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Effect Of Altered Volumes Of 2% Lignocaine On Dental Treatments Under General Anesthesia

Research Article

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Introduction

The International Association for the Study of Pain's widely used definition states, "Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage"[1]. Pain is described as a very subjective feeling related to experience in early life and is influenced by such factors as age, fear, personality, circumstances and culture. Pain stems from a variety of events and is a conscious, emotional, and individual experience. In addition to the distinct psychological response to tissue damage, there is also a physiologic component [2].

The Centers for Disease Control and Prevention reports that about 1 of 5 (20%) children aged 5 to 11 years have at least one untreated decayed tooth [3]. Most of the children, dental treatment can be completed in the normal dental setting using any of a number of behavior management techniques. For a minority of children, however, special behavior management methods, including general anesthesia (GA), may be required to provide optimal dental treatment. Such groups include children with extreme anxiety, extensive treatment needs, very young age, and/or physical/mental disabilities. This requires the use of general anesthesia for treatment of these groups of children.

According to AAPD local anesthetics and sedative agents both depress the CNS. Therefore, it is recommended that the dose of local anesthesia be adjusted downward when sedating children with opioids [4]. Also in general anesthesia, the anesthesia care provider needs to be aware of the concomitant use of a local anesthetic containing epinephrine, as epinephrine can produce dysrhythmias when used with halogenated hydrocarbons (e.g., halothane) [5]. Local anesthesia has been reported to reduce pain in the postoperative recovery period after general anesthesia [6, 7]. In a previous study, two of the authors of this study found no evidence of reduced postoperative pain when 0.25% bupivacaine was applied topically to sockets immediately on extraction of teeth under general anaesthesia [8].

From halothane and possibly sevoflurane, they likely pass through a dose stage where there is not only an increased sensitivity to pain but also an increased propensity toward remembering experiences. This low-dose-related, memory-enhancing effect might contribute to intraoperative awareness in cases where lighter anesthesia levels are achieved [9]. The process of physiologically interpreting pain is likely more complex than is currently understood in the literature. The perception of pain appears to be a dynamic process influenced by the effects of past experiences. According to Melzack, patients who receive inhalational anesthesia should also receive the protection of regional anesthesia to prevent the occurrence of persistent central nervous system (CNS) changes and enhanced postoperative pain [10].

In a study by Watts et al there was a significant difference in the postextraction end-tidal carbon dioxide; and heart rate in children who were and were not given local anesthesia. There was a statistically significant relationship between local anesthetic use and anesthesiologist intervention from which they confirmed that those who were not given intraoperative local anesthesia were more likely to experience vital sign fluctuation requiring anesthesiologist intervention [11].

The objectives of this study were to: examine the physiologic effects during pediatric dental procedures (pulpectomy, restoration, stainless steel crown, and extraction) on children undergoing general anesthesia; and determine if there is a relationship between the volume of local anesthetic usage and therapeutic intervention by an anesthesiologist.

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Materials And Methods

This randomized clinical trial was conducted in 30 children aged between 3 and 5 years undergoing general anesthesia for full mouth rehabilitation and accompanying their parents to the department of pediatric and preventive dentistry.

Ethical approval

The study was registered with the Institutional Review Board of the Saveetha Institute of Medical and Technical Sciences, Chennai, Tamil Nadu, India. Ethical approval was obtained from the Institutional Review Board of the SIMATS. Informed consent was obtained from all parents of the children before including them in the study. Informed consent was obtained from the parents/guardians of participating children prior to the treatment.

Source of participants

Children were selected based on the inclusion criteria. Single operator and single anaesthetist constant throughout the study. Children with ASA status 1 and 2 were only included. Children with a history of any systemic disease, children below 3 years, mentally disabled children were excluded from the study.

Clinical procedure

Standard scrubbing and draping procedures were followed. Children were intubated and all the relevant clinical procedures were performed. Either no LA (group 1), Maxillary infiltration or mandibular nerve block (group 2/3) was administered based on the test group. All clinical parameter values were noted 5 min before, during and immediately after the procedure at an interval of 5 min. Heart rate and end tidal carbon dioxide values were monitored for all participants.

