

Virtual Reality Hypnosis Reduces Preoperative Anxiety in Pediatric Reconstructive Burn Patients

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Introduction

Children who require numerous surgical procedures often develop severe preoperative anxiety. This is especially true in children with burns who may associate reconstructive surgery with painful postoperative events¹. Preoperative anxiety is stressful for the child and distressing for the parents; alleviation of this stress may be beneficial psychologically as well as physically. Postoperative regression, nightmares, separation anxiety, eating problems and fear of physicians have been related to preoperative anxiety in children^{2,3,4}. Various pharmaceutical regimens to reduce preoperative anxiety have been devised; however, variable patient response and side effects often limit the efficacy of this approach.

Hypnosis is a state of focused attention with increased suggestibility. Hypnosis has been found to be more effective than midazolam for reducing preoperative anxiety in children undergoing lower abdominal procedures.⁵ The effect of hypnosis on the preoperative anxiety levels in children undergoing reconstructive burn surgery has not been studied.

We report on the use of a novel Virtual Reality Hypnosis device (VRH) to induce a preoperative hypnotic state in pediatric patients scheduled for elective burn reconstruction. We compared the efficacy of VRH with that of a standard preoperative medication in the reduction of preoperative anxiety.

Methods

All aspects of this study were approved in advance by the Institutional Review Board. Written informed consent was obtained from 24 children, ages 14-21 years (and their parents), scheduled for reconstructive burn surgery. A blinded randomization scheme was used to assign patients to the VRH group or control with the intent of one of every four patients being assigned to the control group.

Both groups were visited by a member of the study team on the evening before surgery and asked to use a Visual Analog Scale (VAS) to rate their anxiety regarding the upcoming surgery. After completing the anxiety score, patients randomized to the VRH group received instruction on using the device. In brief, the device consists of a headset containing both audio and video outputs which play a program of pleasant visual images, soothing music, and a relaxing voice meant to induce a hypnotic state of relaxation. Once the headset is in place, external stimuli are minimized and the patient's thinking is narrowly and selectively focused on a single concept or idea. Concentration is withdrawn from the "real world", and awareness is internalized in virtual and imaginary worlds.

The total program lasts 20 minutes. After completing the VRH session, each patient was asked again to rate their anxiety using the VAS.

On the morning of surgery, all patients received 0.1mg/kg of diazepam by mouth one hour before surgery. Patients in the VRH group began a VRH session immediately after receiving their preoperative medication. Upon presentation to the operating room holding area a member of the study team, blinded to group assignment, asked each patient to rate their anxiety using the VAS.

All patients received a standardized anesthetic by an anesthesiologist who was unaware of group assignment.

Anxiety scores recorded for the two groups were compared using the nonparametric Wilcoxon rank sum test. A p value less than 0.05 was considered to be statistically significant.

Results

A total of 24 patients were found to meet the study inclusion criteria and all agreed to participate. Randomization allocated 17 patients to receive VRH and 7 acted as control (Table 1). All patients completed the study.

Table 1

Patient characteristics (mean, range)

	n	Age (years)	Male/female
VRH	17	18.0 (15-21)	7/11
Control	7	17.4 (16-19)	5/2

Anxiety scores measured at the beginning of the study period (the night before surgery) were comparable between the groups. After the VRH group received a VRH session anxiety scores were repeated and were found to have decreased significantly. Control group anxiety scores were unchanged for the same time period (Table 2).

Table 2

Anxiety scores the night before surgery (mean \pm SD)

	Pre VRH	Post VRH	
VRH	4.1 (\pm 3.1)	2.1 (\pm 2.5)	p<0.05

Control	2.9 (± 2.4)	2.9 (± 2.4)	NS
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On the morning of surgery (one hour preoperatively) anxiety scores were measured and the VRH group received another session of VRH. Anxiety scores in the two groups were comparable before VRH, but after a VRH session the VRH group had significantly less anxiety (Table 3).

Table 3

Anxiety scores the morning of surgery (mean \pm SD)

	Pre VRH	Post VRH	
VRH	3.8 (± 3.9)	2.2 (± 3.0)	p<0.05
Control	3.6 (± 2.7)	3.6 (± 2.7)	NS

Discussions

Practitioner-guided, clinical hypnosis has an established literature supporting its efficacy in the management of anxiety symptoms⁶. The VRH device allows the patient to be guided into clinical hypnosis through the virtual reality experience. Hypnosis in a virtual reality environment comprises hypnotic language patterns, auditory rhythms corresponding to alpha brain wave frequencies, and visual images. The VRH system uses techniques not accessible to a clinical hypnotherapist including binaural beats, visual and narrative metaphors, color, biophilia, body language, reframing, matching and mirroring to visual cues, classical conditioning to visual cues and other cognitive intervention strategies.

