RESEARCH ARTICLE

CLINICAL USE OF VIRTUAL REALITY DISTRACTION SYSTEM DURING PERIODONTAL TREATMENT MODALITIES- A RANDOMISED CLINICAL TRIAL

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ABSTRACT

Background: Dental anxiety and anxiety-related avoidance of dental care create significant problems for patients and the dental profession. Distraction interventions are used in daily dental practice to help patients cope with unpleasant procedures. Patients with dental fear tend only go to the dentist when they experience pain, thereby increasing the chance that their visit to the dentist will involve pain and exacerbating their anxiety. Dentists themselves suffer from heightened discomfort when treating such anxious patients.
Materials and Method: 50 patients were recruited from the outpatient department of Saveetha Dental College. They were divided into two groups- group 1 is control group (n=25) and group 2 is study group (n=25). All the study subjectswere asked to fill the dental anxiety questionnaire (5 point Likert scale) and dental concern assessment form. The study group subjects were treated using the virtual reality distraction system. The VAS scale was employed pre and post operatively to assess the patients pain and pulse rate with oxygen saturation was recorded using pulse oximeter.
Results: The results showed that majority of the patients were anxious and concerned about a variety of parameters like sound of drill, injection, scraping of teeth while cleaning etc. Data analysis indicated statistically significant difference between control and study group, with regard to the VAS levels, with a p-value of 0.000.
Conclusion: The study concludes that use of immersive VR distraction can be an effective method of pain control during ultrasonic scaling procedure.

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INTRODUCTION

One of the most challenging aspects of dentistry is the treatment of patient pain (Cohen, 2007). Inspite the advances in dental technologies and treatment, many people still avoid or delay dental care because of the fear and anxiety of pain (Locker, 2003). Analgesics have been the solution for alleviating pain in the past. However, medications are most often not effective. These advances have moved towards using distraction and hypnosis techniques to treat pain (Schmitt, 2011). Distraction has been found to take a patient's attention away from pain. By encouraging a patient to focus his/her attention on other thoughts, less attention is available for the pain (Hodes, 1990 and Miron, 1989). Dental anxiety is very common (Oosterink, 2009), and anxious patients are less likely to keep their appointments (Kleinknecht, 1978), take longer to treat and feel less satisfied with their treatment (Locker, 1991), and make their dentists feel anxious too (Hill, 2008).

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Armfield and colleagues (Armfield, 2007), described a vicious cycle of dental anxiety. This suggests that people with high dental fear delay dental treatment, which can lead to more extensive dental problems and symptomatic visiting in turn maintain or exacerbate existing dental fear. Memories and expectations thus play an important role in sustaining dental anxiety. Although we focus on dental treatment, experiences and expectancies of the patient are very important in determining future uptake of treatment (Redelmeier, 2003). Virtual reality (VR) uses advanced technologies to create virtual environments (VE) that allow patients to be immersed in an interactive, simulated world (Sharar, 2008). Virtual reality (VR) is a state of technologically advanced system that allows users to be transported into a 'virtual world. These advanced systems interact at many levels, stimulating sights, sounds, and motion to encourage immersion in the virtual world to enhance distraction from pain (Wiederhold, 2007). It uses sophisticated systems such as head-mounted, wide field-of-view, 3D displays and motion sensing systems that present the 360 degree illusion of being completely surrounded by the

virtual world (Dr. Shabina Shafi, 2015). Oral prophylaxis is the initial procedure done in the dental treatment plan. Supra gingival scaling is usually completed first followed by sub gingival scaling which may require LA. It can be done mechanically using hand scalers or using ultrasonic scalers (David). Patient may experience unpleasant pain or sensitivity during the procedure. VR distraction during dental treatment may improve treatment experience and help to break the negative cycle. Hence, the aim of this study is to assess the clinical utility of VR distraction system during ultrasonic scaling.

