

The Incidence of Post-Extraction Pain and Analgesic Usage in Children

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Summary

A parentally completed questionnaire was used to investigate the incidence of post-extraction pain in children. Significantly more patients in the study group reported pain following dental extraction than did control patients. Increasing age was significantly associated with the report of pain, but not with the use of a pain medication, even when the degree of difficulty of the extraction procedure was standardized. These findings suggest that the report of pain represents a late learned response while medication usage represents an early learned response. Those patients that reported increased severity of pain were significantly more likely to require a pain medication, but the pain medication was most effective for only mild pain. Additionally, male patients were significantly more likely to report complete effectiveness when pain medication was used. Contrary to some popularly held beliefs, the results of this study indicate that children do experience post-extraction pain and some children experience pain of sufficient intensity to require an analgesic for relief of post-extraction pain. Additionally, for a small group of patients, neither aspirin nor acetaminophen are adequate in fully relieving post-extraction discomfort. For these patients other agents may be indicated to fully relieve pain.

Introduction

Many studies have examined the incidence of post-extraction pain in adults.^{1,2,3} The multifactorial nature of the pain response^{4,5} and its subjective nature may lead to minimized pain report in children, since they have had limited exposure to many of the identified and unidentified elements that may ultimately form an individual's response to noxious stimuli. However, very few studies have investigated the incidence of post-operative pain in children. Whether children differ qualitatively or quantitatively in their response to painful stimuli is not well known. Additionally, the few investigations that have used children as their subjects have studied the behavioral aspects and responses to chronic pain and have ignored the issue of acute pain.^{6,7}

Although children may not communicate their responses to noxious stimuli in the same manner as adults,⁸ a recent study has shown that children do experience post-operative pain and may require analgesic relief.⁹ In light of some popularly held notions that children do not have post-operative pain, do not require local anesthetics or do not require post-operative analgesics, this finding may be significant for health care providers.

The dentist is routinely faced with the situation of tooth extraction and subsequent tissue trauma. This study reports the incidence of post-extraction pain, the incidence of analgesic usage following dental extraction and the reported efficacy of analgesics in children, in order to enable the practitioner to assess the need to manage the post-extraction response in the pediatric population.

Methods

A questionnaire was developed and distributed to the parents of 229 pediatric dental out-patients un-

Accepted for publication May 12, 1986.

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dergoing dental extractions. Recognizing the multifactorial nature of pain, the questionnaire identified four broad categories for investigation. These categories included: the demographic variables of age and sex; child and parental histories of analgesic use, usage patterns and reported efficacy; technical and descriptive aspects of the extraction procedure; and a measure of state behavior.¹⁰ The incidence of the report of post-extraction pain, analgesic use and reported efficacy are presented here. The questionnaire was distributed within a private practice specializing in pediatric dentistry and orthodontics, located in an upper middle-income suburb. All children and adolescents who were to undergo dental extraction were eligible for inclusion in the study.

The survey form was distributed to parents of children who were to undergo dental extraction and who agreed to participate in the study. The survey form was accompanied by a letter that explained that the intent of the questionnaire was to help understand children's reactions to common dental procedures once they had left the dental office. Following the extraction procedure the pediatric dentist was instructed to avoid the suggestion of pain to the parent or child, but to answer any questions that may have been posed by the parent or child. The survey form was also distributed to the parents of twenty children that were to undergo either routine dental examination or dental prophylaxis and topical fluoride application. This group of patients was designated as the study control. Additionally, within the study group a cohort of patients undergoing extractions of standardized difficulty, based upon the amount of remaining alveolar bone support, as described by Acs and Moore, were analyzed.¹¹ This cohort was chosen to control for the degree of difficulty of the extraction and to eliminate possible confounding factors, such as primary tooth extraction in the younger age group and permanent tooth extraction in the older group.

The returned survey questionnaires were collected and assembled for statistical analyses. Outcome variables were defined as the reported presence or absence of pain, the utilization of a pain medication in

those patients that reported pain and the reported efficacy of the pain medication for those patients that took a pain medication. Pain was reported as being mild, moderate or severe in nature. Efficacy was reported as either being complete, partial or not effective.

The raw data were then analyzed to ascertain the numbers and relative proportions of those children that reported pain, required pain medication and reported complete analgesic efficacy. Data were additionally analyzed by sex and by age groupings. Chi-square testing for significance was performed on all the data generated from the questionnaire.

Results

The questionnaire was returned by 221 of 229 patients in the study group (96.5%). All patients in the control group returned completed questionnaires. The mean age was 9.1 years, with 90% of the patients in the 6 to 13 year age range. The study sample included 114 females (51.6%) and 107 males (48.4%). For purposes of analyses, ages were grouped as follows: 2 to 5 years, 6 to 9 years, 10 to 13 years and 14 to 17 years. The incidence of responses in the youngest age group (2 to 5 years) and the oldest group (14 to 17 years) was too low for Chi-square analysis, limiting statistical comparisons to the two middle age groups.

