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Management of Dental Anxiety: Is There Scope Beyond Conscious Sedation?

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ABSTRACT

Background: Dental anxiety is a common problem, which can affect people of all ages, but appears to develop mostly in childhood. Practitioners use numerous methods to control dental anxiety in children during the dental procedures. Objective: To evaluate the effectiveness of nitrous oxide/oxygen (N2O/O2) inhalation sedation and video-eyeglass distraction (VED) in the management of anxious pediatric patients during dental extraction. **Methods**: The study was conducted on 40 children aged 6-12 years who required extraction of at-least one mandibular primary molar under local anesthesia. The children were randomly divided into two groups with 20 children in each – Group-A wearing video-eyeglass and Group-B using N2O/O2 inhalation sedation during dental extraction. The physiological assessment was done by recording heart rate using fingertip pulse oximeter. The psychological assessment was done by recording base line anxiety before the treatment and post treatment anxiety at the completion of extraction using Venham's anxiety scale (VAS). Independent t-test with p value <0.05 level of significance was used to compare means of two groups. **Results**: Comparison of Venham's anxiety score of participants at the completion of extraction, showed statistically no significant difference (p=0.946). The mean pulse rate recorded at different time points between the two groups was also statistically non-significant (P=0.923, 0.957, 1.00 respectively). **Conclusion**: Both N2O/O2 inhalation sedation and VED were equally effective in reducing anxiety during dental extraction but considering the adverse effects and requirement of expert personnel in N2O/O2 inhalation sedation, VED may be preferred because of its better applicability.

Keywords: Conscious sedation, Dental anxiety, Extraction, Video- eyeglass.

INTRODUCTION

Dental anxiety among children is a great challenge posed to every dentist in everyday dental practice. The prevalence of dental fear and anxiety is often reported to be high among children.[1] Dental fear is ranked fourth among common fears and ninth among intense fears.[2] Studies have shown that nearly one in four children (22%) seen by pediatric dentists may present marked behavior management problems.[3] The presence of disruptive behavior whether the result of anxiety, temperament or simple noncompliance is of particular concern for a pediatric dentist as it can limit child's access to quality health care, increase the length of treatment time as well as increase risk of injury to the child.[4] Anxiety is often closely linked to painful stimulus and increased pain perception, and thus these patients experience more pain that lasts longer. So, it is very important not only to identify such children but also treat them appropriately when they arrive at dental office.[5] The pediatric dentist should aim at alleviating the anxiety and fear in such a way that the children are positively motivated on a long term basis for future dental visits.

Numerous pharmacological and non-pharmacological techniques have been proposed for achieving non-disruptive behavior during the dental treatment.[6] Among the non-pharmacological methods distraction and among the pharmacological techniques conscious sedation with N2O/O2 seem very promising in managing anxious children during the dental treatment, but there is dearth in literature about the comparison between the two techniques.[7]

Based on the theory of Mc-Caul and Mallot, a patient's pain perception is decreased when he is distracted from an unpleasant stimulus.[8] By encouraging the patient to focus his/her attention on other things, less attention is available for pain. Previous techniques to distract a child include watching television, listening to music, counting

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the furniture in the room, story- telling and brief relaxation.[9] Seyrek et-al compared three distraction techniques and found that video techniques were more effective than an audio program,[10] but according to Cassidy et-al,[11] watching television cartoons did not distract children during needle injection. The possible reason may be that children concentrated on the surrounding environment and not on the television.

One approach that may enhance the salience of distraction is through the use of audiovisual video-eyeglass.[3] Video-eyeglass provides a method of distraction that combines visual and auditory distraction, eliminates visual interference and reduces auditory interference. Recently the results of meta-analysis by Melissa et-al,[12] showed that virtual reality distraction ranks among the most effective of psychological interventions for reducing both psychological and experimental pain.

An alternative approach to non –pharmacological behaviour management is the minimal sedation in the form of inhalation of N2O/O2.[13-15] It provides a rapid onset and early recovery.[16] Treatment with nitrous oxide and oxygen is a well-established method for pain alleviation and has been used with good results particularly in children who fear the dentist.[17]

The limited reported studies in literature regarding the comparison between these techniques prompted us to evaluate and compare the effectiveness of N2O/O2 inhalation sedation and video-eyeglass distraction in managing anxious children during dental extraction.

