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Use of virtual reality for treating burned children: case reports

Utilização da realidade virtual no tratamento de crianças queimadas: relato de casos

Utilización de la realidad virtual en el tratamiento de niños quemados: relato de casos

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ABSTRACT

Objective: To report the use of virtual reality (VR) in pain intensity during dressing change of two burned children hospitalized in a Burn Treatment Center (BTC) in Southern Brazil. **Method:** Case report on the use of VR during dressing change of two burned children hospitalized in a BTC, from May to July 2016. For assessing pain, a facial pain rating scale was applied at four times: just before the dressing, during the dressing without the use of VR, during the dressing with the VR, and after the use of VR. **Results:** The use of goggles was easy to apply and well-accepted by the children, and also had a relevant effect reducing pain. **Conclusion:** VR can become an important nonpharmacological method for treating pain in burned children.
Descriptors: Virtual Reality Exposure Therapy; Burns; Pediatrics; Burn Units; Pain; Three-dimensional Imaging.

RESUMO

Objetivo: Relatar a utilização da Realidade Virtual (RV) na diminuição da intensidade dolorosa durante a troca de curativo de duas crianças queimadas internadas em um Centro de Tratamento ao Queimado (CTQ) do Sul do Brasil. **Método:** Relato de caso da utilização da RV durante a troca de curativos de duas crianças queimadas internadas em um CTQ, de maio a julho de 2016. Para avaliar a dor, foi utilizada escala numérica sobreposta à de faces, sendo aplicada em quatro momentos: imediatamente antes do curativo, durante o curativo sem uso da RV, durante o curativo com a RV e após a utilização da RV. **Resultado:** O uso dos óculos foi de fácil aplicação e bem aceito pelas crianças, além disso houce efeitos relevantes em relação à diminuição da dor. **Conclusão:** A RV pode se tornar um importante método não farmacológico no tratamento da dor em crianças queimadas.
Descritores: Terapia de Exposição à Realidade Virtual; Queimaduras; Pediatria; Unidades de Queimados; Dor; Imagem Tridimensional.

RESUMEN

Objetivo: Relatar la utilización de la Realidad Virtual (RV) en disminución de intensidad del dolor durante cambio de vendajes de dos niños quemados, internados en un Centro de Tratamiento del Quemado (CTQ) del Sur de Brasil. **Método**: Relato de caso de utilización de RV durante cambio de vendajes de dos niños quemados internados en CTQ, de mayo a julio de 2016. Se evaluó el dolor utilizando escala numérica conjuntamente con la de faces, aplicándosela en cuatro momentos: inmediatamente antes del vendaje, durante el vendaje sin utilizar la RV, durante el vendaje utilizando RV y luego de la utilización de la RV. **Resultado**: El uso de los visores fue simple y bien recibido por los niños; además, hubo efectos relevantes en relación a la disminución del dolor.
Conclusión: La RV puede constituir un importante método no farmacológico para el tratamiento del dolor en niños quemados.
Descriptores: Terapia de Exposición Mediante Realidad Virtual; Quemaduras; Pediatría; Unidades de Quemados; Dolor; Imagen Tridimensional.

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INTRODUCTION

Burn injuries represent a major public health problem. In Brazil, approximately one million people suffer from some form of burn every year; of these, 300,000 involve children, with approximately 40,000 demanding hospitalization[1].

At any stage of the lifecycle, burn leads to physical and psychological changes related to body image and self-esteem involvement, changes in lifestyle and also towards treatment, including unpleasant procedures that could cause pain, suffering, anxiety, and depression. Pain is an individual and subjective experience; therefore, its management with burned children is a challenge. Successful pain management involves a continuous and thorough assessment, besides individualized therapy combined with drug and nonpharmacological methods[2-4].

One of the nonpharmacological methods that have been studied is virtual reality (VR). VR is a groundbreaking technique that allows the user to get immersed in a virtual environment, with three-dimensional vision and interaction through movements, which promotes distraction of the real senses. This interaction is achieved using a helmet, goggles, gloves, control, or even, voice command, allowing the patient to enjoy the sensation of being, acting, and living inside the virtual environment in real-time. The use of goggles provides a wide field-of-view with various degrees and image synchronicity according to the user's movement[4-5].

It is noteworthy that a study showed a decrease in pain effects during dressing application, contributing to the reduction of 44%, 32%, and 27% of cognitive, affective, and sensorial pain, respectively. It also showed that entertainment can provide a three-fold increase, indicating humor improvement of the person who suffered burns[6]. In addition, an integrative review showed promising results with the use of VR during the performance of painful procedures, such as dressing and physiotherapy, finding a 30% reduction in pain intensity, 42% in unpleasantness, and 67% in cognitive dimension that could be related to the attention given by the person to the virtual world[4].

In light of this context, it became clear that the use of VR may integrate and improve nursing care, since it is a new technology with evidence of pain reduction and other benefits. It is important to emphasize the lack of original Brazilian articles published on this topic. Moreover, despite widespread international publications, there are few studies carried out by nursing professionals. Thus, it becomes crucial to develop publications to promote the use of VR in the Brazilian nursing care context. Therefore, the objective of this study is to report the efficacy of the use of VR relieving pain during dressing changes in two burned children hospitalized in a reference Burn Treatment Center (BTC) reference in Southern Brazil.

