Collection of clinical evidence

VERSAJET◊ Hydrosurgery System*

✚ Evidence in focus

Developed by Evidence Communications, Global Clinical & Medical Affairs

Smith+Nephew

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*This compendium includes evidence for the VERSAJET Hydrosurgery System and VERSAJET II Hydrosurgery System

VERSAJET◊ System indication

The VERSAJET System is intended for wound debridement (acute and chronic wounds, and burns), soft tissue debridement and cleansing of the surgical site in applications that, in the physician's judgment, require sharp debridement.

The VERSAJET System enables a surgeon to hold, cut and remove damaged tissue and contaminants while simultaneously irrigating a wound using a high velocity stream of sterile saline.[1,2] Irrigation fluid from the wound is evacuated into a container, minimising saturation of the debridement area and reducing the risk of splashing and aerosolisation.[1,2]

1. Granick MS, Posnett J, Jacoby M, Noruthun S, Ganchi PA, Datiashvili RO. Efficacy and cost-effectiveness of a high-powered parallel waterjet for wound debridement. *Wound Repair Regen.* 2006;14(4):394–397. **2.** Mosti G, Iabichella ML, Picerni P, Magliaro A, Mattaliano V. The debridement of hard to heal leg ulcers by means of a new device based on Fluidjet technology. *Int Wound J.* 2005;2(4):307–314.

Introduction

87

The VERSAJET◊ System has a strong evidence base.

As of March 2021, **87 clinical publications** regarding the VERSAJET and VERSAJET II Systems have been identified. This evidence collection contains a summary of the most relevant publications, including those that present data on the key outcomes for the product and present the highest level of evidence (levels 1–3). It does not include all publications due to the volume of studies.

Levels of evidence

4

High-quality RCTs, systematic review of level I studies

10

Lesser quality RCTs, prospective comparative studies, systematic review of level II studies

10

Retrospective comparative studies, systematic review of level III studies

31

Case series

32

Expert opinion, case studies or bench research (including 4 in vitro and 8 preclinical studies)

VERSAJET◊ System evidence collection guide

Key for icons

Key outcomes for the VERSAJET System

- Controlled tissue removal
- Impact on bacterial load
- Wound bed preparation
- Impact on bleeding
- Impact on pain
- Efficient resource use

Link to Evidence in focus summary

Link to open access reference

Evidence pyramid

Level 1 Level 2 Level 3 Level 4 Level 5

Abbreviations

cfu	Colony forming unit
ns	Non-significant
OR	Odds ratio
RCT	Randomised controlled trial
SD	Standard deviation
TBSA	Total body surface area
VAS	Visual analogue scale

Key studies

Click on the arrow by the study name to see the study overview

EVIDENCE LEVEL		Controlled tissue removal	Impact on bacterial load	Wound bed preparation	Impact on bleeding	Impact on pain	Efficient resource use
	**Bekara F, et al.** *Arch Plast Surg.* 2018						✓
	Edmonson SJ, et al. *Burns.* 2018	✓	✓	✓			✓
	Kakagia DD, et al. *J Burn Care Res.* 2018	✓		✓			✓
	Shimada K, et al. *Int Wound J.* 2021		✓	✓	✓	✓	✓
	**Caputo WJ, et al.** *Int Wound J.* 2008						✓
	Granick MS, et al. *Ostomy Wound Manage.* 2007		✓				
	Gravante G, et al. *J Burn Care Res.* 2007	✓		✓	✓		✓
	Hyland EJ, et al. *Burns.* 2015	✓					
	Liu J, et al. *Int Wound J.* 2015		✓		✓		✓
	Oosthuizen B, et al. *Int J Burn Trauma.* 2014			✓			✓
	**Fraccalvieri M, et al.** *Int Wound J.* 2011		✓				
	Granick MS, et al. *Wound Repair Regen.* 2006						✓
	James CV, et al. *Wounds.* 2021		✓				
	Legemate CM, et al. *Burns.* 2019		✓	✓	✓		✓
	Mosti G, et al. *Int Wound J.* 2005		✓	✓		✓	✓
	Mosti G, Mattaliano V. *Wounds.* 2006		✓	✓		✓	✓
	Schwartz JA, et al. *J Wound Care.* 2014	✓	✓	✓			

Click here to see additional studies

Bekara F, et al.

New techniques for wound management: A systematic review of their role in the management of chronic wounds

Bekara F, Vitse J, Fluieraru S, et al. *Arch Plast Surg.* 2018;45:102–110.

Overview

- A systematic literature review comparing VERSAJET◊ System debridement, ultrasound therapy and plasma-mediated bipolar radio-frequency ablation therapy (COBLATION◊ Technology) for the management of chronic wounds
- 389 references were identified from MEDLINE, PubMed and Embase published up to January 2016
- A total of 14 studies were selected for inclusion:
  - 7 studies with VERSAJET System (255 patients)
  - 6 studies with ultrasound (296 patients)
  - 2 studies with COBLATION Technology (31 patients)

Results

- Majority of wounds required one procedure with the VERSAJET System (Figure) and with COBLATION Technology; for ultrasound the number of procedures was highly variable ranging from 1–10

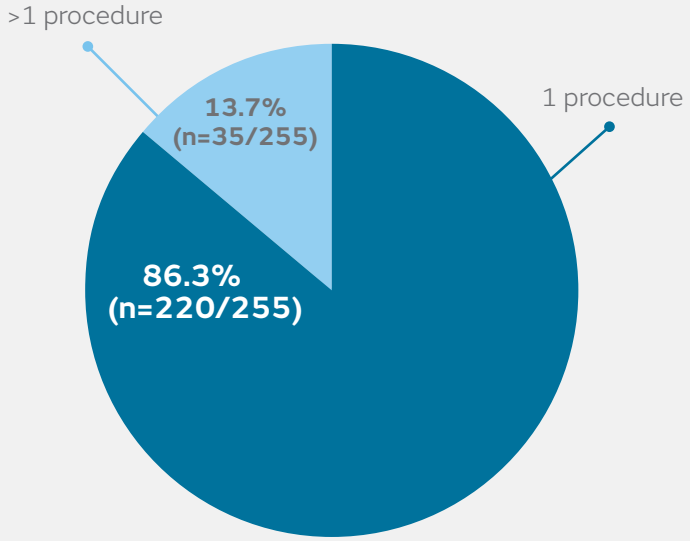

Figure. Number of procedures required when using the VERSAJET System for debridement of chronic wounds

Conclusions

The majority of patients treated with the VERSAJET System and COBLATION Technology only required one procedure compared with a variable range for ultrasound.

