

Hydromechanical Therapy Improves Cutaneous Wound Healing Through Tissue Regeneration and Bioburden Reduction

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Background

- Chronic wounds are difficult to treat, costly, and pose a significant burden on quality of life.
- Many therapy options exist including:
 - Basic dry debriding dressings, novel dressings, platelet or stem cell therapy, negative pressure wound vacuums, hyperbaric oxygen therapy, and low-level laser therapy.
- Mechanical stress may promote angiogenesis, oxygen delivery, fibroblast differentiation, and cell division and hypertrophy.
- Bacterial biofilms produce proteases and disrupt host immune cell function, contributing to delayed wound healing.

Objective: To evaluate the effect of hydromechanical therapy on wound healing and bacterial burden in a porcine model

Methods

- 10 full thickness square wounds were created on Guizhou pigs and infected with *Pseudomonas aeruginosa*.
- Day 2:
 - WaterPik** → Irrigation therapy at 25 psi for 2 minutes
 - Control** → Dry dressing changes twice daily
- Wound size, bacterial burden, gene transcriptions, and biofilm formation were measured and evaluated.

Results

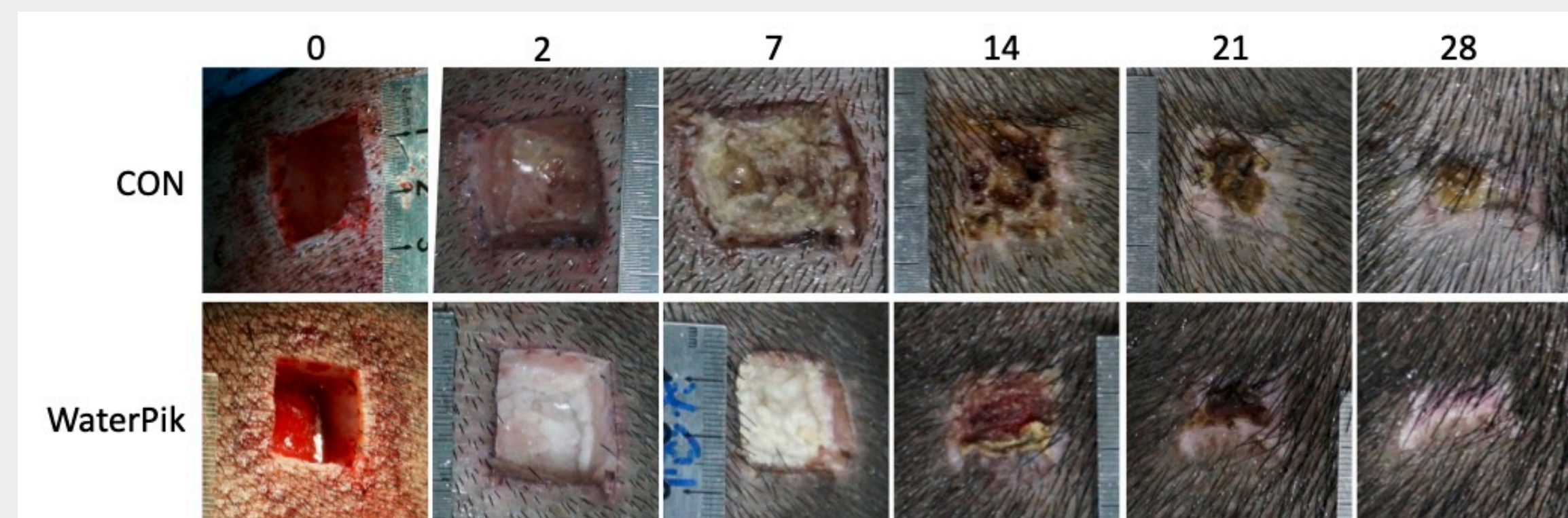


Figure 1: WaterPik and control group wound healing from 0 to 28 days

Results

Hydromechanical therapy significantly accelerated time to wound closure.