VRH differs from more traditional forms of hypnosis by inducing the patient with eyes open, and presenting visual images in isolation or coordinated with music, environmental sounds and binaural beats. According to Patterson⁷ visual stimuli can make the induction process less effortful. Visual images are potent tools for distracting the conscious mind, and they reduce conscious, critical analysis of verbal suggestions. Visual images are used as subliminal metaphors to reinforce verbal suggestions. Visual images are also used in isolation or coordinated with hypnotic language patterns and auditory signals to deepen trance states and deliver therapeutic suggestions through the application of recognized hypnotic principles, including imagination, association, repetition, pleasure, fixation of attention, anchoring and imbedded commands⁸. With use of the VRH device, patients have a perception of being immersed in a “safe zone”, where limited auditory and visual stimulation from the “real world” creates a stress free environment conducive to relaxation and altered states of consciousness.

These results demonstrate that the viewing of a VRH session the night before and the morning of surgery can significantly reduce preoperative self reported anxiety scores in teenagers scheduled for reconstructive burn surgery. Each patient ranked their anxiety four times before surgery, twice the night before and twice on the day of surgery. The group who viewed the VRH program demonstrated a significant decrease in anxiety immediately afterwards; however, by the morning of surgery, anxiety levels were once again comparable to those of the control group. While we did not specifically study the duration of anxiety reduction by VRH, the scores the morning of surgery were obtained upon entry to the operating room. Even though 30 minutes had passed since viewing the VRH program anxiety scores were lower than the control group.

We did not include a measure of post operative behavior in our study; however we did note that none of the patients had any untoward behaviors postoperatively. In addition, a number of the patients volunteered that they “enjoyed” the VRH sessions and wanted to use the device again. Several of the patients in the VRH group did use the device on the day after surgery, per patient request.

There are a number of validated tools available to rate patient anxiety. Self evaluation of anxiety using a VAS has been previously validated² by comparison with results obtained using the State-Trait Anxiety Inventory, a well recognized and established anxiety measurement tool. The VAS is easily understood and has the advantage of not forcing patients to use previously provided descriptive terms to rate their anxiety. In addition, past work has taught us that many pediatric burn patients have learned various coping strategies for dealing with anxiety which may lead to underestimation of anxiety by an observer. As anxiety is a subjective experience, self evaluation by the patient experiencing the sensation is very valuable and valid data.

Both groups of patients received a standard preoperative anxiolytic one hour before surgery, just before the second VRH session. Although it could be argued that the VRH group should have not received an anxiolytic, we were uncomfortable in withholding preoperative medication from this highly anxious patient group.

Our study population was confined to a fairly narrow age range because the subject material in the VRH program was not thought suitable for younger children. At this time, program material aimed at a younger age group is under development and will be studied when available.

In conclusion, the use of VRH was useful in reducing anxiety levels in a group of teenage patients undergoing elective reconstructive burn surgery. The device itself has no known side effects and presents minimal risk to the patient. We feel that if the VRH device were widely available it would be used freely by most of our patients in this population.

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¹ McCall, Fischer et al

² . Beeby DG, Morgan Hughes JO. Behavior of unsedated children in the anaesthetic room. *Br J Anaesth* 1980;52:279-81.

³ Vernon DT, Schulman JL, Foley JM. Changes in children's behavior after hospitalization. *Am J Dis Child* 1966;111:581-93.

⁴ Kain Z, Mayes L, O'Connor T, Cicchetti D. Preoperative anxiety in children: predictors and outcomes. *Arch Pediatr Adolesc Med* 1996;150:1238-45.

⁵ [Calipel S](#), [Lucas-Polomeni MM](#), [Wodey E](#), [Ecoffey C](#). Premedication in children: hypnosis versus midazolam. *Paediatr Anaesth*. 2005 Apr;15(4):275-81

⁶ Solomon S, Johnson D. Psychosocial treatment of posttraumatic stress disorder: a practice-friendly review of outcome research. *J Clin Psychol* 2002; 58(8): 947-59

⁷ Patterson DR, Tininenko JR, Schmidt AE, Sharar SR. Virtual Reality Hypnosis: a case report. *Int J Clin Exp Hypn* 2004; 52: 27-38

⁸ Carbis C, Mastropaulo J. Virtual Medicine. Available from: URL:

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