Wound Debridement Using VERSAJET
A Novel Hydrosurgery System

Summary
This report describes a case of surgical wound debridement using the VERSAJET Hydrosurgery System in preparation for split-thickness skin grafting.

Case History
A fifty-two-year-old otherwise healthy female suffered a brown recluse spider bite to the dorsum of her left foot and ankle in the summer of 2002. The area became warm, swollen, and necrotic, and she presented to a local hospital where the area was debrided and wet-to-dry dressing changes were started. However, the wound failed to heal and enlarged to a 23 x 7 cm painful ulcer, despite long-term antibiotics. About four weeks after the initial injury, she presented to our hospital with the non-healing ulcer extending across her left foot and ankle (Figure 1).

The extensor tendons and medial portion of the tibialis anterior tendon were exposed. Broad-spectrum antibiotics were started and we debrided the ulcer using the VERSAJET System (Figures 2 and 3).

One week later, after treatment with a Topical negative pressure, a split-thickness skin graft was placed over the ulcer with 100% take and complete wound closure, which continued through now six months of follow-up (Figure 4).

Discussion
High-pressure waterjets have been used widely for industrial applications. Qualities of these fluidjets such as their precision, ability to cut selectively, minimisation of thermal damage to tissues, and ability to create a smooth surface make them ideally suited for use as a surgical debridement tool. We employed a novel fluidjet-based tool for management of a variety of difficult wound problems (see indications below). The new VERSAJET Hydrosurgery System is appropriate for a spectrum of traumatic and non-traumatic wounds. The tip of the VERSAJET directs a hair-thin stream of sterile saline fluid parallel to the wound surface (Figures 5, 6 and 7).

Indications
- Ulcerated wounds
- Venous stasis
- Ischaemic
- Diabetic
- Neuropathic
- Infected joints
- “Roadrash”
- De-epithelialisation/De-fatting of skin
- Other open/infected wounds

These fluidjets cut and remove unwanted tissue without driving microbial contamination deeper into the wound. Used properly, this device also decreases the risk of over-aggressive excision of healthy tissue, which can be common with standard knife debridement. Based on the Venturi effect of fluid dynamics, the fluidjet is accelerated through a constricted opening with a corresponding decrease in pressure, resulting in a suction effect that lifts and removes contaminants from the wound site without requiring an external suction (Diagram 1). This effect reduces spillage, maintains good visibility, and minimises loading of the tissues with fluid. The ability of the VERSAJET Hydrosurgery System to “hold” the targeted tissue via the suction effect is especially useful for tissues that cannot be held readily by forceps (as required for most knife or scissor debridements). Examples of such wounds include fragile granulation tissue, infected tendons, or indurated areas such as irradiated tissues and venous stasis ulcers. Deep cavities and ulcer edges can also be accessed easily, while minimising the amount of healthy tissue resected. Even in the best of hands, meticulous knife debridement often leads to an uneven wound surface and removal of more tissue than necessary. However, with the fluidjet technique described, there is a consistent and reproducible degree of debridement. Because of the precision of the VERSAJET System, even small structures such as the soft tissue overlaying the fingers can be debrided safely and effectively.

An additional observation when comparing the fluidjet system to knife debridement is that there appears to be less bleeding with the VERSAJET System, thus requiring less use of electrocautery to obtain haemostasis. After debridement, we typically apply an epinephrine-soaked gauze pad to the wound. Only if necessary, any remaining bleeding will then be addressed with electrocautery.

This method protects the viability of debrided tissue while minimising the tissue destruction caused by thermolectric haemostasis. Because the transmission of blood-borne pathogens is a concern in the operating room, the VERSAJET System offers an added safety advantage. Although prolonged contact with the fluid stream can cause injury, the tool is a non-sharp instrument that reduces the risk of injury for surgeons and operating room personnel. The suction effect results in minimal spillage and, should injury occur, it is due to a sterile saline jet, rather than a contaminated blade.
Conclusion

The surgical principles of wound management have remained unchanged. However, the tools and level of precision in debriding wounds have improved. This new fluidjet-based device is appropriate for a spectrum of traumatic and non-traumatic wounds and is particularly useful for fragile, hard-to-grasp tissues and in difficult to reach anatomic locations. With the VERSAJET Hydrosurgery System, wounds can be debrided in a safer, more controlled manner with less overall bleeding. In our experience, the improved quality of the surgical debridement often enables us to graft or close the wound following a single debridement.

The VERSAJET Hydrosurgery System is an effective addition to the surgeon’s armamentarium for treating a wide variety of challenging wounds.

Figures 5, 6 and 7. Photographs of the VERSAJET Handpiece and the high-pressure waterjet found in the tip, the functional area for debridement.

Diagram 1. The fluid dynamics involved in making the VERSAJET System an effective debridement tool.