

Regenerative Capacity of the Axolotl (*Ambystoma mexicanum*) Extracellular Matrix: A Retrospective Study on the Application of Xenografts in Chronic Wound Care

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ABSTRACT

Diabetic foot ulcers (DFU) and venous leg ulcers (VLU) are common chronic conditions seen in rural communities where accessibility to health care and health resources is limited. Many patients with DFU and VLU also present with comorbid metabolic conditions such as uncontrolled type 2 diabetes (T2D), hypertension, and obesity. Complications of these metabolic conditions include peripheral neuropathy and diminished vascularization of the wound bed, resulting in significantly delayed wound healing.

The exceptional regenerative capacity of the axolotl (*Ambystoma mexicanum*) was harnessed by NeXtGen™ Biologics into a collagen wound matrix, NeoMatriX®, that was applied to chronic wounds refractory to standardized collagen wrapping treatment. Measurements of each wound's length, width, and depth were obtained at the time of the application of the graft and compared to wound measurements at successive follow-up visits. Results showed that the axolotl graft significantly reduced the size of chronic wounds after a single application, with complete resolution of the wound achieved in a vast majority of the patients.

The xenograft derived from the extracellular matrix of the axolotl successfully resolved chronic lower extremity wounds at a remarkable rate. Further implications for these findings include reducing the need for patients in rural communities to make multiple visits to the clinic to manage their chronic wounds, reducing barriers to healthcare accessibility and improving the quality of patient's lives.

BACKGROUND

- Lesions are classified as chronic wounds once they demonstrate a significant delay in wound healing or lack of improvement for 4 months. Chronic wounds affect roughly 6 – 7 million individuals in the United States annually and accumulate over \$20 billion dollars in expenditures related to healthcare costs and decreased economic productivity. In addition to their financial burden, chronic wounds are detrimental to a patient's quality of life due to the pain, psychological and emotional distress, and reduced productivity.
- The rate of metabolic diseases such as Type 2 Diabetes (T2D), hypertension (HTN), and obesity are disproportionately higher in rural communities due to the shortage of primary care and lower health literacy. Patients with uncontrolled T2D and hypertension often develop peripheral neuropathy and impaired vascularization, placing them at an increased risk of developing chronic wounds over their lifetime.
- Researchers have long been interested in molecular targets that can be harnessed to facilitate healing. The axolotl (*Ambystoma mexicanum*) possesses a remarkable ability to heal themselves and regrow limbs throughout their entire lifespan. Their regenerative properties is now a point of interest for the development of skin grafts that can be applied to chronic wounds to facilitate wound healing with remarkable outcomes.

OBJECTIVES

- Identify patients with chronic lower extremity wounds with existing comorbidities such as Type 2 diabetes, hypertension, and obesity
- Apply NeoMatriX® on the lesions that have exhibited delayed wound healing
- Achieve successful closure of the lesion after one or more applications of NeoMatriX®

METHODS

- Data from 21 chronic wound cases where NeoMatriX® was applied was obtained from 2022 – 2025
- Wound measurements including length, width, and depth were recorded prior to the application of NeoMatriX®. At each follow-up visit, wound measurements were recorded again to visualize the progression of healing.
- The total surface area of each wound was calculated using the measured lengths and widths of each wound

