SONOCA-185®

Ultrasonic Debridement Accelerated Wound Treatment (UAW)

Faster healing (diabetic foot) than sharp surgical debridement performed in theatre $p=0.001$; the mean healing rate at 14 days for Sonoca debridement was 2.5 times faster than sharps debridement in theatre.

Reduced pain and analgesia use compared with theatre based sharps.$^{1,2,7}$

Heals recalcitrant venous ulcers; a third of of ulcers of over 6 months duration.$^4$

Lower infection rates post trauma surgery.$^6$

Broad spectrum antimicrobial effect (includes VRE, MRSA) that penetrates into wound bed.$^8,^9$

Less damage to healthy surface tissue than scalpel or water jet.$^5$

Faster healing (venous ulcer) -55.4% vs 14.5% (placebo ultrasound bath) mean reduction; both arms received compression and dressing.$^{15}$

Moves procedures from theatre to outpatient setting.
What is Sonoca?

Sonotrodes (handpieces) are completely autoclavable.

Sonoca is neurosurgical dissector technology modified for wound debridement.

How does Sonoca work?  

**Conventional Debridement Effects**
- Decreased bacterial colonisation of wound surface via debridement and flushing
- Selective - spares healthy tissue

**Wound produces acute healing responses**
- Vasodilatation and resolution of vasospasm result in increased blood flow
- Stimulation of fibroblasts, macrophages and endothelial cells.
- Limited trauma - histological samples demonstrate that healthy tissue at the wound edge and bed remain undamaged

**Antibacterial action - broad spectrum**
- Breaks the biofilm: Fibrinolytic separation and debridement of denatured proteins
- Destroys bacterial: Decreased bacterial colonisation of adjacent peri-wound tissue due to the effects of cavitation

Antimicrobial effect

**In-vitro: Intravital staining with acridinorange in the fluorescence microscope**

- Intravital staining with acridinorange under fluorescence light impressively demonstrates the bactericidal effect of ultrasonic treatment using the Sonoca.
- Using this staining technique, vital bacteria are fluorescing in green whereas germs appearing in red are dead. Many bacteria are torn into small particles by the ultrasonic treatment.

**In-vivo: Germ reduction in the wound bottom (biopsies) with diabetic foot syndrome**

- Germ numbers in tissue homogenates sampled from 5 patients suffering from diabetic foot syndrome.
- Small biopsy samples were taken before initial treatment and after the dressing replacement following UAW treatment the next day. The figures indicate the number of germs per ml of tissue homogenate, roughly matching one gram of tissue.

Non healing, Infected Wound

Unresponsive non healing wound (4 weeks duration). Wound culture positive for Vancomycin Resistant Enterococcus and resistant Pseudomonas Aeruginosa.

After 1st treatment, Wound size began to decrease. Wound culture negative for VRE or Pseudomonas and remained so after each UAW course until the wound healed.
Evidence: Case Studies

Chronic diabetic foot wound \(^{11,7}\)

Scheduled for amputation, the foot belongs to a diabetic with complicating inhibitors including alcoholism and a smoking dependency.

Peripheral arterial disease \(^{11}\)

Before (left) and after (right) a single 3 minute UAW procedure on a toe amputated due to peripheral arterial disease.

Pressure ulcers \(^{18}\)

Initial UAW treatment, difficult general conditions, fast expanding necrotic process, amputation is considered. 14 days after daily debridement with ultrasound the wound is closed and infection resolved.

Post thrombotic syndrome (2 year duration) \(^{18}\)

Left: After a single 5 minute UAW treatment
Right: 6 weeks later very efficient healing can be seen.

