The "Point of Care" section answers everyday clinical questions by providing practical information that aims to be useful at the point of patient care. The responses reflect the opinions of the contributors and do not purport to set forth standards of care or clinical practice guidelines. This month's responses were provided by speakers at the 2006 CDA Annual Convention (www.cda-adc.ca), which will be held August 24–26 in St. John's, Newfoundland.

QUESTION 1

How can I promote positive behaviour among children visiting the dental office?

Background to the Problem

Promoting a positive attitude toward dentistry in a safe environment, so that quality dental care can be provided, should be the ultimate goal of every dental health professional who interacts with children in the dental office. Unfortunately, modern dental curricula and popular continuing dental education programs are, for the most part, bereft of education in developmental psychology, education and training in communication skills and, most importantly, opportunities for students and dentists to practise the communication and behavioural skills that are so important in promoting and developing positive attitudes in this setting. As a result, nearly all dental professionals have had to learn through trial and error how to interact successfully with children. The following material has been excerpted or modified, with permission, from "Clinical Guideline on Behaviour Guidance for the Pediatric Dental Patient," an evidence-based guideline that was revised in 2005 by the Behaviour Management Subcommittee of the American Academy of Pediatric Dentistry.

Behaviour Guidance

Dental practitioners need to recognize that behaviour guidance is a continuum of interactions among the dental health care provider, the child (patient) and the parent, which are directed toward communication and education. We, the dental professionals, are working to alleviate fear and anxiety while promoting an understanding of the need for good oral health and how that is achieved. Communication between the child and the dentist is built on a dynamic process incorporating dialogue, facial expression and vocal tone.

The validity of the techniques used in behaviour guidance cannot be evaluated on an individual basis but must be evaluated within the context of the child's life experience, developmental age, and medical and dental experience. As such, behaviour guidance involves more than the simple application of techniques; rather, these methods must be integrated into an overall approach that is individualized for each child. As a result, behaviour guidance is as much an art as a science, a comprehensive, continuous approach that is meant to develop and nurture the relationship between patient and dental staff which, ultimately, builds trust, banishes fear and anxiety, and facilitates communication.

Maintaining compliance among children in the dental office demands skills of verbal guidance, expectation setting, discouragement of inappropriate behaviour and reinforcement of appropriate responses. Because children who are seen in dental offices exhibit a broad range of physical, intellectual, emotional and social development, as well as diverse attitudes, it is important that the dental team have at their disposal a wide range of behaviour guidance techniques so that they can meet the needs of each individual child.

Numerous barriers may hinder the development and implementation of a behaviour guidance plan, which in turn affects the outcome. Developmental delay, physical or mental disability, and acute or chronic disease are all potential reasons for uncooperative behaviour. In healthy children, the reasons for noncompliance are often more difficult to determine. Major factors can include fears transmitted by a parent, a previous unpleasant medical or dental experience, inadequate preparation for the first visit or dysfunctional parenting practices.[1,2]

Decisions regarding behaviour guidance techniques must involve the caregiver or parent, members of the dental team and possibly the child, if appropriate. Parents must be informed about the nature of the techniques to be used, their risks and benefits, and any alternative techniques, and the practitioner should be prepared to answer questions from the parent. Before treatment commences, it is imperative to document in the dental chart that a discussion about the behavioural guidance plan has occurred and that the parent understands what will be done. Some practitioners prefer to use consent forms for certain techniques, but this is a matter of personal choice.

An in-depth description of various behaviour guidance techniques is beyond the scope of this article. Readers are encouraged to review the document "Clinical Guideline on Behaviour Guidance for the Pediatric Dental Patient" (www.aapd.org/media/policies_guidelines/g_behavguide.pdf) for the objectives, indications and contraindications of specific techniques. This guideline has been endorsed by the members of both the American and Canadian academies of pediatric dentistry.

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Dr. Milnes' full-day session at the CDA Annual Convention, titled "Contemporary dental treatment of children," will be presented on Saturday, August 26.