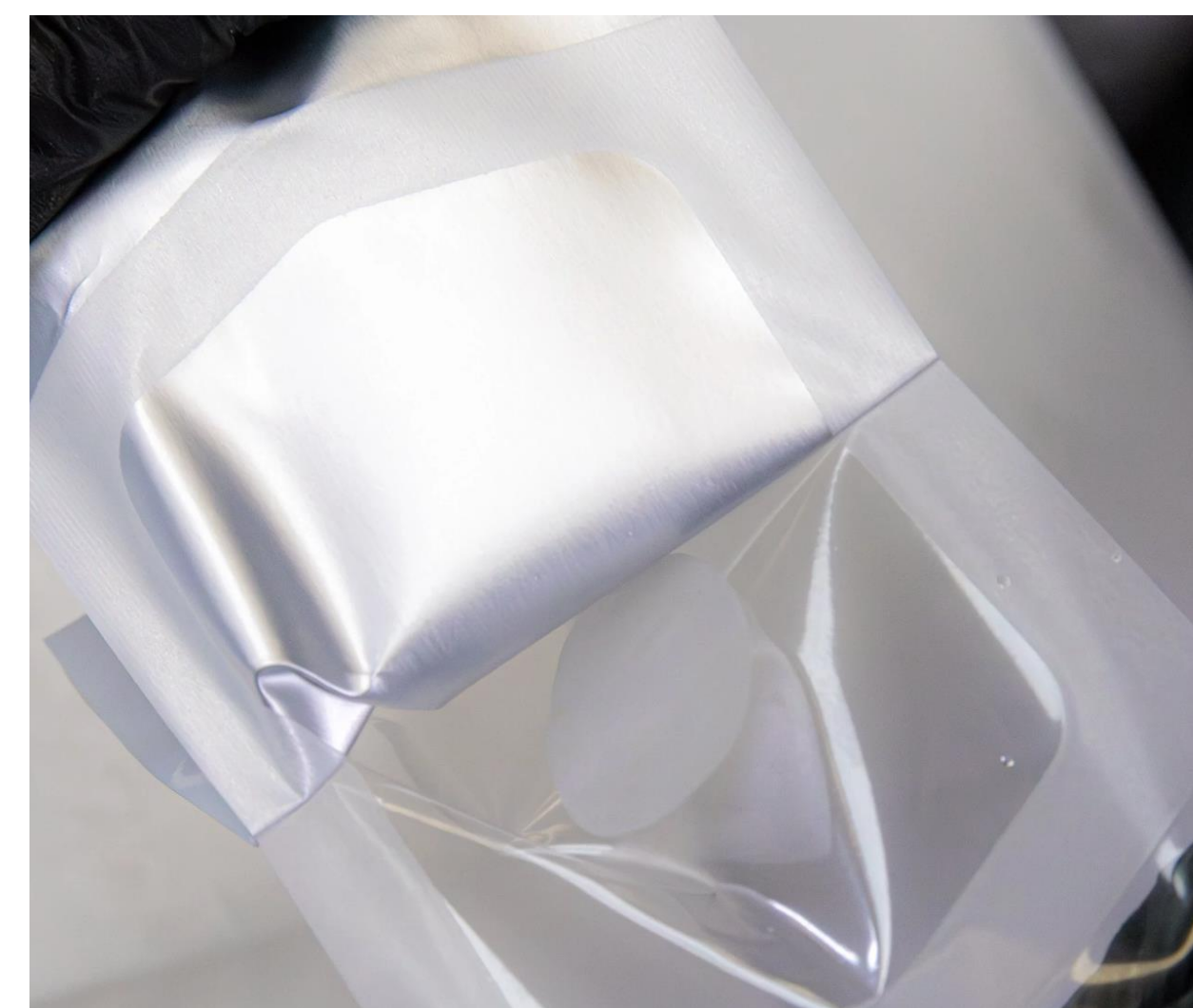


Figure 1. Sample of the NeoMatriX® that was applied to the wound bed of each patient

RESULTS



Figure 2. Case 18 is a 58-year-old male with a DFU that reached 100% wound size reduction after one application

