



**The Libyan International Medical University
Faculty of Basic Medical Science**



Tilapias Skin Burn Bandage

Mohamed Mahmoud Burnia

2157

Supervised by: Dr. Osama Othman.

Assisted by: Dr. Marwa Yousef.

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Abstract:

This report shall cover a modern method to treat second and third degree burns using the tilapias skin as a bandage, you will also find a definition about the tilapias fish, the component of the tilapias skin, types of the tilapias fish, the way that the tilapias skin works to treat second and third degree burns, and some cases that can proof the effectivity of the talipias skin burn bandage treatment.

Introduction:

Tilapia are primarily freshwater fish that live in shallow streams, wetlands, rivers, and lakes, and are less commonly found in brackish water. Dating back to 2002, Tilapia is the fourth most eaten fish in the United States. Due to its low cost, simple preparation, and mild taste, tilapia's popularity came about.⁽⁸⁾



The tilapias can treat two types of burns which are second degree burns. Second degree burns are divided into 2 types which are: superficial partial-thickness burns and extreme partial-thickness burns. Some portion of the skin appendages remain viable in these burn injuries, allowing the burn wound to be healed epithelially without skin grafting. Superficial partial burning includes the epidermis and superficial (papillary) dermis, frequently leading to thin-walled, fluid-filled blisters. These burns look red, hot, and gentle. When held by a gloved hand, they are exquisitely fragile. By outgrowth of epithelial buds from viable pilosebaceous units and sweat glands residing in the papillary and reticular dermis, they recover in about 2-3 weeks, normally without scarring.

The other type that the talipes can treat is the third degree burns. They are burns of full thickness which destroy both epidermis and dermis. The dermis capillary network is totally destroyed. Burned skin with underlying clotted arteries has a white or leathery look and is anesthetic. Unless a third-degree burn is small enough to heal by contraction (< 1 cm), skin grafting is always required for the burned area to resurface. Scalds of the immersion, flame burns, chemical and high-voltage electrical wounds.⁽⁶⁾

The tilapias skin has high levels of type 1 collagen. Type I collagen is the most prevalent collagen present in nearly all connective tissues, collagen type 3 is a collagen of fibrillar and consists of only one α collagen chain, that the amount of collagen proteins, types 1 and 3, which are very important for scarring, exist in large quantities in tilapia skin, even more than in human skin and other skin, unlike most other collagen. It also contains high levels of moisture which is a liquid diffused or condensed in the tilapias skin.⁽⁵⁾

Collagen is a central protein of the extracellular matrix structurally and functionally, which is also involved in scar formation during connective tissue healing. The skin of tilapia is applied directly to the burned area and covered with a bandage, without any cream being needed. Doctors remove the bandage after about 10 days. It is possible to peel off the tilapia skin, which has dried out and loosened from the burn. The tilapia skin, which has dried out and loosened from the burn, can be peeled away easily.⁽¹⁾

Tilapia skin is a frugal and safe way to treat second- and third-degree burns patients. This fish skin contains large quantities of moisture and proteins of type I collagen at levels comparable to human skin. Which will prevent scarring while promoting the healing of wounds.

Aim:

The purpose of this report is to know how the heal skin burns with a skin fish called the tilapias fish. And to know the rate of success of this treatment.

Material and methods:

A 23-year-old male patient, with no comorbidities, arrived at a burn treatment center in Fortaleza, Brazil after a thermal injury caused by contact with flames from a gunpowder explosion. Superficial partial thickness burns (SPTB) were present in right upper limb and deep partial thickness burns (DPTB) were present in left upper limb, face and anterior and posterior thorax. Involvement of 16% of total body surface area was calculated with the Lund and Browder chart. After admission as inpatient, he was resuscitated with intravenous fluids using the Parkland formula and remained hemodynamically stable. Local Institutional Review Board approval and written permission from the patient were obtained, in accordance with the Declaration of Helsinki. No conflicts of interest are present.⁽⁴⁾

Result:

The tilapias skin treated the burn that it was in the right upper limb and in the left upper limb therefore the tilapias skin burn bandages perfectly treated the burn without leaving any scars or any changes in the previously burned skin.

