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Assessment of early postoperative pain and haemorrhage in young children undergoing dental extractions under general anaesthesia

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Background. There have been a lot of guidelines issued about dental extractions under general anaesthesia. There is a considerable body of research about the use of local anaesthetic as an adjunct. Some of this research appears to be contradictory about the use of local anaesthetic in addition to general anaesthesia in very young children. This study attempts to clarify the issue.

Aim. To determine whether postoperative pain/distress in the early recovery period was different for those children who did or did not have local infiltration anaesthesia for extractions under general anaesthetic, and whether the incidence of clinically significant postoperative bleeding was different for the two groups.

Design. Children aged 2–6 years, admitted for extraction of deciduous posterior teeth under general anaesthetic, were randomized to groups that were or were not given local infiltration anaesthesia during the procedure. The children were premedicated with paracetamol and ibuprofen, and had absorbable haemostatic packs inserted during the operation. Staff blinded to treatment allocation made observations in the recovery period of pain and any interventions for bleeding.

Results. There was no difference in postoperative pain, as measured using CHEOPS scale between the two groups, but an increase in post operative bleeding in the group who did not have local anaesthetic administered 5/38 compared to 0/38, $P = 0.02$.

Conclusions. As use of local anaesthetic reduces bleeding without altering pain or distress in young children undergoing posterior deciduous tooth extraction, we should consider using as an adjunct to general anaesthesia.

Introduction

There are existing guidelines and evidence for dental clinicians on the use of general anaesthesia for treatment of children, relating to prescribing of this technique, treatment planning for such interventions[1,2]. To date, there has been less consensus or evidence about the details of the clinical operative techniques that should be used to reduce postoperative morbidity. Young children may be distressed by the numbness of local anaesthesia and by the bleeding from dental extractions. Some operators use local anaesthetic as an adjunct to general anaesthesia for its associated vasoconstriction. While this could reduce bleeding, it could increase distress due to associated facial numbness.

Previous research on whether to use local anaesthetic in young children has been ambivalent, with one study suggesting that the use of local anaesthetic reduced bleeding but increased distress[2], while another suggested that local anaesthetic was more effective than systemic analgesia and that patients who received local anaesthetic injections were more settled in recovery[3]. A study that investigated bupivicaine-soaked swabs as an alternative topical method of postoperative pain control, in order to avoid the postoperative facial numbness which can be distressing for young children, showed they were ineffective[4] at reducing pain.

Absorbable haemostatic packs can also be placed in sockets to reduce bleeding. Where children have absorbable haemostatic packs placed, it is unclear whether the addition of local anaesthesia with vasoconstrictors reduces distress or bleeding.

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Term	Behaviour	Score	Definition
Cry	no cry	1	child is not crying
	moaning	2	child is moaning or quietly vocalizing; silent cry
	crying	2	child is crying but the cry is gentle or whimpering
	scream	3	child is in a full-lunged cry; sobbing; may be scored with complaint or without complaint
Facial	smiling	0	score only if definite positive facial expression
	composed	1	neutral facial expression
	grimace	2	score only if definite negative facial expression
Child verbal	positive	0	child makes any positive statement or talks about other things without complaint
	none	1	child is not talking
	other complaints	1	child complains but not about pain, e.g. thirsty or wants mum
	pain complaints	2	child complains about pain
	both complaints	2	child complains of pain and other things
Torso	neutral	1	body (not limbs) is at rest; torso is inactive
	shifting	2	body is in motion in a shifting or serpentine fashion
	tense	2	body is arched or rigid
	shivering	2	body is shuddering or shaking involuntarily
	upright	2	body is in vertical or upright position
	restrained	2	body is restrained
Touch	not touching	1	child is not touching or grabbing at the wound
	reach	2	child is reaching for but not touching the wound
	touch	2	child is gently touching wound or wound area
	grab	2	child is grabbing vigorously at the wound
	restrained	2	child arms are restrained
Legs	neutral	1	legs may be in any position but are relaxed
	squirming/kicking	2	definite uneasy or restless movements in the legs and or striking out with foot or feet
	drawn up/tensed	2	legs tensed and/or pulled up tightly to body and kept there
	standing	2	standing, crouching, or kneeling
	restrained	2	child's legs are being held down

Fig. 1. Central Hospital of Eastern Ontario pain score.

