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Innovative developments in the field of Wound Surgery

By Mark S. Granick, M.D., F.A.C.S.

Chronic wounds have become a worldwide medical epidemic. These disorders cause an alteration of the activities of daily living, a loss of work time, an impediment to interpersonal interactions, as well as considerable morbidity and mortality. The cost of wound treatment is prohibitive. Despite the importance of preventing and caring for wounds, physicians are woefully ill equipped to do so.[1] Wound care is not recognised as a specific medical specialty, but a mix of internal medicine, surgery, podiatry, physiatry, dermatology and other specialties. I am a plastic surgeon with an academic and clinical interest in wound surgery and have been in practice during a time when the importance of wound management has been increasingly recognised.

The modern era of wound surgery began in the 18th century when a French military surgeon recognised that amputating injured limbs prevented infection, sepsis and death from war related wounds.[2] Wound surgery has become more refined since then. With the advent of advanced wound therapies, wound bed preparation became important in order to prepare a wound for a successful outcome following application of an expensive dressing or regenerative material. Wound bed preparation can be achieved in a number of ways, but surgery sets the standard.[3] The goals of wound debridement consist of reducing bacterial burden, controlling biofilm, removing necrotic tissue, and changing the chemical milieu of the wound surface from the dysfunctional chronic to an acute phase of healing.

Traditionally wound surgery was performed by scalpel, scissors, and saw. During the past 20 years, two interesting surgical debridement tools were introduced. The Versajet® (Smith and Nephew, Hull, UK) is a high powered waterjet that removes precise layers of tissue by means of a thin but powerful stream of fluid that essentially shaves off the surface of the wound[4]. Utilising the Venturi effect, the stream of fluid is collected and passively brings surface fluids and debris along with the evacuated fluid stream. The limitation of the device is that it performs poorly in dense tissues, in deep wounds, and it lacks versatility. Nevertheless it was a breakthrough for wound surgery and was demonstrated to be cost effective as well.[5]

Since then, a new generation of direct contact low frequency ultrasound hand pieces were introduced by Misonix, Inc., Farmingdale, NY, USA. These devices, the SonicVac® and SonicOne®, use ultrasound to disrupt and remove surface debris, biofilm, and necrotic tissue from wounds.[6] The ultrasound acts on tissue by the physical processes of bubble cavitation and acoustic microstreaming. These are the result of the 22.5 Kilohertz vibration of the ultrasonic waves. The vibrations cause enlarging gas bubbles to emerge from tissue and subsequently implode, releasing mechanical energy. The microstreaming is a percussion wave resulting from the oscillations which also impart a high degree of mechanical energy. The device has multiple tips all of which perform different functions from bone cutting to pinpoint dissection through dense tissues.

The handles use piezoelectric crystals to convert electrical energy into vibrations, which are then concentrated in the tip of the instrument. A stream of fluid,