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Mirror Therapy as an Alternative Treatment for Phantom Limb Pain: A Short Literature Review

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LETTER TO EDITORS

Phantom limb pain (PLP), any painful sensation that refers to an absent limb, is frequently found among persons who have experienced the loss of any body part through amputation [1]. It is estimated that more than 80% of patients with total or partial loss of a limb develop PLP [2]. It seems that PLP is more intense in the distal portion of the phantom limbs and can have different qualities such as shooting, burning, throbbing or cramping pain [1]. In patients with an amputation, PLP can be a distressing and enduring experience. Usually spontaneous resolution of phantom limb pain is very slow, taking many months and often years, and in many cases, the pain becomes chronic with a significant impact on the patient's quality of life [3,4]. The prevalence of limb loss in the United States was 1.6 million in 2005, which is projected to increase by more than double to 3.6 million by 2050 [5]. Given that the prevalence of limb loss is estimated to double in the next four decades, and the negative impacts of phantom pain in these patients, the importance of identifying accessible and cost-effective treatments for phantom pain is increasing [6]. The pathophysiology of PLP is still unknown and is not completely understood, therefore provides a challenge to those involved in the management and treatment of this pain [7]. It has been shown that a range of treatments such as pharmacological treatment, neuromodulation, physical treatment, nerve block and surgical treatment has been unsuccessful in treating PLP and any efficacious methods have yet to be proven [1,8].

Mirror therapy, a non-pharmacological and alternative treatment strategy that has been proven successful in managing phantom pain, is a neurorehabilitation technique designed to remodulate cortical mechanisms of pain. With this technique, patients perform movements using the unaffected limb while watching its mirror reflection superimposed over the (unseen) affected limb, thus creating a visual illusion (and therefore positive feedback to the motor cortex) of movement of the affected limb. The visual illusion of movement of the affected limb generates positive feedback to the motor cortex, which might in turn interrupt the pain cycle [9].

A few studies on the effectiveness of mirror therapy as a pain management intervention for patients with PLP exist. In a case study by MacLachlan et al., mirror therapy was used to treat PLP in a patient with a lower limb ampu-

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tation (amputation through the hip due to necrotizing fasciitis) who presented PLP at the time of treatment. The authors showed that during the intervention, there was a significant reduction in the patient's PLP, an increase in the sense of motor control over the phantom limb and a change in the aspects of the phantom limb that was experienced [3]. In addition, Darnall reported a case in which a 35-year-old man with an acquired above-knee amputation of the left lower limb had success with home-based patient-delivered mirror therapy after failing to respond to conventional treatment for PLP; with mirror therapy, his phantom pain resolved, and his nerve pain was well managed [10]. In another pilot study by Darnall et al., 40 patients with unilateral amputations and PLP were studied to evaluate the feasibility and preliminary efficacy of self-delivered home-based mirror therapy for PLP. Patients received an explanation of mirror therapy and were asked to self-treat for 25 minutes daily. Patients completed the home therapy and posted answers to sets of outcomes questionnaires at months 1 and 2 post-treatment. The results of the study showed a significant reduction in average phantom pain intensity at month 1 (n = 31, P = 0.0002) and month 2 (n = 26, P = 0.002). However, patients with higher education levels experienced a greater reduction in pain intensity compared to patients with lower education levels [6].

Hanling et al. described the cases of 4 patients who performed daily mirror therapy for 2 weeks before undergoing elective limb amputation and its effect in preventing PLP. It was shown that one of the patients experienced no PLP. Rare episodes of mild PLP were experienced by two of the patients, without affecting their quality of life or their participation in physical therapy; one patient reported daily, brief episodes of moderate PLP without any effect on his participation in physical therapy or his stated quality of life [8]. In addition, Kim et al. reported the successful reduction of PLP in a 30-year-old male patient with an above-elbow amputation using mirror therapy. In this patient, mirror therapy resulted in dramatic pain relief for chronic phantom limb pain when other treatments such as medications, physical therapies, nerve blocks and nerve transformations did not work [11]. In addition, in a study of patients with PLP who had undergone lower limb amputations, Chan et al. found that all patients in the mirror therapy group (15 minutes daily for 4 weeks) reported a significant decrease in pain intensity [12]. However, in a randomized controlled trial by Brodie et al. on 80 lower limb amputees, mirror therapy only produced a significantly greater number of phantom limb movements compared to the control condition but did not reduce phantom limb pain and sensations any more than that of the control condition [13].

In summary, considering the importance of PLP and its management, as well as the potential effectiveness of mirror therapy as an easy-to-use and low-cost adjuvant therapeutic technique, it seems that this modality can be widely used to treat PLP, although future research including randomized controlled trials to evaluate the efficacy of mirror therapy in PLP is warranted.

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