The aim of this study was to determine whether postoperative distress in the early recovery period was different for those children who did or did not have local infiltration anaesthesia for extractions under general anaesthetic, and whether the incidence of clinically significant postoperative bleeding was different for the two groups. The study intended to examine the apparent postoperative pain of children patients using a validated, reproducible tool developed elsewhere – Children's Hospital of Eastern Ontario Pain Scale (CHEOPS)[5] – and to record the incidence of clinically significant events relating to haemorrhage. The CHEOPS is shown in Fig. 1.

Materials and methods

Subjects and setting

Local ethics committee approval was obtained, and an explanatory leaflet about the study was included with the booking information sent to parents prior to admission. Separate consent was obtained on the day of admission, for the procedure and for inclusion in the study. The study involved children aged under 6 years of age on the day of the procedure, who were admitted to the Day Surgery Unit of Dumfries & Galloway Royal Infirmary for extraction of deciduous posterior teeth under general anaesthesia.

Children with severe learning difficulties or communication disorders such as autism, those with bleeding disorders or who were receiving systemic anticoagulants, or who were given a sedative preoperative medication were excluded. Those children who were having deciduous incisor extractions only were also excluded; many operators feel that the numbness of the nose and face associated with use of anaesthetic infiltration in the anterior area is especially likely to cause distress in young children, and prefer not to use it in this situation. Children of parents who expressed a preference for or against use of local anaesthetic were also excluded.

Method

The children were premedicated with oral paracetamol (20 mg/kg) and ibuprofen (5 mg/kg). Children who refused oral premedication had rectal diclofenac suppositories administered (approximately 1 mg/kg) while under anaesthesia.

Induction of anaesthesia was either intravenously with propofol, or by inhalation with nitrous oxide and sevoflurane. The airway was maintained by sevoflurane via either a laryngeal mask airway, or a nasal dental mask. After induction of anaesthesia, the dentist checked each case consecutively against a randomization list previously prepared by computer (Arcus Quickstat, V1.0), which allocated each child to the 'local anaesthesia group' or 'non-local anaesthesia group'. The children in the local anaesthesia group then received intraoral infiltrations using 4% lidocaine with 1 : 80 000 adrenaline and absorbable haemostatic packs, while the children in the non-local anaesthesia group had haemostatic packs alone.

The dental operator performing the extractions could thus not be blinded with regard to use of local anaesthetic, since it was she who administered it. Those children who did not receive local anaesthetic were the controls within the study. All children had a dental pad inserted between the teeth before they awoke. The initial results were checked after 40 patients to perform a power calculation as to the number of children required to show at least a difference of 1 with regard to the respective CHEOPS scores with a 5% type I error and a type II error of 80%. This analysis suggested that about 40 patients were needed in each group.

The bleeding and pain in the early postoperative recovery period were assessed by the postanaesthesia care unit staff who were blinded to the treatment allocation and not present in theatre at time of randomization. The recovery staff assessed pain using the CHEOPS scale, which has previously been used for assessment of distress during induction for children having dental extractions under general anaesthesia[6], and has shown good reliability when used by parents and nursing staff[7]. The recovery staff made an assessment using the CHEOPS score for the period between the child awakening and being sufficiently recovered to return to the discharge waiting area. They also recorded whether they needed to change the dental pads due to excess bleeding, whether suctioning for bleeding was required, whether the dentist had to reassess the child for bleeding, or needed a further operation to control bleeding. Early discharge sometimes occurs due to the child being very distressed, so incidence of this was also recorded.

