

## Continuous External Tissue Expander for Closure of Lower Extremity Wounds – A CASE SERIES

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### Introduction

This case series is presented to demonstrate the effects of continuous external tissue expansion on velocity of healing in lower extremity wounds. Increasing the speed of wound closure has become the standard of care to attempt to decrease complications. Sheehan et al demonstrated that a decrease in wound area of 50% by the fourth week will yield a high probability that the wound will obtain complete closure<sup>1</sup>. This novel technique provides the wound care professional with access to a tool to assist in rapid wound area reduction. This unique continuous external tissue expander (DermaClose RC) utilizes the elastic properties of skin enabling wound care practitioners to reduce wound area rapidly and more efficiently than other methods previously reported in the literature.

### Design/Method

A multicenter retrospective case series analysis was conducted examining 25 lower extremity wounds. These wounds could not be closed primarily. The intent of the review was to examine reduction of wound area and healing velocities. Co-variables examined were demographics, application time, anchor placement and complications. Wound area was calculated prior to device application and at a removal of the device.

Case	Age	Sex	Location	Type of Wound	Initial Wound Size (cm <sup>2</sup> )	Wound Size (cm <sup>2</sup> ) at Removal	Wound Size Change (cm <sup>2</sup> )	Device Application Duration (Hr)	Velocity of Healing (cm <sup>2</sup> /Day)
1	64	M	Lateral Foot	Surgical	47.3	6.0	41.3	24	41.3
2	55	M	Dorsal Foot	Surgical	24.0	0.0	24.0	24	24.0
3	61	M	Anterior Leg	Surgical	4.8	0.0	4.7	24	4.8
4	46	M	Posterior Leg	Surgical	30.0	0.0	30.0	24	30.0
5	68	M	Foot	Surgical	72.3	0.0	72.3	168	10.3
6	48	M	Foot	Surgical	13.0	0.0	13.0	168	1.9
7	83	M	Foot	Surgical	53.3	0.0	53.3	168	7.6
8	52	M	Foot	Surgical	27.0	0.0	27.0	168	3.9
9	71	F	Heel	Pressure	3.8	0.2	3.6	96	0.9
10	70	F	Midfoot	Neuropathic	6.5	0.2	6.3	144	1.0
11	76	M	Leg	Surgical	87.5	0.0	87.5	96	21.9
12	79	M	Plantar Foot	Neuropathic	70.0	0.2	69.0	48	34.9
13	60	F	Symes Amputation	Ischemic	2.7	0.0	2.7	24	2.7
14	80	F	Heel	Neuropathic	9.3	0.9	8.4	96	2.1
15	43	M	Foot	Surgical	54.0	27.0	27.0	72	9.0
16	58	M	1st MTP	Trophic	6.0	1.2	4.8	24	4.8
17	47	M	Plantar 1st Metatarsal	Trophic	17.5	3.5	14.0	24	14.0
18	65	M	1st Metatarsal	Trophic	7.5	1.2	6.3	24	6.3
19	60	F	5th Metatarsal	Trophic, Arterial	3.8	0.8	3.0	24	3.0
20	58	M	3rd Metatarsal	Trophic	15.0	2.5	12.5	1	300.0
21	68	F	1st MTP	Surgical	15.0	5.0	10.0	72	3.3
22	33	M	Lateral Heel	Surgical	12.0	2.1	9.9	24	9.9
23	91	F	Lateral Leg	Open Fracture	20.0	5.6	14.4	96	3.6
n/a	n/a	n/a	Anterior Leg	Open Fracture	144.0	56.0	88.0	96	22.0
n/a	n/a	n/a	Medial Leg	Open Fracture	18.0	6.6	11.4	96	2.9

## Materials

A continuous external tissue expander (DermaClose RC) was applied to all wounds. The unique characteristics of this device are that it provides continuous tension at 1.2Kg of force, not requiring additional adjustment, and that it is applied in either a radial or shoelace pattern to stretch the skin on the subcutaneous plane until the edges of the wound are brought close enough for final suturing.

## Results

Retrospective analysis of 25 wounds revealed that the mean area reduction was 86.9% +/- 14% with device application and the mean velocity of healing was 22.6cm<sup>2</sup>/day. The mean duration of device application was 3 days and the mean duration for wound margin approximation was 12 days. One patient was lost to follow up after 14 days and was not included in the analysis for wound margin approximation time. Adverse events included slippage of anchors, tearing of the skin, line breakage and patient discomfort. These events were reported in less than 4% of the study population. One case reported line breakage and two wounds required reapplication of the device but all wounds progressed to complete closure.