Discussion:

What is the tilapias fish? Will the tilapias fish is a species of freshwater, plant-eating fish, and chances are you ate it last year. On average, each American eats more than 1 pound (lb) of the fish each year. Today, it's the fourth most consumed fish in the United States, after tuna, salmon, and Alaskan pollock. Tilapia is an inexpensive, mild white fish that's easy to prepare and cook, making it an appealing dinner choice. But beyond taste, it's the farming practices that have caused tilapia to explode in popularity. Nicknamed the "aqua-chicken," tilapia can be produced on a mass scale, allowing the fish to be widely available at a high quality and an affordable price.⁽⁸⁾

Tilapias fish's skin has many components, but the main component is collagen, as we all know that collagen is a natural polymer commonly used in pharmaceutical products and nutritional supplement because of its biocompatibility and biodegradability. Collagen is a fibrous protein that protects various tissues, with repeated units of glycine-proline-hydroxyproline forming its primary structure. Because of the risks of animal-borne disease, traditional sources of collagen, such as

bovine and pig skins or chicken waste, restrict their use. The tilapias fish contains type 1 and 3 collagen, although type (1) is the most abundant, the collagen produces another type of protein called gelatin, which is a nearly colorless and tasteless water-soluble protein derived from collagen and used in food preparations, in photographic processes, and in glue.⁽¹⁾

The skin of the tilapias fish is similar to the human skin and without any microbes, therefore the mechanism of action of the tilapias skin healing the human skin is similar to the wound healing process, which is divided into four phases, first phase homeostasis, the second phase is defensive or inflammatory, the third phase is the proliferative phase, the fourth and last phase is the maturation phase, the homeostasis phase is when the Platelets aggregate and degranulate, leading to clot formation and release of growth factors (GFs) and cytokines. Those, in turn “call” neutrophils, eosinophils, and monocytes to initiate the inflammatory phase (IF), the inflammatory phase Proteolytic enzymes secreted by inflammatory cells nudge the ECM to give rise to peptides, which in turn activate macrophages and additional neutrophils to secrete proinflammatory cytokines (tumor necrosis factor- α and interleukin-1b), which directly influence deposition of collagen in the wound by inducing collagen synthesis via fibroblasts and downregulating tissue inhibitors of matrix metalloproteinases (MMPs). Various GFs stimulate fibroblast, epithelial, and endothelial cell migration. In the proliferation phase the cleavage products from collagen degradation stimulate fibroblast proliferation and GF production, leading to ECM and vascular endothelial proliferation. Collagen cleavage products also stimulate keratinocyte migration from the edge of the wound over new granulation tissue, leading to reepithelialization. The last phase is the maturation phase, the goal in this phase is to achieve the balance between synthesis of new matrix and degradation by MMP's (matrix metalloproteinases).⁽³⁾

A case of car mechanic Antonio Janio badly burned his arm when a cylinder of soldering gas leaked, Odorico de Morais the doctor applied the tilapias bandage directly in the burned area of his arm without any cream needed. After 10 days the doctors removed the bandage, which as dried and loosened from the burn and can be peeled away. “Use the tilapia skin. It’s excellent,” Janio said. “It takes the pain away. You do not need to take medicine. In my case, I did not need it, thank God.” “The use of tilapia skin on burns is unprecedented,” said Odorico de Morais, “The fish skin is usually thrown away, so we are using this product to convert it into something of social benefit.”⁽²⁾

