



Eggs and Abdominal Membrane of Tunga Penetrans as Promoters of the Cicatrization Process of Cutaneous Wounds

Alberto José Piamo Morales^{1*} and Mayra García Rojas²

¹Maternal Child of Amazonas. Pathological Anatomy Department, Puerto Ayacucho, Venezuela.

²Maternal Child of Amazonas. Gynecology and obstetrics service, Puerto Ayacucho, Venezuela.

Abstract

Introduction: There is a global level the need to create new and effective therapeutic strategies that improve and accelerate the scarring processes of chronic ulcers, it is possible that the components of the Gestation of T. Penetrans could generate or promote the healing process.

Methods: A controlled experimental study was carried out in a cutaneous wound a mixture of eggs and abdominal membrane of T. penetrans, which was obtained from a T. gravid penetrans (8 days) that was on the skin from the foot of the same individual and was extracted by means of surgical decapitation of the cutaneous ampoule, said biological material was deposited in a recent sterile glass that with subtle circular movements partially homogenized.

Results: In the experimental wound, the formation of an initial brown yellow crust was observed in a period of 6 hours. At 48 hours, the crust was thick and very dark, which rose above the surface of the skin. In the HC the coast is still yellowed remained below the surface of the brink of healthy skin. At 5th day of evolution, the retraction of the crust was greater in the HE as well as the edges of the injury. Both wounds heal in equal time, however it could be appreciated that there was a slight depression in the control while in the experimental wound the neoformation tissue was at the level of the surrounding skin.

Conclusions: The properties of a mixture of eggs and abdominal membrane of T. penetrans are demonstrated to stimulate the effective healing of a cutaneous wound.

KEYWORDS: Tunga penetra; Healing; Inflammation; Wound; Eggs.

INTRODUCTION

While most chronic wound treatments are related to wound bandages, [1] active treatment such as enzymes, skin grafts and growth factors are emerging with great potential as they improve the healing process [2]. Motivated by finding new therapeutic strategies that improve and accelerate the healing processes, a first experimental trial was performed in vivo in which Eggs and abdominal membrane of Tunga Penetrans were applied in a cutaneous wound and healing was compared with a control wound to the which only general measures of asepsis were applied. This hypothesis, that the components of the Gestation of T [3]. Penetrans could generate or promote the healing process arose after observing in dozens of patients the natural evolution of lesions by tungiasis, once these ectoparasites die or are extracted, producing A thick and hard black crust (Figure 1) [6-7].

T. Penetrans is an ectoparasite of a millimeter long (Figure 2), it is endemic in countries of Latin America, the Caribbean and Sub-Saharan Africa, [4] whose

*Correspondence:

Alberto José Piamo Morales, Maternal Child of Amazonas, Pathological Anatomy Department, Puerto Ayacucho, Venezuela.

Article Type: Review Article

Received: 07/11/2021

Published: 09/12/2021

Citation:

Alberto José Piamo Morales^{1*} and Mayra García Rojas². Eggs and Abdominal Membrane of Tunga Penetrans as Promoters of the Cicatrization Process of Cutaneous Wounds

Op Acc Jour of Sur & Case Stud 3(1)-2021.

Copyright © All rights are reserved by Alberto José Piamo Morales^{1*} and Mayra García Rojas²



Figure 1: Scar formation in the corneal stratum between four and six weeks after the infestation.



Figure 2: Tunga Penetrans female.



Figure 3: Application of the mixture of eggs and abdominal membrane of *T. penetrans*. Eggs and membrane of *T. penetrans* are observed

permanent penetration in the skin produces the tungiasis [5]. The periungueal region of the fingers of the feet is the preferred site by the flea, although the infestation can also occur in the hands, elbows and the genital and anal region. After penetrating the host epidermis, the flea suffers a peculiar hypertrophy as eggs are They develop within their abdomen to become a globular neosome, in a period of 3 weeks, hundreds of eggs are produced and expelled through the subsequent abdominal segments protruding in the corneous stratum [9].

METHODS

Study Design and Population

An experimental controlled study was carried out in which 3 male individuals, white skin without personal pathological history of diabetes mellitus or venous insufficiency were performed in lower limbs. In each individual, a surgical wound was performed in the middle third of the anterior face of each thigh, in the form of an eyelet of 1.2 x 0.5 cm with a depth of 0.3 cm.

After ASEPSIA of the area, 1 cc Lidocaine was administered to 2% and subsequently incision was made with scalpel n ° 22, compressive hemostasis was then performed and then occluded with sterile and adhesive Gaza for a period of 6 hours. Subsequently, the wound was uncovered and when corroborating the ceasefire, a mixture of eggs and abdominal membrane of *T. penetrans* (Figure 3) was applied, which was obtained from a *T. GRAVIDA T. PRANS* (8 days) That was in the skin of the foot of the same individual and extracted by means of surgical decapitation of the cutaneous ampoule, said biological material was deposited in a recent sterile glass that with subtle circular movements partially homogenized. At 72 hours and at 6 days applied, the egg mixture and abdominal membrane of *T. penetrans* was carried out culture of the surface of the wounds [8].