MATERIALS AND METHOD

In this randomized clinical trial, 50 patients were recruited from the outpatient department of Saveetha Dental College. Patientswith no prior history of dental visits and those presenting with generalized chronic gingivitis were included in the study. Individuals were excluded from participation if they presented with severe dental calculus, periodontal disease, dental caries, those taking psychotropic drugs, with history of convulsive disorders, vertigo, or equilibrium disorders, or required antibiotic pre-medication. The 50 patients were divided into two groups- group 1 control group (n=25) and group 2 study group (n=25). Demographic details like name, age, sex was recorded and a written informed consent was obtained from both the groups of patients.Subjects were randomised and segregated to study or control group using simple randomised method employing paper chits. All the patients were asked to fill the VAS scale pre-operatively and post-operatively. They filled the Norman Corah dental anxiety questionnairewhich consisted of 4 questions to evaluate their anxiety towards dental treatment and they were classified into low, moderate, high or severe anxietycategories. They also filled the dental concern assessment forms (5 point Likert scale)which assessed their level of concern or anxiety into low, high, moderate and don't knowregarding the sound or vibration of drills, numb feeling, injections, probing, sound or feel of scraping during teeth cleaningetc,. The pre-operative, intra-operative, post-operativepulse and oxygen saturation was assessed using pulse oximeter. On both the group, the clinician performed a full mouthultrasonic scaling procedure with the use of VR in the study group and without the use of VR in the control group. The VR included a relaxing video of the ocean view. The statistical analysis was performed using SPSS software version. The variables were subjected to Kolmogrov-Smirnov and Shapiro Wilk's tests and they followed a parametric distribution. The statistical analysis was performed using SPSS software Macros version.

RESULTS

The results from the Norman Corah questionnaire shows that majority of the patients visiting the dental clinic for the first time are anxious. The levels vary from moderate (60%) to high (34%) to severe (6%) anxiety levels (Figure 1). The data from the concerns assessment form also reveals that most of them are concerned or anxious about the sound or vibration of drills, numb feeling, injections, probing, sound or feel of scraping during teeth cleaning, x-rays, rubber dam, root canal treatment, extraction, gagging, smell in the dental office, cost of the treatment, number of appointments or time required for treatment etc (Figure 2,3,4). The pre-operative and postoperative VAS scores were compared for the two groups using t-test and there was a statistically significant difference

between the pre-operative and postoperative VAS scores in the study group (p-value<0.000) (Table 1). The other parameters such as pulse rate and oxygen saturation did not show any statistical significance on comparison between the two groups.
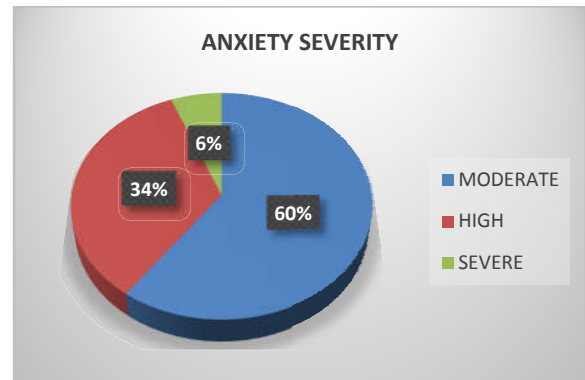

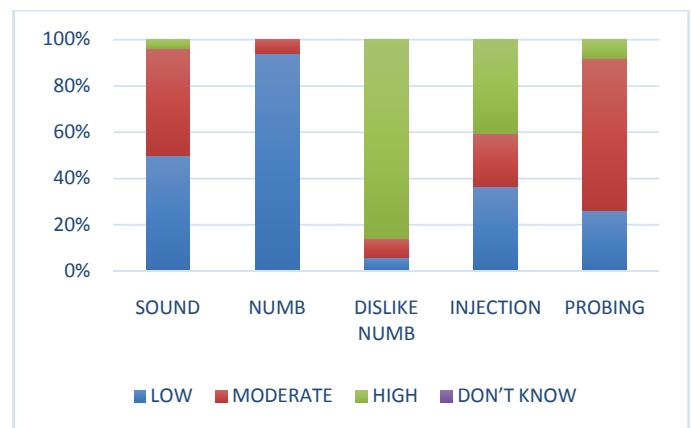**Figure 1. Anxiety levels based on Norman Corah questionnaire**

Figure 2. Classification of patient population (%) based on their concern about sound, numbness, dislike to numb feeling, injection and probing
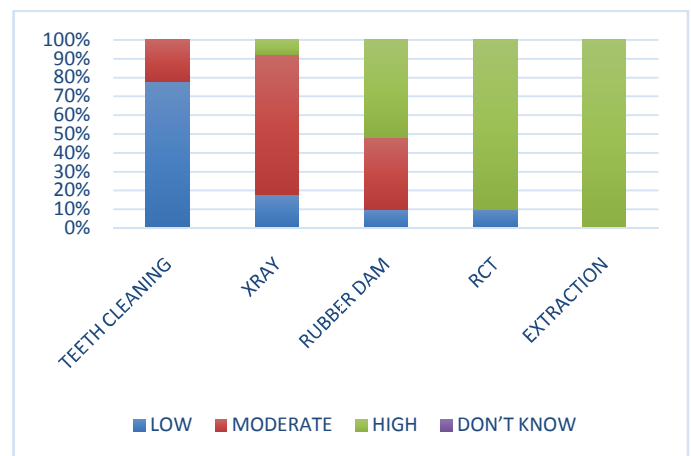
Figure 3.Classification of patient population (%) based on their concern about teeth cleaning,   x-ray, rubber dam, root canal treatment and extrcation