Ulcus cruris, chronic venous insufficiency (CVI), with phleb-lymphedema

Before UAW treatment present for 25 years

After 10 treatments

Reducing Post Trauma infection \(^{18}\)

Heel pressure ulcer

After 5th UAW treatment

Ulcus cruris, postthrombotic syndrome

1 UAW application
application time: 3 minutes
hoof sonotrode / spray and contact mode

Left: After a single 5 minute UAW treatment
Right: 6 weeks later very efficient healing can be seen.
Evidence: Randomised controlled trials

**Efficacy of UAW on chronic and acute wounds**

<table>
<thead>
<tr>
<th>Type of wound</th>
<th>No. patients</th>
<th>Age range of patients (years)</th>
<th>Average no. of ultrasonic treatments</th>
<th>Dressing type</th>
<th>100% Healed</th>
<th>50-99% Healed</th>
<th>0-49% Healed</th>
<th>Average % Wound Area Open at 3 mo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Venous stasis ulcer</td>
<td>5</td>
<td>53-83</td>
<td>15</td>
<td>5 S</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>36%</td>
</tr>
<tr>
<td>Diabetic ulcer</td>
<td>2</td>
<td>45-51</td>
<td>12</td>
<td>2 S</td>
<td>0</td>
<td>2†</td>
<td>0</td>
<td>38%</td>
</tr>
<tr>
<td>Pressure ulcer</td>
<td>3</td>
<td>51-84</td>
<td>6</td>
<td>2 S, 1 A</td>
<td>3 (1)</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Arterial insufficiency ulcer</td>
<td>2</td>
<td>74-82</td>
<td>11</td>
<td>1 S, 1 P</td>
<td>2 (2)</td>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Other nonhealing/surgical</td>
<td>5</td>
<td>32-73</td>
<td>11</td>
<td>4 S, 1 A</td>
<td>3 (2)†</td>
<td>1</td>
<td>1†</td>
<td>34%</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>32-83</td>
<td>11</td>
<td>9</td>
<td>6</td>
<td>2</td>
<td>21%</td>
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</tbody>
</table>

S, Saline moist gauze; A, alginate; P, Panafill Ointment (Heathpoint, Ltd)
* Parentheses denote the number in each group receiving a skin graft.
† Patient with sickle cell anemia.
† One patient on antibiotics prior to treatment.

**Chronic non-healing ulcers of 6+ months duration when UAW is added to therapy**

<table>
<thead>
<tr>
<th>Ulcer type</th>
<th>No</th>
<th>Mean Duration/treatment (min)</th>
<th>No of treatment</th>
<th>% heal</th>
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<tbody>
<tr>
<td>Rheumatoid</td>
<td>3</td>
<td>3.62 ± 2.6</td>
<td>18</td>
<td>33</td>
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<tr>
<td>Sickle</td>
<td>2</td>
<td>4 ± 1.13</td>
<td>1013</td>
<td>100</td>
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<tr>
<td>Venous</td>
<td>13</td>
<td>6.56 ± 3.39</td>
<td>72</td>
<td>31*</td>
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<tr>
<td>Total</td>
<td>18</td>
<td>103</td>
<td>38.9</td>
<td></td>
</tr>
</tbody>
</table>

*One patient excluded due to non-compliance to protocol and was excluded from analysis
**One additional patient achieved complete healing outside the 12-week follow-up period

**References**

1. Singh, Arthar 2005, 'Usage of Ultrasound in Wound Management: Comparison between Ultrasound Wound Debridement and sharp debridement in Diabetic Foot Ulcers: a randomized clinical trial', paper presented to the Combined Scientific Meeting of the Malaysian Orthopaedic Association and the Asia Pacific Orthopaedic Association Trauma Section Meeting 2006 and was awarded the Mahmud Merican Award for best research paper and presentation.
8. Verhage, Mary M., Niezgoda, J., Jeffery A., 'Ultrasonic-Assisted Wound Treatment (Sonoca) vs MRS, VRE and other Pathogens: Case Studies', *Center for Comprehensive Wound Care and Hyperbaric Oxygen Therapy, Aurora Health Care, Hyperbaric and Wound Care Associates, Milwaukee, Wisconsin.*
9. Pierson, Tony, CPT, Learmonth, Sarah, 1LT, Blunt, Dennis, CPT, Niezgoda, Jeffery A, McNabb, Kevin, LC.