Wound Debridement: A Comparison of Two Techniques for Particle Clearance

Introduction

Retained foreign particles in wounds may potentiate wound infections. High pressure pulsatile lavage (HPPL) is used in most centres as an aid to wound debridement. Questions about the efficacy and the potential role of pulsatile lavage in cell injury have arisen. In this study, we utilised a vacuum jet technique (VJT) (developmental version of VERSAJET Hydrosurgery System) in which a high pressure fluid flow is directed parallel to the wound surface. The high pressure, parallel flow creates a vacuum by the Bernoulli effect, lifting loose particles and tissue into the fluid stream for removal (Figure 1). The VJT was compared to HPPL for efficiency in removing particles from deliberately contaminated wounds.

Methods

12 cm by 12 cm wounds, increasing in depth from 1 cm (superior) to 3 cm (inferior) were created in paired fresh cadaveric human thighs (3). Two grams of fine metallic particles (-20 mesh; Grade A-172; lot #0468009) and two grams of larger particles (1-3 mm diameter; Grade M-932; Lot #04810005) (both from OMG Americas, Research Triangle Park, NC) were evenly disbursed over each wound. The particles were pressed into the tissue by application of a 15 kg weight for 30 seconds.

The VJT was used to debride the wound on the right leg and HPPL was used to debride the wound on the left leg. Wounds were debrided for 3 minute intervals for a total of 15 minutes. Radiographs were taken prior to the start of debridements, and were also taken at the end of each interval. The radiographs were digitised and blinded, and the number of metallic particles present in each wound were counted by 3 observers. The means (± standard deviation) were calculated and compared for statistical significance using Sigmastat with p<0.01.

Results

Both wounds had similar number of particles prior to the start of debridement (Figures 3 and 4). At 3 minutes, VJT had removed 45% (± 3%) of particles compared to HPPL which removed 7% (± 5%) of particles (Figures 5 and 6). At 9 minutes, the VJT had removed 73% (± 4%), while the HPPL had removed 18% (± 8%) (Figures 7 and 8). At 15 minutes, VJT had removed 88% (± 1%) of particles, while HPPL had removed 22% (± 6%) of particles (Figures 9 and 10). The vacuum jet technique was significantly more effective at removing particles than HPPL at all time points (Figure 2).
Conclusion

Removal of metallic particle wound contaminants in a paired fresh human cadaveric model is more thoroughly and quickly accomplished with the vacuum jet technique than with high pressure pulsatile lavage. Faster, more effective removal of particles from contaminated wounds should decrease the potential for infections associated with foreign particles.