Table 1. Pre and post operative VAS between study and control group

	Pre-op vas	Post-op
Group 1(study)	3.04±1.020	.08±.400
Group 2(control)	2.64±1.25	1.60±.816
P-value	0.22	0.000

Data expressed as means ± SD; p-value <0.05 is significant
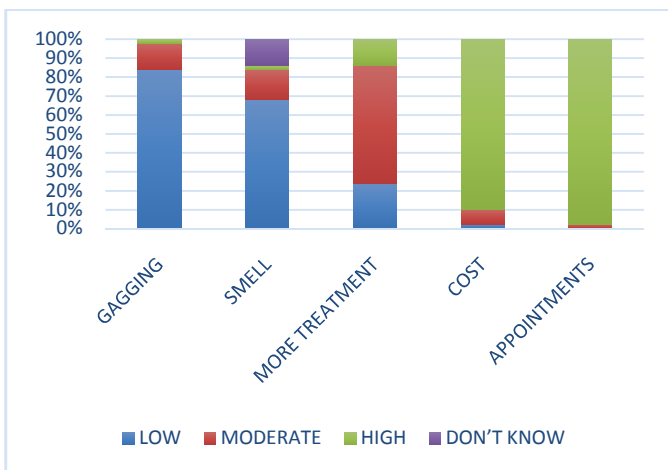
Figure 4. Classification of patient population (%) based on their concern about gagging, smell in the dental office, more treatments, cost and more appointments

Table 2. Pre, intra and post operative SPO2 between study and control group

	Pre spo2	Bet spo2	Post spo2
Group 1(study)	98.28±.678	98.20±.577	98.40±.707
Group 2(control)	98.48±.586	98.32±.690	98.40±.500
P-value	0.27	0.50	1.0

Data expressed as means ± SD; p-value <0.05 is significant

Table 3. Pre, intra and post operative pulse between study and control group

	Pre pulse	Bet pulse	Post pulse
Group 1(study)	88.04±5.420	82.96±6.439	84.64±5.415
Group 2(control)	82.80±14.045	85.32±12.622	85.12±13.670
P-value	0.08	0.40	0.87

Data expressed as means ± SD; p-value <0.05 is significant

DISCUSSION

This randomized controlled clinical trial shows that most of the patients visiting a dental office for the first time are anxious, tensed and concerned about several factors relating to their surrounding and treatment. The results of our study shows that there is a statistically significant difference between the pre-operative and postoperative VAS scores in the study group (p-value<0.000).These results are in accordance to a similar study conducted in 2015 (Padrino-Barrios, 2015), among 30 individuals, in which a split mouth design was utilized. The subjects were randomly divided into 2 groups: Group A used IV eyewear during the first one-half of the appointment (right side of the mouth) and Group B used IV eyewear during the second one-half of the appointment (left side of the mouth). Their results indicated no statistically significant difference between Group A and B with regard to mean dental anxiety levels at baseline with a p-value of 0.07. Data showed a significant difference when comparing the calmness mean scores within Group A pre- and post-IV treatments with a p-value 0.01.Both treatment groups experienced a decrease in anxiety levels from pre to post IV treatments.

Another study was conducted where the authors recruited 38 patients (Elena Furman, 2009). They used a within-patient/split-mouth design. Patients underwent scaling procedure under three treatment conditions in three quadrants. The three conditions were control, watching a movie and VR.