Group 1: No local anesthetic agent administered
Group 2: 2% lignocaine with adrenaline administered
Group 3: 2%lignocaine with adrenaline administered in half volume

Statistical methods

The results were tabulated and analysed using the SPSS software. The data collected were statistically analyzed using the SPSS version 18.0 software (SPSS Inc., Chicago, IL, USA). One-way analyses of variance were used to test the difference between the heart rate at baseline and during the various procedures groups. One way ANOVA was also used to find the significance among the various groups against each clinical procedure done. In all the above tests, $P< 0.05$ was taken to be statistically significant.

Results

A total of 30 patients, 18 boys and 12 girls, were included.The mean heart rate was 112.39 beats per minute (bpm) at baseline and lower in groups were local anesthesia was given. Within the no LA group, the mean heart rate was higher after extraction (119.62) compared to baseline (112.39). The values appeared highest for extraction followed by crown placement and then pulpectomy overall.

Discussion

This study attempted to be a comprehensive evaluation of vital signs examination during dental rehabilitations for children and to study the effect of varying volumes of local anesthetic agents on children undergoing general anesthesia.

The research was focused on an ambulatory dental surgery with an average of around 180 minutes for each room-in room-out case and its own post-anesthesia unit and recovery nurse. The difficulty of ambulatory dental procedure is to provide patients with fast turnaround and rehabilitation while still attempting to minimise material costs. The older, cheaper anaesthetic agent imposes longer healing times and can therefore increase postoperative costs [12]. The best possible outcome is to use a newer and usually more costly treatment that reduces costs in a way that does not compromise the recovery rates or safety [11].

In this study sevofluorane was used as the anesthetic agent and induction was done using propofol. Ersin et al reported that the use of sevoflurane resulted in more pain than their control group,

Table 1.

Heart Rate During Various Procedures	No Local anesthesia		Local anesthesia (recommended dose)		Local anesthesia (half the recommended dose)	
	Mean	P	Mean	P	Mean	P
Baseline	112.39		105.31		107.44	
Pulpectomy	114.74	0.41	109.66	0.2	110.32	0.067
Crowns	113.97	0.84	112.98	0.06	111.57	0.76
Extraction	119.62	0.071	116.42	0.03	117.94	0.04
End tidal carbon dioxide						
Baseline	50.21		50.54		51.58	
pulpectomy	53.87	0.21	51.94	0.23	52.92	0.43
Crowns	51.48	0.58	50.43	0.99	51.79	0.61
extraction	52.73	0.03	51.24	0.01	51.51	0.09

the subjects of which were anesthetized with halothane [13].

LA has the ability to block priming in PMNs that is to stop the exaggerated response created due to exposure of cells to certain mediators which can present as pain as well as lead to various pathological mechanisms [1].

Of the various studies done four of them [13-16] cited reported using local anesthesia intraoperatively, while others did not indicate in their methodology whether or not it was used. Noble et al [15] and Atan et al [14] both reported less distress and pain, respectively, when local anesthesia was used. Neither study, however, used a multiple regression analysis to explore possible covariates which may have increased, decreased, or eliminated the significance of this finding.

Children having extractions as the most invasive procedure were more likely to show vital sign fluctuations as compared to other procedures. Noble et al found that the greater the number of teeth extracted, the greater their distress reported-although with 4 or more extractions, the distress ratings began to plateau [15]. Conversely, Chelliah et al reported that 88% of patients had mild or no pain after extractions and none required analgesics16. The majority of their children studied, however received intraoperative local anesthesia. Watts et al stated that 42% of the time anesthesiologist intervention was required and extraction was the main cause of vital sign fluctuation [11].

There were few limitations to the study. It was often found that children become agitated during the immediate recovery period due to the numbness. The subsequent injury to the local soft tissue can occur which contributes to post operative pain and also create disinterest among pediatric dentists in the usage of the same [17].

In this study, the order of procedures performed was up to the dentist completing the case. This could have an effect on the timing and efficiency of local anesthesia administration.

Conclusion

Changes in the vital signs "Per procedure" were more significant than "per patient" changes. Patients who were not given intraoperative local anesthesia were more likely to experience vital sign fluctuation that required anesthesiologist intervention. Patient who received half or the full recommended dosage of local anesthesia experienced similar vital sign fluctuations and the findings were not statistically significant but it appeared to be less as compared to the children who did not receive any local anesthesia.

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