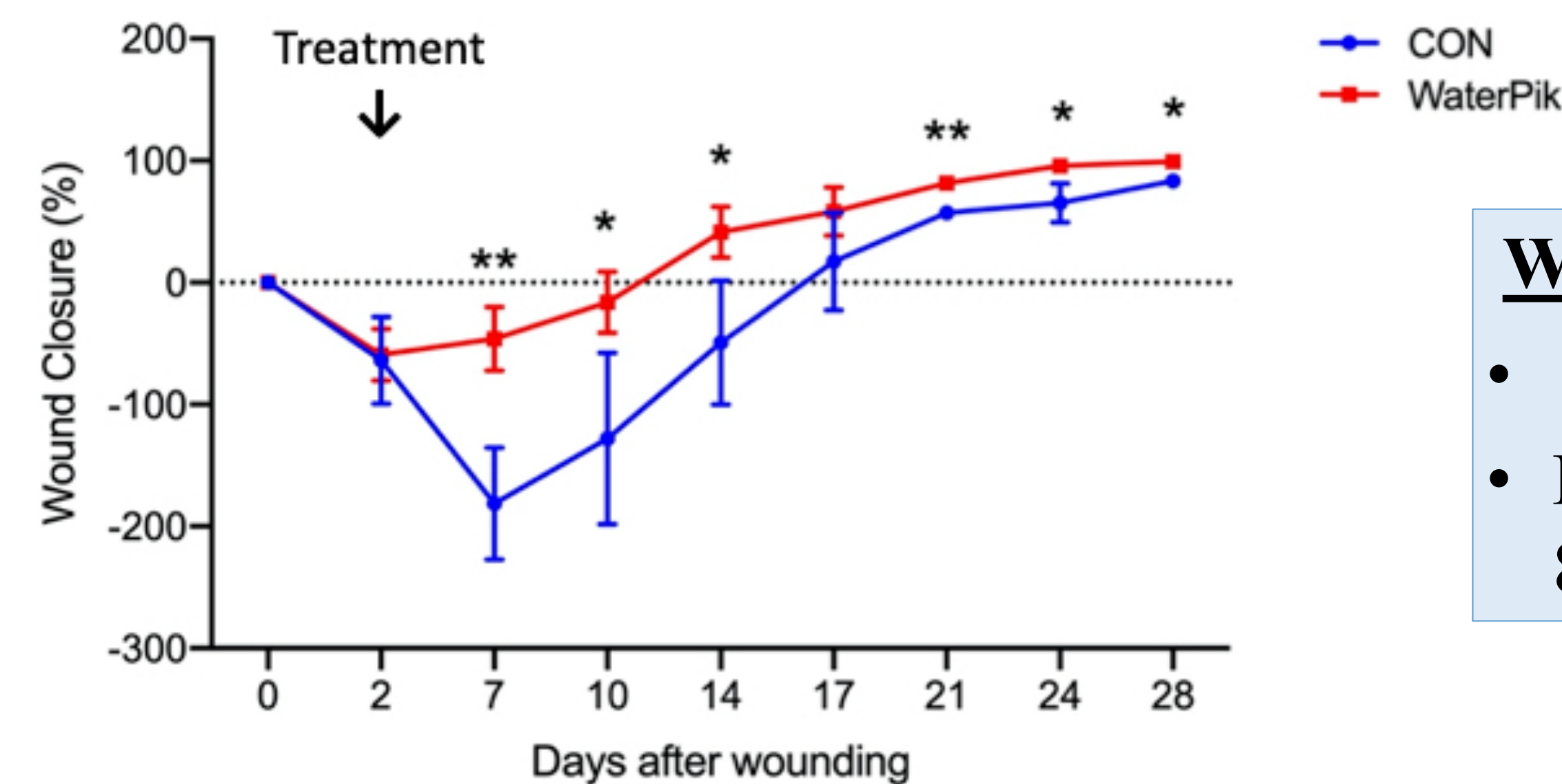


Figure 2: Graph depicting wound closure over time.

