Original Article

Evaluation of pre-operative anxiety effect on inhalation sedation with nitrous oxide in periodontal surgery

Kaviani N.[1*], Birang R.[2], Shahaboee M.[3], Malamed SF.[4]

[1] MD., Anesthesiologist, Assistant Professor of Department of Oral and Maxillofacial Surgery and Dental Research Center, Dental school, Isfahan University of Medical Sciences, Isfahan, IR Iran. [2] DDS-MSc, Professor of Periodontology, Isfahan dental school, Isfahan University of Medical Sciences, Isfahan, IR Iran. [3] DDS-MSc, Associated Professor of Periodontology Isfahan dental school, Isfahan University of Medical Sciences, Isfahan, IR Iran. [4] DDS, Professor of Anesthesia & Medicine, The Herman Ostrow School of Dentistry of U.S.C., Los Angeles, CA, USA.

Correspondence: Kaviani N. Department of Oral and Maxillofacial Surgery, Dental school, Isfahan University of Medical Sciences, Hezar Jarib St, Isfahan, Iran. Email: kaviani@dnt.mui.ac.ir

ABSTRACT

Introduction: Large proportions of population are phobic about dental procedures. This phobia can decrease the pain threshold and make the dental procedure more difficult. Inhalation sedation, a mixture of oxygen and nitrous oxide is an effective method to decrease anxiety and pain in dentistry. The efficiency of inhalation sedation and analgesia can be affected by several factors, especially anxiety. The purpose of this study was to assess the effect of preoperative dental anxiety on inhalation sedation with nitrous oxide in adult periodontal surgery. Materials and Methods: Thirty-two patients who were candidates for periodontal surgery were enrolled in the study. Their level of anxiety was determined by Dental Anxiety Scale-Revised (DAS-R) system. The periodontal surgery was done under nitrous oxide/oxygen sedation (premixed 50% N2O:50% O2). Throughout the surgery, the level of patient sedation and the operation condition were evaluated by Dental Sedation Teacher Groups (DSTG) system by a dentist. Results: Before operation, 9 (28.1%) patients had severe anxiety. Under inhalation sedation, 30 (93.8%) patients had appropriate sedation and periodontal surgery was done without difficulty in 90.7% of patients. In patients with more anxiety, the efficacy of sedation during operation was lesser and the surgery was more difficult ($r = -0.078$, $P = 0.000$). Conclusion: Our study showed that the patients' preoperative dental anxiety was so high but use of N2O/O2 sedation had proper consequence for the surgeons. This method was more effective in the patients with less anxiety.

Keywords: Periodontal surgery, Conscious sedation, Nitrous Oxide, Anxiety

Introduction

A high percentage of dental patients have some level of anxiety or phobia associated with dental procedures. Severe fear and anxiety can prevent 7-15% of patients from seeking dental care [1]. Also, fear and anxiety can decrease the pain reaction threshold during dental procedures.

Pain in dental procedures is not only due to periodontal and dental injury but also to various factors such as the mood of the patient, previous unpleasant dental experiences and the level of anxiety [2-5].

Dental Anxiety Scale - Revised (DAS-R) is a scoring scale system that evaluates fear and anxiety during dental procedures. The DAS-R is simple and accurate [6-10].

Conscious sedation is one of the most important methods for decreasing anxiety and phobia in dentistry [1, 2, 11-14]. It is an altered level of consciousness that still permits patients to respond to physical stimulation and verbal commands, and to preserve an unassisted airway [2].

One of most important techniques of conscious sedation is inhalation sedation. Inhalation sedation by using premixed nitrous oxide-oxygen can be used for relief of mild to moderate levels of dental anxiety [3]. It also has analgesic effects. The advantages of this method are rapid onset of effect, early elimination and recovery. Additionally, the duration of its action can be easily controlled [11, 12, 15-18].

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In dental procedures, induction of inhalation anesthesia is performed with the 10% N2O and then gradually increases to 30-40% [1, 16, 19-23]. The response of the patients to the inhalation sedation can be different depending on the level of patients' anxiety and fear before dental procedures [8-10, 24].

Vassend and colleagues [25] showed that the efficacy of inhalation sedation was not related to the pre-operation anxiety of the patients. In opposition, Hoxy [2] found that patients with high level of pre-operative anxiety were not good candidates for inhalation sedation and it was better to use general anesthesia. They suggested that using inhalation sedation for dental procedures must be individualized based on preoperative level of patients' anxiety and fear.

