RESEARCH ARTICLE

COMPARISON OF EFFICACY OF NITROUS OXIDE INHALATION SEDATION AND OXYGEN INHALATION SEDATION DURING ADMINISTRATION OF INFERIOR ALVEOLAR NERVE BLOCK IN PAEDIATRIC PATIENT AGED 7-10 YEARS: A RANDOMISED DOUBLE BLIND CONTROL STUDY

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ABSTRACT

Aim: The purpose of our study was to compare the efficacy of nitrous oxide and oxygen inhalation sedation for pain control during inferior alveolar nerve block administration in children.

Design: In this randomized, double-blinded, parallel-group study, 40 children in the age group of 7-10 years divided into 2 groups: Group A (Nitrous oxide sedation) and Group B (oxygen). Pain perception for local anesthesia was assessed using face, legs, activity, cry, consolability scale. Children’s behaviour was assessed using Frankl ratings, depth of sedation using Observer’s Assessment of Alertness/Sedation scale. The vital signs and oxygen saturation were recorded.

Results: There was a statistically significant lower pain reaction in nitrous oxide group during administration of nerve block (P < 0.01). Improvement in the behavior of the children belonging to nitrous oxide group during and after the procedure as compared to the oxygen group (P < 0.01) was also observed.

Conclusion: Nitrous oxide inhalation produces adequate sedation with vital signs within normal limits and treatments successfully completed.

INTRODUCTION

Non pharmacological behavior management techniques are routinely used to create an environment wherein the dentist can carry out dental procedures easily by winning the confidence of the child patient. However, in case of very fearful or anxious children, these techniques may not be sufficient. In such scenario conscious sedation may prove to be a helpful tool (Folayan et al., 2002). Use of pharmacological behavior management techniques such as nitrous oxide (N2O) conscious sedation coupled with local anesthesia when required the foundation of the delivery of pain-free dentistry to children (Hosey, 2002). But the administration of local anesthesia itself is potentially the most anxious aspect of the dental procedure for the child (Roberts and Hosey, 2005). Administration of local anesthesia often leads to high anxiety and uncooperative behavior in children. Nerve Block anesthesia is known to be more painful and least accepted by children. Dentists have always been on the lookout to make this difficult procedure more comfortable for the child. WAND (Gibson et al., 2000), 30 gauge needles (Ram et al., 2007), two stage injections (Fayle et al., 2002) have all been attempts in this direction. It is a well-known fact that N2O–O2 sedation is an excellent adjunct to lessen anxiety and pain. A combination of nitrous oxide with oxygen (N2O–O2) has been successfully employed by the profession to manage anxious children. Nitrous oxide-oxygen (O2) was frequently used in combination with many drugs such as chloral hydrate, hydroxyzine, midazolam (Lindsay, 1980). The purpose of our study was to use N2O–O2 to evaluate its effectiveness for pain control during inferior alveolar nerve block administration in children.

MATERIALS AND METHODS

In this randomized, double-blinded, placebo-controlled parallel-group study, the sample size was calculated using the formula which yielded power of 0.90 at 95% confidence level. Thirty children in the age group of 7-10 years were selected.
after screening for the following inclusion and exclusion criteria:

**Inclusion criteria**

The inclusion criteria were as follows:

- Dental treatment to be done under inferior nerve block anesthesia
- Subjects who belong to Frankl 2 and 3 rating during examination process
- Subjects belong to American Society of Anesthesiologists 1 category
- Subjects’ whose parents/guardians were willing to give written informed consent

**Exclusion criteria**

Exclusion criteria were as follows:

- Clinical condition contraindicating the use of N₂O-O₂
- Subjects with known allergy to lignocaine.

**Randomization**

Subjects were randomly allocated into two Groups- A and B using the chit-pick box method. Group A (n =15) were given N₂O-O₂ sedation and Group B (n=15) only oxygen as placebo. This was a double blinded blinded study whose duration was six months.

**METHODS**

A thorough extra- and intra-oral physical examination with special focus on airway was done. Before commencing the sedation process, child’s behavior was again determined using Frankl scale (Wright, 1975). The vital signs and oxygen saturation were evaluated and noted prior to the dental treatment. The technique (Clark, 2010; Malamed and Clark, 2003) was described to the patient as per the child’s level of understanding using euphemisms. Sedation was carried out by Specialist and Experienced physician. During sedation, constant communication with the child including physical, visual and verbal contact was maintained. Once the objective signs of sedation were observed the child was questioned as to how he or she was feeling. Depending on child’s response, it was concluded if the ideal level of clinical sedation was achieved or not. Following successful sedation, inferior alveolar nerve block was administered. Post administration of local anesthesia, child’s behaviour was assessed using face, legs, activity, cry, consolability (FLACC) (Merkel et al., 1997) scale. The depth of sedation was assessed using Observer’s Assessment of Alertness/Sedation (OAA/S) scale (Chernik et al., 1990). The obtained data were compiled systematically and analyzed using SPSS for Windows release 19.0. The level of significance was kept at P < 0.05.

**RESULTS**

Of 30 children involved in study, 18 (60%) were females, 12 (40%) were males. The duration of local anesthesia administration of ranged from 9 to 15 min depending on the behavior management and requirement of sedation for each child. Behavior recording, OAA/S, FLACC scale during the procedure is given in Table 1.

**DISCUSSION**

The present study examined the effect of N₂O-O₂ on the behavior pattern, level of sedation attained and pain experienced by children during dental procedures. Children between 7 and 10 years of age were chosen for the study because at this age they can understand the verbal explanation given to them regarding enrollment to the study. Total of 12 males and 18 females subjects were part of the study. Gender is not known to influence subjective response to N₂O sedation (Zacny and Jun, 2010). Many studies in literature on N₂O-O₂ sedation have used various visual analogue scales in which children rate their pain at the end of the procedure (Blain, 1998; Crawford, 1990). But, this can be unreliable and inconsistent in children especially after an episode of sedation. In this study an FLACC scale was used to observe the children’s behaviour by an independent observer to eliminate this bias. Though the relaxed behaviour of the children in group A can easily be attributed to the anti-anxiety and analgesic properties of Nitrous oxide (Holroyd and Roberts, 2000), the important clinical implication of the study is that, inhalation sedation with N₂O-O₂ could be ideally used in children during the stressful episode of local anesthetic administration to prevent their potential deterioration of behaviour instead of using it as an advanced behaviour management tool in combination with other sedative agents to correct already deteriorated behaviour. No adverse events occurred in our study. The safety of this technique lies in the ability to titrate N₂O to the desired concentration. Many studies focus on the use of N₂O-O₂ in combination with other agents justifying that the outcome is better. A study by (Fukuta et al., 1994) found better patient compliance to wear the nasal hood in children who were given N₂O-O₂ subsequent to intranasal administration of midazolam. But in the present study, all the children accepted the hood after appropriate non-pharmacological behaviour management technique.

**Conclusion**

Reaction of the children receiving nitrous oxide sedation was significantly lower than children who received oxygen alone during the administration of the Inferior Alveolar Nerve Block.

**REFERENCES**


