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An Assessment of Post: Extraction Pain Relief in Children

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ABSTRACT

Aim: To compare the efficacy of the pre-emptive administration of Piroxicam, Ibuprofen, Mefenamic acid and Placebo in reducing post-extraction pain in children.

Materials and Method: 60 children aged 6-14 years, who needed primary tooth extraction were treated, with treatment preceded by local anaesthesia and analgesic drugs during the preoperative period. A Five Face Scale was used to evaluate pain reaction during injection, extraction and postoperative period.

Results: Pre-emptive analgesics showed lower pain scores. Additionally, Piroxicam exhibited lower pain scores than Ibuprofen, Mefenamic Acid and Placebo at the 1 hour and 4 hours period.

Conclusions: Preoperative use of Piroxicam, Ibuprofen and Mefenamic Acid may provide a pre-emptive analgesic effect after primary tooth extraction.

Keywords: Pre-emptive, Pre-operative, Piroxicam, Ibuprofen, Mefenamic Acid, Smiling Faces Scale.

INTRODUCTION

Pain management has been a subject of increasing interest during the past decade and has become a common practice in dental patients.[1] Analgesic use after tooth extraction in children has been reported to be very helpful. But it has been demonstrated that the pre-operative oral usage of analgesics showed beneficial post-operative pain relief properties.[2] Hence to provide a feasible and best alternative in pain control, the present study has been taken up to assess and compare whether the pre-emptive administration of Piroxicam, Ibuprofen and Mefenamic acid have a beneficial effect in alleviating post-operative pain following tooth extraction in children.

Materials and Methods

Sixty children, age 6-14 years, who needed extraction of Primary Maxillary or Mandibular teeth were treated in the Department of Pedodontics, with treatment precceded by local anesthesia. The study design, objectives, potential benefits, and methodology were explained to both children and their parents. Consent and ethical committee clearance were obtained from institutional review board prior to study.

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Previously, a pilot study was carried out in the same department, to overview the proper study design and to take care of possible constraints during main study.

Inclusion criteria

- Those teeth indicated for extraction i.e which cannot be restored
- Children and parents who agreed to wait after the extraction period
- Abscess with infection exceeding 1/3rd of the interadicular area

Exclusion criteria

- Children who had acute pain
- Patients taking analgesics within 5 hours prior to the dental extraction
- History of prolong bleeding and platelet disorders
- Hypersensitivity or allergic reaction to analgesics or any other of the other drugs tested

Procedure

The subjects were randomly selected and divided into four groups:- Group I: Piroxicam dispersible (10 mg), Group II: Ibuprofen suspension (100 mg/5 ml), Group III: Mefenamic acid suspension (100 mg/ 5 ml); Group IV: Vitamin C (Control) according to the analgesics used (n=15). Each patient received a premeasured volume (20 ml) of the assigned solution from a number-coded lightproof plastic container. Both the researcher and the child/parent were blind to the content of the container.

The subjects were given Piroxicam, Ibuprofen, Mefenamic acid and Placebo 30 minutes prior to administration of local anaesthetic agent. Topical anaesthesia in the form of benzocaine gel 20% was applied to the dried mucosa. All children were given 2% lidocaine with a 1: 100,000 epinephrine injection sufficient for obtaining adequate anaesthesia. All primary teeth were extracted intact with a minimum of surgical trauma in an uncomplicated fashion.

Evaluation of pain

The children were asked to rank their sensations at 1 hour and 4 hours after extraction. Each subject quantified the pain perceived using Smiling Faces Scale (Five-Facial Rating Scale) for pain intensity measurement that has been previously validated in children. The child was shown a set of five cartoon faces with varying facial expressions ranging from a smile/ laughter to tears. The scores given were:

0 - No sign of pain

1 - Mild pain

2 - Moderate pain

3 - Severe pain

4 - Very severe pain

Statistical analysis

The observations thus obtained were subjected to statistical analysis using SPSS (Statistical Package for Social Sciences) Version 15.0 Statistical Analysis Software. The values were represented in Number (%) and Mean ± SD. The Kruskal-Wallis and Mann-Whitney U tests were used to know the effect of each variable and to reveal the statistical significance. The confidence level of study was proposed to be 95% Hence, *P*-value < 0.05 has been considered significant, *P*-value < 0.01 has been considered highly significant and *P*-value < 0.001 has been considered very highly significant.

RESULT

All 60 patients enrolled in the study were evaluated. The research was designed so that 15 subjects were assigned randomly to each of the four solution groups. Table 1 shows comparison of overall pain scores in different study groups. The pain score for maximum number of patient in Group I (Piroxicam) showed was between 0 to 1 and 0 to 2 in Group II (Ibuprofen), while for Group III (Mefenamic acid) and Group IV (Placebo) pain scored ranged between 1to 4 at 1 hour and 4 hours.

Table 1: Comparison of overall pain scores in different study groups.