Edmonson SJ, et al.

Time to start putting down the knife: A systematic review of burns excision tools of randomised and non-randomised trials

Edmonson SJ, Ali Jumabhoy I, Murray A. *Burns.* 2018;44(7):1721–1737.

Overview

- A systematic literature review comparing the VERSAJET◊ System or NexoBrid™ with conventional debridement for the treatment of acute burns
- 7,148 articles were identified from CENTRAL, PubMed, CINAHL, Embase and clinical trial registries published up to July 2017
- A total of 18 studies were selected for inclusion:
  - 9 studies with the VERSAJET System
  - 9 studies with NexoBrid™

Results

- The VERSAJET System enabled precise excision of burnt skin, maximising dermal preservation (two studies)
- The VERSAJET System was useful to access difficult areas, reducing chance of damage to fragile structures (one study)
- Bacterial load was reduced following debridement with the VERSAJET System compared with baseline (two studies)
- Compared with conventional debridement, use of the VERSAJET System:
  - Reduced the loss of viable dermis
  - Decreased the number of debridement procedures
  - Was potentially cost effective

Conclusions

Use of the VERSAJET System offers comparable outcomes to conventional debridement with benefits of increased dermal preservation, decreased number of debridement procedures and the potential to be cost effective.

Kakagia DD, et al.

The efficacy of Versajet™ hydrosurgery system in burn surgery. A systematic review

Kakagia DD, Karadimas EJ. *J Burn Care Res.* 2018;39(2):188–200.

Overview

- A systematic literature review to evaluate the efficacy, safety and cost-effectiveness of the VERSAJET◊ System for the treatment of adult and paediatric burns published between 2005 and October 2016
  - Of 78 studies extracted from MEDLINE and Scopus databases, a total of 20 manuscripts were identified for inclusion

Results

- The VERSAJET System was faster in contoured anatomic regions, and more selective and precise than conventional escharotomy
- Similar quantitative superficial bacterial load reduction was observed compared with pulse lavage
- No significant difference in adequacy of debridement, operative time, quality of healing and infection rates compared with conventional escharotomy
- Possible reduction in hospital stay, nursing time, dressing changes and need for reoperations may counterbalance the cost of the VERSAJET System

Conclusions

The VERSAJET System is safe and efficacious for burn debridement, particularly for contoured regions. In addition, reduced resource use may counterbalance the cost of the VERSAJET System.

Shimada K, et al.

Efficacy of Versajet hydrosurgery system in chronic wounds: A systematic review

Shimada K, Ojima Y, Ida Y, Matsumura H. *Int Wound J.* 2021;[Epub ahead of print].

Overview

- Independent, systematic literature review comparing the VERSAJET◊ System and VERSAJET◊ II Hydrosurgery System with conventional debridement in adults and children with chronic wounds, skin ulcers and non-acute wounds
  - Of 497 studies extracted, a total of 7 studies (645 patients) published between 1 January 2000 to 10 August 2020 met the criteria for inclusion

Results

- Compared with conventional debridement, use of the VERSAJET System resulted in:
  - Significantly shorter procedure time (two of three studies; mean difference, -8.87min; p<0.00001; Figure)
  - Similar time to wound closure (two studies) and reduction in bacterial load (one study)
  - Less saline use and blood loss (one study each)
  - Potential cost savings (two of three studies)
- In >70% of cases, one session of use with the VERSAJET System achieved adequate debridement to prepare the wound bed for closure or secondary healing (five studies)
- Pain with use of the VERSAJET System was mild to moderate and tolerable to patients (two studies)

mean difference
in debridement procedure time
between the VERSAJET System
and conventional debridement

Figure. Mean difference in procedure time using the VERSAJET System versus conventional debridement (two studies)

Conclusions

Use of the VERSAJET System significantly reduced mean debridement procedure time compared with conventional debridement in a pooled analysis of two prospective RCTs; adequate wound bed preparation was achieved in a single session for most cases.

Caputo WJ, et al.

A prospective randomised controlled clinical trial comparing hydrosurgery debridement with conventional surgical debridement in lower extremity ulcers

Caputo WJ, Beggs DJ, DeFede JL, Simm L, Dharma H. *Int Wound J.* 2008;5:288–294.

Overview

- A prospective, randomised, single-centre study to compare the effect of the VERSAJET◊ System with conventional sharp debridement plus pulse lavage in patients with lower extremity ulcers
  - VERSAJET System debridement (n=22)
  - Conventional sharp debridement (n=19)
- Wounds were monitored for 12 weeks

Results

- 39% significant relative reduction in mean time to debride wounds with the VERSAJET System versus conventional debridement (p=0.008; Figure)
- Compared with conventional debridement, procedures with the VERSAJET System required trays containing fewer instruments (100 vs 13) and no additional Interpulse device
- Significant reduction in saline use with VERSAJET System compared with conventional debridement (431.6 vs 3,000ml; p<0.001)
- No significant difference in median time to wound closure with the VERSAJET System versus conventional debridement (71 vs 74 days; p=ns)