WaterPik Group:

- Increased wound healing by day 7.
- Day 28: 99% closure compared to 83% in the control. (p<0.05)

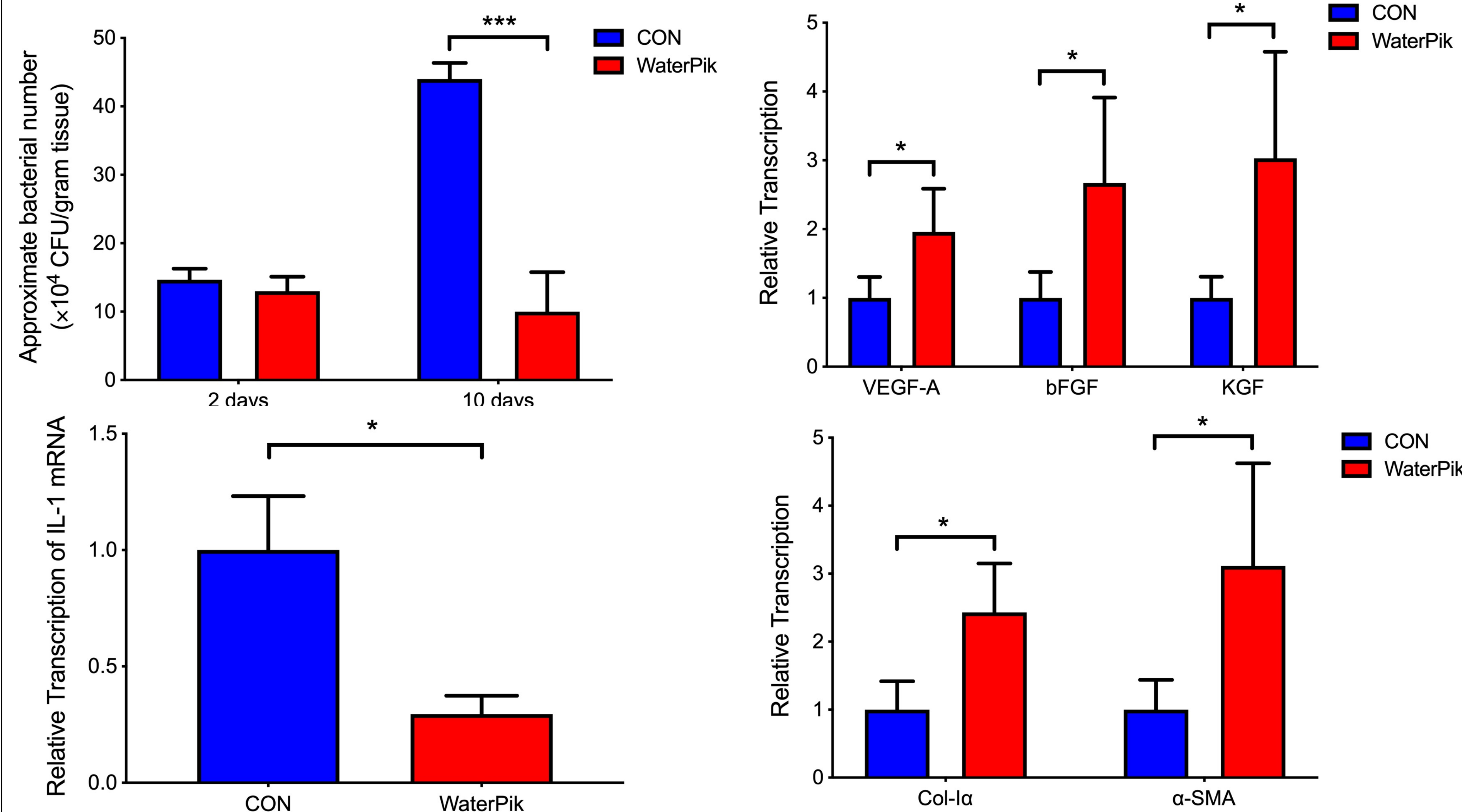
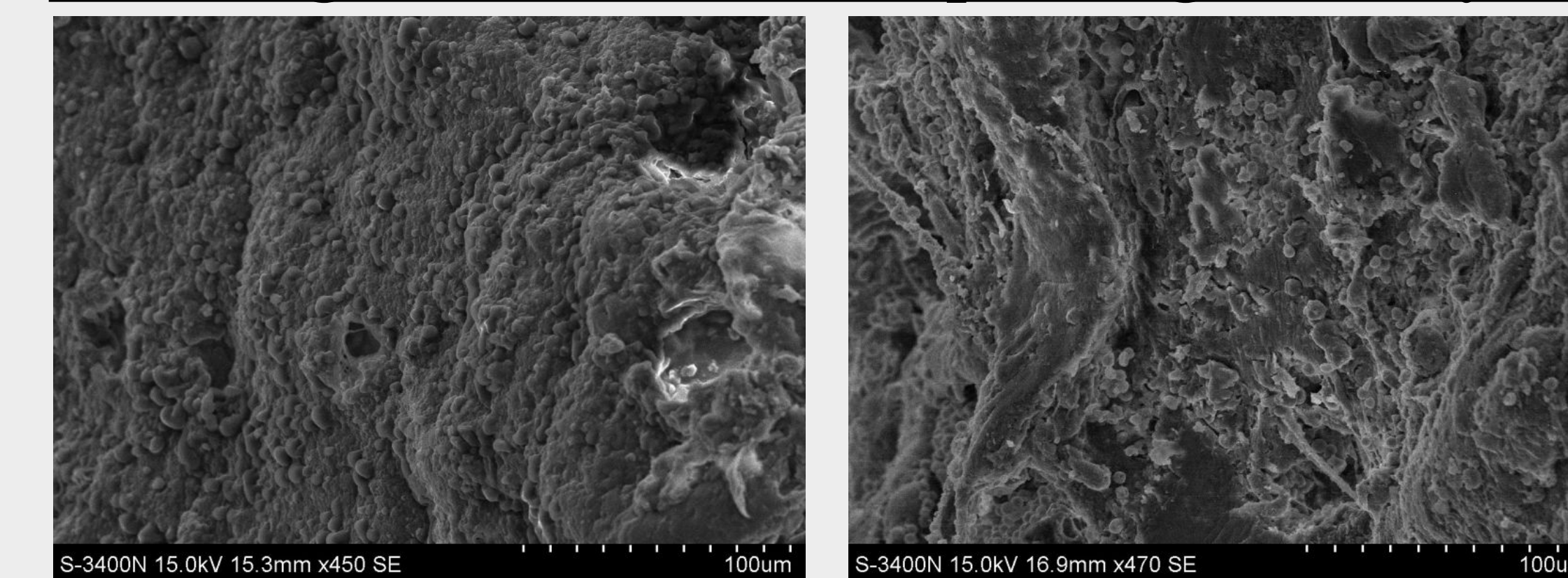


Figure 3: Real Time PCR A) Comparison of wound bacterial bioburden at day 2 compared to day 10 after wounding and inoculation. B) Expression of VEGF-A, bFGF and KGF on day 10. C) Expression of pro-inflammatory IL-1 mRNA at day 10. D) Expression of collagen Iα and α-SMA at day 10.

Scanning Electron Microscope Images at Day 10



Control

WaterPik

WaterPik:

- Significantly lower bacterial burden
- No biofilm under electron microscopy

Control:

- Intact fibrous biofilm with a compact arrangement and smooth surface

Frequent daily mechanical debridement may either disrupt biofilm formation or facilitate its removal.

Conclusions

- Hydromechanical therapy may accelerate wound healing through enhanced angiogenesis, dermal and epidermal regeneration, and biofilm disruption.
- This is a promising, low-cost yet effective and easily accessible modality to augment chronic wound healing.

Citations

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