References

1. Baier K, Milgrom P, Russell S, Mancl L, Yoshida T. Children's fear and behaviour in private pediatric dentistry practices. *Pediatr Dent* 2004; 26(4):316–21.

2. Rud B, Kisling E. The influence of mental development on children's acceptance of dental treatment. *Scand J Dent Res* 1973; 81(5):343–52.

QUESTION 2

How should I treat a Class III skeletal malocclusion in the early mixed dentition?

Background to the Problem

Even though Class III skeletal malocclusions occur in only 1% to 3% of populations of European descent,[1] their management can be prolonged and complicated. Class III skeletal malocclusions can be due to mandibular prognathism, maxillary retrognathism or a combination of these conditions. Maxillary retrognathism is present in approximately 60% of Class III skeletal presentations.[2] A complicating factor to early treatment of Class III skeletal malocclusions is that a significant amount of future mandibular growth can be expected, which increases the possibility of outgrowing any early correction.

In patients with mandibular prognathism, treatment with a chin cup appliance is designed to restrain mandibular growth.[3] Treatment of these cases can be frustrating, as the appliances must be worn into late adolescence until mandibular growth ceases. If treatment is terminated while growth is ongoing, the potential to outgrow any correction increases significantly. Rather than intervene early in these patients, treatment is usually delayed until late adolescence, when growth is almost complete. Orthognathic surgery is usually necessary if significant excess mandibular growth occurs during the teenage growth spurt.

In patients with maxillary retrognathism, treatment has been aimed at maxillary protraction with extraoral face-mask appliances (**Figs. 1** and **2**). Studies have shown that significant skeletal maxillary changes can result if the treatment is provided early in the mixed dentition rather than in the late mixed dentition or permanent dentition.[4]

Maxillary expansion appliances have been used in conjunction with the application of protraction forces to facilitate sutural effects, but recent research has shown that such expansion may be unnecessary.[5] Maxillary protraction is more effective in patients with increased overbite, reduced lower face height and a shallow mandibular plane angle, as the maxilla tends to be extruded posteriorly, which causes the mandible to rotate downward and backward. Treatment is ineffective in patients with an open bite tendency, increased lower face height and a steep mandibular plane angle. The long-term post-treatment results of maxillary protraction show promise with

Figure 1: Cephalometric radiograph of a boy (7 years and 2 months of age) before placement of a maxillary protraction appliance (image obtained in centric relation before anterior shifting of the mandible).

Figure 2: Complete anterior crossbite before placement of a maxillary protraction appliance (image obtained in maximum intercuspation after anterior shifting of the mandible).

Figure 3: Cephalometric radiograph after 8 months of treatment with a bonded maxillary protraction appliance.

Figure 4: Positive overjet after placement of a maxillary protraction appliance.

respect to relapse and continued mandibular growth in a majority of patients (**Figs. 3** and **4**).[6] With the advent and development of skeletal anchorage systems, maxillary protraction with intraoral elastics may hold promise in the treatment of maxillary retrognathia.

Management of Class III Skeletal Malocclusions in Young Children

The dentist should evaluate the patient's facial profile for the underlying cause of the Class III skeletal malocclusion.

1) To assess the anteroposterior relationship of the maxilla and mandible, have the patient stand and look into the image of their own eyes in a mirror. Drop an imaginary perpendicular line to the floor through the nasal bridge. The base of the nose, the upper lip and the chin should lie very close to this line. Positioning of the maxilla significantly behind this reference line suggests maxillary retrognathism, whereas positioning of the chin significantly ahead of this reference line suggests mandibular prognathism.
2) For patients with Class III relationships due to maxillary retrognathism, early intervention with maxillary protraction may be indicated. These patients should be evaluated by an orthodontist early in the mixed dentition stage to confirm the diagnosis of maxillary retrognathism and to begin treatment if necessary.
3) For patients with Class III skeletal relationships due to mandibular prognathism, initiation of orthodontic treatment should usually be delayed until the late permanent dentition stage. These patients could be referred to an orthodontist to confirm the diagnosis of mandibular prognathism and to monitor the skeletal growth and dental development of the patient.