We have another case which talks about Maria Ines Candido da Silva a 36 years old female works as a waitress at a restaurant in north east Brazil. An explosion from a gas canister at the restaurant she was working at caused severe burns to her arms, neck and some of her face. The doctors recommended the women to try the tilapias skin burn bandage treatment that has no side effects, 'I was in absolute agony and desperate for anything to ease my suffering,' said Miss da Silva. There for the patient accepted the doctor recommendation and asked the doctor to start this treatment immediately. So the team of doctor José Frota Institute Burns Unit in Fortaleza applied the skin of the tilapias fish in her arms, neck and her face. After the bandage dried out the doctors peeled it away from the burned areas, the outcomes were outstanding the patients arm, neck and face were treated without any scars or other changes in the burned areas. 'I loved the treatment and would recommend it to anyone who has suffered like me.' Said Miss da Silva.⁽⁷⁾

By noticing these two cases showed the success of the tilapias skin burn bandage treatment. The man’s arm treated perfectly without any side effects, as well as for the women’s arms, neck, and face. From this we can know that the tilapias skin burn bandage has showed a great results in treating the burned skin of the human without leaving any scars. So we can say that this treatment is effective and should be considered as a first line in treating the second and third degree burns.



Conclusion:

To conclude, the tilapia skin burn bandage is an effective way and fast way to treat skin burn bandages without any side effects and it's easy to use, the skin of tilapia is similar to the human skin, it has two main components which are collagen type 1 and type 3 which are important for the burn healing. The mode of action of this fish is similar to the human wound healing mode of action which is divided into four phases, which are homeostasis, inflammatory response, proliferative, and lastly maturation phase. Lastly, we talked about two cases, a car mechanic and a waitress who both had burns and both of them got treated by the tilapia skin burn bandage.

References:

1. Valenzuela-Rojo DR, López-Cervantes J, Sánchez-Machado DI. Tilapia (*Oreochromis aureus*) Collagen for Medical Biomaterials. In *Seaweed Biomaterials* 2018 Nov 5 (p. 47). IntechOpen: <https://www.intechopen.com/books/seaweed-biomaterials/tilapia-oreochromis-aureus-collagen-for-medical-biomaterials>.
2. Whitaker P, Garcia P. Brazilian doctors use fish skin to treat burn victims.[online] 2017 [Cited 2017 May 28]:<https://www.reuters.com/article/us-health-brazil-burns/brazilian-doctors-use-fish-skin-to-treat-burn-victims-idUSKBN18L1WH>.
3. Eming SA. Introduction to wound healing and tissue repair. In *Atlas of Ulcers in Systemic Sclerosis* 2019 (pp. 39-41). Springer, Cham: https://link.springer.com/chapter/10.1007/978-3-319-98477-3_5.
4. Lima Júnior EM, De Moraes Filho MO, Costa BA, Rohleder AV, Rocha S, Becker M, Fechine FV, Forte AJ, Alves AP, Silva Júnior FR, Martins CB. Innovative Burn Treatment Using Tilapia Skin as a Xenograft: A Phase II Randomized Controlled Trial. *Journal of Burn Care & Research*. 2020 Jan 4: <https://academic.oup.com/jbcr/article-abstract/40/5/714/5492723>.
5. Sherman VR, Yang W, Meyers MA. The materials science of collagen. *Journal of the mechanical behavior of biomedical materials*. 2015 Dec 1;52:22-50: <https://www.sciencedirect.com/science/article/pii/S1751616115001903>.
6. Hettiaratchy S, Dziwulski P. Pathophysiology and types of burns. *Bmj*. 2004 Jun 10;328(7453):1427-9: <https://www.bmj.com/content/328/7453/1427.short>.
7. Lima-Junior EM, de Moraes Filho MO, Costa BA, Fechine FV, de Moraes ME, Silva-Junior FR, Soares MF, Rocha MB, Leontsinis CM. Innovative treatment using tilapia skin as a xenograft for partial thickness burns after a gunpowder explosion. *Journal of Surgical Case Reports*. 2019 Jun;2019(6):rjz181:
8. Wikipedia: <https://en.wikipedia.org/wiki/Tilapia>.