The results were recorded on a spreadsheet (Microsoft Excel 2000) and analysed with Arcus Quickstat (version 1.0). The CHEOPS results were compared with a Mann–Whitney *U*-test, and all the other results with Fisher's exact test.

Results

Eighty-five children were included, between August 2004 and July 2006. One child who received local anaesthesia was excluded from analysis as he had been given the opioid fentanyl intravenously. Eight more children were excluded for failure to collect all the data required for the CHEOPS score.

Table 1 outlines the patient characteristics. The children were of similar age, and had a similar number of teeth removed.

The results of the CHEOPS and bleeding observations are outlined in Table 2.

Analysis of results

There was no significant difference in the CHEOPS score between the two groups of children as demonstrated by the Mann–Whitney *U*-test

Table 1. Number of children included in each group, including their ages and the number of teeth extracted.

	Local anaesthesia	No local anaesthesia
Number of children	45	40
Age	5.2	4.9
Median (interquartile range)	(4.2–5.7)	(4.1–5.4)
Number teeth extracted	4	4
Median (range)	(1–12)	(1–14)
Exclusions/missing data	7	2

Table 2. Postoperative recovery period observations for each group.

	Local anaesthesia	No local anaesthesia
CHEOPS median	6	6
(Range)	(0–11)	(0–13)
(Interquartile range)	(5–8)	(5–8.75)
Suctioning for bleeding*	0	5
Dental pack change	1	1
Dentist called back to child	0	1
Delayed discharge	0	0
Early discharge	1	3
Re-operation for bleeding	0	0

*Fisher's exact test $P = 0.02$.

($P = 0.99$). The children who had no local anaesthesia had significantly more suctioning for bleeding, as demonstrated by Fischer's exact test ($P = 0.02$) for a two-tailed test. However, this was not sufficient to require re-operation, nor the dentist to be called back more often, as demonstrated Fisher's exact test ($P = 0.48$).

Discussion

Children aged over 6 years of age can be counselled preoperatively to expect numbness of the lips or gums when they wake up after the procedure, but younger children are often not capable of understanding this. Clinically and anecdotally, younger children sometimes appear to be as distressed by the numbness as by any postoperative pain. As one of the main justifications cited by clinicians for using local anaesthetic is to reduce postoperative distress, it is important to distinguish whether this practice actually does so in young children, or whether it would be better to omit this procedure for extraction of deciduous molars. Most child patients are routinely given oral analgesics immediately pre- or postoperatively in addition to any local anaesthesia, and this may be adequate by itself for controlling any post operative pain. While this study recorded the analgesics administered, no attempt was made to randomize or systematically allocate patients to different analgesic groups. The numbers of patients in each different analgesic group was too low to allow statistical analysis using this variable.

To show a statistically significant difference in CHEOPS scores, on the basis of our final results, there would have had to be around 500 children or more in the study to demonstrate a difference in score of only 1. Any difference in pain or distress caused by use or non-use of local anaesthetic is likely to be fairly small. Although postanaesthetic care staff were blinded to the treatment group allocation, they may have become aware of children who complained of their face feeling strange, and thus not been blinded when making their observations. The CHEOPS score ranges from a minimum of 4 to a maximum of 13. A child with no pain-related behaviour, who is not crying or touching at the wound has a score of 6, while a child with scores of 4 or 5 must show some positive behaviour such as smiling or talking spontaneously about a subject unrelated to their operation. The median pain score being 6 for both groups suggests that pain was well controlled with preoperative paracetamol and a nonsteroidal anti-inflammatory drug (NSAID). There were more children excluded in the local anaesthesia group (mostly for failure to complete the CHEOPS score in full) but analysis with and without the excluded patients made no change to the Mann–Whitney *U*-test, which remained 'not significant'. Although there was only one dental operator, there were multiple teams of recovery staff observing the children postoperatively throughout the study period. As the CHEOPS is a standardized observational operational tool, the staff collecting the data were not calibrated in its use, and interobserver reliability was not assessed.