In conclusion, children with Class III skeletal relationships due to maxillary retrognathism should be referred early in the mixed dentition stage for an orthodontic consultation to determine whether maxillary protraction is a treatment possibility. Research has shown that early intervention with maxillary protraction is more effective than late intervention.

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References

1. Proffit WR, Fields HW Jr, Moray LJ. Prevalence of malocclusions and orthodontic treatment need in the United States: estimates from the NHANES III survey. *Int J Adult Orthodon Orthognath Surg* 1998; 13(2):97–106.

2. Guyer EC, Ellis EE 3rd, McNamara JA Jr, Behrents RG. Components of class III malocclusion in juveniles and adolescents. *Angle Orthod* 1986; 56(1):7–30.

3. Sugawara J, Mitani H. Facial growth of skeletal Class III malocclusion and the effects, limitations and long-term dentofacial adaptations to chincap therapy. *Semin Orthod* 1997; 3(4):244–54.

4. Franchi L, Baccetti T, McNamara JA. Post pubertal assessment of treatment timing for maxillary expansion and protraction therapy followed by fixed appliances. *Am J Orthod Dentofacial Orthop* 2004; 126(5):555–68.

5. Vaughn GA, Mason B, Moon HB, Turley PK. The effects of maxillary protraction therapy with or without rapid palatal expansion: a prospective, randomized clinical trial. *Am J Orthod Dentofacial Orthop* 2005; 128(3):299–309.

6. Wells AP. Long term efficacy of reverse pull headgear therapy [master's thesis]. Chapel Hill (NC): University of North Carolina; 2005.

QUESTION 3

How much local anesthetic can I give to a child in one appointment?

Background to the Problem

The local anesthetics used in dentistry are very safe. Even though their adverse event rate is low, such incidents are occasionally observed simply because of the sheer volume of injections given. Each dentist in Canada uses approximately 1,800 cartridges of local anesthetic each year,[1] and in the United States, dentists use a total of over 300 million cartridges annually.[2] One possible adverse event is the occurrence of toxic effects from an overdose of anesthetic. While this is not a common concern for adult patients, it is a greater risk for children. As will be demonstrated below, it is relatively easy to administer an overdose to a young child. How can we prevent this problem? In other words — how can we determine how much is too much?

Management of the Problem

Step 1: Become familiar with recommended maximum doses

The first step is to know the recommended maximum doses of local anesthetics. Recommendations are based on body weight, and different values are presented in different sources in the literature. The doses in **Table 1** are taken from the standard pharmacology text by Yagiela and others,[3] as well as the current edition of the *Compendium of Pharmaceuticals and Specialties*.[4] These values should be considered accurate, although other published recommendations give lower maximums for some drugs.[2,5]

Table 1 Recommended maximum doses of local anesthetics in dentistry[3,4]

Drug	Maximum dose (mg/kg)
Articaine with epinephrine	7
Bupivacaine with epinephrine	2
Lidocaine with epinephrine	7
Mepivacaine plain or with vasoconstrictor	6.6
Prilocaine plain or with epinephrine	8

Step 2: Determine body weight

Record the body weight of the child.

Step 3: Perform calculations

This information can be used to calculate the maximum dose, which will then determine the volume and number of cartridges for any local anesthetic being considered.

To calculate the dose of a local anesthetic in each cartridge:

- The numeric value of a percent solution represents grams of anesthetic per 100 mL.
- Move the decimal place one digit to the right, and this value becomes the dose in milligrams per millilitre (e.g., 2% lidocaine = 20 mg/mL; 4% prilocaine = 40 mg/mL).
- Each cartridge holds 1.8 mL (notations on more recently released formulations may list 1.7 mL, which means that there is a *minimum* of 1.7 mL in the cartridge; however, all cartridges used in Canada have a volume of essentially 1.8 mL).
- Multiply the volume by the concentration to obtain the dose in a single cartridge (e.g., one cartridge of 4% articaine contains 1.8 mL × 40 mg/mL = 72 mg).