MATERIALS AND METHODS

This study was conducted in the department of Pedodontics and Preventive Dentistry Bapuji Dental College and Hospital Davangare Karnataka India The ethical approval was obtained from the Research Development and Sustenance Committee of the college. All patients and their parents received both written and verbal information about the procedure before the inclusion. Those who agreed and were willing to participate a written consent from the parents/guardians was obtained along with a brief medical and dental history of patients.

Sample size: The size of the sample necessary to detect a statistically significant difference was determined with a power calculation based on the results from previous studies using formula given by Chow et-al.[16,18] To achieve an 80% power to detect a statistical difference of 5% between the two groups a sample size of 40 was required.

Subjects: The children were selected from the out-patient department of the Pedodontic and Preventive Dentistry of the college who reported for the routine dental check-up during May 2017 to February 2018.The children aged 6-12 years who came to the dental clinic for the first time with Frankel behavior rating 2 or 3 were selected. The selected children should have at least one primary molar to be extracted under local anesthesia. Medically compromised, children with recent upper respiratory tract infection, highly un-cooperative and those having vision or hearing problem or requiring special health care needs were excluded from the study.

Study design: This study was designed as a prospective, randomized controlled clinical trial with parallel group design. The study was conducted on 40 children aged 6-12 years. The children were randomly divided into two groups-video-eyeglass distraction group and N2O/O2 group. The principle investigator performed the randomization before beginning the study. Each participant received an opaque envelope containing a number to assign him/ her to one of the two groups. After selection, the base line anxiety was recorded using Venham's anxiety rating scale by an independent observer. During this visit dental examination and radiographs were taken when necessary and after screening the child, next appointment was scheduled after five days to perform the extraction.[19] It was decided that the same treatment be carried in all the children to ensure standardization All extractions were scheduled in the morning and performed by one pediatric dentist.

In group (I) video-eyeglass was introduced to the child using tell show do technique before the treatment. Once they were adapted to it they were given an option to select their choice of movie from a varied list. The video-eyeglass positively occluded the dental environment and involved them in seeing and hearing a movie appropriate to their age. The topical anesthetic gel (benzocaine 20%) was applied to the dried mucosa for two minutes and then lidocaine 2% (1: 80,000) was administered. The pulse rate was monitored using pulse oximeter. Once anesthesia was achieved the teeth were extracted. At the completion of extraction video-eyeglass and pulse oximeter were removed. They were wiped with 70% ethyl alcohol for cleansing and for avoiding any cross infection.

In group (II) nitrous oxide and oxygen was delivered via nasal mask using Quantiflex MDM system. All the children were instructed not to eat for two hours before the extraction. At the start of the treatment 100% oxygen was delivered for 2 minutes and then nitrous oxide was titrated in 5-10% increments to the maximum desired level for each child and once the desired level was achieved it was maintained throughout the procedure. An experienced operator trained in sedation technique was responsible for administering the N2O/O2. A maximum concentration of 30% nitrous oxide and 70% oxygen was chosen to avoid the risk of over sedation. The extraction was carried in the same

manner as in video-eyeglass distraction. The blood pressure, pulse rate, arterial oxygen saturation and level of response were monitored throughout the treatment. At the completion of treatment the children were transferred to recovery room where monitoring and supervision continued for 20 minutes after the commencement of conscious sedation. The criteria for discharge were that the vital signs were within the normal range, able to walk unaided and full verbal communication. The post-surgical and sedative instructions were given and the child was finally discharged from the clinic.

Behaviour during treatment: Pulse rate was recorded before starting the treatment, three minutes after administering the local anesthesia and after completion of the treatment in both the groups. The Venham's anxiety scale was used to grade the anxiety during the extraction. All the recordings were noted by an independent observer who assessed the child throughout the treatment. Scores obtained on the basis of Venham's anxiety scale and pulse oximeter were tabulated and subjected to statistical analysis using independent t-test. Statistical analysis was carried out using statistical package for social sciences (SPSS) VERSION 16 at $p<0.05$.