Data Collection

The wound was evaluated daily, with measurements of its dimensions with a millitheld rule. As well as direct observation of the characteristics of the scarring crust: appearance, color and retraction of the crust, retraction of the edges, pigmentation and size of the wound. Signs of inflammation (increase in temperature and volume, pain, flushing and swelling) and infection of the surrounding wound or tissues, systemic effects were also evaluated as a fever, regional adoiners (inguinal) [10].

Ethical Consideration

Each individual was carried out detailed explanation of the proceedings and on the topical application of a mixture of eggs and abdominal membrane of *T. penetrans*.

The acceptance to participate in the experimental study was formalized with the signing of a document called informed consent, which each participant read and after his understanding, signed [11].

RESULTS

On both thighs, a surgical wound was performed in the shape of 1 x 0.5 x 0.3 cm; The one on the right side was selected to be the experimental wound (HE) on which the mixture of eggs and abdominal membrane of *T. penetrans* was applied; and that of the left thigh represented the control wound (HC) on which only general measures were applied. After a period of 6 hours of applied the mixture of eggs and abdominal membrane of *T. penetrans* was observed the formation of an initial brown yellow crust in the HE with slight retraction of the edges of the lesion, while in the HC the Formation of a yellowish moist layer [12].

At 48 hours in the HA, the crust was thick and very dark, which rose above the surface of the skin. In the HC, the coast still yellow remained below the surface of the brink of healthy skin (Figure 4). At 5th day of evolution, the

retraction of the crust was greater in the HE as well as the edges of the injury. At 10 days of evolution, in both wounds the crust was reduced; And at 14 days the scientist of the HC had fallen and in HE I still persisted a small central crust. The valuation of day 18 allowed us to observe that both wounds had scarred, however it could be appreciated that in the HC there was a slight depression while in the wound I have the neoformation tissue was at the level of the surface of the surrounding skin (Figure 5) [13].

In one of the individuals, the mixture of eggs and abdominal membrane of *T. penetrans* was observed after 24 hours of applied, the formation of a light erythema with 0.5 cm diameter, accompanied by pruritus, which slowly disappeared to the 72 hours None of the patients developed adverse events during application the mixture of eggs and abdominal membrane of *T. penetrans*. The cultures of the surface of the wounds were negative for bacterial growth [14].

DISCUSSION

Once the penetration is completed, *T. Penetrans*

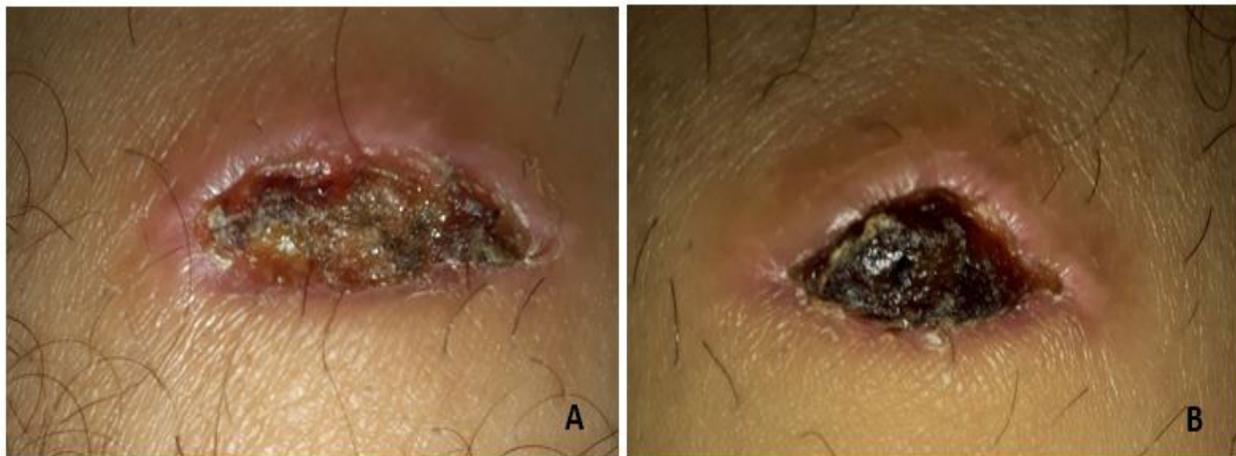


Figure 4: 48-hour period of applied the mixture of eggs and abdominal membrane of *T. penetrans*

