Mandibular Block or Maxillary Infiltration: Does it Influence Children's Opposition to a Subsequent Dental Visit?

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Purpose: *Local anesthesia by mandibular block or maxillary infiltration is commonly administered to children receiving dental treatment of primary molars. Discomfort, when presenting, most often involves the lower lip. The purpose of this study was to investigate whether children would be more opposed to attending a dental treatment following anesthesia by mandibular block than by maxillary infiltration.* ***Methods:*** *Each of 102 children in two age groups: 3 to 5 years, and 6 to 9 years, received the two types of local anesthesia at dental appointments one week apart. Their opposition to attending a subsequent appointment was assessed by parent report.* ***Results:*** *More adverse reactions were observed during and following anesthesia with mandibular block than with maxillary infiltration. Few of the children in either age group expressed opposition to attend a dental visit after receiving mandibular block or maxillary infiltration in the previous visit.* ***Conclusions:*** *Though more adverse reactions were observed in children following mandibular block than maxillary infiltration, this did not result in increased opposition to attend a subsequent dental appointment.*

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INTRODUCTION

Behavior management is critical to the success of pediatric dental procedures. When a child is calm during administration of local anesthesia and treatment, the clinical process may be more effective. Many techniques have been described for managing child behavior in the dental office, both pharmacologic and non-pharmacologic.[1] The memory of previous dental experiences has been found to influence the behavior and the experience of children during subsequent treatment sessions.[2]

Local anesthesia is the most common form of operative pain control in dentistry. Of the many techniques available, supraperiosteal infiltration in the buccal fold for maxillary teeth and inferior alveolar nerve block for mandibular teeth are the most frequently used in children.[3] Accidental biting or chewing of the lip, tongue, or cheek is a complication of residual soft tissue anesthesia, of both maxillary infiltration and mandibular block.[3] The sensation of numbness from anesthesia may cause children to scratch the soft tissues of their mouth, and to bite their lips and tongue. Discomfort due to soft tissue anesthesia most often involves the lower lip. The tongue is less frequently injured, and the upper lip is rarely involved.[3]

In our clinic, we cope with children's frequent complaints about the feeling of numbness due to local anesthesia, particularly following mandibular block. However, to the best of our knowledge no evidence based study has assessed the effect of this feeling on children's willingness or opposition to attend a subsequent dental appointment. Therefore, the purpose of the current study was to compare, according to parent report, children's opposition to attending a dental appointment following administration of two common types of local anesthesia. Due to the greater discomfort to the lower lip resulting from soft tissue anesthesia, we hypothesized that children would be more opposed to attending a subsequent dental appointment following local anesthesia by mandibular block than by maxillary infiltration.

MATERIALS AND METHOD

This study was conducted by three pediatric dentists in the Department of Pediatric Dentistry of the Hadassah School of Dental Medicine and in their private pediatric dental clinic in Jerusalem and Tel Aviv. Selection criteria for this study

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included American Society of Anesthesiology (ASA) Class I, no prior dental treatment with local anesthesia, and the need for at least two clinical sessions of similar non-emergency procedures. We enrolled in the study 102 children between the ages of 3 and 9. For analysis, children were assigned to two age groups: group A, aged 3 to 5 years old, and group B, aged 6 to 9 years old.

At the first visit at the clinic, and following routine policy, each child's preoperative behavior was rated from 1 (least cooperative) to 4 (most cooperative) on the Frankl Behavior Rating Scale.[4] A rating of 1 was an exclusion criterion. Those whose preoperative behavior was assessed as 2-3 were sedated with nitrous oxide/oxygen prior to anesthesia.

Each patient was randomly assigned, by the toss of a coin, to receive either maxillary infiltration or mandibular block for the first visit. Each received the other local anesthesia during the second visit, and anesthesia according to clinical needs in the third visit, when there was a third visit. The interval between operative visits was one week. Three experienced pediatric dentists administered the anesthetic injections using the same techniques, including distraction means, rates of injection, and timing of treatment following anesthesia. The same pediatric dentist treated the same patient at all visits.

