EFFECT OF VIRTUAL REALITY (VR) GLAASSE ON GAG REFLEX DURING TAKING MAXILLARY IMPRESSION

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Abstract

The aim of our study is to assess the effectiveness of Virtual Reality (VR) glasses in reducing the gag reflex during maxillary impressions and to evaluate baseline gag reflex levels in patients without VR glasses. Additionally, we measure patient comfort using the Visual Analog Scale (VAS) with and without VR glasses during the procedure. This comparative experimental study was conducted from March to June 2024 at Iqra Dental Clinic, Iqra National University, Peshawar, involving 40 patients aged 18-65 years.

Dental impressions are essential for replicating oral tissues accurately; however, the gag reflex, a natural defense mechanism, often complicates the procedure. Our study explores the potential of VR glasses as a distraction tool to alleviate this reflex, improving patient comfort and reducing clinical stress.

Results show a significant decrease in the gag reflex when using VR glasses, with mean scores dropping from 5.2 without VR glasses to 0.85 with them (p-value 0.001). The VAS scores indicate that patients were more comfortable during the procedure with VR glasses. This suggests that VR glasses effectively reduce the gag reflex and enhance the patient experience during maxillary impressions.

Keywords: Maxillary Impression, Visual Analog Scale, Gag Reflex, Virtual Reality Glasses.

Introduction

The negative reproduction of oral soft and dental hard tissue for fabricating dental and maxillofacial prosthesis is called Dental impression (1). Different types of impression materials are used to replicate and record intraoral structures for fabrication of definitive restorations and prosthesis indirectly in dental laboratory (2). Any dental prosthesis must be built from precise impressions. For the best cast, it's important to capture the dynamic interplay between the mouth's stationary and moving parts. Dental impression materials were defined in a 1998 FDA document as class II devices made of materials like polysulfide or alginate that were meant to be used on a premade impression tray to recreate the shape of a patient's gums and teeth. Research and the manufacturing of restorative prosthetics like dentures and gold inlays will benefit from the device's models (3).

Irreversible hydrocolloid impressions are a commonly used in daily practice. The most frequently used dental material is Alginate. Impression is usually taken at the first dental visit for studying the case and for treatment planning for further procedures, its results are crucial to forming a first "idea" about the patient's oral health status and for prosthesis fabrication. Recording maxillary impression is a challenge for both dentists and patients because of the gag reflux that patient faces when a tray full of impression materials covers the palate because it initiates retching (3). A gag reflex causes retching by involuntarily tightening the muscles of the throat or soft palate. This is the body's natural defensive system that helps keep harmful substances and other objects out of the airways (pharynx, larynx, and trachea) (5). This defense system is hardwired from birth to keep foreign bodies out of the airway. On the other hand, it may be conditioned by external stimuli that travel via the bloodstream or the cerebrospinal fluid, such as sights, smells, sounds, psychological input, chemicals, or even toxins (4). Problems may arise during prosthodontic therapy treatments if the patient gags (5). as it commonly occurs during taking a maxillary impression. Clinicians successfully treat many patients with mild gagging problems using minor procedural modifications or distractions following anxiety reduction protocols. However, severe gagging can be elicited in some patients when the dentist's fingers or instruments contact the oral mucosa or even by nontactile stimuli, such as, patients seeing the dentist, instruments, smell or remembering a previous dental experience. Providing dental treatment for this challenging group can be a stressful experience for both patients and Dental care providers (6). In our study we will use VR glasses with a 3D landscape video along with a soothing music for the patient as a distraction. Which we assume will aid in a smooth procedure, reducing chair side time and will help in a quality impression for patients having severe gag during impression. This study will add knowledge to the existing body of literature and will help to make polices needed for impression taking. This will decrease burden on clinics as VR glasses will act as a good anxiety reduction tool.