Pain Score	Group I (n=90)		Group II (n=90)		Group III (n=90)		Group IV (n=90)	
	No.	%	No.	%	No.	%	No.	%
0	58	64.4	7	7.8	0	0.0	0	0.0
1	32	35.6	50	55.6	30	33.3	7	7.8
2	0	0.0	33	36.7	39	43.3	29	32.2
3	0	0.0	0	0.0	17	18.9	28	31.1
4	0	0.0	0	0.0	4	4.4	26	28.9
Mean Score	0.36		1.29		1.94		2.81	
SD	±0.48		±0.60		±0.84		±0.95	
Median	0.00		1.00		2.00		3.00	

Table 1 depicts on overall assessment, the pain score for maximum number of patients

Table 2 shows that pain scores during the entire evaluation period revealed Group I (Piroxicam) to have significantly lower pain scores as compared to all the other three groups. Also Groups II (Ibuprofen) had significantly lower pain scores as compared to Groups III (Mefenamic acid) and Group IV (Placebo). Pain scores in Group III (Mefenamic acid) were of lower order as compared to that of Group IV (Placebo) and the difference was statistically significant.

Table 2: Between group comparison of pain scores in different study groups during entire evaluation period (Mann-Whitney U Test)

Comparison	z-Score	"p" value
Group I vs Group II	8.749	<0.001
Group I vs Group III	10.679	<0.001
Group I vs Group IV	11.587	<0.001
Group II vs Group III	5.180	<0.001
Group II vs Group IV	9.439	<0.001
Group III vs Group IV	5.821	<0.001

DISCUSSION

Pain is a multidimensional sensory experience that is intrinsically unpleasant and associated with hurting and soreness. It may vary in intensity (mild, moderate or severe), quality (sharp, burning or dull), duration (transient, intermittent or persistent) and referral (superficial or deep, localized or diffuse). Patients typically associate dental care with pain, and an experience of poorly managed pain related to dental treatment can lead patients to avoid or postpone treatment, as well as make them more difficult to treat.[3] **O'Keefe EM (1967)** found that there was a strong relationship between pre-operative and post-operative pain.[4]

Primary dental extraction have been, and still are, carried out without any pain relief medication in the belief that children do not experience significant amounts of pain. Numerous studies have shown that pain is associated with such extractions. These painful episodes could potentially lead to further dental anxiety and hinder the child's dental treatment in the future. There has been a great deal of interest in the provision of local anaesthesia during dental extractions, but there is limited literature regarding the efficacy of analgesia medication pre-operatively in extractions of children, and as to which analgesic is the most effective.[5]

One concept that has been receiving much interest and research time recently is pre-emptive analgesia.[6] Pre-emptive analgesia is a treatment that is initiated before the surgical procedure in order to reduce this sensitization.[7] It has been suggested by **Coderre *et al.* (1993)** that all the patients should receive pre-emptive analgesics in order to achieve adequate post-operative pain control.[8]

Pre-emptive analgesia is regularly practiced as a part of well-defined protocol in most of the tertiary hospitals in developed countries. There is lack of universally recommended pre-emptive analgesic practice in our setting.[9] In quest of effective pain control, the practice of post-operative analgesia in developed countries is changing fast. However, traditional practice of pain control in our country has remained same. From this stand point, it was relevant to study the present status of pre-emptive analgesics and its effects on post-operative pain control in paediatric patients of our country.[10] Hence the present study has been taken up to assess post-extraction pain relief in children after administration of pre-operative analgesic medications.

Pre-emptive analgesia can be achieved by using different analgesic drugs that work at different sites or by using a combination of drugs.[10] A combination of Opiods, Non-Steroidal Anti-Inflammatory Drugs (NSAID's) and Local Anaesthetic agents are said to provide a favourable pain relief.

Although Opiods provide effective pain relief, they are associated with known side effects such as emesis, excessive sedation and risk of respiratory depression. The analgesic effect and lack of opioid-like adverse effects of NSAIDs have rendered their administration increasingly popular in the treatment of post-operative pain.[11] For dental pain, NSAIDs are one of the most frequently taken analgesic medications. Their popularity is attributed to their abundant over-the-counter availability, efficacy in relieving pain and fever, and low side effect profile at therapeutic doses.[12] Amongst the most common NSAIDs, analgesics that have provided promising results in pediatric patients are Piroxicam, Ibuprofen and Mefenamic acid. Hence in the present study the above analgesics have been taken up as pre-emptive analgesics.

Piroxicam is an oxicam non-steroidal anti-inflammatory drug. The principle advantage of Piroxicam is its long half life which permit its administration in a single daily dose. One disadvantage of Piroxicam as a post-operative analgesic is its slower onset of action compared with other oral agents and alternative routes of administration. This difficulty may be overcome by pre-operative administration of the drug. [13]

Ibuprofen is a propionic acid derivative of NSAIDs group with peripherally acting analgesic and anti-inflammatory properties.[14] Moore *et al.* (1985) concluded Ibuprofen to be safe and effective in the relief of post-operative dental pain in adults.[15]

Another study carried out by Mehlisch *et al.* (1990) inferred that Ibuprofen was preferred analgesic in the treatment of post-operative dental pain, unless the patient is allergic to aspirin or other NSAIDs or when not contraindicated.[16] But very few studies have evaluated the use of pre-operative analgesics in children. Hence in the present study, Ibuprofen has been taken up in pediatric patients.