At least one injection comprising 2% lidocaine 1:100.000 epinephrine was administered to one jaw prior to each dental treatment; a rubber dam was used. Treatment complexity was defined as simple (Class I, Class II) restorations and complex (stainless steel crowns, pulp therapy, dental extractions).[5]

Topical anesthetic gel on a cotton-wool roll was applied to the injection site prior to injection. A short needle (20 mm, 30 gauge) was used for both maxillary infiltration and mandibular block. Injection of the local anesthetic was slow, approximately 1 ml per minute, with an average duration of nearly two minutes. To assure that the palatal tissue would be anesthetized, and that the child would not feel any pain during the dental procedure, intrasulcular palatal infiltration was delivered for complex treatments.

At each of the two or three operative sessions, one of three dental assistants, in the role of observer, filled in a research chart (Figure 1). She asked the child's parents if he/she was opposed to coming to the appointment (Figure 1,

Figure 1.
ASSESSMENT OF LOCAL ANESTHESIA: MAXILLARY INFILTRATION OR MANDIBULAR BLOCK
Operator:_____ Child's Name:_____ Age _____ Behavior at initial visit (Frankl) 2) (3) (4)

		1st treatment	2nd treatment	3rd treatment
Date				
1. At home, did the child oppose coming to the dental clinic?		YES / NO	YES / NO	YES / NO
2. Did the child cry when he/she entered the clinic?		YES / NO	YES / NO	YES / NO
3. Did the child oppose siting on the dental chair voluntarily?		YES / NO	YES / NO	YES / NO
4. NITROUS OXIDE/OXYGEN		YES / NO	YES / NO	YES / NO
5. LOCAL ANESTHESIA		Mandibular block/ Max. infiltration	Mandibular block/ Max. infiltration	Mandibular block/ Max. infiltration
6. Treatment performed		Simple/complex/ combined	Simple/complex/ combined	Simple/complex/ Combined
THE MODIFIED BEHAVIOR PAIN SCALE				
7. During injection:	crying	YES / NO	YES / NO	YES / NO
	eye movement	YES / NO	YES / NO	YES / NO
	hand movement	YES / NO	YES / NO	YES / NO
	feet movement	YES / NO	YES / NO	YES / NO
	torso movement	YES / NO	YES / NO	YES / NO
8. After treatment	crying	YES / NO	YES / NO	YES / NO
	scratching	YES / NO	YES / NO	YES / NO
9. At home	crying	YES / NO	YES / NO	YES / NO
	scratching	YES / NO	YES / NO	YES / NO
	biting	YES / NO	YES / NO	YES / NO
	numbness	YES / NO	YES / NO	YES / NO
	analgesics	YES / NO	YES / NO	YES / NO

questions 1 to 3), During the anesthetic injection and immediately after treatment she assessed the child's behavior according to the Modified Behavioral Pain Scale[6] (Figure 1, items 4 to 8). This scale assesses body movements, crying, scratching, and biting. The observers acquired experience with the scale in earlier studies.[7] Inter-observer calibration was calculated in a pilot study of 15 patients, kappa= 0.89.

Approximately one hour after completion of treatment, the same observer called the child's parent to ask about the reaction to the local anesthesia (Figure 1, item 9), and whether analgesics were needed.

The Hadassah Human Subjects Institutional Board approved this prospective study. Consent was obtained from each participant's parent.

Frequencies and percentages were calculated for the categorical variables. Frequencies of the categorical variables between age groups were compared by the "Chi square test" (a parametric test) or by "Fisher-Irwin exact test (a non-parametric test for small sample). The statistically significant level for all tests was $p \leq 0.05$.

RESULTS

Group A (mean age 4.4 ± 0.6) comprised 31 boys and 27 girls; group B (mean age 7.5 ± 1.2) comprised 28 boys and 16 girls. The difference in proportions between the sexes was not statistically significant.

There was no statistically significant difference between the age groups in behavior at the initial pre-operative visit, as assessed by the Frankl scale, (p=0.118). Considerably more children in group A than in group B opposed attending the first treatment session, 25/58 (43%) and 3/44 (6.8%) and respectively, p=0.0001 (Table 1). Almost half the children in each group received inhalation sedation with nitrous oxide/oxygen (Table 1).