Objectives
1. To evaluate the baseline level of gag reflex in patients undergoing maxillary impressions without the use of VR glasses.
2. To assess effectiveness of VR glasses in reducing the gag reflex during maxillary impressions compared to standard procedures without VR glasses.
3. To measure patient comfort levels using VAS scale during the maxillary impression procedure with and without the use of VR glasses.

Materials and Methods
3.1 Study Design
Comparative experimental study.

3.2 Study Setting:
Impressions from study participants were taken in Iqra Dental Clinic, Iqra National University, Peshawar.

3.3 Duration of Study:
The study took 4 months to complete after approval from the supervisor and approval committee of Allied health sciences, Iqra National University.

3.4 Sample size:
Convenient sampling technique.

3.5 Sample selection
3.5.1 Inclusion criteria:
Age: Adults aged 18-65 years, requiring a maxillary impression for dental treatment.
Gender: Male and female

3.5.2 Exclusion criteria:
Individuals those are unable to wear VR glasses.
Gender: male and female

3.6 Data collection procedures
Impression techniques
One operator selected pre-prepared commercial stock tray by try-in for maxillary arch of the selected participants. Alginate impression materials (Normal set, CA-37, Cavex Holland BV) was used to take impression using manufacturer's Instructions. Using standard protocols maxillary impressions were taken by the same operators for the control group without using VR glasses. For the group using VR glasses participants were made to wear VR glasses playing Landscape video in 4K and after a minute impression was taken. VAS was taken from each patient to gauge their Gag reflex after taking Impression from participant of both groups (17).

3.7 Data analysis
The collected data was analyzed using SPSS version 2021. Independent variable of our study are VR glasses and alginate impression. Whereas dependent variable is Gag reflex. Descriptive analysis is used for calculating means standard deviation and standard errors. ANOVA was used for checking the significance of the study data and Post Hoc Tukey was used for multiple comparison. A P value of <0.05 will be considered as statistically significant.

Results
The correlation between VAS with VR glasses and VAS without VR glasses shows that the VAS with VR glasses score decreases, the VAS without VR glasses score increases, and vice versa. This strong negative correlation suggests that the use of VR glasses has a significant impact on the VAS score, potentially indicating that VR glasses may have a positive effect on the user experience compared to not using VR glasses as shown in figure 4.1.
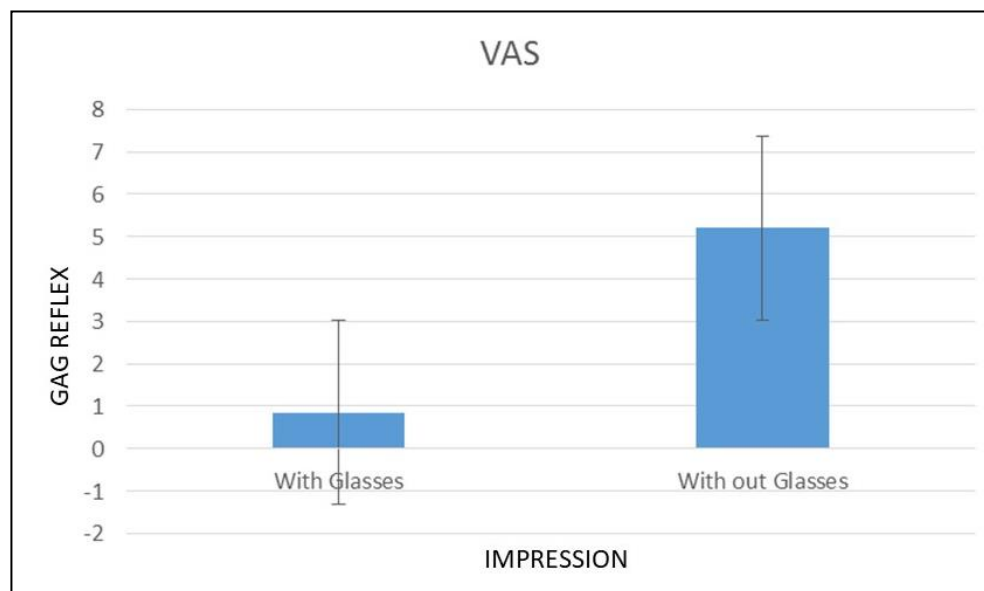

