



International Journal of Veterinary Sciences and Animal Husbandry



ISSN: 2456-2912

VET 2024; 9(4): 522-526

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www.veterinarypaper.com

Received: 20-05-2024

Accepted: 26-06-2024

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Use of tilapia fish (*Oreochromis niloticus*) skin graft for chronic wound management in six dogs

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DOI: <https://doi.org/10.22271/veterinary.2024.v9.i4h.1601>

Abstract

Second-intention healing can lead to joint dysfunction and loss of mobility. The extracellular matrix maintains the tissue structure and regulates cell growth and migration. The use of fish collagen in pigs and rats has shown early healing. TADM is also of good use in acute wound healing. Six clinical dog cases with different wound patterns were selected for the study. After descaling and myotomy of the under-skin muscle, various treatments of normal saline and glycerol were given. Two cooperative dogs were applied without any sedation or anaesthesia. For the other dog, xylazine with propofol was given as anaesthesia. Two cases required reapplication of graft. The young dog shows early wound healing after the graft.

Keywords: Wound, fish skin graft, tilapia skin acellular dermal matrix, tilapia, skin graft, biological dressing

Introduction

The simplest technique to achieve reliable healing should be used for every skin wound. One should realize that Second-intention healing can result in joint dysfunction due to skin contractures and might result in unwanted scar tissue and skin friability. Skin grafting is a novel technique that is used whenever trauma or oncologic surgery has resulted in significant skin loss. Wounds with large surfaces and wounds at the distal limb should be considered for the graft. Full-thickness skin lost due to trauma and the lack of dermis will lead to difficulty in the epithelialization of keratinocytes in the natural epidermis. Skin defects exceeding 4 cm can be effectively repaired by skin transplantation

With the removal of the cellular structure and collagen extraction from animal skin, the remaining graft has relatively weak immunogenicity. Extra Cellular Matrix (ECM) maintains the tissue structure and regulates cell growth and migration. It also plays a crucial role in the specific process of skin repair.

Additionally, fish collagen has also been widely studied. Acellular fish skin provides better healing on deep partial thickness burn wounds in porcine. Collagen extracted from Tilapia quickly and effectively promotes full-thickness wound healing in rats also, the extracted marine collagen peptides from tilapia skin promote wound healing such as deep II degree scald in rabbits. Different studies have shown that collagen-rich fish skin materials have high biodegradability, so we judge that the obtained Tilapia Skin acellular dermal matrix (TADM) has a good potential for application in acute wound repair and regenerative medicine. Tilapia skin is rich in type I collagen, which helps form supra-molecular assembly in the extracellular matrix. It forms a perfect matrix with rigidity and resistance to stretching; collagen, by its chemotactic nature, attracts fibroblast, supports new blood vessels, and helps in the formation of granulation tissue. Tilapia fish skin graft promotes epithelialization by a large amount of moisture and collagen protein (27%) for chronic nonhealing wounds and wounds at medical management requiring fast healing for better prognosis.

Materials and Methods

Evaluation of Patients

A total of 10 cases were presented to the Veterinary Clinical

Complex, KNP College of Veterinary Science, Shirwal Dist. Satara with history (Table 1). All cases were examined for physio-biochemical and cardiopulmonary evaluation.

Table 1: Cases presented

Case no	Breed	Sex	Age	Area	History
1.	Spitz	Female	2 year	Left Shoulder	Post-injury wound dehiscence
2.	German cross	Male	7 month	Right hindlimb	Dog bite
3.	Non-descript	Female	2.5 month	Left forelimb	Accident
4.	Doberman	Female	3year	Ventral abdomen	Post-tumour excision suture dehiscence
5.	Non-descript	Female	5 month	Right hindlimb	Accident
6.	Pitbull	Male	3.5 year	Thoracic region	Boar attack

Preparation of Tilapia Fish Graft

Freshly caught tilapia fish from the local fishermen was procured. The fish was examined and checked for any skin discontinuations. Scales were brushed and obliterated from the skin. With the help of a sterile surgical blade, incisions were made across the three borders to avoid tearing of the skin while debriding. The skin was separated from the underlying muscles, and debridement of underlying tissues was done. The fish skin is rinsed with 0.9% saline and soaked in 2% chlorhexidine gluconate in a sealed container for 60 min. It was rinsed with 0.9% saline and soaked in a mixture of 75% glycerol and 25% saline solution in a sterile sealed container for an hour. The fish skin is rinsed again with sterile 0.9% saline and moved to another sealed sterile container filled with 100% glycerol, in which it is massaged for 5 min and kept soaked for 3 h. The skin is packed in sealed plastic envelopes and stored at 4 degrees Celsius.



Pic 1: Descaling of tilapia Fish



Pic 2: Tilapia Fish Skin Graft

Application of Tilapia Fish Graft

Two cooperative dogs with injury at the right forelimb and

right hindlimb were treated by putting a tilapia graft and applying vet wrap around it. Other animals, after pretreatment with atropine @ 0.04 mg/kg S/C, were sedated with inj. Xylazine @1.0 mg/kg. Induction of anaesthesia was done with Inj. Propofol @4 mg/kg.

Preparation of wound for graft

Wound scrubbing was done with betadine 5% solution, and surgical debridement was done with BP blade no 21. Foreign debris is removed with thumb forceps, and necrotic tissue is removed by sharp dissection until healthy bleeding is encountered. Wound edges were also debrided. An appropriate-size graft was cut and applied to the wound. Stay sutures were taken with Nylone no 3-0 at the edges to hold the graft.