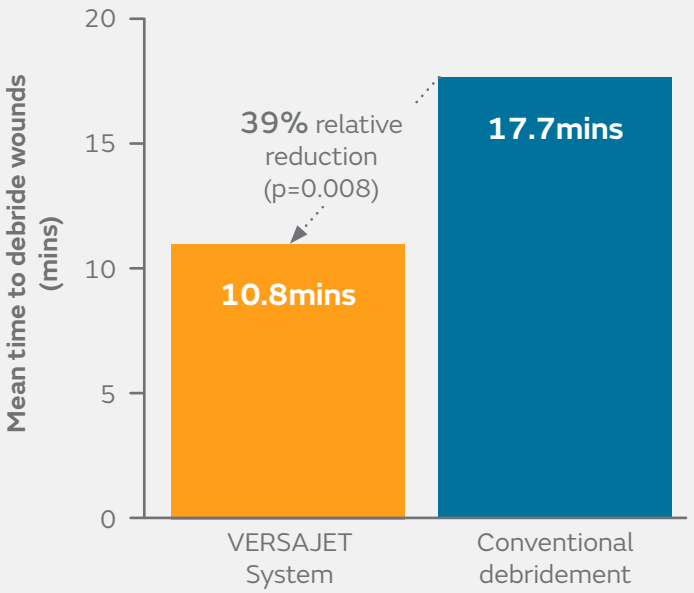

Figure. Mean time to debride wounds (mins) with the VERSAJET System and conventional debridement

Conclusions

Debridement with the VERSAJET System was quicker than with conventional debridement, requiring trays containing fewer instruments and less saline for the treatment of lower extremity ulcers.

Granick MS, et al.

Comparison of wound irrigation and tangential hydrodissection in bacterial clearance of contaminated wounds: results of a randomized, controlled clinical study

Granick MS, Tenenhaus M, Knox KR, Ulm JP. *Ostomy Wound Manage.* 2007;53(4):64–66.

Overview

- RCT conducted at two centres in patients with acute, open, surgical and traumatic wounds, to compare debridement with the VERSAJET◊ System and pulse lavage
  - VERSAJET System, n=12
  - Pulse lavage, n=9
- Tissue samples were taken centrally from the same location in the wound immediately before and after treatment

Results

- Bacterial counts decreased in wounds debrided by the VERSAJET System and pulse lavage (p=ns; Figure)
- In both groups the absolute bacterial counts decreased by an average of one to two orders of magnitude

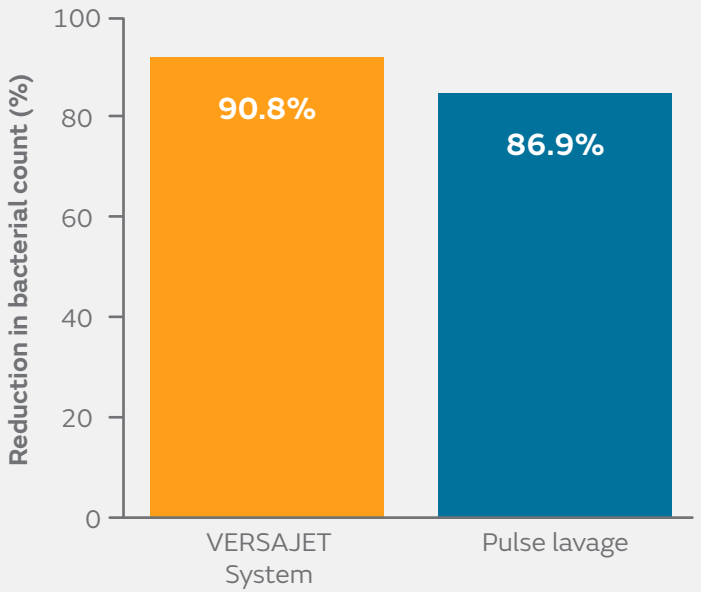

Figure. Reduction in percentage bacterial count following treatment with the VERSAJET system and pulse lavage

Conclusions

Use of both pulse lavage and the VERSAJET System reduced bacterial counts in acute, open, surgical and traumatic wounds.

Gravante G, et al.

Versajet hydrosurgery versus classic escharectomy for burn débridment: a prospective randomized trial

Gravante G, Delogu D, Esposito G, Montone A. *J Burn Care Res.* 2007;28:720–724.

Overview

- Prospective, randomised trial at a single burn centre, comparing the VERSAJET◊ System with hand-held dermatome escharectomy for thermal burn debridement
  - VERSAJET System, n=42
  - Dermatome escharectomy, n=45
- After debridement, patients underwent immediate skin grafting where possible

Results

- Adequate wound bed debridement achieved with both techniques
- Similar overall operative times with the VERSAJET System and dermatome escharotomy
  - VERSAJET System was significantly faster for body areas that are difficult to debride, such as hands, face and genitals (13 vs 24mins; p=0.02; Figure)
  - Dermatome escharotomy was significantly faster for large surface areas, such as trunk, arms and legs (21 vs 14mins; p=0.01)
- No significant difference in wound closure time and contracture incidence between the two groups
- Where minor wound bed bleeding occurred with the VERSAJET System, it resolved spontaneously or after electrocautery

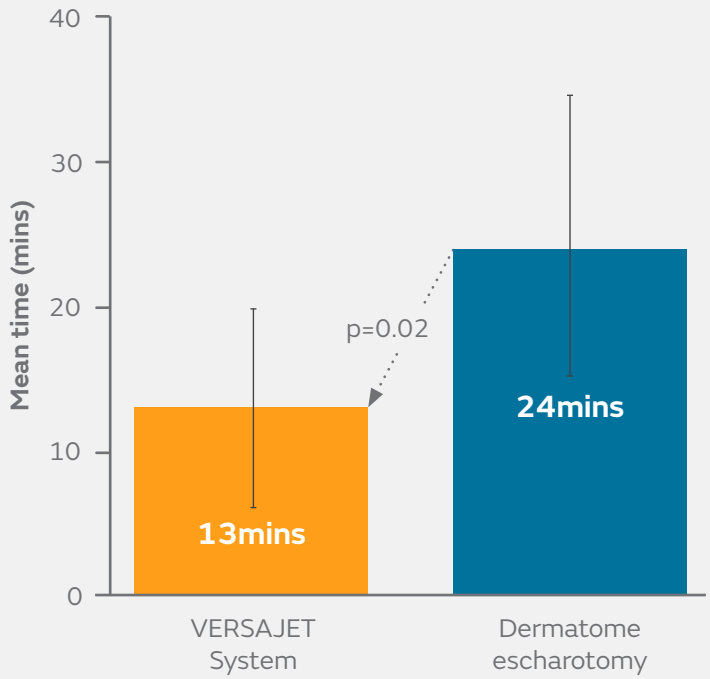

Figure. Mean time to debride 10% TBSA (±SD) of hands, face and genitals with the VERSAJET System and dermatome escharotomy

Conclusions

The VERSAJET System reduced procedure time for areas that are difficult to debride (eg, hands, face and genitals) versus dermatome escharotomy. The authors noted that the VERSAJET System was simple to use and precise at reaching and maintaining the correct dermal plane.