METHOD

This is a study involving case reports on the use of VR in two burned children hospitalized in a reference BTC in Southern Brazil, from May to July 2016.

The use of VR was through three-dimensional vision goggles and stereo sound from a Samsung Gear VR Innovator Edition for Note 4®. The images were reproduced by a Samsung Note S4® (connected to the goggles) mobile phone, reproducing three-dimensional games simulating a roller coaster ride and a marine environment, both available free of charge for download.

Dressing change was the moment chosen for using the VR, considering that this is the time when children experience higher pain intensity, as a result of the manipulation of the injury caused by the burn[2-3]. It is important to point out that dressing change includes opening, removing the old dressing, balneotherapy, chossing and applying the new dressing, and closing the injury.

Regarding pain assessment, a facial pain scale was applied together with a numeric scale. These tools were chosen because they an be easily understood by children, as they allowed a visual assessment through the faces because they represent distinct expressions of pain discomfort, guided by the numeric scale from zero to ten[3].

For assessing the pain, the scale was applied at four times: just before dressing change, during dressing change without the use of VR, during dressing change with VR, and after closing the dressing without VR. It should be emphasized that children were free to choose in which moment they would start using the goggles while changing the dressing.

While using VR, the children were also asked questions related to the presence of side effects, such as nausea and dizziness. In addition, the observations made by the researchers were recorded for supplementing further assessments, whereas the fun and immersion during the use of VR goggles were observed. It should be mentioned that the goal of VR was to supplement the pharmacological treatment; therefore, the drugs according to medical prescriptions were administered.

This case report is part of a project called "*Realidade Virtual no tratamento da dor em queimaduras e o impacto na qualidade de vida*," which was approved by a research ethics committee. For the use of images and publication, an authorization provided by the children and their guardians was requested through a consent form and a free and informed consent form. Ethical principles established by Resolution no 466/2012 were observed.

CASE REPORTS

Case 1

S.L.D.P., nine years old, male, student, was admitted to the emergency unit on June 6, 2016, accompanied by his mother, showing history of burn for one day, with "mixed" (with oil) gasoline, over his lower limbs. In the initial evaluation, the child showed stable vital signs, was conscious, oriented, making contact, and indicating the burned areas. The burn showed intact blisters and regions of skin exposed in the lower limbs, with higher involvement in the back region. The assessed regions were classified with 7% of thickness of burned body and burns with partial superficial thickness. In the same day, he was admitted to the BTC and started treatment with a non-adherent dressing, which was kept for 48 hours. During dressing change, the team identified burned areas that evolved into full thickness burns. Before conducting balneotherapy, sedation with Morphine® was administered. The first pain assessment took place

before starting the procedure, whereas the child chose the face corresponding to value four. During balneotherapy, maximum face value (10) was chosen. After finishing the bath, the child started using the VR goggles, remaining immersed until dressing closure, and watching a game that simulates a roller coaster, totaling 25 minutes of use. During this period, it was noted that the child had been distracted and immersed, moving his head and upper body, responding to the stimuli generated by the images of the game. After using the VR, a new assessment of pain perception was carried out, in which the child referred to the face corresponding to number four. The dressing was closed with alginate and silver foam; again, the pain scale was applied, to which the child graded number four. It is worth highlighting that, during the use of VR, the child did not show any sign of side effect. On July 15, 2016, grafting was carried out without complication. The child was discharged from the hospital on July 22, 2016.

Case 2

V.V.M., eight years old, male, student, arrived at the emergency accompanied by his mother on May 24, 2016. He had a history of burns of 12 hours, with gasoline, on the face, cervical region, upper chest, and suspicion of involvement in the airways. During initial assessment, the child showed stable vital signs, was conscious, oriented, making little contact, indicating burning sensation in the airways. The burned area showed dermis exposed in the thoracic and cervical regions. During assessment, he was classified with 5% of thickness of body burned and partial superficial burn thickness. The child was kept in the emergency for 24 hours due to the suspicion of involvement of the airways. On the following day, the boy was admitted to the BTC and a non-adherent dressing was applied on this thorax and cervical, remaining for 24 hours, and with collagenase on the face. During dressing change, epithelial tissue was identified in the face region, and an area with cervical and thoracic fibrin. For covering it, collagenase was used. On May 31, while opening the dressing, an increase in the area of cervical fibrin was found. Prior to balneotherapy, sedation with Tramal® was administered. The first pain assessment took place before starting the procedure, whereas the child chose the face corresponding to value two. Without the use of VR, in the balneotherapy, face with value six was chosen. During the bath, the child started using the VR goggles, and remained immersed until dressing closure, watching a game that simulated the seafloor, for 35 minutes of use. The child reported that, using the goggles, he felt more distracted and with less pain. A drop on painful expressions during the use of VR in the balneotherapy was also noticed. After using the VR, a new pain assessment was carried out, when the child indicated grade zero. The dressing was closed, applying thoracic and cervical silver sulfadiazine, occasion in which the child gave grade zero again. On June 1st, the dressing was changed again with the use of VR. On that day, Dipyrone® was administered for sedation. Accordingly, the child used VR watching a game that simulated a roller coaster during 15 minutes, after the balneotherapy until dressing closure. It was noted that the child was immersed in the virtual world, moving his head and limbs according to the stimuli provided by the program. While assessing the pain, the child referred to the pain face corresponding to two, before the dressing; during dressing change, he gave grade four; during the use of VR, pain was classified as zero pain and even after the closure, which that day was carried out with a non-adherent dressing in the cervical and thoracic regions and essential fatty acid on the face. It is important to emphasize that at any moment, during the use of VR, the child showed signs of side effect. On June 3rd, 2016, he showed improvement in the burned area and was discharged from the hospital (Figure 1).