Reactions to the first visit

Table 1 presents behaviors during the first visit and negative reactions (crying, scratching or biting lips and cheek) after the operative dental treatment, as assessed by parents. For both age groups, more than half the children had at least one negative reaction after mandibular block anesthesia, compared with less than one half at maxillary infiltration. Differences in crying, scratching or biting lips and cheek between the two types of anesthesia and between the age groups were not statistically significant (Table 1). The proportion of children who needed analgesia was similar for the two injection techniques (Table 1).

Opposition to the second visit

The proportion of children who opposed attending a second dental appointment was similar following mandibular block and maxillary infiltration (Table 2), and following simple and complex treatment in the first visit (Table 3).

Reactions to the second visit

There were no statistical differences for either age group in negative reactions at home (crying, scratching, biting or numbness) following maxillary infiltration and mandibular block.

Of children in group B who received maxillary infiltration, more took analgesics after complex treatment than after simple treatment (p = 0.02). No such difference was found

Table 1. Parameters of treatment, behavior and reaction to anesthesia during the first visit.

		Group A (ges 3 to 5) N=58 (%)	Group B (ages 6 to 9) N=44 (%)	p values
Opposed coming to the first visit	YES	25 (43.1)	3 (6.8)	0.0001 *
	NO	33 (56.9)	41 (93.2)	
Use of nitrous oxide / oxygen	YES	26 (44.8)	20 (45.5)	1.00
	NO	32 (55.2)	24 (54.5)	
Local anesthesia in the 1st visit	Mand. block	33 (56.6)	20 (45.5)	0.252
	Max. infilt.	25 (43.1)	24 (54.5)	
At least one negative reaction after mandibular block at first visit	yes	21 (63)	11 (55)	0.533
	no	12 (37)	9 (45)	
At least one negative reaction after maxillary infiltration at first visit	yes	10 (40.0)	7 (29.0)	0.459
	no	15 (60.0)	17 (71.0)	
Analgesics after mandibular block	yes	4 (12.0)	3 (15.0)	0.764
	no	29 (88.0)	17 (85.0)	
Analgesics after maxillary infiltration	yes	4 (16.0)	3 (15.0)	0.539
	no	20 (80.0)	17 (85.0)	

* Statistically significant
Negative reactions: crying, scratching, biting

Table 2. The effect of the type of local anesthesia administered during the first visit on opposition to attending a second visit

			Mandibular block N (%)	Maxillary infiltration	p values
Opposed coming to second visit	Group A N=58	YES	13 (40.0)	7 (28.0)	0.366
		NO	20 (60.0)	18 (72.0)	
	Group B N=44	YES	5 (25.0)	1 (4.0)	0.058
		NO	15 (75.0)	23 (96.0)	

for children in group A. Of children in group B who received mandibular block, only one underwent complex treatment, thus no conclusions could be reached.

Opposition to the third visit

For group A, 52% (14/27) of the children who received mandibular block and 52% (16/31) of those who received maxillary infiltration in the second visit opposed attending the third visit.

For group B, 19% (3/16) of the children who received mandibular block in the second visit, and 25% (7/28) of those who received maxillary infiltration opposed attending the third visit. This difference was not statistically significant.

For children in both age groups who underwent simple treatment, there was no statistically significant correlation between the type of anesthesia at the second visit and opposition to the third visit.

One child in group B who received maxillary infiltration and underwent a complex treatment in the second visit refused to come to the third visit (Table 4).

No statistically significant correlation was found between behavior at the initial visit, as assessed by the Frankl scale, and opposition to the second and third appointments for either the younger or the older age group.

DISCUSSION

The findings of this study did not reject the null hypothesis, namely that the type of anesthesia: mandibular block or maxillary infiltration used at one dental appointment did not affect children's opposition to attend a subsequent appointment. This was despite the observation that a higher proportion of children who received mandibular block anesthesia presented adverse reactions, such as pain or discomfort, crying, or scratching or biting of soft tissue than did those who received maxillary infiltration anesthesia.

In this prospective study, children were randomly assigned to one type of anesthesia at the first visit, and received the other type at the subsequent visit. The complexity of the dental procedure and age of children were considered. Dental assistants assessed children's behavior during dental visits. Parents reported by means of a phone interview, their children's behavior immediately following dental treatment, and by personal interview, their willingness to attend a subsequent visit.