Hyland EJ, et al.

Prospective, randomised controlled trial comparing Versajet™ hydrosurgery and conventional debridement of partial thickness paediatric burns

Hyland EJ, D'Cruz R, Menon S, et al. *Burns.* 2015;41(4):700–707.

Overview

- A single-centre, prospective RCT comparing the VERSAJET◊ System to conventional debridement for the treatment of partial thickness burns
  - VERSAJET System, n=30 (mean age, 2.2 years)
  - Conventional debridement, n=31 (mean age, 2.9 years)
- All patients were ≤16 years of age

Results

- Median amount of viable dermis lost during debridement was significantly reduced with the VERSAJET System compared with conventional debridement (p=0.02; Figure)
- With the VERSAJET System versus conventional debridement there was no significant difference in:
  - Median duration of surgery (40 vs 35mins; p=ns)
  - Mean graft take at Day 10 (92 vs 94%; p=ns)
  - Time to healing following grafting (13 vs 13; p=ns)
  - Post-operative wound infection 30 vs 23%; p=ns)
  - Scarring at 3 and 6 months (p=ns)

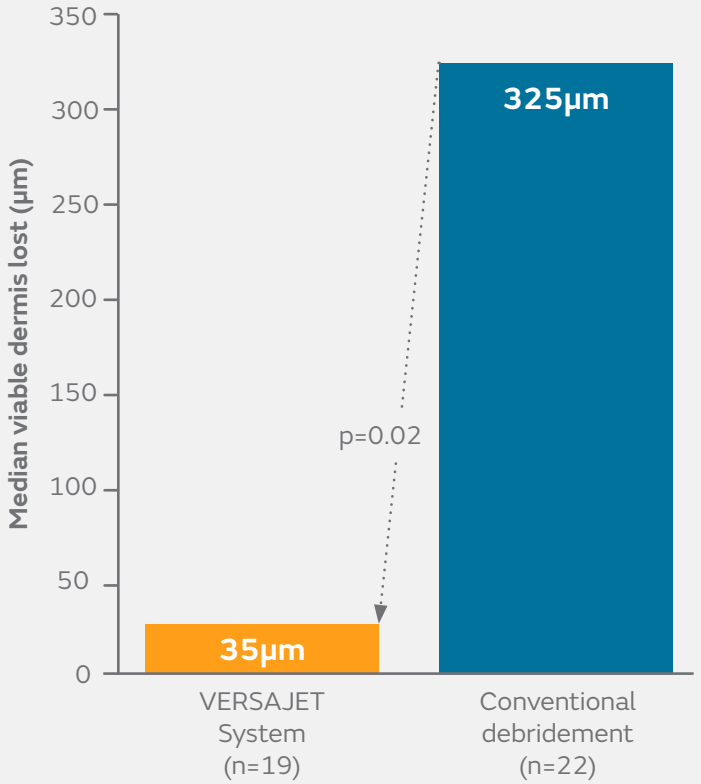

Figure. Median amount of viable dermis lost with conventional and VERSAJET System debridement

Conclusions

Use of the VERSJAET System is a precise method for burn wound debridement, significantly reducing the loss of viable dermis compared with conventional debridement.

Liu J, et al.

Comparing the hydrosurgery system to conventional debridement techniques for the treatment of delayed healing wounds: a prospective, randomised clinical trial to investigate clinical efficacy and cost-effectiveness

Liu J, Ko JH, Secretov E, et al. *Int Wound J.* 2015;12(4):456–461.

Overview

- Single-centre, prospective RCT comparing the efficacy and cost-effectiveness of the VERSAJET◊ System with conventional surgical debridement
  - VERSAJET System, n=21
  - Conventional debridement, n=19
- Patients had delayed healing traumatic wounds or chronic cutaneous defects of ≥30 days duration or a delayed healing dehisced incision that required excision and closure

Results

- Mean total excision time was more than twice as fast with the VERSAJET System than with conventional debridement (14.2 vs 33.9mins; p=0.033)
- Maximum blood loss for overall excision procedures was significantly lower with the VERSAJET System compared with conventional debridement (p=0.003; Figure)
  - Less blood loss was also observed with the VERSAJET System during the first excision procedure
- Median $\log_{10}$ total bacterial count was reduced from baseline by 20% following treatment with VERSAJET System debridement (4.0 vs 3.2cfu/g; p=ns) and 17.5% with conventional debridement (4.0 vs 3.3cfu/g; p=ns)
- No significant difference was identified between the groups in, achievement of, and time and cost to achieve stable wound closure (p=ns)

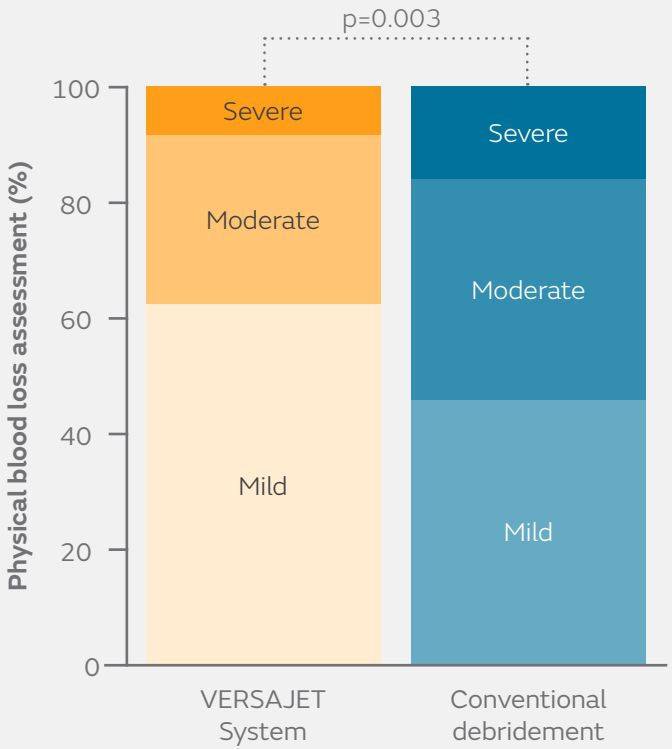

Figure. Percentage of mild, moderate and severe blood loss with the VERSAJET System and conventional debridement

Conclusions

Use of the VERSAJET System enabled significantly faster debridement and reduced blood loss compared with conventional debridement for the treatment of delayed healing and chronic wounds.

