

## HYPOTHESIS

Utilization of a low-frequency (22.4kHz), high-intensity (~60 W/cm<sup>2</sup>) direct contact ultrasound device for debridement of lower extremity wounds allows for reduction in time to healing, and decrease postoperative infection rate.

## METHODS

- This study is based upon a retrospective single-center database from 2010-2016 of eighty-nine lower extremity wounds was conducted in sixty-five patients.
- Patients presenting with a wide variety of wounds were evaluated by an interdisciplinary team of consisting of plastic and podiatric surgery.
- Inclusion criteria consisted of:
  - Patients presenting with one or more lower extremity wounds who underwent ultrasonic surgical debridement by a member of the team.
- Wound healing was assessed at 60, 120, and 180-day post-ultrasonic debridement.
- Studeis conducted:
  - Descriptive statistics
  - Post-debridement outcomes
  - Regression analysis



Figure 1: Pre & Post Debridement

Post-Operative Outcomes	
<b>60-Day Post-Misonix</b>	
<25% Reduction	19 (22%)
25%-50% Wound Reduction	26 (30%)
50%-75% Wound Reduction	17 (20%)
100% Wound Reduction	15 (17.4%)
Unknown (Lost to F/U or Amp.)	9 (10.4%)
<b>120-Day Post-Misonix</b>	
<25% Reduction	8 (9.3%)
25%-50% Wound Reduction	26 (30%)
50%-75% Wound Reduction	16 (18.6%)
100% Wound Reduction	22 (26%)
Unknown (Lost to F/U or Amp.)	14 (16.3%)
<b>180-Day Post-Misonix</b>	
<25% Reduction	8 (9.3%)
25%-50% Wound Reduction	20 (23.2%)
50%-75% Wound Reduction	11 (12.8%)
100% Wound Reduction	28 (32.6%)
Unknown (Lost to F/U or Amp.)	17 (19.8%)

Figure 3: Post-Operative Outcomes-2

Post-Operative Outcomes	
Average Length of Hospital Stay	7.93 days
Average Length of Procedure	57 mins.
Avg. Number of Post-Misonix Debridements	1.3
Readmission Post-Misonix	47 (52.8%)
Total Number of Reoperations	91
Further Debridements	37 (40.6%)
Split Thickness Skin Graft Placement	21 (23%)
Skin Substitute Placement	16 (17.5%)
Flap placement/coverage	2 (2.2%)
Reoperations Related to Wound Complications	
Below-Knee Amputation	7 (7.7%)
Above-Knee Amputation	2 (2.2%)
Split Thickness Skin Graft Failure	3 (3.3%)
Skin Substitute Failure	2 (2.2%)

Figure 2: Post-Operative Outcomes



Figure 4: Partial Debridement

## RESULTS

- Eighty-nine patients evaluated by the multidisciplinary team who underwent low-frequency (22.4kHz), high-intensity (~60 W/cm<sup>2</sup>) direct contact ultrasonic debridement were identified. Of these patients, sixty-five were classified as having a lower extremity wound and had complete medical records throughout the studied follow up period.
- Mean age was 57.0 years and average BMI was 31.1kg/m<sup>2</sup>.
- High-risk comorbidities included
  - Smoking (43%, n=28), Diabetes (55.4%, n=36), Peripheral vascular disease (56.9%, n=37), Hypertension (68%, n=44)
- The average wound age at initial presentation was 555.7 days and average wound size was 9.8cm x 7.4cm
- 60-days post-ultrasonic debridement:**
  - 68.5% (n=61) of patients had greater than 25% wound reduction, with 35% (n=31) achieving 50%-100% wound reduction
- 180-day post-ultrasonic debridement:**
  - 75% (n=67) received greater than 25% reduction with 65% (n=58) reaching 50-100% wound reduction.
- Limb salvage rate was 91.1% (n=79)
  - Amputations occurred in 8.9% (n=10)
- Regression model analysis showed a history of smoking (p=0.028) or diabetes (p=0.004) was independently associated with decreased wound healing outcomes at 120-days. The absence of diabetes was associated with successful wound healing rates (p=0.035) at 180-day outcomes.

## DISCUSSION/CONCLUSION

In our system, a coordinated multidisciplinary approach with the utilization of a low-frequency high-intensity direct contact ultrasonic debridement tool on patients presenting with lower extremity wounds improves time to healing with positive wound healing outcomes and an increase in limb salvage rates. Utilizing the low-frequency (22.4kHz), high-intensity (~60 W/cm<sup>2</sup>) ultrasound was efficient at removing biofilm and tissue necrosis while minimizing viable tissue loss and promoting a healthy granular wound bed. In a complex patient population, our results suggest that ultrasonic surgical debridement is a safe and effective adjunctive therapy in the management of chronic wound healing.