To our knowledge, there was no study to investigate the association of preoperative anxiety with efficacy of inhalation sedation in dental procedures in adults. The aim of the present study was to evaluate the effect of pre-operative dental anxiety on inhalation sedation with nitrous oxide in periodontal surgery.

Materials and Methods

After obtaining approval by the University Ethical Committee and written informed consent, this prospective nonrandomized study was performed with 32 ASA (American Society of Anesthesiologists) I-II[1] [26] Question: What does the number 28 mean? There were 32 patients enrolled. patients, aged 20-40 years old, scheduled for periodontal surgery. Patients who were smokers or received any drug before the operation were excluded from the study.

During the preoperative evaluation, the level of patients' dental anxiety based on DAS-R system was recorded by interview. All patients were asked to withhold solids and liquids 8 and 2 h prior to the operation respectively. All of the operations were performed in the morning. After sitting in the dental chair, a pulse oximeter (Criticare Systems, Inc, USA) with sound muted was applied to the patients finger and the dental nasal mask was placed.

Oxygen was administered to the patients with inhalation sedation apparatus (Quantiflex, ASE, USA) with the flow of 6 l/min for 2 minutes through nasal mask [19]. After that, N2O was added to the mixture of gas by the rate of 10% per 2 minute until the fixed total respiratory gas of 50% N_20 and 50% O_2 was achieved. The exhaled gas was scavenged from the operating room. After 5 minutes, the surgeon infiltrated two dental cartridges (lidocaine 2% with 1:80,000 epinephrine) and after obtaining adequate pain control, periodontal surgery on one jaw was initiated. During the operation, a maximum of 3 cartridges were infiltrated, if necessary. When the treatment was finished, the nitrous oxide flow was turned off and oxygen 100% administered for 5 minutes.

During the surgery, one anesthesiologist was responsible in administration of gas mixture and recording vital signs.

The blood pressure, heart rate and oxygen saturation were determined by cardiovascular monitor machine (Cardioset S110A; Sairan Company; IRAN) at the beginning of surgery and every 10 minutes thereafter. During surgery the level of patient sedation and the operation condition were evaluated by Dental Sedation Teacher Groups (DSTG[2]) system by a dentist. In DATG system, the numbers 2 and 3 shows appropriate sedation and conditions for operation (Table 2 and 3) [27]. If the patient exhibited nausea, vomiting, cyanosis or other side effects, they were excluded from the study.

At the end of the dental treatment, the patient was transferred to the post-anesthesia care unit (PACU) where monitoring was continued; they were observed by a sedation nurse. The patient remained in PACU for at least 20 min, the evaluated for discharge. The criteria for discharge were normal vital signs, able to walk unaided and have full verbal communication. Written and verbal postoperative sedation and surgical information were offered.

All results are presented as mean and number (percentage). Data were analyzed by using SPSS 15.0 for Windows (SPSS Inc., Chicago, IL). The correlation between the anxiety level of patients before dental procedure and the median of the DSTG scales of the patients during surgery was analyzed by Spearman test at the significant level of $P < 0.05$.

Results

The lowest and highest anxiety scores of the patients were 9 and 18 respectively. Mean (SD) of anxiety score was 12.18 ± 2.7. Thirty patients (93.7%) had anxiety (anxiety score > 9). Among these 30 patients, 9 (28.1%) had severe fear of dentistry (phobia) (anxiety score > 15). Only 2 patients were without anxiety (anxiety score < 9) (Table 1).

The mean sedation score during the operation was 2.62 ± 0.60. Only one patient (3.1%) during the operation was fully awake. Thirty patients (93.8%) had appropriate sedation. There were no patients with deep sedation, in which state they are unable to respond to physical stimulations (Table 2).

According to the Pearson test there was a significant inverse correlation between anxiety score and sedation score. The greater the level of anxiety the lower the success of sedation during surgery ($P< 0.000$, $r = - 0.078$).

The level of sedation in 29 patients (90.7%) was acceptable (degree 1 and 2 in DSTG system) while in the others the operation was difficult or impossible (Table 3).