Oosthuizen B, et al.

Comparison of standard surgical debridement versus the VERSAJET Plus™ Hydrosurgery system in the treatment of open tibia fractures: a prospective open label randomized controlled trial

Oosthuizen B, Mole T, Martin R, Myburgh JG. *Int J Burn Trauma.* 2014;4(2):53–58.

Overview

- Prospective RCT comparing the VERSAJET◊ System with standard surgical debridement for open tibia fractures
  - VERSAJET System, n=16
  - Standard surgical debridement, n=24

Results

- Significantly fewer debridement procedures required prior to wound closure with the VERSAJET System compared with standard surgical debridement (p<0.001; Figure)
- Non-significant reduction in median days to closure with the VERSAJET System versus standard surgical debridement (3 vs 5 days; p=ns)
- No significant difference in the number of operating room procedures required for wound closure (p=ns)

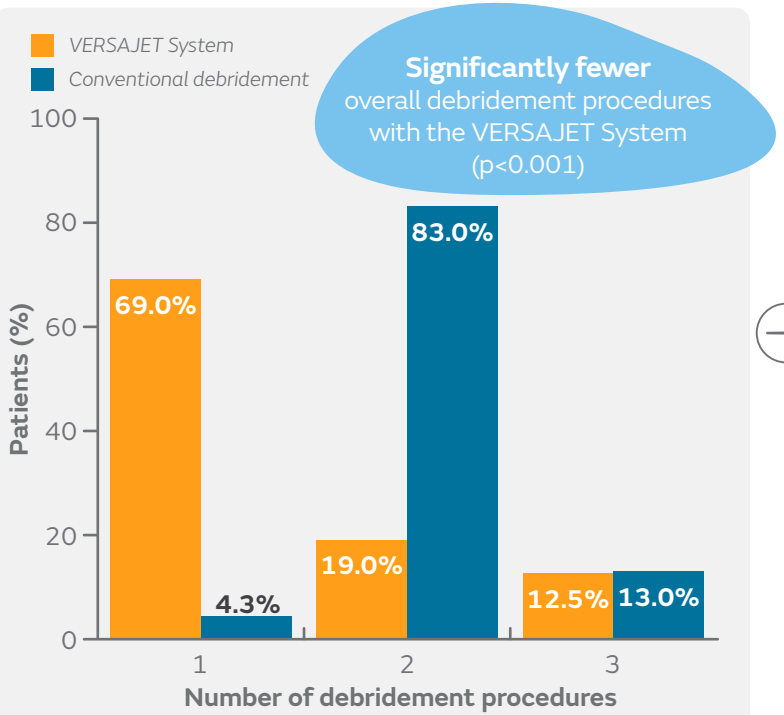

Figure. Percentage of patients requiring 1, 2 and 3 debridement procedures prior to wound closure with the VERSAJET System and standard surgical debridement. One patient in the conventional debridement group withdrew from the study before wound closure

Conclusions

With the VERSAJET System, significantly fewer debridement procedures were required prior to wound closure compared with standard surgical debridement for patients with open tibia fractures.

Fraccalvieri M, et al.

Surgical debridement with VERSAJET: an analysis of bacteria load of the wound bed pre- and post-treatment and skin graft taken. A preliminary pilot study

Fraccalvieri M, Serra R, Ruka E, et al. *Int Wound J.* 2011;8(2):155–161.

Overview

- Single-centre, prospective cohort study of patients with skin injuries undergoing debridement with the VERSAJET◊ System before skin or Integra graft (n=27)
- 100 bacteriological swabs were taken, 50 prior to and 50 following debridement with the VERSAJET System
- Correlation between bacterial load and positive or negative result of graft take or integration was investigated

Results

- The most common bacteria in the pre-treatment swabs were: *Staphylococcus aureus* (21 swabs), *Pseudomonas aeruginosa* (15 swabs), *Proteus mirabilis* (8 swabs) and Gram positive polymicrobial flora (GPPF; 6 swabs); 8 swabs did not contain bacteria
- The most common bacteria in the post-treatment swabs were: *S. aureus* (17 swabs), *P. aeruginosa* (7 swabs) and *P. mirabilis* (8 swabs) and GPPF (8 swabs); 12 swabs did not contain bacteria
- 50% of analysed bacterial swabs showed a reduction in bacterial load of the wound, 17% showed an increased bacterial load and 33% showed no change following debridement with the VERSAJET System
- Following treatment with the VERSAJET System, results of skin graft take were as follows:
  - With increased bacterial load: 3 positive, 1 negative
  - With bacterial load unchanged: 5 positive, 3 negative
  - With decreased bacterial load: 5 positive, 7 negative

Conclusions

Use of the VERSAJET System helped to reduce bacterial load compared with baseline in half of the wounds assessed. The authors noted that reducing bacterial load is not the only variable involved in successful healing of the skin graft.

Granick MS, et al.

Efficacy and cost-effectiveness of a high-powered parallel waterjet for wound debridement

Granick MS, Posnett J, Jacoby M, et al. *Wound Repair Regen.* 2006;394–397.

