

Machine Elf 27 optimizes Meta Quest 2 Virtual Reality hypnosis during laser gingivoplasty

Abstract

Introduction and aims: Dental procedures are often difficult for patients causing anxiety/fear. Hypnosis is a state of consciousness, in which a patient's attention is detached from immediate environment by focusing or involvement to create a hypnotic reality. Virtual Reality is an artificial environment which is experienced through sensory stimuli provide by a computer. Aim of this case report is to use hypnosis during gingivoplasty.

Materials and methods: Machine Elf 27 360° Virtual Reality projection in Meta Quest 2 Head-Mounted Display Set with headphones was used during anaesthesia-free laser gingivoplasty in order to optimize the hypnosis effect in general healthy adult patient.

Results: Patient felt no pain, did not hear environment sounds around, confirmed, that "smelled something burning", and felt the entire headset uncomfortable. HMD was a physical obstacle so it did not make the procedure any easier itself for the operator.

Conclusion: Machine Elf 27 optimizes VR hypnosis during dental procedure.

Clinical relevance: Virtual Reality hypnosis helps in patient's premedication.

Keywords: anxiety, gingivoplasty, hypnosis, implant, laser, pain, virtual reality

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Introduction

Dental procedures are difficult for patients. Anxiety/fear and pain during surgery, post-treatment pain and anxiety/fear, the subjective uncertainty of the treatment results, the direct proximity of the operator in the oral cavity, maintaining consciousness during the operation, all burden the patient's psyche.

Defining the differences between patient's anxiety or fear and managing them, helps minimize procedural complications. The use of various methods of local anaesthesia blocks the patient's feeling of pain.¹ Explaining the method and effect of treatment to the patient, also using Augmented Reality (AR), strengthens trust in the doctor.² The use of Mixed Reality (MR) allows shortening the operation time, increasing accuracy, optimizing prognosis.³

Still, the issue of patient's awareness remains; are we able to run off the patient's consciousness during dental operation, without the use of general conventional anaesthesia?

Hypnosis is being described as a state of consciousness, in which a patient's attention is detached from immediate environment by focusing or involvement to create a hypnotic reality.⁴ As defined by the Merriam-Webster dictionary, citation: "Virtual Reality (VR) is an artificial environment which is experienced through sensory stimuli provide by a computer."⁵ In operative dentistry, focusing on stimuli/distracting attention from the procedure has history of at least half a century.⁶

Evidences of binocular vision, that is fundamental for stereopsis in VR, were proven in early XIX. True VR desires a synchronized 4-sensory stimulation in a Head-Mounted Display, 6-degree of freedom (6-DoF) tracking, suppression of external stimuli (visual, auditory, kinetic, and olfactory).⁷

Articles regarding the use of VR in operative dentistry focus on methods of qualitative and quantitative assessment of the effectiveness of anti-anxiety/fear or analgesic effects, their various parameters, sophisticated statistics or scales. Clinical ones describe in finest detail the methods of the operation itself.

Therefore, the aim of this case report is to draw the reader's attention to the parameters of the VR devices, and in particular in term of selecting a specific movie, so that the potential hypnosis effect during surgery is optimal, in an adult patient during laser gingivoplasty.

Material and methods

In an adult, generally healthy patient, an exposure with healing cup of osseointegrated titanium alloy dental implant (AB Dental Ashdod, Israel) was performed.

Gingivoplasty was done with SOL Desktop Dental Laser System INRG Wireless (Den-Mat Holding, LLC, Lompoc, CA, USA) in a CUT mode for soft tissue/gingiva microsurgery (Figure 1).



Figure 1 Patient during implant exposure laser gingivoplasty in HMD Virtual Reality hypnosis.

With the patient's consent, the procedure was performed without local anaesthesia, using VR hypnosis. For this purpose a VR Set consisted of Meta Quest 2 Head-Mounted Display (HMD), flexible Headstrap, Meta Quest Link PC Software, Link Cable PC USB Type-C 5m (Meta Platforms Inc., Menlo Park, CA, USA) was

used (a wireless version is also available). HMD was merged with Headphones Logitech G Pro (Logitech Int. S.A., Lausanne, CH) with active ambient noise reduction, dedicated to Meta Quest 2 HMD. The whole set was correlated with Meta Quest 2 compatible personal computer (Dell, Round Rock, TX, USA), which made it possible to control independently of the patient.