College *et al* [8] also reported more adverse reactions following mandibular block anesthesia. They found postoperative soft-tissue trauma after mandibular anesthetic blocks to present in 16 % of 4 to 7-year-olds and 13 % of 8 to 11-year-olds.

Despite the negative reactions, few of our patients needed analgesics following anesthesia with either mandibular block or with maxillary infiltration. In contrast, Acs and Drazner[9] found that 31.5 % of children reported pain following routine restorative procedures; 52.9 % of these patients, mean age 8.1 years old (range 6–13) required analgesic relief.

The current study supports our previous finding that

Table 3. The effect of complexity of treatment in the first visit on opposition to attending a second visit

			Mandibular block		p	Maxillary infiltration		p
			Simple N (%)	Complex N (%)		Simple N (%)	Complex N (%)	
Opposition to attending the second visit	Group A	yes	3 (23.0)	10 (50.0)	0.159	3 (20.0)	4 (40.0)	0.378
		no	10 (77.0)	10 (50.0)		12 (80.0)	6 (60.0)	
	Group B	yes	2 (20.0)	3 (30.0)	1.00	3 (13.6)	4 (40.0)	0.451
		no	8 (80.0)	7 (70.0)		19 (86.4)	6 (60.0)	

Table 4. The effect of complexity of treatment in the second visit on opposition to attending a third visit

			Mandibular block		p	Maxillary infiltration		p
			Simple N (%)	Complex N (%)		Simple N (%)	Complex N (%)	
Opposition to attending the third visit	Group A	yes	6 (40.0)	8 (67.0)	0.252	7 (44.0)	9 (60.0)	0.366
		no	9 (60.0)	4 (33.0)		9 (56.0)	6 (40.0)	
	Group B	yes	3 (20.0)		1.00	3 (13.6)	4 (66.7)	0.021*
		no	12 (80.0)	1 (33.0)		19 (86.4)	2 (33.3)	

*statistically significant

children perceive similarly anesthesia by maxillary infiltration and mandibular block.[10] It seems that opposition to attending a second dental visit is not related to scratching of the soft tissues and biting lips and tongue following a sensation of numbness. Interestingly, Versloot *et al* [2] did not find differences in pain to associate with which jaw, upper or lower, received local anesthesia. Nor did they find differences in pain between high and low anxious children. However, they did find that children aged six years and older, with previous dental experience, reported greater pain than children without previous experience, though this difference was not statistically significant. They concluded that memories of previous dental experience and previous treatment had considerable influence on children's behavior and experience during subsequent treatment sessions.

We reported that close to half of the children in the younger group opposed attending the first visit. This proportion did not change considerably in the second visit, for those who received maxillary infiltration or mandibular block in the first visit, regardless of whether the treatment was simple or complex. It seems that fear, which is affected by temperament and verbal intelligence has a greater impact on younger children's opposition to a dental appointment. Along this line, Arnrup *et al*[11] suggested that children with different levels of fear, temperament, and behavioral profiles can benefit from different treatment regimens. We suggest that good dentist-child rapport contributes considerably to children's capability of coping with the unpleasantness of dental treatment.

In the older age group, children who received maxillary infiltration were more likely to be opposed to attending the third treatment if they underwent complex treatment at the second visit than if they underwent simple treatment. We were not able to investigate such an association in children who received mandibular block since only one of them underwent complex treatment. It is possible that children who received complex treatments in the upper jaw felt more pain after treatment than those who received a successful mandibular block, and that this was the reason for anxiety and opposition to the third appointment. It thus seems that the pain of the treatment had a greater effect than the type of anesthesia on willingness to come to a subsequent dental appointment.

Subjective assessment of behavior is an unavoidable limitation of such a study. Nevertheless, the dental assistants who both assessed children's behavior and interviewed parents received prior experience in the role of study observer.

CONCLUSIONS

Though more adverse reactions were observed in children following mandibular block than maxillary infiltration, our hypothesis that this would result in increased opposition to attend a subsequent dental appointment was not confirmed.

The demonstration that discomfort after dental treatment with local anesthesia does not increase children's opposition to attend a subsequent appointment leaves the decision of whether to start treatment with maxillary infiltration or mandibular block to the discretion of the dentist.

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