Figure 4.1: Showing VAS of Gag reflex in patients with and without VR glasses

Grouped statistics of the data showed that mean VAS score with VR glasses was 0.85 ±1.5 and a standard error of 0.35 whereas for the control group without VR glasses was 5.2 ±2.8 with a standard error of 0.63. This indicates that the participant's experience was significantly influenced by the use of VR glasses, with a much lower average score when using VR glasses compared to without VR glasses, users experienced a relatively low level of anxiety when using VAS with VR glasses. This is a positive insight, indicating that the technology may have a calming or soothing effect on users. It

could be beneficial to further explore the specific features or aspects of VAS with VR glasses that contribute to this low anxiety level, in order to replicate and enhance these in future designs. (Table 4.1).

Group Statistics

	Groups	N	Mean	Std. Deviation	Std. Error Mean
VAS	With Glasses	20	.8500	±1.56525	.35000
	With out Glasses	20	5.2000	±2.83957	.63495

Table 4.1: Showing Means, standard deviation and standard errors of VAS in various Groups.

One way analysis of variance of the collected data showed significant results of the between the control group without using VR glasses with that of the group using VR glasses Table 2. Whereas table 3 shows multiple comparisons of our study groups.

Discussion
The results of current study indicated that VR technology has the potential to lower gag reflex during maxillary impression taking and enhance the overall patient's experience, as reflected in the results of VAS scores. These findings are in close relation with a study done by Niharika et al in 2018, the use of virtual reality (VR) eyeglasses during pulp therapy of primary molars in children led to a significant decrease in pain perception and anxiety levels. The data from our study showed that using VR glasses technology in impression taking could also suggest that users generally prefer using VR glasses over not using them, as evidenced by the notable difference in VAS scores.

The results of the current study suggested that VR devices can be a useful tool for managing pain and anxiety in dental patients, as the dental procedures and too cumbersome and patients gets anxious because of the sight of different restorative and surgical instruments. The results of our study are in comparison with a study done by Niharika et al in 2018, as they used VR glasses in a group of children in vital pulpotomies and they discovered auspicious results of reduced anxiety levels and increased patient compliance towards dental procedures (23).

The gag reflex can significantly hinder dental procedures, particularly during maxillary impression-taking. Several techniques have been explored to mitigate this issue. An earplug technique was found to effectively reduce gag reflex severity in adults (18). However, a study on children showed that the earplug and temporal tap technique did not significantly reduce gag reflex during impression-taking, although it led to a better patient experience (19). Acupuncture has also shown promise in managing gag reflex. A study reported that acupuncture decreased gag reflex by 70% during upper alginate impression-taking (20). Similarly, ear acupuncture was found to be effective in controlling gag reflex in prosthodontic patients, with 7 out of 10 patients experiencing significant reflex reduction (21). These findings suggest that both mechanical and alternative techniques may offer potential solutions for managing gag reflex during dental procedures.

The strong negative correlation between VAS with VR-glasses and without VR-glasses suggests that VR glasses may have a significant impact on the user experience, potentially improving it by providing a distraction during impression taking these findings are strengthened by a study done by Custódio et al. in 2020, they analyzed 9 randomized clinical trials that assessed the effect of VR glasses on their patient's behavior during dental care and concluded That the use of VR glasses is an effective tool for improving patient's behavior and reducing their pain perception during dental treatment (22).

Conclusion
This study concluded that The mean Gag reflex in maxillary impression without using VR glasses was 5.2 whereas the mean gag reflex in maxillary impression taking with VR glasses was 0.85
The Gag reflex in maxillary impression using VR glasses was significantly decreased *p*-value 0.001

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