Overview

- Retrospective, single-centre study to compare the efficacy and cost-effectiveness of the VERSAJET◊ System with conventional surgical debridement for acute and chronic wounds
  - VERSAJET System debridement, (n=40; 45 wounds)
  - Conventional surgical debridement (n=22; 22 wounds)
- Median wound area was significantly larger in the surgical debridement group compared with the VERSAJET System group (213 vs 88cm^2; p=0.016)

Results

- Significantly fewer mean debridement procedures with the VERSAJET System compared with surgical debridement (p=0.0002; Figure)
  - The result was not affected by patient age or wound area
- Similar debridement times with the VERSAJET System and surgical debridement (p=ns)
  - Pooled mean time for any debridement procedure was 65mins per procedure
- Estimated net cost savings per patient were $1,900 with the VERSAJET System compared with surgical debridement (based on 2002/3 cost-to-charge ratios)

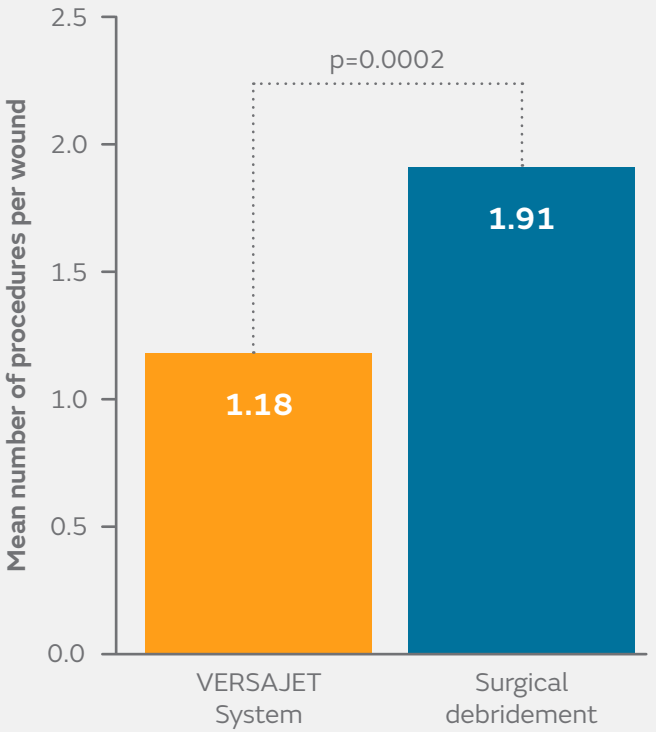

Figure. Mean number of debridement procedures with the VERSAJET System and surgical debridement

Conclusions

Use of the VERSAJET System resulted in fewer debridement procedures per wound compared with surgical debridement and estimated potential cost savings.

James CV, et al.

Hydrosurgical debridement use associated with decreased surgical site-related readmissions: A retrospective analysis

James CV, Patel M, Ilonzo N, et al. *Wounds.* 2021;[Epub ahead of print].

Overview

- Independent, retrospective, single-centre review of patients who underwent debridement of lower extremity wounds
- Chart review was undertaken for 289 patients; 190 had undergone one of three mechanical debridement methods in the operating theatre:
  - VERSAJET◊ II System (n=41)
  - Sharp debridement (with scalpel/scissors; n=132)
  - Sharp debridement and pulse irrigation (n=17)

Results

- Of the 190 patients who underwent debridement, 40 (21%) had an unplanned readmission due to a wound-related complication within 30 days of discharge
- Use of the VERSAJET II System had a significant beneficial effect on unplanned readmissions due to SSIs compared with sharp debridement, with or without pulse irrigation (p=0.0033; Figure)
- Use of the VERSAJET II System helped to reduce the odds of unplanned readmission due to SSIs by 69% (OR: 0.31; 95% confidence intervals, 0.142–0.677)

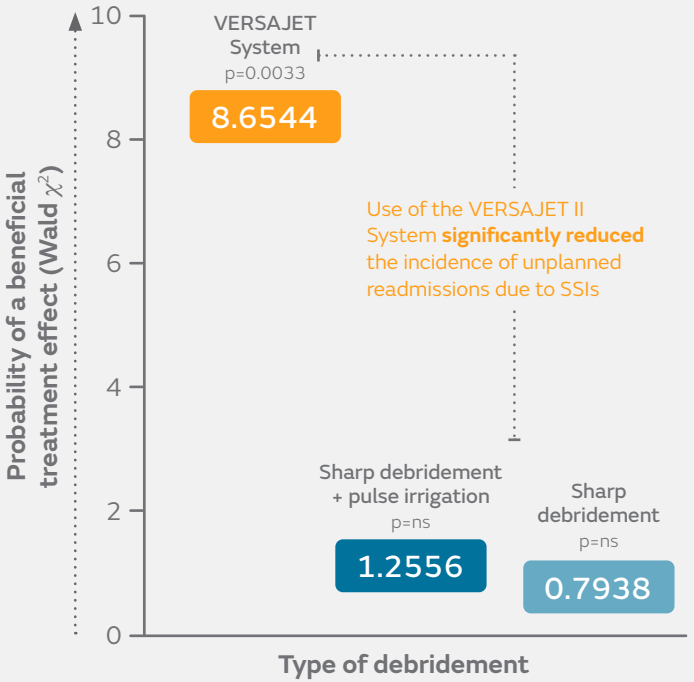

Figure. Probability (χ^2, Wald test) that each type of debridement affected incidence of readmissions due to SSIs

Conclusions

Use of the VERSAJET II System to debride lower extremity wounds helped to significantly reduce the odds of readmission for SSIs compared with sharp debridement. The authors suggest this may be due to superior debridement of wounds with irregular contours and that fewer readmissions may potentially help to reduce wound care costs.

Legemate CM, et al.

Application of hydrosurgery for burn wound debridement: An 8-year cohort analysis

Legemate CM, Goei H, Gostelie OFE, et al. *Burns*. 2019;45(1):88–96.