According to the Pearson test there was no significant correlation between anxiety score and operation condition ($P= 0.175$, $r = 0.34$). In those patients with greater anxiety,

[1](American Society of Anesthesiology) ASA Classification
Class I- A Normal Healthy Patient
Class II- A patient with mild systemic disease
Class III - A patient with severe systemic disease that result in functional limitation
Class IV- A patient with severe systemic disease that is a constant threat to life

[2] DSTG = A group of scientists who investigate and teach sedation techniques in dentistry. They have score system for measurement of dental anxiety.

surgery was more difficult ($P < 0.000$) while in 3 patients with anxiety scores greater than 15 their operation was difficult or impossible to complete.

There were no side effects such as nausea, vomiting, cyanosis or other problems during the perioperative period. Blood pressure, heart rate and arterial oxygen saturation throughout the surgery were within normal limits.

Discussion

In the present study we evaluated the correlation between dental fear and anxiety with the level of sedation and operating conditions during periodontal surgery in patients receiving inhalation sedation with nitrous oxide and oxygen. According to our findings, severe fear and anxiety (DSA ≥ 15) was seen in 28.1% of the patients. This was much higher than the 4.2% incidence of severe anxiety (phobia) in the study of Moore et al [6].

The higher incidence of anxiety and fear in our study may be related to previous painful dental experiences or under-treatment of pain and anxiety in our patient poulation. As Trond [1] and Vassend [28] studies showed, these experiences may increase the fear and anxiety of dental treatments. In some countries, such as Norway, there are several methods for preventing and treating pain and anxiety, while it seems that in our population this important issue was not considered very much or at all.

During surgery using inhalation sedation 92.8% of patients had appropriate sedation. This finding is compatible with other studies that described inhalation sedation as an effective means of decreasing anxiety and improving the operating condition in phobic patients [1, 2, 11, 12, 18, 21, 25].

In our study, there were 9 phobic patients (28.1%) while there was only one who was fully awake during the surgical procedure. In addition, the planned surgery could not be completed in 3 patients (9.4%). These findings show that inhalation sedation is effective even in highly anxious patients. This finding is in agreement with the Roberts and Holroyd studies [17, 23] that showed inhalation sedation can be an effective alternative to general anesthesia. This is quite the opposite of Luciaine's conclusion [29] that inhalation sedation should not be used for every high anxiety patient and that the method of choice for these patients was general anesthesia.

As our study showed, there was a significant correlation between anxiety level and difficulty of operation. This finding is in agreement with Hoxy [2] who showed that more anxious patients endured more difficult surgery.

We did not find a significant correlation between preoperative anxiety scores and operating conditions. More studies must be performed before a final conclusion can be made in that regard.

As was noted in other studies [11,16,18,23], there were no significant side effects in any of the patients in our study as well.

Conclusion

The level of severe anxiety and fear of dentistry in the present study was quite high (28.1%), but the use of inhalation sedation with N2O-O2 can provide appropriate sedation during periodontal surgery. This technique is used for the first time in Iran and used nasal masks that were made by the authors. Appropriately designed prospective clinical trials are needed to establish the relative efficacy of nitrous oxide, compared with other treatments, in reducing anxiety and encourage dental health in adults with dental fear and anxiety.

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Table 1: Patient anxiety scale before the operation

Level of Anxiety	Number (%)
Minimum Anxiety (DAS-R <9)	2 (6.3)
Moderate anxiety (DAS-R = 9-12)	5 (15.6)
High anxiety (DAS-R = 13-14)	16 (50.0)
Sever anxiety (or phobia) (DAS-R = 15)	9 (28.1)

DASR= Corah's Dental Anxiety Scale – Revised

Table 2: Frequency distribution of different levels of sedation score during the operation according to DSTG system

Score	Condition	Number (%)
1	Fully awake and orientated	1 (31)
2	Drowsy	11 (34.4)
3	Eyes closed, responds promptly	19 (59.4)
4	Eyes closed, rousable on mild physical stimulus	1 (3.1)
5	Eyes closed, unrousable on mild physical stimulus	0 (0)

DSTG= Dental Sedation Teacher Group

Table 3: Frequency distribution of different level of dental Operative condition according to the DSTG* system

Score	Description	Number (%)
1	Good	10 (31.3)
2	Fair	19 (59.4)
3	Poor	2 (6.3)
4	Impossible	1 (3.1)

Good = Patient fully cooperative with optimum degree of sedation; Fair = Minimal interference from patient due to over/under sedation; Poor = Operating difficult due to over/under sedation; Impossible = Action taken (e.g. GA). DSTG= Dental Sedation Teacher Group.