Paired *t* tests revealed that VAS scores were significantly lower during VR compared with the movie (*P*<.001) and control (*P*<.001) conditions. Similarly, BP and PR were lowest during VR, followed by the movie and control conditions. Patients reported that they preferred the VR condition. The probable limitations of this study may include less sample size; blood pressure of the patients were not measured; passive VR was not used and the patients were not in control of their VR environment. An inexpensive, commercially available VE could have a significant impact in reducing perceived pain involved in a variety of medical procedures. The physiological results of this research suggest that the use of the VR distraction system may be a beneficial option for patients with mild to moderate fear and anxiety associated with dental treatments. This system may be a useful adjunct in dental offices to help reduce anxiety, discomfort, boredom, and the time required to perform routine dental procedures. It allows them to relax by allowing them to navigate to another location while still physically remaining in the dental office (Mark D. Wiederhold)

Conclusion

VR distraction is clinically viable technique with a high potential to alleviate pain/anxiety associated with various dental procedures. It has proved to be effective in majority of patients and seems to be safe technique that do not require any previous education and training. The results of this study suggest that use of immersive VR distraction can be an effective method of pain control during ultrasonic scaling. The portable, affordable & easy-to-operate VR system makes this technique an appealing approach for reducing dental anxiety.

REFERENCES

Armfield, J., Stewart, J., Spencer, A.J. 2007. The vicious cycle of dental fear: exploring the interplay between oral health, service utilization and dental fear. *BMC Oral Health* 7: 1.

Clinical Use of Virtual Reality Distraction System to Reduce Anxiety and Pain in Dental Procedures. Mark D. Wiederhold, Kenneth Gao and Brenda K. Wiederhold. 2014 Jun 1; 17(6): 359–365. doi: 10.1089/cyber.2014.0203.

Cohen, L.A., Harris, S.L., Bonito, A.J, et al. 2007. Coping with toothache pain: a qualitative study of low-income persons and minorities. *Journal of Public Health Dentistry*, 67:28–35.

Distraction using virtual reality technology: a review, Dr. Shabina Shafi, Dr.Suheel Manzoor, Dr Noopur Kaushik. ISSN 2320-5407. International Journal of Advanced Research (2015), Volume 3, Issue 12, 1465 – 1468

Hill, K.B., Hainsworth, J.M., Burke, F.J.T., Fairbrother, K.J. 2008. Evaluation of dentists' perceived needs regarding treatment of the anxious patient. Br Dent J 204: E13.

Hodes, R.L., Howland, E.W., Lightfoot, N, et al. 1990. The effects of distraction on responses to cold pressor pain. Pain, 41:109–114.

Kleinknecht, R.A., Bernstein, D.A. 1978. The assessment of dental fear. *BehavTher* 9: 626–634.

Locker, D. 2003. Psychosocial consequences of dental fear and anxiety. *Community Dental Oral Epidemiology*, 31:144–151.

Locker, D., Liddell, A.M. 1991. Correlates of dental anxiety among older adults. J Dent Res 70: 198–203.

Miron, D., Duncan, G.H., Bushnell, M.C. 1989. Effects of attention on the intensity and unpleasantness of thermal pain. Pain, 39: 345–352.

Oosterink, F.M.D., de Jongh, A., Hoogstraten, J. 2009. Prevalence of dental fear and phobia relative to other fear and phobia subtypes. *Eur J Oral Sci* 117: 135–143.

Oxford Handbook of Clinical Dentistry. By David A. Mitchell, Laura Mitchell. Chapter 5; Restorative dentistry 1: Periodontology. Pg. 200.

Redelmeier, D.A., Katz, J., Kahneman, D. 2003. Memories of colonoscopy: a randomized trial. Pain 104: 187–194.

Schmitt, Y.S., Hoffman, H.G., Sharar, S.R. 2011. A randomized, controlled trial of immersive virtual reality analgesia during physical therapy for pediatric burn injuries. Burns 37:61–68.

Sharar, S.R., Miller, W., Patterson, D.R. 2008. Applications of virtual reality for pain management in burn-injured patients. Expert Review of Neurotherapeutic, 8:1667–1674.

The Use of Immersive Visualization for the Control of Dental Anxiety During Oral Debridement. Padrino-Barrios C, McCombs G, Diawara N, De Leo G. J Dent Hyg. 2015 Dec;89(6):372-7.

Treatment Planning in Dentistry. By Stephen J. Stefanac, Samuel P. Nesbit. Chapter 7: The Disease Control Phase of Treatment.

Virtual Reality Distraction for Pain Control During Periodontal Scaling and Root Planing Procedures. Elena Furman, T. Roma Jasinevicius, Nabil F. Bissada, Kristin Z. Victoroff, Robert Skillicorn, Marc Buchner. December 2009Volume 140, Issue 12, Pages 1508–1516.

Wiederhold, M.D., Wiederhold, B.K. 2007. Virtual reality and interactive simulation for pain distraction. Pain Medicine 2007; 8:S182–188.

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