RESULTS

Of the 40 participants enrolled in the present study there were 23 boys and 17 girls randomly distributed between the two treatment groups. There was no significant difference between the two groups regarding gender (p=0.945) [Table 1]. The mean age of the patients in conscious sedation group was (9.2±1.84) and in video-eyeglass distraction it was (9±1.88) which is statistically non-significant (P=0.736) [Table 2]. As shown in [Table 3] there was statistically no significant difference (p=0.999) regarding baseline anxiety between the two treatment groups. Comparison of Venham's anxiety score of participants at the end of extraction procedure did not showed any significant difference (p=0.946) [Table 4]. Similarly no significant difference in the mean scores of pulse rate was found at different time points between the two groups (p=0.923, 0.957, 1.00 respectively) [Table 5].

The Venham's anxiety score and pulse rate at different time points between the two groups are illustrated in [Figure 1 & 2].

Table 1: Distribution of patients according to gender

Sex	Group				Total	
	Nitrous oxide		Video eyeglass			
	Count	%	Count	%	Count	%
Female	9	45.0	8	40.0	17	42.5
Male	11	55.0	12	60.0	23	57.5
Total	20	100.0	20	100.0	40	100.0

P=0.945

Table 2: Distribution of patients according to age

	Group						p value
	Nitrous oxide			Video eyeglass			
	N	Mean	S D	N	Mean	S D	
Age	20	9.2	1.84	20	9.0	1.88	0.736

Table 3: Comparison of baseline anxiety between the two groups.

Anxiety baseline	Group				Total	
	Nitrous oxide		Video eyeglass			
	Count	%	Count	%	Count	%
1	6	30.0	6	30.0	12	30.0
2	11	55.0	11	55.0	22	55.0
3	3	15.0	3	15.0	6	15.0
Total	20	100.0	20	100.0	40	100.0

p = 0.999

Table 4: Comparison of clinical anxiety between the groups during extraction

Clinical Anxiety	Group				Total	
	Nitrous oxide		Video eyeglass			
	Count	%	Count	%	Count	%
0	7	35.0	8	40.0	15	37.5
1	12	60.0	11	55.0	23	57.5
2	1	5.0	1	5.0	2	5.0
Total	20	100.0	20	100.0	40	100.0

p = 0.946

Table 5: Comparison of pulse rate between the groups during extraction

Pulse Rate	Group						p value
	Nitrous oxide			Video eyeglass			
	N	Mean	S D	N	Mean	S D	
Initial	20	93.2	4.95	20	93.1	4.81	0.923
After 3mn	20	89.8	5.94	20	89.7	5.83	0.957
at the end	20	90.2	5.32	20	90.2	5.32	1.000