Report of Pain

Pain following dental extractions was reported in 37.6% of the study group. None of the patients in the control group reported pain following their dental visit ($p < 0.01$). The mean age for those reporting pain was 9.5 years. Overall, age was not significantly associated with the report of pain, although older children tended to report pain more often (Table 1). Comparison of the 6 to 9 year old group to the 10 to 13 year old groups, however, revealed that this older group was significantly more likely to report pain ($p < 0.05$).

For those patients reporting pain ($N=83$), 43.4% were male and 56.6% were female. Among male

TABLE 1. Pain Report, Medication Usage and Efficacy by Age Group

Age Group (years)	N (%)	Subjects Reporting Pain (%)	Subjects Taking Medication (%)	Reporting Pain and Taking Medication (%)	Subjects Reporting Complete Efficacy of Pain Medication (%)
2 - 5	13 (5.9)	4 (30.8)	3 (23.1)	75.0	66.7
6 - 9	109 (49.3)	34 (31.2)	19 (17.4)	55.9	88.2
10 - 13	91 (41.2)	42 (46.2)*	24 (26.4)	57.1	83.3
14 - 17	8 (3.6)	3 (37.5)	3 (37.5)	100.0	100.0
Totals	221 (100.0)	83 (37.6)	49 (22.2)	59.0	80.9

* $p < 0.05$, $X^2 = 4.17$, d.f. = 1

subjects (N=107), 33.6% reported pain. Among female patients (N=114), 41.2% reported pain. Chi-square analysis revealed no significant association between the sex of the patient and the report of pain following dental extraction, although female patients tended to report pain more often (Table 2).

When only those patients undergoing extractions of standardized difficulty are considered, significantly fewer ($p < .05$) of the 6 to 9 year olds reported pain (29.7%), than the 10 to 13 year olds (48.1%, Table 3).

Medication Usage

Of the patients enrolled in the study group, 22.2% required a pain medication. None of the children in the control group reported taking any medication. For those children that reported pain (N=83), 59.0% required a pain medication. Age was not related to the use of pain medication in those children who reported pain (Table 1).

A lower proportion of the male patients that reported pain took a pain medication (50.0%) than did female patients that reported pain (60.6%). This difference however, was not statistically significant (Table 2). All patients that used a pain medication reported using either aspirin or an acetaminophen. Regardless of the medication used, the reported dosage did not exceed 325 mg.

Reported Efficacy

For purposes of statistical analyses, the efficacy variable was recoded from three to two categories. This was done because only 2 patients answering

this question (N=47) reported the medication they used to be completely ineffective. For this reason, these two respondents were combined with those that reported their medication to be only partially effective in relieving post-extraction discomfort. This post hoc group was then compared to those reporting complete effectiveness of their pain medication.

Only 9 patients reported that the pain medication they used was not completely effective. These patients were distributed across the age ranges and meaningful statistical analysis was not possible (Table 1). All male patients who took an analgesic (N=16) reported complete relief, while 71.0% of the female patients that required post-extraction analgesics reported complete efficacy ($p < 0.05$, Table 2). Complete efficacy was reported in 91.6% of the 6 to 9 year old patients in the select cohort that required pain medication as well as 91.6% of the 10 to 13 year olds in the cohort (Table 3).

Severity of Pain

Pain was reported as being either mild, moderate or severe in nature. Since only 3 patients reported severe pain, those patients reporting either moderate or severe pain were combined and compared to those patients reporting only mild pain. The severity of pain experienced by the child following extraction was significantly related to the use of an analgesic ($p < 0.01$) with 44.2% of the patients reporting mild pain requiring a pain medication, in comparison to 83.9% of those patients reporting moderate or severe pain.

The severity of pain was also significantly related to the reported efficacy of the pain medication ($p <$

TABLE 2. Pain Report, Medication Usage and Efficacy by Sex

Sex	N (%)	Subjects Reporting Pain	Subjects Taking Medication	Reporting Pain and Taking Medication (%)	Subjects Reporting Complete Efficacy of Pain Medication (%)
Male	107	36 (33.6)	18 (16.8)	50.0	100.0
Female	114	47 (41.2)	31 (27.2)	66.0	71.0
Totals	221	83 (37.6)	49 (22.2)	59.0	80.9

TABLE 3. Pain Report, Medication Usage and Efficacy for Selected Age Groups Undergoing Extractions of Standardized Difficulty

Age Group (years)	N	% of N Reporting Pain	% of N Taking Medication	Reporting Pain and Taking Medication (%)	Subjects Reporting Complete Efficacy of Pain Medications (%)
6 - 9	91	29.7	13.2	44.4	91.6
10 - 13	54	48.1*	22.2	46.1	91.6
Totals	145	36.5	16.6	45.3	91.6

* $p < 0.05$, $X^2 = 4.21$, d.f. = 1

0.05). Only 9.1% of the patients who reported mild pain (N=22), claimed incomplete relief, while 28.0% of those who reported moderate or severe pain (N=25), claimed incomplete relief.