*This 47 y/o male presented with a chronic wound to the left leg 13 months duration and depression. The last Achilles tendon repair resulted in a post-operative complications leaving a 10cm long x 3cm wound. Sharp debridement was performed to resect 0.5 cm of the chronic wound margin. The wound margins were then mobilized by undermining approximately 0.5 cm. The skin edges were fully approximated inter-operatively and retention sutures placed. The device was left in place for 24 hours and the edges were coapted and sutured without tension and the device removed. On day 25 all sutures were removed and the wound was deemed healed.*



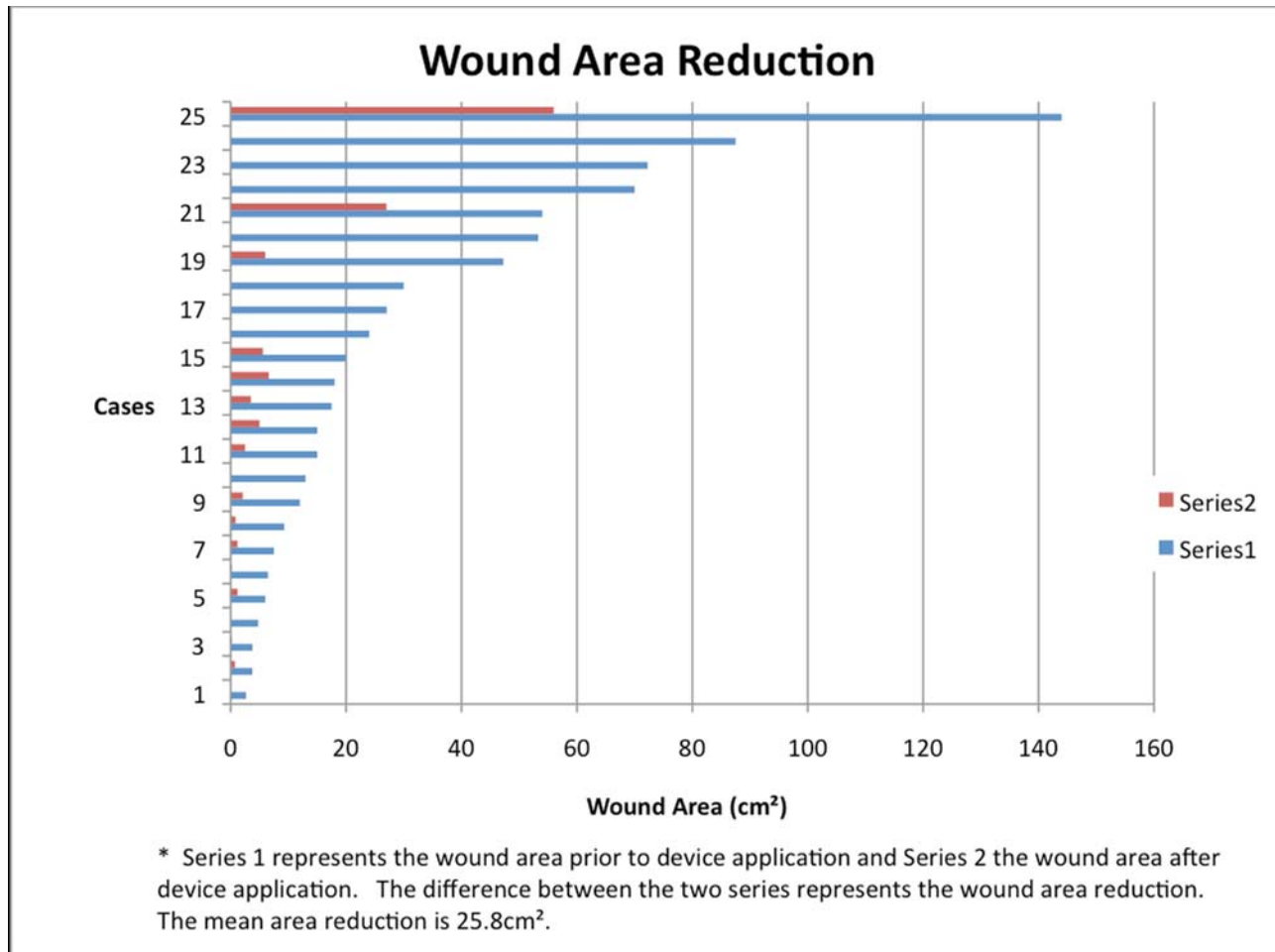
*This 48y/o 430-pound diabetic male sustained a left heel puncture wound from an unknown object as a relief worker following Hurricane Katrina. The patient has been treated with multiple modalities without much success. After three years, the full-thickness ulcer had improved to 3.6cm x 2.9cm x 1.2 cm deep with a granular base and mildly undermining hyperkeratotic rim with no signs of infection or ischemia. The DermaClose™ RC was applied. One week later the device was removed with 100% edge approximation. The skin edges were freshened and successfully closed without tension or suture ischemia.*



*This patient's wound had been treated for two years prior to being referred to our wound care center. She presented with a charcot foot deformity and a 3cm plantar wound. The DermaClose™ RC was placed and within two days had reduced in size to approximately 0.8cm. On day five sutures were placed to secure the expanded tissue margins. At sixteen days the wound was superficial and at 28 days the wound was completely healed.*

## Cases

The cases above represent a sampling of the wounds included in the case series. The uses of this novel device include intraoperative, delay primary closure and wound reduction allowing for subsequent secondary healing of a smaller wound.



## Conclusion

This case series demonstrates the rapid area reduction that continuous external tissue expansion (DermaClose RC) can provide. When compared to previously reported velocity of healing this device demonstrates faster area reduction. We believe that the DermaClose RC is an essential tool to be used to decrease wound area, accelerate healing and prevent the complications associated with chronic wounds.

## References

1. Sheehan, P., Jones, P. et al. Percent Change in Wound Area of Diabetic Foot Ulcers Over a 4-Week Period Is a Robust Predictor of Complete Healing in a 12-Week Prospective Trial. *Diabetes Care*. 26(6):1879-1882