Nitrous oxide—oxygen inhalation for outpatient otologic examination and minor procedures performed on the uncooperative child

Gadi Fishmana,*, Eyal Botzerc, Nisim Marouanid, Ari DeRowea

Pediatric Otolaryngology Unit, "Dana" Children's Hospital, Tel-Aviv Sourasky Medical Center, Sackler School of Medicine, Tel-Aviv University, 6 Weizmann St., Tel-Aviv 64239, Israel

Pediatric Dentistry, Tel-Aviv Sourasky Medical Center, Sackler School of Medicine, Tel-Aviv University, Tel-Aviv, Israel

Department of Anesthesiology, Tel-Aviv Sourasky Medical Center, Sackler School of Medicine, Tel-Aviv University, Tel-Aviv, Israel

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KEYWORDS

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Summary

Objective: Otomicroscopic examination with suctioning of ears or other procedures is frequently uncomfortable especially for children. Anxiety and pain with lack of cooperation may result in trauma to the ear, incomplete examination, delayed diagnosis and treatment and need for completion of the examination under general anesthesia. The purpose of this study was to evaluate the efficacy and safety of utilizing nitrous oxide—oxygen inhalation for sedation and analgesia in otologic examination and minor surgical procedures performed on the uncooperative child at the outpatient clinic.

Methods: In a prospective pilot case series study conducted at the Pediatric Otolaryngology outpatient clinic of a tertiary medical center, nitrous oxide—oxygen inhalation was administered by the examining otolaryngologist and the assisting nurse. The study group included children over 2 years old, for which an accurate diagnosis of ear pathology could not be made or a minor surgical procedure could not be tolerated because of anxiety and lack of cooperation.

Results: Completion of the indicated procedure was successful in 21 of 24 patients (88%). Full cooperation, where no restraint was necessary was achieved in 20 of 24 patients (83%). The mean rank pain scores, evaluated separately by the patient, parent and staff, were in the mild pain range using a 0—10 coding for Faces Pain Rating

* Corresponding author. Present address: 13340 Outlook, Apt. 218, Overland Park, KS 66209, USA. Tel.: +1 913 897 8264.
E-mail address: nognet@sbcglobal.net (G. Fishman).
1. Introduction

Otomicroscopic examination with suctioning of ears or other procedures is frequently uncomfortable especially for children. Anxiety and pain with lack of cooperation may result in trauma to the ear and incompletion of the examination. This scenario frequently leads to delayed diagnosis and treatment and the need for completion of the examination under general anesthesia.

Although nitrous oxide has been commonly used for dental office procedures [1], in hospital wards [2] and in a variety of other procedures in children [3,4], it has not been evaluated in the pediatric otolaryngology outpatient clinic. This fact and the reported long lasting psychological effects of pain in children [5] underlined the basis for our study.

2. Methods

Children over 2 years old, for which an accurate diagnosis of ear pathology could not be made or a minor surgical procedure could not be tolerated because of anxiety and lack of cooperation, were included in the study. Nitrous oxide—oxygen inhalation before and during the otologic examination or procedure was administered by the examining otolaryngologist and the assisting nurse. A second physician (a dentist with previous experience with nitrous procedures) was present to assist. Nitrous oxide—oxygen was delivered as a mixture of 30—50% nitrous oxide/50—70% oxygen. Patients were instructed not to eat 6 h prior to the procedure. Clear fluids were allowed up to 2 h before starting it. Written consent was obtained in all cases. Procedures such as suctioning of ears, removal of cerumen impaction or of a foreign body or ventilation tube, coagulation of recurrent bleeding site in the nose, frenulotomy and an excision biopsy of lip lesion were performed.

A questionnaire was filled out after each procedure. The items comprising the questionnaire were: demographic data, type of procedure, length of inhalation, assessment of cooperation before starting the procedure according to Frenkel Scale [6], pain during procedure evaluated by the patient (where appropriate), staff and the parents separately using Wong—Baker Faces Scale [7], the need for restraint evaluated by the staff, the parent’s agreement to repeat the procedure if needed and adverse reactions.