A “Machine Elf 27 Avoiding the Void” projection was used. This 360° movie by Trey Ratcliff & Sam Mahrtens, is described as “exploring the math of V3 of the Menger, with spherical structures through creation by the minutes of filaments. Music with all these worlds seems to be a pulsing balance of life and release.” It was applied with the intention of VR hypnotic effect. The movie is available in Ascend Catalogue of Tripp Platform (TIPP, Inc., Los Angeles, CA, USA) subscriber. For the purpose of this dental procedure it was applied in non-commercial, individual, medical intra-operation way.

After the procedure, the patient was asked about anaesthesia-free post-gingivoplasty impressions, pain and wearing the HMD, according to zero-one code: 0 – no pain, 1 – feeling pain; 0 – comfort of wearing HMD, 1 – no comfort of wearing the HMD.

Results

15 minutes implant gingivoplasty was carried out routinely, with time-normal gum regeneration in the context of the emergence profile.

The patient accepted the VR hypnosis. Felt no pain, did not hear environment sounds around, and admitted that it allowed focusing on immersive projection (code 0).

Patient confirmed, that “smelled something burning”, also felt the entire headset was bearable but uncomfortable (code 1).

HMD was a physical obstacle so it did not make the procedure any easier itself for the operator.

Discussion

During dental operations, stability of the patient position is fundamental; therefore games and the use of controllers are impossible. Headphones – active ambient noise reduction, are essential in true VR immersion.

Among 6 papers found using Oculus/Meta HMDs in medical applications, including only 4 with intraoperative dental utilization, in none of them did the authors correlate the headset with headphones for active background reductions.

In 2018 Barbara Atzori with team, pioneered the introduction of the Oculus HMD in dental application, used a high-tech computer game “Snow World” created by Hunter Hoffman and David Patterson for effective pain management in burned patients, but requiring the patient to be active with head and hands.⁸

May Amulgait and Ammar Abu Mostafa used in 2022 “Henry” the hedgehog fairy tale in adult patients.⁹

In 2023 Lior Zaidman with colleagues in Jerusalem, gave to children two cartoon series and a children’s show, without details of the name and film producer; although they rightly pointed out that the use of HMD alone does not provide isolation from ambient sounds.¹⁰

Alireza Ghodabi’s research team used in 2024 Meta Quest 2 in 2024 during dental implanting. They went into detail about the methodology of the procedure itself, the numerous analytical parameters, the extensive statistics, did not mention what specific movie/projection they used for VR immersion.¹¹

The “Machine Elf 27 Avoiding the Void” VR projection proposed in this case report is a 3D 360° synthetic movie production, with the intention of maximum focus of the observer, specifically the patient during dental procedure. Only these types of projections, specially designed and produced, might be able to achieve the goal of true hypnosis¹² – not charlatan fiction, but evidence-based, interdisciplinary, with neuroscience, psychology, music composing, olfactology, engineering, movie production, medicine.

As far as the performance of the Meta Quest 2 is concerned, it is high technologically advanced, compared to the previous Rift,⁸ Go¹⁰ and Quest⁹ versions, obviously, but even to the more up-to-date Quest 3 or Pro ones: optics – binocular fresnel lenses, 58-68 mm IPD, grayscale via tracking cameras pass-through, RGB sub pixel layout, 100 nits peak brightness, 120 Hz refresh rate, 1832x1920 per eye resolution, 97° horizontal, 93° vertical FoV, 104° horizontal, 98° vertical, 113,46° diagonal RFoV, 90° binocular overlap, 20 PPD pick pixel density, 6 DoF inside-out via 4 cameras tracking type, 1000 Hz tracking frequency, Android 10 operating system, 91.5x102x142.5 mm dimensions, 503 g weight, Octa-core Kryo 585CPU, 6 GB, 128 GB storage.

One thing is certain: as HDM technology develops, unfortunately weight and size increase, which from a clinical view is quite a handicap both for the patient and the physician. The smaller the dimensions, while maintaining high immersion parameters of the HMD, the better in terms of ergonomics.

For future research consideration, the optimum VR set should be the size of swimming glasses, the headphones the size of plugs, and the olfactory effect should be achieved with the membranes of the nostril openings, by providing pleasant aromas, possible sedative, blocking stenches from the clinical environment.

Conclusion

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None

Conflicts of interest

The author declares there are no conflicts of interest.

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