Overview

- Retrospective cohort study of patients admitted to three burns centres, data were collected using the Dutch Burn Repository R3
- Patients (59.5% males; median age, 41 years) with burns of median 5% TBSA received debridement using:
  - VERSAJET◊ System alone, n=506
  - Standard debridement alone, n=1,008
  - Both, n=599

Results

- Younger age, scalds, larger TBSA burned and head/neck and arm burns were significant independent predictors of VERSAJET System use
  - For burns of one region, the VERSAJET System alone was most commonly used for debridement of the neck, scalp and genitals
- Median TBSA excised was greater in both groups where the VERSAJET System was used versus standard debridement alone (Figure)
- Compared with standard debridement alone, patients treated with the VERSAJET System alone:
  - Received dermal substitutes significantly less frequently (1.5 vs 0.2%; p=0.021)
  - Had a significantly smaller mean volume of blood transfusion (156.0 vs 57.2ml; p=0.036)
  - Underwent significantly fewer surgical procedures (mean 1.4 vs 1.2; p=0.019)
  - Had significantly fewer wound infections (3.8 vs 1.6%; p=0.019)

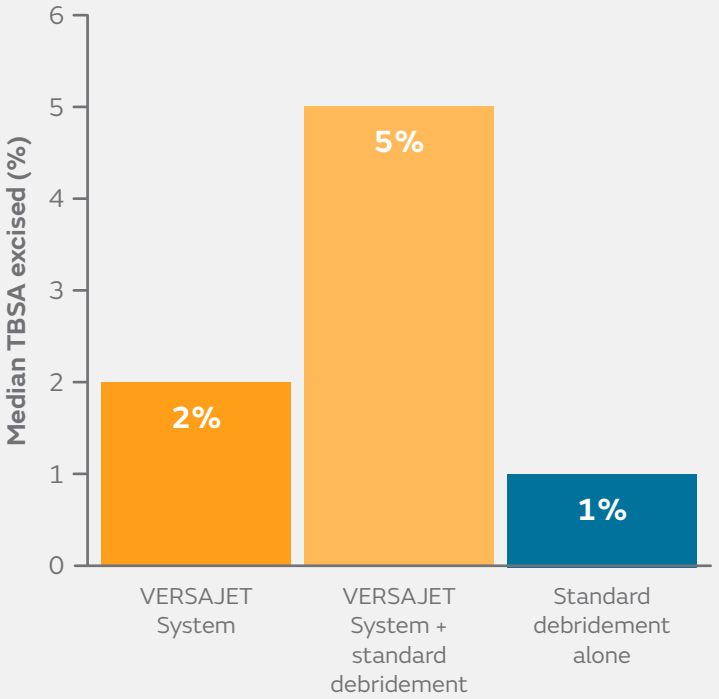

Figure. Median TBSA excised (%) with the VERSAJET System alone, the VERSAJET System plus standard debridement and standard debridement alone. p<0.001 for the VERSAJET System versus SD alone. Missing data, n=188

Conclusions

The VERSAJET System is a useful tool for burn wound debridement prior to skin grafting and is often used in combination with standard debridement. Predictors for VERSAJET System use are young age, scalds, high TBSA burned and burn sites with irregular (convex) contours.

Mosti G, et al.

The debridement of hard to heal leg ulcers by means of a new device based on Fluidjet technology

Mosti G, Labichella ML, Picerni P, et al. *Int Wound J.* 2005;2(4):307–314.

Overview

- Single-centre, observational study to compare the effect of the VERSAJET◊ System with traditional debridement (moist dressings) in patients with hard to heal vascular leg ulcers
  - VERSAJET System debridement, (n=68; 118 ulcers)
  - Moist dressings (n=99; 159 ulcers)
- Almost all procedures were performed on the ward at the patient's bedside

Results

- Adequate wound debridement, suitable for skin graft, was achieved in a single procedure using the VERSAJET System in 46 patients (68%)
- Use of the VERSAJET System substantially reduced the wound bacterial burden from 10^6 to 10^3 in 43% of patients (n=9/21)
- Reduced mean time to complete ulcer debridement by 4.7 days with the VERSAJET System versus moist dressings (Figure)
  - Consequently, hospital length of stay was also reduced
- Pain during VERSAJET System procedures was acceptable to the majority of patients after adjustment of the power level

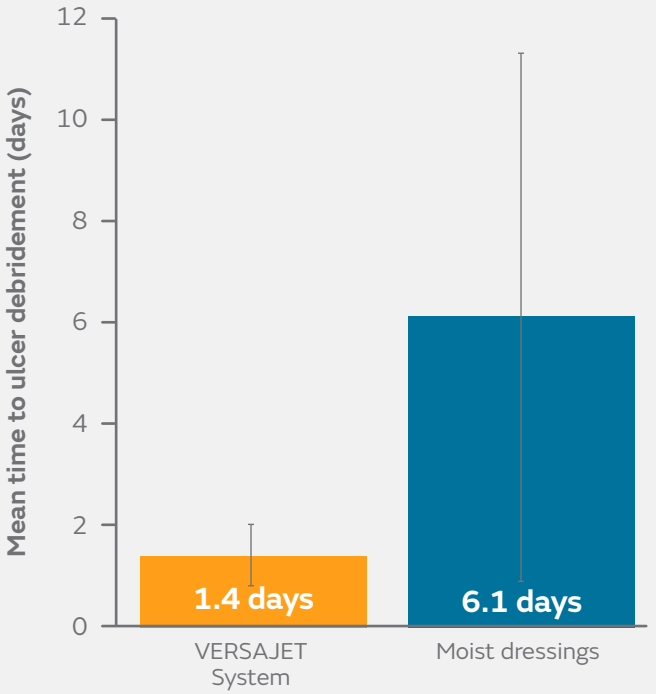

Figure. Mean time to complete ulcer debridement (±SD) using the VERSAJET System and moist dressings

Conclusions

Use of the VERSAJET System typically achieved complete ulcer debridement in a single procedure and reduced length of hospital stay compared with moist dressings.

Mosti G, et al.

The debridement of chronic leg ulcers by means of a new, fluidjet-based device

Mosti G, Mattaliano V. *Wounds.* 2006;18(8):227–237.

