Feasibility of virtual reality immersion in reducing pain and anxiety during external fixator care procedures

Christopher August Iobst[1], Anirejuoritse Bafor
[1]Nationwide Children's Hospital

INTRODUCTION:
The need for frequent adjustment and pin-site care following the application of external fixators may be potentially painful and cause fear, anxiety, and even post-traumatic stress in patients following limb reconstruction procedures. Virtual reality (VR) immersion is a non-invasive, non-pharmacological distraction technique that has shown potential in previous studies as a promising technique for pain management. The aim of our study was to evaluate the feasibility of virtual reality in the management of pain and anxiety during post-op external fixator care procedures.
METHODS:
This was a single-center, IRB-approved, prospective, randomized, controlled crossover clinical trial involving patients aged between 5 and 21 who were scheduled to undergo limb lengthening or reconstruction surgery with an external fixator. The HIPAA-compliant Aqua virtual reality application from the KindVR® platform was utilized for this study. The PROMIS Pediatric Anxiety and the PROMIS Pediatric Pain Interference, as well as the corresponding parent proxy surveys, were used for baseline assessment of the study subjects at enrollment. Patients were seen during the first four consecutive outpatient post-operative visits for care procedures for their external fixators. Subjects were randomly assigned to a 'VR first' group (study group 1) or a 'no VR first' group (study group 2) using a free online random sequence generator. Study visits alternated between VR immersion experience during care procedures and care procedures without the VR immersion experience. The primary study endpoints of pain and anxiety levels in subjects undergoing external fixator care procedures with and without virtual reality immersion were assessed before, during, and after the procedure using the Wong-Baker Faces (FACES) scale and Children's Fear Scale for pain and anxiety scoring, respectively. Proxy scores for pain and anxiety were obtained from parents or legal guardians using the PROMIS Parent Proxy Numeric Rating Scale and the parent-reported Children's Fear Scale for pain and anxiety, respectively. We also obtained provider assessment of pain and anxiety using the FLACC survey and Children's Fear Scale.
RESULTS:
A total of 29 patients (16 male and 13 female) completed all study activities and were evaluated. The mean age at enrollment was 14.5 ± 3.1 years (14.4 ± 2.2 years for group 1 and 14.7 ± 4.0 years for group 2). The median number of pin sites was 7 (range 7 – 14). The mean PROMIS Pediatric Anxiety score was 17.9 ± 7.3 (17.9 ± 8.1 for group 1 and 18.0 ± 6.6 for group 2), while the mean PROMIS Pediatric Pain Interference score was 19.8 ± 8.4 (19.6 ± 10.0 for group 1 and 19.9 ± 6.1 for group 2).
There was a consistent trend of higher anxiety scores in all patients and from the perspective of the proxies (parents and providers) during the non-VR immersion experience compared to the VR immersion visits. The pain and anxiety scores were significantly lower in group 1 patients during the non-VR immersion study visits compared to patients in group 2. This observation was also consistent with survey findings among the proxies and providers.
DISCUSSION AND CONCLUSION:
The use of VR immersion for pin-site care procedures is associated with lower anxiety scores. VR immersion at the first post-operative visit following limb reconstruction surgery was also associated with significantly lower pain and anxiety scores during subsequent non-VR immersion visits. Consequently, we recommend adding VR to your management protocol as a valuable method of distraction during external fixator pin site dressing changes.