Results and Discussion

Case 1 and Case 2, with 12cm × 5 cm and 15cm × 6 cm wounds, showed granulation after 10 and 7 days, respectively. In case no 3 ND, a 2.5-month-old puppy showed granulation in three days and healing in 14 days. Case no 4, with 17cm × 7cm showed granulation in 12 days, but healing was seen after 37 days. Case 5, with 9 cm × 3 cm, showed granulation after six days, and healing was seen after 22 days. Case 6, with a wound 11 cm × 4 cm, showed granulation in 8 days; healing was seen after 30 days. The time required for wound healing is less, with minimal complications. Lima *et al.* 2019, reported similar findings with tilapia grafts in human cases after gunpowder explosion wounds. Luze *et al.* (2022) [8] reported similar findings after applying tilapia grafts to burn cases. No other hemodynamic complications were seen after fish grafting. A similar finding was reported by Alam and Jeffery (2019) [9]. Cases 1 and 3 required reapplications of graft. Young animal shows early wound healing. Wound with small wound sizes also shows early healing. Technique choice also influences the success of skin grafts. Grada *et al.* (2018) [1] also observed that the age of animals affects wound healing. A similar finding with Nile tilapia graft. He mentioned that the Nile tilapia graft is an excellent candidate among xenografts in treating wounds. This displays an excellent wound management method.

Table 2: Time required for wound healing

Case no	Wound dimension Length, Width	Time required for granulation	Time required for healing
1.	12 cm, 5 cm	10 days	35 days
2.	15 cm, 6 cm	7 days	32 days
3.	8 cm, 4 cm	8 days	14 days
4.	17 cm, 7 cm	12 days	27 days
5.	9 cm, 3 cm	6 days	22 days
6.	11 cm, 4 cm	8 days	30 days



Pic 3: Case no 2 with initial wound



Pic 4: Case no 2 Application of Tilapia Fish Skin Graft



Pic 5: Healing of Skin wound after 32 Days



Pic 6: Wound dehiscence after Suturing



Pic 7: Wound Dressing



Pic 8: Application of Skin graft



Pic 9: Wound Healing after 35 days.



Pic 10: Puppy with wound dehiscence Post Amputation



Pic 11: Application of Tilapia Skin Graft



Pic 12: Granulation after 8 days.



Pic 13: Wound 14 days post graft

Conclusion

Skin can regain its strength through precise wound management. Tilapia skin graft increased the rate of wound healing, decreased pain, and required dressing changes. It is a very cost-effective technique for use in animals. This xenograft has shown superior outcomes in both function and aesthetics. It may be a good substitute for treating superficial and partial-thickness wounds. A wound with a tilapia graft heals depending on the wound's size and the animal's age. Wounds in young animals show early wound healing. An appropriate selection procedure is required for fast wound healing.

Conflict of Interest

Not available.

Financial Support

Not available.

References

1. Grada A, Mervis J, Falanga V. Research techniques made simple: animal models of wound healing. *J Invest Dermatol.* 2018;138(10):2095-105.
2. Edmar ML, Manoel OMF, Bruno AC, Francisco VF, Maria EAM, Francisco RS, *et al.* Innovative treatment using tilapia skin as a xenograft for partial thickness burns after a gunpowder explosion. *J Surg Case Rep.* 2019;(6):1-4.

3. Ghosh B, Sánchez VD, Parvati P, Anam SMA, Dominique O, Shahtaj AS, *et al.* Use of Nile tilapia fish skin in treatment for burn victims. *Int J Surg Glob Health.* 2023;6(5):1-5.
4. Khurshid A, Steven LAJ. Acellular fish skin grafts for management of split thickness donor sites and partial thickness burns: A case series. *Mil Med.* 2019;184(Supplement_1):16-20. Available from: <https://doi.org/10.1093/milmed/usy280>
5. Lv K, Wang L, He X, Li W, Han L, Qin S. Application of tilapia skin acellular dermal matrix to induce acute skin wound repair in rats. *Front Bioeng Biotechnol.* 2022;9:1-10.
6. Xuewei Z, Chen X, Hua H, Rubei H, Jiashang L, Changsheng L, *et al.* Decellularized extracellular matrix scaffolds: recent trends and emerging strategies in tissue engineering. *Bioact Mater.* 2022;10:15-31. Available from: <https://doi.org/10.1016/j.bioactmat.2021.09.014>
7. Yang CK, Polanco TO, Lantis JC. A prospective, postmarket, compassionate clinical evaluation of a novel acellular fish-skin graft which contains omega-3 fatty acids for the closure of hard-to-heal lower extremity chronic ulcers. *Wounds.* 2026;28(4):112-118.
8. Luze H, Nischwitz SP, Smolle C, Zrim R, Kamolz LP. The use of acellular fish skin grafts in burn wound management - A systematic review. *Medicina.* 2022 Jul 9;58(7):912.
9. Alam K, Jeffery SL. Acellular fish skin grafts for management of split thickness donor sites and partial thickness burns: A case series. *Military medicine.* 2019 Mar 1;184(Supplement_1):16-20.

How to Cite This Article

Agivale SM, Shende HU, Mehendale SV, Ram GR, Salunke VM, Ulemale AH, *et al.* Use of tilapia fish (*Oreochromis niloticus*) skin graft for chronic wound management in six dogs. *International Journal of Veterinary Sciences and Animal Husbandry.* 2024;9(4):522-526.

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