Figure 1 – Child using virtual reality goggles while waiting for dressing closure, Florianópolis, Santa Catarina, Brazil, 2016

DISCUSSION

In light of the presented cases, it can be noticed that pain is a subjective and individual experience related to physical factors, such as the size and depth of the burn, as well as the psychological and emotional support provided by the family and the healthcare team; therefore, its management must also to be specific, addressing the needs of each child[5-8].

Pain that is not properly treated leads to adverse effects, during its acute and late stage, reducing the collaboration of the patients in activities that improve their rehabilitation, such as feeding, interaction with family and healthcare professionals, and sleep quality. Furthermore, it contributes to the development of posttraumatic stress disorder, anxiety and/or depression, and low quality of life[2-4].

Therefore, pain relief is not only a basic need, but also the right of the child, and must be one of the priorities of health care. Thus, the most adequate approach should focus on frequent assessment of the pain, in an attempt to find alternative or additional measures when pain relief seems inadequate. In conventional treatments, pharmacological methods are used with analgesics and opioids; although this link with drugs is used, a total reduction of painful symptoms is not achieved. Therefore, it is important to link pharmacological to nonpharmacological methods[3,9].

The use of VR in the reported cases shows relevant effects related to pain reduction. It was possible to notice that the therapy with three-dimensional goggles was beneficial, because the equipment ended up distracting the child during dressing procedure. These findings support studies that, besides pointing out the distraction, highlight entertainment and less time thinking about the pain, reduction in the need to increase pharmacological dosages, less need to add more than just one sedation and, especially, a significant drop in the amount of pain[4,7,10].

The use of goggles was easy to apply and well-accepted by the children; after all, besides being convenient to put on and take off, they did not cause any adverse effect while wearing them. In addition, some game options were offered, allowing the children to choose their favorite ones, which in turn helped to increase their interest and probable fun. Although the objective of the study was not to evaluate the software used, it should be stressed the importance of using virtual environments that captivate the children, so they could be kept entertained in the virtual world for a longer time. Consequently, the choice of software to be used is essential, because it has a direct relation with the amount of pain during treatment[2,5-6].

The results of several studies have shown that there is no reduction in the VR effect even after a few days using it, and that its use reduces significantly pain, anxiety, and stress[5-9]. This allows to consider that child resistance could be improved during hospital stay and, thus, facilitate the care provided by the health team and minimize the effects of a prolonged hospital stay, as well as the incidence of psychological and psychiatric disorders[10].

Study limitations

This study showed limitations on its sample, since it was based on case reports. Therefore, data could not be generalized. However, according to the two presented cases, there was a reduction in the pain and painful expressions during the use of VR as dressings were managed.

Contributions to the nursing field

VR is a groundbreaking technology without evidence of its application in the Brazilian context related to burns, but it could be included for nursing care. This technology can help in the process of managing burns, minimizing pain and anxiety, especially during procedures considered painful, such as dressing changes.

Thus, taking into consideration the active and permanent care actions provided by nursing to burned patients, the use of VR in the clinical practice can optimize dressing changes, improve children's collaboration during the procedure, and reduce the healthcare team stress, as the child becomes more peaceful and collaborative.

CONCLUSION

The use of VR has been insufficiently studied and applied in Brazil up to date. This is reflected by the lack of original articles that address its use focused on burned children. Therefore, this text will serve as an incentive for the development of further studies, with an aim of improving the care provided, as VR could become a potentially viable method for treating acute pain.

This study showed the importance of using nonpharmacological methods, such as VR, as an adjunct treatment of burned pediatric patients and its effects relieving pain during wound care procedures, thus reflecting on a better physical and mental status of the patients during the hospitalization period.

Undoubtedly, other studies, including significant samples and designs that allow comparison of measures, could contribute with solid statistical data regarding the relationship between VR use and reduction of pain in burned patients.

Therefore, based on these two monitored cases, it stands to reason that immediate interventions for relieving the pain of burned patients are crucial for better acceptance of the procedures and care provided to the wounds. Based on these two cases, since it was possible to confirm that the well-being of both patients was improved while they were using the VR, there is a belief that this method can become an important non-drug tool for helping to relieve the pain and its subsequent effects on burned patients.

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