasm is a lower airway obstruction due to contraction or spasm of the bronchial smooth muscle. It may result from a Type 1 anaphylactic allergic reaction or an anaphylactoid reaction, independently or in combination with laryngeal oedema, or as a consequence of the hyperactive airway typical of patients with asthma. Regardless of the cause of the bronchospasm, the patient will exhibit dyspnoea and wheezing attributed to obstruction in the chest, not the throat or mouth. Bronchial smooth muscle is under autonomic nervous control and requires beta-2 sympathomimetics for relaxation. Following primary assessment, including oxygen supplementation, a selective beta-2 agonist such as salbutamol (2–3 inhalations every 1–2 minutes x 3 if needed) should be administered via a metered inhaler. This is preferred over adrenaline as it is less likely to produce positive cardiotoxic side effects attributed to stimulation of the beta-1 receptors. Spacer chambers can be attached to inhalers, and minimize the co-ordinated effort on the part of the patient.

Additional agents frequently mentioned in dental literature for managing asthma and allergic or anaphylactoid reactions include aminophylline and corticosteroids. These are not recommended for initial acute treatment because of limited efficacy and significant toxicity (aminophylline) or delayed onset, e.g. several hours (corticosteroids). Minor rashes can be managed with an antihistamine such as diphenhydramine.

SUMMARY

Preoperative and intraoperative assessment of the respiratory status is essential for patient care and for effective management of serious untoward incidents. Fundamental principles of physiology and patient assessment should be familiar if the clinician is to properly assess the status of the patient and select the appropriate treatment protocol. It is this familiarity that distinguishes cognitive from technical ability, and assures optimal care for the patient. ■



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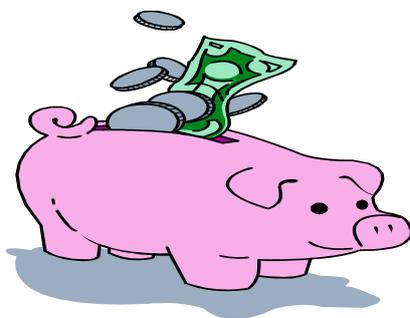
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6. Robb ND. Conscious sedation in dentistry. In: Heasman PA, editor. *Master Dentistry Vol. 2: Restorative Dentistry, Paediatric Dentistry and Orthodontics*. Edinburgh: Churchill Livingstone; 2003. pp. 149-168.

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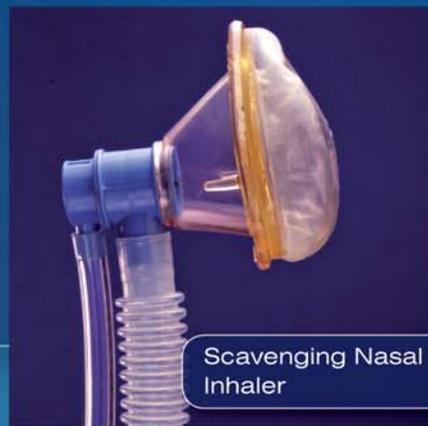
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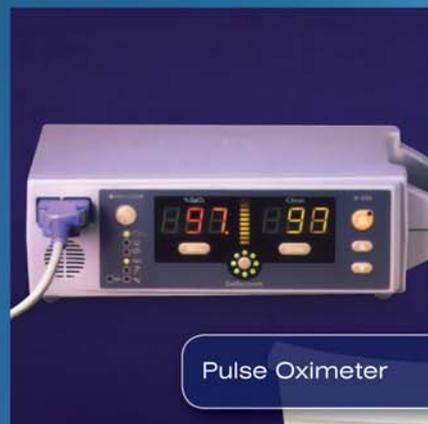
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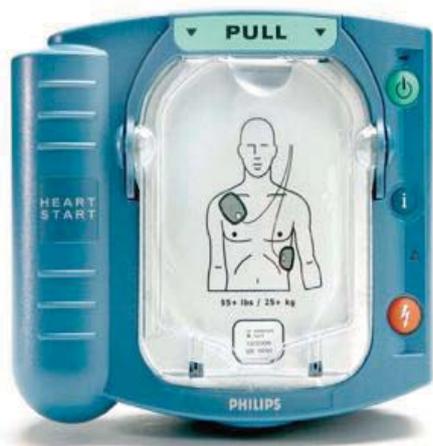


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	19-21	AAGBI	Winter Scientific Meeting	QEII Conf. Centre Westminster	meetings@aagbi.org
	31	AAGBI	Seminar: Resuscitation	21 Portland Place, London	http://aagbi.org/events/seminars2.htm#Z56
FEBRUARY					
	19-20	SAAD	Dental Nurse Part II Course	London	http://www.saad.org.uk/courses
	24-26	ADSA	Las Vegas Reviews	Caesar's Palace Hotel Las Vegas, USA	http://www.adsahome.org/vegas.html
MARCH					
	5-6	SAAD	National Course in Conscious Sedation for Dentistry (inc nurses)	London	http://www.saad.org.uk/courses
	14	Society for Education in Anaesthesia (UK)	Annual Scientific Meeting	Exeter	http://www.seauk.org/?q=node/11
APRIL					
	28-30	ADSA	Annual Session	Westin Kierland Resort & Spa Phoenix-Scottsdale, USA	http://www.adsahome.org/annual.html
MAY					
	10	DSTG	Annual Symposium	Liverpool Maritime Museum	www.dstg.co.uk
JUNE					
	11-12	SAAD	National Course in Conscious Sedation for Dentistry (inc nurses)	London	http://www.saad.org.uk/courses
	10-15		Euroanaesthesia 2011	Amsterdam RAI Convention Centre	http://www.euroanaesthesia.org/sitecore/content/Congresses/Euroanaesthesia%202011.aspx
	29-1 July	GAT	Annual Scientific Meeting	Leeds	www.aagbi.org
JULY					
	until 1	GAT	Annual Scientific Meeting	Leeds	www.aagbi.org
SEPTEMBER					
	3-4	SAAD	Dental Nurse Part II Course		http://www.saad.org.uk/courses
	7-10	ESRA	XXX Annual ESRA Congress	Dresden, Germany	http://www2.kenes.com/esra2011/pages/home.aspx
	24	SAAD	Annual Conference	RSM - 1, Wimpole Street, London	www.saad.org.uk
NOVEMBER					
	5-6	SAAD	National Course in Conscious Sedation for Dentistry (inc. nurses)	London	http://www.saad.org.uk/courses
2012 FEBRUARY					
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