As an example, to calculate the maximum volume of 3% mepivacaine plain for a child weighing 20 kg, in terms of number of cartridges:

- Total dose that can be given = 6.6 mg/kg [from **Table 1**] × 20 kg [body weight] = 132 mg
- Concentration of drug is 3% = 30 mg/mL
- Maximum volume that can be administered = 132 mg ÷ 30 mg/mL = 4.4 mL
- Each cartridge = 1.8 mL
- Maximum number of cartridges = maximum volume ÷ cartridge volume = 4.4 mL/1.8 mL = 2.4 cartridges

Table 2 uses the maximum doses in **Table 1** to calculate the maximum number of cartridges of local anesthetics for children weighing 14 kg, 18 kg and 23 kg. These weights correspond to the 50th percentile weights for a 3-year-old, a 5-year-old, and a 7-year-old, respectively.

Bupivacaine has been omitted from **Table 2** because it causes a long duration of soft-tissue anesthesia and is therefore not recommended for use in children. The maximum number of

Table 2 Maximum number of drug cartridges of local anesthetics for children[a]

Drug	Maximum no. of cartridges		
	3-yr-old (14 kg)	5-yr-old (18 kg)	7-yr-old (23 kg)
4% articaine with epinephrine	1.4	1.8	2.2
2% lidocaine with epinephrine	2.7	3.5	4.5
3% mepivacaine plain	1.7	2.2	2.8
2% mepivacaine with vasoconstrictor	2.6	3.3	4.2
4% prilocaine plain or with epinephrine	1.6	2	2.6

[a]*Using 50th percentile of weight for age. Calculations should be based on the child's body weight and not his or her age.*

cartridges for each drug presented in **Table 2** would be smaller if the lower maximums for children, as reported in the literature,[2,4,5] were used in the calculations.

Table 2 shows that, depending on the drug formulation selected and the weight of the child, even 2 or 3 cartridges may be an overdose. To minimize the likelihood of toxic effects, selecting a low-concentration solution would appear to be the best approach. This means that 2% lidocaine with 1:100,000 epinephrine may be the ideal local anesthetic for a child, with 2% mepivacaine with vasoconstrictor a close second. Because of its higher concentration, the 3% mepivacaine formulation may not be as good a choice, even though it contains no vasoconstrictor. There should be little concern about prolonged duration of action due to vasoconstrictor, as it has been shown that the degree of soft-tissue anesthesia does not differ substantially between 2% lidocaine with 1:100,000 epinephrine and 3% mepivacaine plain or 4% prilocaine plain.[6] The maximum number of cartridges may be reached more readily with either of the 4% solutions available (articaine or prilocaine), simply because there is more drug in each cartridge.

In conclusion, knowing the weight of the child and the recommended maximum doses allows us to calculate how much local anesthetic can be given safely. The selection of a low-concentration local anesthetic appears to be the most prudent choice for a young child.

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References

1. Haas DA, Lennon D. Local anesthetic use in dentistry in Ontario. *J Can Dent Assoc* 1995; 61(4):297–304.

2. Malamed SF. Handbook of local anesthesia. 5th ed. St. Louis: Mosby; 2004. p. 285.

3. Local anesthetics. In: Yagiela JA, Dowd FJ, Neidle EA, editors. Pharmacology and therapeutics for dentistry. 5th ed. St. Louis: Mosby; 2004, p 265.

4. Canadian Pharmacists Association. Compendium of pharmaceuticals and specialities 2005. p. L28.

5. United States pharmacopeial drug information index. 24th ed. Thomson Micromedex; 2004. p. 169.

6. Hersh EV, Jermann DG, Lamp CJ, Johnson PD, MacAfee KA. Assessing the duration of mandibular soft tissue anesthesia. *J Am Dent Assoc* 1995; 126(11):1531–6.