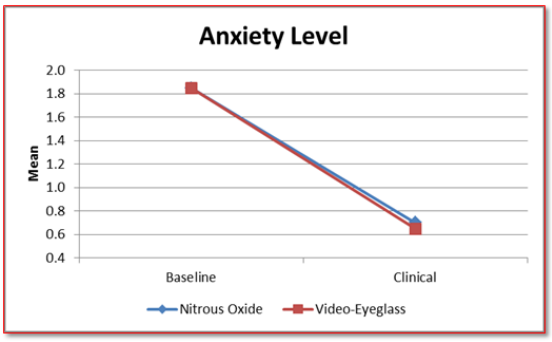

Figure 1: Mean change in anxiety between the two groups

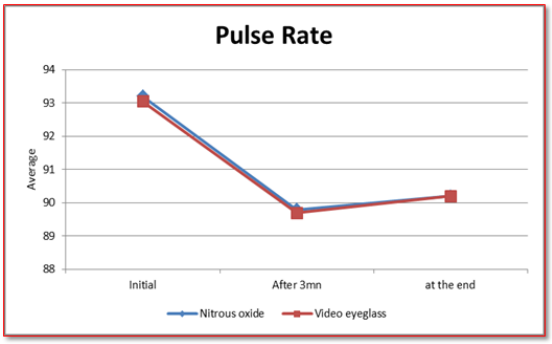

Figure 2: Mean change in pulse rate between the two groups

DISCUSSION

One of the primary desires of every pediatric dentist is to treat their patients in an anxiety free environment as successful care of the pediatric dental patient depends on the effective management of child's behavior. Both pharmacological and non-pharmacological behavior guidance techniques may be used depending on the individual patient and the dentist.[7] Since every child is different, a pediatric dentist recommends the method based on the child's health history, type of treatment required, emotional and intellectual development, parent's preferences and dentist's skills. The present study investigated the outcome of two different methods for the management of dental anxiety i.e. video-eyeglass distraction and inhalation sedation with N2O/O2. Anxiety is significantly correlated to age and gender,[20] the similarity of groups in this regard is an essential part of every such study to facilitate the comparison. There was no significant difference in age and gender between the study groups in the present study. Younger children exhibit a higher level of fear and anxiety than the older children, and the distraction technique is helpful in those children who have low level of dental fear.[8] For this reason age group of 6-12 years was selected. All children were chosen with no past dental history as negative experience of the previous visit may lead to dental anxiety and fear. Wright et-al and Freeman pointed to the importance of first dental experience where more aversive procedure resulted in less positive behavior.[21] Similar results were reported by Howard and Freeman.[22]

There are several scales available to assess the level of anxiety in children including Venham's anxiety rating scale. Regarding evaluation of scales to measure the dental anxiety and fear, it has been shown that none of the scales is better than the other nor can act as a gold standard.[23] Venham's anxiety scale which was used in this study is an effective and reliable means of assessing the anxiety in children.[19,20] The physiological changes were measured by using pulse oximeter which is considered to be an excellent means of monitoring pulse rate. Pulse rate has been used as an outcome measure in numerous medical, paramedical and dental studies of fear and anxiety.[24-27]

The results revealed by physiological and psychological parameters indicated that the video-eyeglass can effectively improve the behavior of children and reduce the dental anxiety and fear. This might be due to the reason that video-eyeglass distracts the attention of the child by eliminating the sight and sound of the anxiety provoking stimuli and there by isolates the child from the unfriendly dental equipment. Although similar studies have been performed, this to our knowledge is the first study that uses video-eyeglass in the reduction of anxiety on children undergoing extraction.

In line with the present study Morris et al concluded that by diverting the attention from an unpleasant medical setting to a pleasant and absorbing virtual world, virtual reality can markedly diminish patient's subjective pain experience.[28]

In the recent studies conducted by Asvanund et al,[29] Khotana et-al,[8] Fakhurdin et-al and Hoge et al,[1,6] the results are corresponding to the current study where a significant reduction in anxiety and positive behaviour was instilled via the video-eyeglass in pediatric dental patients.

Moreover in the present study, sedated children with N2O/O2 showed reduction in anxiety as depicted by pulse rate and Venham's anxiety scores. The use of titrated amounts of N2O/O2 as a

behavior management is recognized as safe and effective technique commonly employed by dentists.[30-32] A study conducted by Burnueit et-al,[33] reported a 96% success rate when N2O/O2 was used for pediatric surgical procedures. They also reported that 84% of the patients who received local anesthesia via injection did not recall the shot. In the present study, no significant difference was seen between video-eyeglass distraction and inhalation sedation with N2O/O2 in reducing the dental anxiety during dental extraction.

Nitrous oxide/oxygen conscious sedation has some side effects such as nausea, vomiting and may cause diffusion hypoxia at the end of treatment. In some cases this pharmacological behavioural technique cannot be used because of anatomical reasons like enlarged adenoids or when there is difficulty in breathing through the nose.[7] In addition, in contrast to video-eyeglass distraction the conscious sedation requires special technique and expert personnel.[13] Therefore with regard to the statistically comparative results of conscious sedation technique and video-eyeglass distraction, it seems that video-eyeglass may be preferred to N2O/O2 sedation in clinical situations.

CONCLUSION

Both video-eyeglass and nitrous oxide/oxygen inhalation sedation were effective in reducing anxiety. But considering the adverse effects and requirement of special technique and expert personnel in inhalation sedation, video-eye glass distraction may be preferred owing to its ease of application.

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