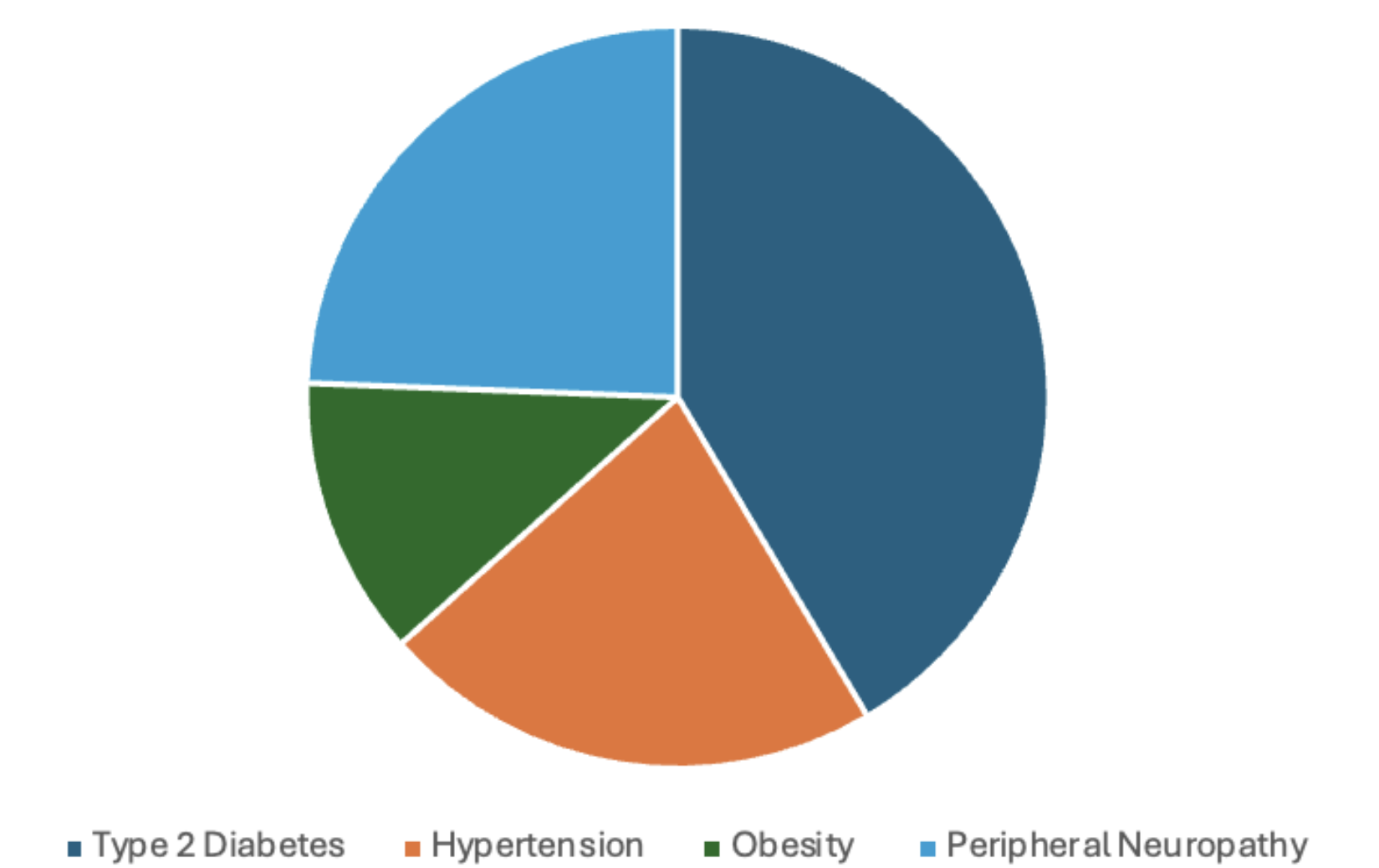


Figure 3. Case 19 is a 52-year-old female with a DFU that reached 96% wound size reduction after one application

RESULTS

Case	Chief Complaint	Length of Treatment (weeks)	Initial Wound Size (cm ²)	Final Wound Size (cm ²)	Size Reduction	Number of Applications (units)
1	Recalcitrant wound	3	2.4	0	100%	3
2	Post-surgical dehiscence	10	3.6	0	100%	18
3	DFU	10	4.0	0	100%	8
4	MTP Amputation	10	5.6	0	100%	9
5	MTP Amputation	9	0.6	0	100%	7
6	MTP Amputation	12	29.25	0	100%	19
7	DFU	8	3.45	0	100%	6
8	DFU	5	0.81	0	100%	3
9	DFU	10	8.4	0	100%	3
10	DFU	5	1.44	0	100%	3
11	DFU	4	2.0	0	100%	3
12	Recalcitrant wound	3	1.44	0	100%	3
13	DFU	2	0.5	0	100%	2
14	DFU	2	0.48	0	100%	2
15	DFU	1	13.12	0	100%	1
16	VLU	3	1.65	0	100%	4
17	DFU	2	1.0	0	100%	1
18	DFU	4	1.05	0	100%	1
19	DFU	4	0.56	0.02	96%	1
20	VLU	2	0.98	0.56	43%	1
21	VLU	4	1.1	0.84	24%	1

Comorbidities



CONCLUSIONS

- Nearly all cases of chronic wound in which where NeoMatriX® was applied achieved a complete 100% size reduction with minimal to no scarring. This demonstrates the ability for chronic wound patients to be successfully treated using axolotl skin grafts.
- Many patients were successfully treated with minimal applications with no reports of adverse effects following graft application. For many rural patients, a highly efficient and effective treatment option can greatly reduce healthcare costs and significantly improve healthcare delivery and their quality of life.

REFERENCES