3. Results

Twenty-four children were included in the study. Male to female ratio was 1:1. Mean age was 6.4 years (range 2—12). Table 1 shows the distribution of the indications. Mean total inhalation time was 8.9 ± 5.5 min. The mean induction inhalation time was 3.0 ± 1.3 min. The mean rank pain scores, evaluated separately by the patient, parent and staff, were in the mild pain range on a 0—10 Faces Pain Rating Scale. Parents underestimated pain but not statistically significant. Fig. 1 summarizes the pain scores. Initial physical restraint was required in 4 of the 24 patients (17%). Twenty-one of the 24

<table>
<thead>
<tr>
<th>Indication</th>
<th>Procedure</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic suppurative otitis media</td>
<td>Otomicroscopic examination with suctioning of ears</td>
<td>9</td>
</tr>
<tr>
<td>Persistent ventilation tube</td>
<td>Removal of VT</td>
<td>6</td>
</tr>
<tr>
<td>Cerumen impaction</td>
<td>Removal of cerumen impaction</td>
<td>6</td>
</tr>
<tr>
<td>Ankyloglossia</td>
<td>Frenulotomy</td>
<td>1</td>
</tr>
<tr>
<td>Lip lesion</td>
<td>Excision biopsy</td>
<td>1</td>
</tr>
<tr>
<td>Rec. epistaxis</td>
<td>Coagulation of bleeding vessels: nasal septum</td>
<td>1</td>
</tr>
</tbody>
</table>
procedures were successfully completed. The procedure was aborted in two children due to complete lack of cooperation during initial inhalation. In one patient the procedure was terminated due to vomiting.

4. Discussion

Since introduced by Tunstall in 1961 [8] the use of a fixed mixture of nitrous oxide and oxygen for alleviation of pain has spread to a variety of hospital settings. It is especially common in dental practice. An impressive French survey shows the usefulness of nitrous oxide—oxygen mixture in a variety of procedures with successful results and without serious side effects [9].

To our knowledge this is the first study for evaluation of the use of nitrous oxide in the outpatient otolaryngology clinic. Despite the small number of children, which were included in this study, it is our strong impression that the use of nitrous oxide can be practically implicated in the otolaryngology outpatient clinic for uncooperative children or for painful but brief interventions. These patients can benefit from reduced anxiety and pain that are frequently associated with the restraint needed to accomplish an otomicroscopic examination and a variety of procedures.

During the study we found that relaxation and distraction techniques, utilized before and during the inhalation, and a comfortable atmosphere, created by the medical staff and the parents, positively influenced the procedure. These were especially effective in children over 3 years old. There was also a correlation between the child’s behavior before starting the inhalation and the length of induction inhalation time. The more cooperative the child was before starting the inhalation the shorter inhalation time needed. This fact also emphasizes the importance of preparing the patient properly before starting the procedure. No serious adverse events were observed in our patients as was reported in other studies [9–11]. The use of less than 50% nitrous oxide in oxygen with no other sedative or analgesic medications is considered minimal sedation (anxiolysis) and as such entails minimal risk to the healthy patient [12]. Under minimal sedation normal response to verbal stimulation is maintained and airway, spontaneous ventilation and cardiovascular function are unaffected. Based on this rationale and according to the recommended guidelines in the literature [12], we did not use monitoring techniques while applying nitrous oxide to our patients during the study period. However, since recent guidelines by the American Academy of Anesthesiology strongly recommend pulse oximetry monitoring during nitrous oxide inhalation, we now use pulse oxymetry in all our procedures. It is important to emphasize that although this form of sedation is defined minimal sedation, adequate resuscitation equipment and trained personnel must be immediately available.

In conclusion, the low pain scores, minor adverse events, high cooperation and successful rates demonstrate the potential usefulness of nitrous oxide—oxygen inhalation, for examination and minor procedures to be performed on the uncooperative child at the outpatient otolaryngology clinic.

References