Discussion

The pain experience often determines whether an individual seeks or avoids health care. Pain is a subjective experience that cannot be observed directly or measured objectively. Clinically, the responses to noxious stimuli vary among individuals; therefore, defining pain only in terms of stimulus and response is inadequate. Pain must also be viewed as a complex psychological phenomenon, including cognitive, emotional and affective components.¹² Some of these components may be subject to the same pattern of development associated with other areas of cognition.

Since pain is partially a learned response,¹³ it is appropriate to examine the response of children to noxious stimuli. The pain experience in children has gone largely unstudied, and those factors influencing the report of pain and the subsequent use of analgesics in children have not been identified.

In one of the very few studies that have examined the incidence of post-operative pain in children, Mather and Mackie reported the incidence of pain following abdominal surgery to be greater than 70%, thus dispelling some popularly held notions about the pain experience in children and the need for post-operative analgesics. In the present study 37.6% of the patients reported pain. That the incidence of pain in this population was half that reported by Mather and Mackie may be related to the lesser trauma associated with dental extractions. However, despite the difference in the incidence of pain, both studies clearly demonstrate a significant association between surgical procedures and the report of pain in children. Additionally, both studies demonstrate the need for post-surgical analgesics in the pediatric population.

The validity of data gathered in a parentally completed questionnaire that reflects subjective experiences of children is closely related to the child's ability to use or exhibit appropriate descriptive terminology. Several investigators have recently reported on the validity of this measurement tool. Sevedra *et al.* concluded that 9-12 year olds were capable of clearly describing pain⁸ and Ross has shown that children 5-12 are capable of adequately representing their pain experiences.¹⁴ Additionally, Williams *et al.* has shown that parents are accurate predictors of their child's reaction to the dental experience.¹⁵

Woodrow *et al.* reported on the differences in pain tolerance of adults according to age and sex. The authors concluded that pain tolerance decreased with increasing age and that males tolerated more pain than females.¹ However, because the youngest

age group in this study was the "less than 20 year" age category and constituted only 2.3% of the study sample, these findings are not necessarily applicable to the pediatric population. Additionally, in Woodrow's review of the literature, it was noted that most investigators failed to corroborate the age trends reported and there was wide disagreement over the relationship of pain sensitivity to sex.

The present study indicates that age is significantly associated with the report of pain. In the setting used in this study, pain tolerance is not as easily defined as in Woodrow's study. If the report of pain is used as a measure of tolerance to pain, then older children are significantly less tolerant of pain and female patients tend to be less tolerant of pain. If, however, the need for analgesics is considered to be an indicator of pain tolerance, then there is no obvious sex or age related difference.

A relatively high percent of the children reporting post-extraction pain required an analgesic for relief (59.0%) and 80.9% of these children reported the analgesic to be completely effective in relieving pain. The severity of pain appears to be significantly associated with the use of an analgesic. Likewise, the reported efficacy of a pain medication appears to be significantly associated with decreased severity of pain. Additionally, the reported efficacy of the pain medication is significantly associated with the sex of the patient, with male patients more often reporting complete efficacy.

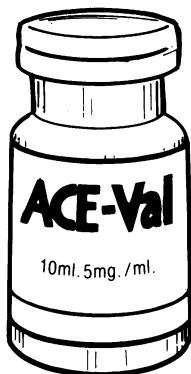
Of particular interest is the association of age with the report of pain, medication usage and reported efficacy. Comparing the 6 to 9 year old group with the 10 to 13 year old group, the older group reported pain significantly more often, even when extraction procedures were standardized for degree of difficulty. However, the rate of analgesic usage for these two groups is virtually identical, suggesting that the reporting of pain and the use of a pain medication represent two entirely different learned responses. The early learned response, the use of a pain medication, may be dependent on parental usage patterns of analgesics or on parental expectations for post-extraction pain, perhaps based upon their own experiences or biases. The late learned response, the reporting of pain, may represent increasing societalization, cognizance and awareness on the part of the maturing child. Other variables, such as the number of teeth extracted or the degree of difficulty of the extraction may also influence the reporting of pain.¹¹ A complete and thorough evaluation of demographic, parental, technical and other factors that may impact upon the report of pain may be used in predicting the pain response in children and defining the dentist's role in managing such a response.

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