Many dental operators would cite reduction in early postoperative haemorrhage as their other main reason for using local as an adjunct to extractions under general anaesthetic. Although previous studies have weighed blood loss using swabs, most clinicians regard the timing of the cessation of haemorrhage of

being of more functional clinical significance in the management of young children. Observations taken intraorally in conscious children would be difficult, and liable to cause distress in themselves. The decision was taken therefore to measure cessation of bleeding by proxy by using use of suction or additional packs. The results showed that there was more suctioning required in the 'non-local anaesthesia' children, and thereby showing an earlier cessation of haemorrhage in the local anaesthesia group. This would suggest that although there is no justification for use of local anaesthetic to reduce pain, as has been shown in previous research[8], there may be grounds for using it to reduce haemorrhage. There were no cases where re-operation was necessary to control bleeding, so it is likely that even in those cases where replacement packs or use of suction was required the amount of blood loss was small, which is supported by previous research[9]. It is difficult to equate objective measurements of blood loss with its clinical significance for the nursing staff. Recovery staff monitor children closely both before they regain consciousness, and afterwards until they are fit to leave the hospital. Their observations are thus arguably a more relevant indicator of clinically significant blood loss in this situation. Severe or prolonged haemorrhage is rare even if local anaesthesia is not used. (Locally compiled figures for incidence of re-operation to control postoperative haemorrhage after extractions in children suggest an incidence of less than 1:600.)

In this study, it was decided to observe clinically significant postoperative haemorrhage during the recovery period, such as the need to clear the mouth of blood using suction, or to replace the pads used to absorb blood because they had become saturated. This was felt to be more relevant than objective measurement of total blood loss. On the basis of our results, use of local anaesthetic does reduce the incidence of problems with haemorrhage in the early postoperative recovery period, but without causing an increase in distress.

CHEOPS scores have been used to assess postoperative pain in young children, but in this study it arguably assessed overall distress, whether due to pain or other causes.

While all would agree that reducing distress in young children who undergo procedures in hospital is desirable, there are many factors that may contribute to it, and thus act as confounding factors in this and other studies. Previous experience of local anaesthetic, general anaesthesia, hospital admission and dental and medical treatment vary enormously amongst young children. Other factors such as the coping skills of the child or parent are beyond the control of the clinical staff. The use of haemostatic packs in the extraction sockets may be important, but it is difficult to design studies to measure this.

Traditionally there has been concern that local infiltration with adrenaline may increase the risk of arrhythmias. This was a concern when the principal general anaesthetic agent was halothane, especially if the airway was difficult to maintain with a nasal mask, with resultant hypoxia and hypercarbia. Since the introduction of sevoflurane (and the increased use of the laryngeal mask airway) arrhythmias have ceased to be a major problem.

While in research terms it is preferable to fully blind all observers, this can be problematic clinically. Blinding the dental operator potentially increases the risk to children of having the wrong teeth taken out, and having additional independent observers available to make and record the observations has resource implications.

In conclusion, use of local anaesthetic does not decrease distress in young children having deciduous molar extractions who also have paracetamol and NSAID analgesia. However, the use of local anaesthesia reduces haemorrhage in the early postoperative period.

What this paper adds

- Confirmation that use of local anaesthetic does not increase postoperative distress in young children having deciduous extractions under general anaesthesia.
- Indication that use of local anaesthetic reduces haemorrhage on the early postoperative period.

Why this paper is important to paediatric dentists

- While all are agreed on the need to reduce distress in young children undergoing dental extractions under general anaesthesia, previous research has produced ambiguous or contradictory results relating to the use of local anaesthetic.
- This paper suggests that there is no overall difference in pain caused by its use, but that dental operators should consider using local anaesthetic because of its effect in reducing postoperative haemorrhage in the early postoperative period.

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