

Acoustic wave therapy for the treatment of extensive scarring tissue

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Medical history

A 63-year-old female patient from Bahrain came to the clinic in June 2013. She had suffered a severe accident due to scalding with hot water in January 2012. Due to the severity of the burn injuries, which were not only extensive but also deep, the patient was in an induced coma in the intensive care unit for 8 weeks. In addition, an MRSA infection occurred during her time in recovery. After initial recovery, the patient was transferred to a special clinic in the UK, where further surgical procedures were performed. Larger areas had to be covered with mesh graft grafts. She began to improve in September 2012, but her general condition remained limited due to chronic pain with high-dose pain medication, some of which was sedating, and restricted movement due to scar-related contractures.

Findings

In 2013, the patient exhibited impaired general condition and reduced range of motion. A cardinal symptom of the patient was severe itching in the scalded body parts, which sometimes increased to pain. Therefore, medication with analgesics (Pregabalin), antihistamines (Cetirizine), and antidepressants (Zopiclone) was still given. The burn sites covered 40-50% of the predominantly right-sided body surface and were irregular, sometimes severely reddened, and markedly indurated. There was strand formation and contractures over the joints, resulting in restricted movement.

Diagnose

The patient was found to have extensive hypertrophic scar patches over her entire body, which had resulted from second- and third-degree burns. Parts of the necrotized skin were covered with well-healed mesh grafts.



Before the treatment - right elbow and shoulder (June 2013)

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Therapy

A number of options are available for the treatment of hypertrophic scars (HTN) and keloids, including intralesional injections with triamcinolone 10 mg/ 40 mg, surgical procedures, or ablative and nonablative laser treatments. (1,2) The selection of the optimal therapy depends on the shape, acuity, and degree of spread of the scar. Since the patient did not want painful therapy, we decided to use acoustic wave therapy (AWT), which is a little-noted method for scar treatment. During a 17-day stay in Zurich (June 10-27, 2013), the patient was treated 14 times with acoustic wave therapy (AWT) using the Cellactor SC1 and V- Actor (Storz Medical). Due to the amazing subjective and objective improvement in her findings, she came to Zurich again the next year and received eight more treatments with AWT within 13 days (13.08.-26.08.2014). Over bony structures as well as over the entire thorax, only low energies can be used. Six defined areas were treated: shoulder, flank, hip, elbow, upper arm with elbow and knee, each on the right side. The total treatment time was approximately two hours and was completed by the application of a moisturizing lotion without specific ingredients.



During the treatment - right elbow (August 2014)



During the treatment – right shoulder (August 2014)

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Discussion

Hypertrophic scars are one of the most common complications of burn injuries. They result from excessive scarring during prolonged abnormal wound healing and are characterized by hyalinized collagen bundles. Important factors in patients with severe burns include chronic or protracted inflammation and infection due to the severity of the injury. Hypertrophic scar is characterized by hypervascularization and increased number of fibroblasts with excessive collagen production and occur in up to 91% of burn injuries, depending on the depth of the wound. While superficial abrasions, cuts, or lacerations usually heal without scarring, injury to the deep dermis results in scarring. The pathophysiology of HTN formation involves a hyperactive proliferative phase in wound healing. A variety of cells (macrophages, fibroblasts, keratinocytes), cytokines, and growth factors participate in this process.⁽³⁾

The shock waves of AWT loosen the hardened fiber bundles by mechanical energy and lead to biological effects in addition to physical effects. Various biological effects on different types of cells and tissues have been demonstrated.⁽⁴⁾ In addition to stimulation of microcirculation with angiogenesis and a lymphatic drainage effect, stimulation of growth factors and stem cells has been demonstrated, such as endothelial nitric oxide synthase (eNOS), vascular endothelial growth factor (VEGF), and proliferating cell nuclear antigen (PCNA).⁽⁵⁾ These lead to the improvement of blood supply and tendon regeneration. The cells dynamically adapt to the force by modifying their behavior and remodeling their microenvironment.



Deep treatment with the C-ACTOR handpiece / Near-surface treatment with the D-ACTOR handpiece / Muscle treatment with the V-ACTOR handpiece

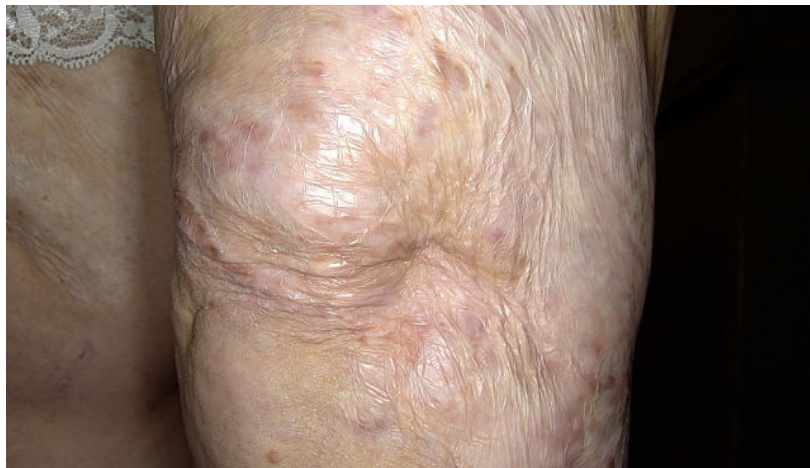
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Conclusion

Clinically, the patient's general condition improved already during the first stay in 2013, although the scars did not look significantly better. The patient stated the scars were softer and she had less discomfort. Pain medications and sedatives were reduced by the second stay. On admission to the second stay, the skin findings showed significant improvement and the patient was much better. By the third stay, the patient was no longer reporting oral medication. Pain and itching, the primary leading symptoms, were no longer cited and the skin condition had improved significantly. In 2018, we were again able to take photographs that showed further improvement.

Objectively, skin elasticity, measured with the cutometer based on the aspiration method (Multiskincenter by Courage & Khasaka), improved. Clinically, the scars became flatter and less noticeable and the mobility of the affected large joints (shoulder, elbow and knee) was improved, making the patient more mobile and able to walk and stand upright again.



On the last consultation - right elbow (October 2018)



On the last consultation - right shoulder (October 2018)

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