A novel device for postburn scar release surgery: Physical therapy

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Introduction
Today and every day, 3 billion people worldwide use open fires to cook meals with susceptibility for fire-related burns. Of all burn injuries that occur worldwide, approximately 50% affect the hands of the victims. As a result, there are millions of patients worldwide who require treatment for hand burn injuries. Proper treatment starts with reconstructive surgery and must be followed by long-term physical rehabilitation in order for patients to achieve full recovery. Of patients who can travel to the city for surgery, only a small fraction receives proper physical therapy due to economic and geographic factors. Thus, these patients are at high risk for developing burn scar contractures or recontractures, immobilizing their hands, and resulting in lifelong disability. Our innovative splint allows for at home physical rehabilitation so that patients can heal at their own pace and prevent contractures without multiple hospital visits.

Methodology
The HandHero splint functions by a static progressive mechanism, in which the patient gradually ratchets his/her hand at his/her own pace until they achieve full recovery [Figure 1]. Static progressive splinting is well-established to be an effective treatment for regaining function of joints affected by burn scar contractures. In high-resource countries, this is typically achieved using custom-built splints requiring expensive supplies and expertise, over multiple follow-up clinic visits. These resources are greatly limited or unavailable in low- and middle-income countries with high prevalence of hand burns. The novelty of the HandHero design is that it provides the patients with the structure to progress in their recovery through the simple dial mechanism of the splint which takes seconds to adjust rather than the hours or days to visit a physiotherapist.

HandHero is an innovative, low-cost medical device that prevents contracture on postsurgery burn patients with hand injuries. It is an orthotic device that is worn by the patient for 6 months to 1 year after surgery and is progressively straightened by the patient at home until the full range of motion is achieved requiring minimal in-person visits with a physical therapist. The HandHero splint works by applying static pressure to the fingers of a contracted hand to gently stretch the tendons and muscles back to a functional state.

Cost
In high-income countries, the cost of one HandHero splint is US $75. In low- and middle-income countries, we work with clients to reach pricing that is both affordable and sustainable.

Health benefit
HandHero makes possible long-term, low-cost, and at-home physical therapy for patients with hand burn scar contractures. The estimated value in terms of lifetime productivity is $10950 per patient who uses HandHero (estimated at $1 per day for 30 years of work).

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Conflicts of interest
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