The Healing Power of Nature

# Successful Staged Limb Salvage In A Poorly Controlled Diabetic Cohort Utilizing Intact Fish Skin Graft – A Case Series

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## INTRODUCTION

Diabetes contributes to poor wound healing through impaired cytokine function, angiogenesis and cellular migration/ proliferation. End stage renal disease impairs wound healing through delayed rates of granulation and decreased keratinization kinetics with an ultimate higher rate of disruption.1,2 Wounds overlying the Achilles region can rapidly progress to tendon exposure secondary to an unreliable vascular supply coupled with a paucity of subcutaneous tissue.3 Traumatic injuries in the postoperative period increases post-operative complications in the orthopedic arthroplasty population.4 The mainstay of treatment of this diverse reconstructive population has been with flaps. Not all patients however are candidates secondary to their underling co-morbidities, chiefly diabetes. This case series highlights the clinical efficacy of intact fish skin grafts (FSG) in this subset of challenging patients.

## METHODS

The current cohort included diverse wound etiologies to include a traumatic lower extremity wound with exposed bone status post recent knee arthroplasty, a stage 4 pressure ulcer with exposed Achilles tendon devoid of peritenon and a dorsal foot wound secondary to venous access complication in an end stage renal patient. All three patients were longstanding uncontrolled diabetics with hemoglobin A1c's between 7.5 and 10.1. All wounds were necrotic with cellulitis at initial presentation (range in size from 3 to 8cm). Each underwent operative debridement, a course of culture specific intravenous antibiotics and application of FSG placed at weekly or biweekly intervals with compression provided by negative pressure wound therapy. (range from 1 to 6 applications) Ultimately all wounds robustly granulated and staged reconstruction was successfully performed with split thickness skin grafts. Long term follow up has confirmed stable and pliable grafts with full range of motion.

## RESULTS

Hemoglobin A1c reflects glycemia over 2-3 months and is the standard measure utilized to monitor glycemic control in diabetic patients. For every 1.0% point increase, the daily wound area healing decreases by 0.028cm2/day.5 To avoid amputation in these high risk patients, the use of advanced wound care products to include CAMPS (Cellular, acellular and matrix – like products) have been recommended.

## CONCLUSIONS

FSGs are FDA approved for treating most chronic and acute wounds. The product is an acellular dermal matrix sustainably harvested from Icelandic cod with a porous microstructure similar to human skin. Characteristics of the xenograft include bacterial resistance, cellular migration/proliferation, angiogenesis, and inflammatory cytokine mitigation.

## CASE 1: 31-YEAR-OLD DIABETIC FEMALE WITH CHRONIC WOUND OF HER RIGHT DORSAL FOOT

**Patient History:** End stage renal disease on dialysis, peripheral neuropathy, retinopathy, hypertension and history of cerebral vascular accident

**Wound History:** Patient presented with 8 cm c 6 cm necrotic eschar with cellulitis; Wound was secondary to an unrecognized extravasation from an intravenous catheter placed during a surgical procedure.

**Patient Outcomes:** Despite glucose management challenges postoperatively, the wound fully granulated after only one FSG application and she underwent a successful staged split thickness skin graft six weeks later. The graft has remained stable and pliable with full range of motion.

**INITIAL PRESENTATION:** 8 CM X 6 CM NECROTIC ESCHAR

APPLICATION OF MICRONIZED AND MESHED FSG

**6-WEEKS POST-OP:** WOUND PREPARED FOR STSG

FINAL PRESENTATION OF HEALED WOUND

## CASE 2: 75-YEAR-OLD FEMALE WITH NECROTIC PRESSURE ULCER OF LE WITH ACHILLES TENDON EXPOSURE

**Patient History:** : Significant history of peripheral neuropathy, hypertension and bilateral lower extremity edema

**Wound History:** Patient presented with a recalcitrant 3-month necrotic pressure ulcer of her left posterior distal lower extremity with significant exposure of her Achilles tendon.

**Patient Outcomes**: The patient achieved successful wound healing with staged split-thickness skin grafting following 6 FSG applications and negative pressure wound therapy, allowing full mobility and stable, pliable tissue coverage.

INITIAL PRESENTATION

2-DAYS POST-OP: FSG APPLICATION

WOUND PROGRESSION FOLLOWING FSG APPLICATION

## CASE 3: 65-YEAR-OLD FEMALE TOTAL KNEE ARTHROPLASTY

**Patient History:** : Uncontrolled diabetes, obesity, and s/p right total knee arthroplasty.

**Wound History:** patient sustained a mechanical fall resulting in ORIF of a right distal tib/fib fracture which resulted in surgical dehiscence. After 6 weeks of local wound care the patient presented with fever, chills, and purulent drainage from the site of her dehisced wound.

**Patient Outcomes:** Three applications of fish skin graft resulted in good healing progression with complete granulation tissue coverage over all exposed bone and periosteum at 40 days from first application to closure.

POST ORTHOPEDIC DEBRIDEMENT

FIRST FSG APPLICATION

2 WEEKS POST-FIRST FSG APPLICATION

1 WEEK POST-THIRD FSG APPLICATION

LONG TERM FOLLOW UP STATUS POST STSG

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