Mefenamic acid, an anthranilic acid derivative, is a member of a fenamate group of NSAIDs used for the relief of mild-to-moderate pain, exhibits anti-inflammatory, analgesic and antipyretic activities.[17,18] Rowe *et al.* (1980) stated that patients who received Mefenamic acid had significantly lower average post-endodontic pain score than did those who received placebo.[18]

According to Phaliwong & Taneepanichskul (2004) Mefenamic acid has great benefits of being rapidly absorbed, metabolized and excreted with low side effects makes it suitable to be used in children.[19] Hence, Mefenamic acid is taken as a drug of choice in the present study for paediatric dental patients.

Many studies have evaluated the efficiency of analgesics before extraction in adults, but by far no studies have assessed the effect of pre-emptive analgesics in alleviating post-operative pain following tooth extraction in children. Hence, the aim of the present study was to compare the efficacy of pre-emptive administration of Ibuprofen, Piroxicam and Mefenamic acid in reducing post-extraction pain in children.

Results of the present study revealed that Piroxicam had better pre-emptive analgesic effect followed in descending order by Ibuprofen and Mefenamic acid.

This is in accordance to a study conducted by Jackson *et al.* (2001) who inferred that Piroxicam could inhibit activation of neutrophils independent of its ability to inhibit the cyclo-oxygense, thereby providing additional anti-inflammatory action.[20] They also concluded that Piroxicam had longer duration of action as it was completely absorbed

after oral administration with the peak concentration in plasma occurring within 2 to 4 hours. According to Negm MM (1989) the long half-life of Piroxicam is the property that enables it to be administered once a day.[21] Piironen *et al.* (1985) studied the effects of Piroxicam administered either before or 3 hours after surgery in patients undergoing extraction of an impacted lower third molar under local anaesthesia. Post-operative pain score at 2, 3 and 4 hours were significantly lower in the group who had received pre-operative medications.[22] O'Hanlon *et al.* (1996) stated that patients given Piroxicam 2 hours pre-operatively requested less analgesia and had a longer time to first analgesic request than patients given Piroxicam prior to induction or post-operatively.[23]

Additionally, results of the present study also revealed that Ibuprofen had better pre-emptive analgesic effect as compared to Mefenamic acid. This finding according to Dionne *et al.* (1978) may be attributed to the fact that Ibuprofen is rapidly adsorbed and reaches plasma levels within 1-2 hours after oral dose and its relatively short half-life.[24] According to Jain *et al.* (1986) Ibuprofen proved to be clinically more effective at various dosages when compared with aspirin alone or combined with codeine.[11] A previous study by Dionne *et al.* (1983) demonstrated that a single dose of Ibuprofen given 30 minutes prior to oral surgery significantly delayed the onset of post-operative pain and resulted in a trend towards less initial pain intensity when compared to placebo.[25]

In the present study, the results concluded that the duration of analgesic effect of Ibuprofen was for a shorter period of time. This result is in accordance to the study conducted by Llorca *et al.* (2008) who stated that Ibuprofen is usually prescribed for short periods of time allowing use of the drug for the control of acute dental pain.[26] Zamiri *et al*. (2009) stated that Ibuprofen was reported to control mild pain and was more tolerable than other drugs, thereby reducing pain after tooth extraction better than aspirin and acetaminophen.[27] Cooper *et al.* (1989) conducted a study to compare relative analgesic efficacy of Ibuprofen and Acetaminophen and concluded that Ibuprofen was more effective analgesic than Acetaminophen for acute pain.[28] Hill *et al.* (1987) stated that pre-operative treatment with an Ibuprofen containing medication was of definite clinical value.[39]

Results of the present study also revealed that Mefenamic acid showed least efficacy for relief of pain when compared to Ibuprofen and Piroxicam. This can be due to the fact that Mefenamic acid has slower oral absorption and peak plasma levels are reached 2 to 4 hours after administration, with a biologic half-life of 2 hours.[20] Rowe *et al.* (1980) inferred that by 4 hours after the initial dose, however, Mefenamic acid controlled pain better than aspirin and continued to do so at every hour/interval thereafter.[18] Khubchandani *et al*. (1995) demonstrated that mefenamic acid significantly has better antipyretic activity than its anti-inflammatory and analgesic properties.[30] Our results were in accordance to Sharma *et al.* (2009) who stated that Mefenamic acid administered before the surgery didn't reduce discomfort during the procedure rather it had a significant effect after the procedure.[31] Hence, from the present study it can be inferred that pre-emptive analgesic administration can be considered as a routine and rational pain management strategy in extraction procedures in children. Moreover, Piroxicam seems to result in lower pain scores compared to Ibuprofen and Mefenamic acid. Pediatric dentists may consider pre-emptive analgesics in children before extractions more frequently as compared to dentistry for extraction in adult parient.

CONCLUSION

This study demonstrates that pre-emptive analgesic administration can be considered as a routine and rational pain management in primary tooth extraction procedures in children. Moreover, Piroxicam seems to result in lower pain scores compared to Ibuprofen and Mefenamic Acid.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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