Overview

- Single-centre study to compare debridement using the VERSAJET◊ System with the use of moist dressings for chronic vascular leg ulcers
  - VERSAJET System, n=142 (245 ulcers)
  - Moist dressings, n=327 (532 ulcers)
- Mean ulcer area and duration were 192cm^2 and 55 months, respectively, for wounds treated with the VERSAJET System compared with 140cm^2 and 36 months for those treated with moist dressings
- Most procedures were performed on the ward according to the patient and ulcer conditions

Results

- One VERSAJET System procedure was sufficient for debridement of the wound bed in 76.1% of patients
- Mean time to complete ulcer debridement was shorter with the VERSAJET System than with moist dressings (Figure)
  - Hospitalisation time was reduced accordingly
- Bacterial burden was reduced from 10^6 to 10^3 cfu/cm^2 in 53 VERSAJET System patients who had clinical signs of infection
- Mean VAS pain score was 4.3±1.9 with the VERSAJET System in the 123 patients who did not receive general anaesthesia and 5.3 with moist dressings (no patients received general or local anaesthetic)
- Patient satisfaction score was 2.8 out of 3 in each group

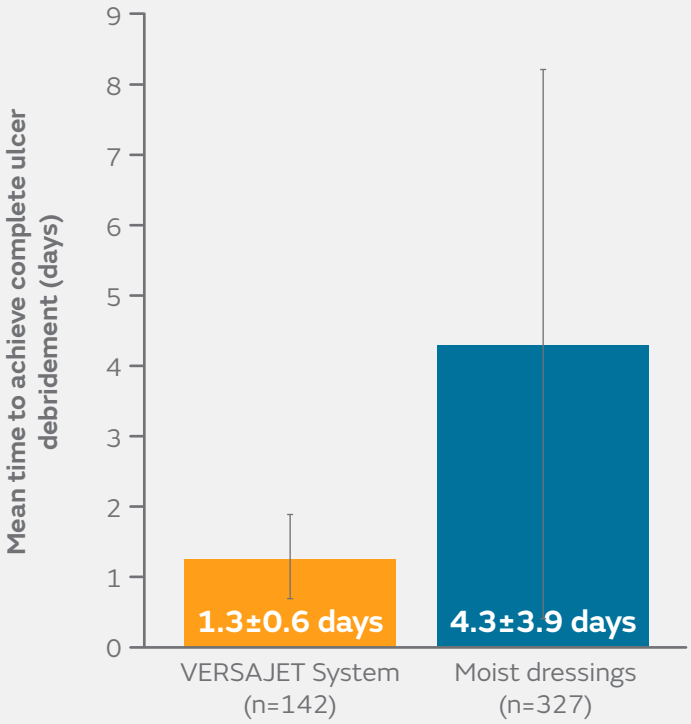

Figure. Mean (±SD) time to clean wound bed with the VERSAJET System and moist dressings

Conclusions

The VERSAJET System provided quicker debridement than treatment with moist dressings in patients with chronic leg ulcers. The VERSAJET System also reduced bacterial burden in patients with clinical signs of infection and length of hospital stay.

Schwartz JA, et al.

Surgical debridement alone does not adequately reduce planktonic bioburden in chronic lower extremity wounds

Schwartz JA, Goss SG, Facchin F, Avdagic E, Lantis JC. *J Wound Care.* 2014;23(9):23(9):S4, S6, S8 passim.

Overview

- Single-centre, prospective pilot study of patients requiring rapid closure of critically colonised lower extremity ulcers undergoing debridement with the VERSAJET◊ System or sharp debridement with pulse irrigation
  - VERSAJET System debridement (n=7)
  - Sharp debridement + pulse irrigation (n=4)
  - Both (n=1)
- All debridement was conducted until healthy bleeding granulation tissue was revealed
- Tissue biopsies were taken before and after debridement

Results

- Two surgeons observed that the VERSAJET System removed necrotic, non-viable, fibrinous tissue without harming healthy granulating tissue in close proximity
  - The VERSAJET System was useful for superficial wounds or wounds with a fine fibrinous coating in areas requiring precise debridement to minimise deep tissue damage
  - Sharp debridement outperformed where wounds required more extensive debridement, had eschar or fibrous components, or where deeper structures required evaluation
- The total bacteria reduction was 7.5×10^6 cfu/g following VERSAJET System debridement compared with 1.3×10^7 cfu/g after sharp debridement (p=ns)

Conclusions

Two surgeons observed that debridement with the VERSAJET System adequately removed necrotic, non-viable, fibrinous tissue. It was most beneficial for wounds requiring precise debridement with minimisation of deep tissue damage.

Additional supporting studies (Levels 4 and 5)

Cubison TCS, Pape SA, Jeffrey SLA. *Burns.* 2006;32(6):714–720.	Dermal preservation using the Versajet hydrosurgery system for debridement of paediatric burns	
Ferrer-Sola M, Sureda-Vidal H, Altimiras-Roset J, et al. *J Wound Care.* 2017;26:593–599.	Time to start putting down the knife: A systematic review of burns excision tools of randomised and non-randomised trials	
Hirokawa E, Sato T, Fujino T, et al. *J Wound Care.* 2019;28(5):304–311.	Hydrosurgical debridement as an approach to wound healing: an animal thermal burn model	
Matsumine H, Giatsidis G, Takagi M, et al. *Plast Reconstr Surg Glob Open.* 2020;8(6):e2921.	Hydrosurgical debridement allows effective wound bed preparation of pressure injuries: a prospective case series	
Matsumine H, Fujimaki H, Takagi M, et al. *Plast Reconstr Surg Glob Open.* 2020;8(9):e3150.	Reconstruction of lower limb necrotizing fasciitis by hydrosurgical debridement and multiperforator anterolateral thigh flap	
McCann MS. Poster presented at Wounds UK; November 12–14, 2007; Harrogate, UK.	Time to start putting down the knife: A systematic review of burns excision tools of randomised and non-randomised trials	
Rennekampff HO, Schaller HE, Wisser D, et al. *Burns.* 2006;31(1):64–69.	Debridement of burn wounds with a water jet surgical tool	
Skärlina E, Wilmink JM, Fall N, Gorvy DA. *Equine Vet J.* 2015;47(2):218–222.	Effectiveness of conventional and hydrosurgical debridement methods in reducing *Staphylococcus aureus* inoculation of equine muscle *in vitro*	
Vanwijck R, Kaba L, Boland S, et al. *J Plast Reconstr Aesthet Surg.* 2010;63(3):544–549.	Immediate skin grafting of sub-acute and chronic wounds debrided by hydrosurgery	
Yang JY, Hwuang JY, Chuang SS. *Ann Burns Fire Disasters.* 2007;20(7):72–77.	Clinical experience in using the water jet in burn wound debridement	

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