Chronic postamputation pain is very commonly seen in patients after amputation. It has devastating effects on their quality of life. We report of a patient with postamputation pain who achieved 100% pain relief and near full functional improvement with periosteal acupunctural electrical stimulation (PAES).

Introduction

Postamputation pain (PAP) includes phantom limb pain and residual limb pain, is highly prevalent in amputees and remains an extremely challenging pain condition to treat, and often severely debilitating. PAP is a complex phenomenon to treat because its pathophysiology involves psychological factors, sympathetic mechanisms, supraspinal, spinal, and peripheral mechanisms. Many treatment strategies have been developed; unfortunately, there is paucity of high quality clinical trials to support most of these treatments. Studies have shown periosteal acupunctural electrical stimulation (PAES) has modestly pain reduction for advanced knee osteoarthritis, but there is a lack of documentation investigating the use of PAES for chronic postamputation pain.[1]

Case description

A 65-year-old male veteran presented with chief complaint of left lower extremity residual limb and phantom pain since left below-knee amputation in 1970, progressively getting worse. He had left below-knee amputation during military training, and received flap coverage surgery in 1970. He described that pain is burning, shooting down his perceived “leg” to his “feet”. His residual limb pain was worse than phantom limb pain. The pain is intermitent, only bothers him when he is walking, 9 of 10 on a visual analog scale. He is able to run without pain, currently training for Houston Marathon. Prior to presentation, he has been treated with optimized doses of NSAIDs, strengthening, stretching, rolling exercise, ice or heat therapy, which provided no benefit. Physical examination demonstrated hyperalgia on anterior well-healed surgical scar on the stump. The 4 fine 30-gauge acupuncture needles were inserted into SP 9, GB 33, GB 34 and LR8 to periosteum as negative leads with 60 Hertz for 45 minutes (see Figure 1). The 4 periostial simulation needles were inserted to touch bone, and returned a little bit. Electrical stimulation was delivered using a Pantheon electroacupuncture unit (model ITO(r) ES-130) at 60 Hz. The waveform delivered by this unit is asymmetrical biphasic square wave. The pulse width is 0.1 milliseconds with a stimulus intensity range of 0 to 10 V. Stimulus intensity was adjusted so that it was clearly painful but tolerated. Because participants can become accustomed to the stimulus, the input was adjusted so that the intensity remained clearly painful but tolerated for the entire 45 minutes.

Figure1: A schematic representation of stimulation sites for Periosteal acupuncture electrical stimulation (PAES). Courtesy Carlos Vargas. Medical Acupuncture for physicians. 2004 (8).

Results

After 3 weeks, patient experienced complete resolution of pain with VAS score down to 0 from 9. Patient had significant improvement with quality of life with Q-LES-Q-SF (Quality of life enjoyment and satisfaction questionnaire-short form) up to 84% from 63%. He was able to walk 1-2 miles everyday without pain. He also remained pain free at 9 months follow up visit. There were no adverse events.

Discussion

PAES is a technique that delivers high-frequency electrical stimulation to periosteum using acupuncture needles. It has been hypothesized that PAES exerts its effect primarily by stimulating sympathetic fibers in and around the periosteum, which in turn stimulates a local increase in blood flow to the area that then modifies vascular sympathetic and segmental nerve responses.[3] Electrical stimulation of acupuncture needles is associated with decreased levels of the inflammatory cytokine interleukin 6 and with release of endogenous opioids that may have analgesic effects on peripheral receptors. [4,5]

Another possible explanation of the mechanism is gate control theory as proposed by Melzack and Wall.[6] It may explain how activation of large myelinated nerve fibers by PAES can inhibit transmission of pain signals (and “close the gate”) from the spinal cord to higher centers in the central nervous system to decrease the perception of pain. Some evidence reveals that plenty of nociceptive nerve endings are found in periosteum including C fibers and A delta fibers. Placing the needles into periosteum proximal to stump area can directly stimulate nerve fibers and achieves pain relief by inhibiting activity in central pain pathways, such as the spinalthalamic tract.

Conclusion

Chronic postamputation pain represents a significant therapeutic challenge due to multiple pain phenotypes and pain generators that are often a mixture of nociceptive and neuropathic pain. To our knowledge, this is the first documented case of PAES for chronic postamputation pain. It may be an effective treatment option, especially when refractory to other conservative treatments.

References


5. X.H. Chen, J.S. Han. Analgesia induced by electroacupuncture of different frequencies is mediated by different types of opioid receptors: another cross tolerance study. Behav Brain Res, 47 (1992), 143–149