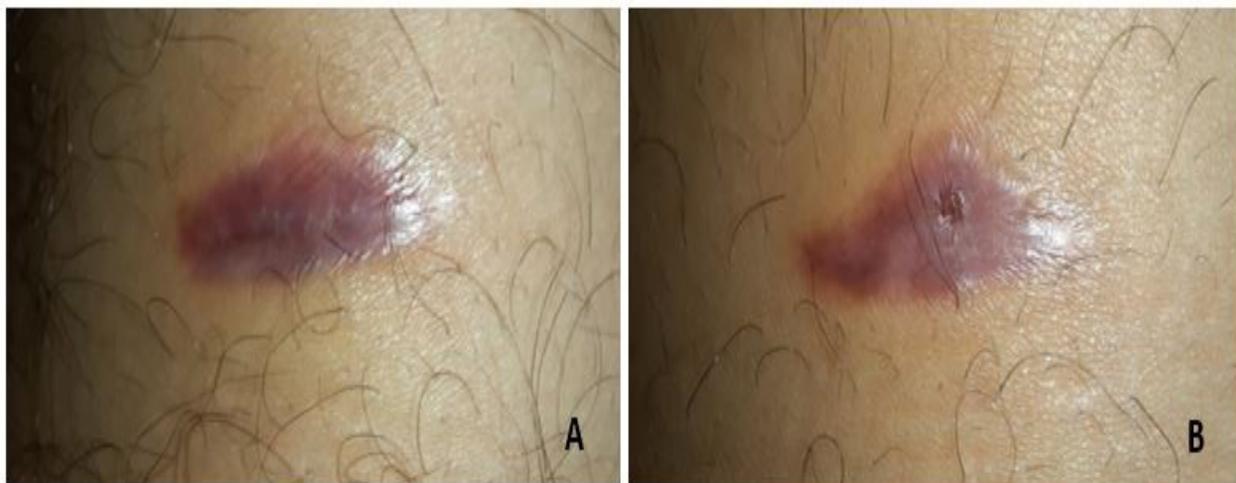


Figure 5: 18-day period of applied the mixture of eggs and abdominal membrane of *T. penetrans*

begins its feeding and the hypertrophic enlargement of the abdomen,¹¹ called neosomy or new body,^{12,13} which is completed on day 6, when it begins to expel the eggs, which are ovoids and They measure around 600 x 320 μm¹¹ that are "expelled one after another, like the cartridges of a machine gun connected together by a viscose substance";¹⁴ or one by one in Rachas [15-18]. After the death of the flea (as part of its life cycle or surgical extraction), the lesion is covered by a thick black crust, leaving an epidermal scar,¹⁶ that microscopically corresponds to acantosis and parakeratotic hyperkeratosis, as well as areas Multifocals of moderate epidermal and dermal necrosis.¹⁷ This fact was the one that I call the attention of the researcher to plant the hypothesis that it was possible to reproduce that cicatrization process in cutaneous wounds [19].

In the present study, in the wound in which the mixture of eggs and abdominal membrane of *T. penetrans* was applied, a thick crust of considerable consistency was formed in a short period (6 hours), which represent a protection of the external environment favoring the creation of a humid environment that promotes scarring.

In addition, in one of the individuals, the mixture of eggs and abdominal membrane of *T. penetrans* was observed after 24 hours of applied, the formation of a slight erythema with 0.5 cm diameter, accompanied by pruritus, which is It corresponds with an inflammatory reaction that coincided with the inflammatory phase of healing [20].

This inflammatory reaction that could be favoring the highly orchestrated sequence of events that occur during healing, is quite possibly promoted by the components of *T. penetrans*, such as:

-Eggs, exoskeleton formed by a coarse eosinophilic cuticle that delimits the body cavity.

The different components of the digestive tract that includes rarestone muscle beams and a simple cubic epithelium coating with irregular granular content pardusco.¹⁷

- Ovaries with sizes 155 to 220 μm diameter.¹⁷

- The saliva could be playing an important role, since Verardi et al.¹⁸ propose the hypothesis that the ampoule is produced as a result of a reaction to unknown flea antigens contained in its saliva. Therefore, it is necessary to isolate the flea saliva to perform trials on the promoted immune response.

- *Wolbachia* SPP: The presence of this endoscopinte in the Ovaries of *T. Penetrans* has been associated with abnormal immunological responses in diseases such as onchocerciasis,^{3,19} according to Heukelbach et al.²⁰, the accumulation of neutrophils and macrophages in the

Immediates of neosomical fleas infected with *Wolbachia* embedded in human tissue. The prevalence of this endobacteria in *T. penetrans* is 100%,²⁰ being found in fleas in Ghana, East Africa and Fortaleza, Brazil, South America [21]. One aspect to be highlighted is that no infections were observed, checked by the clinic and by cultivation of the surface of the wounds from the application of the egg mixture and abdominal membrane of *T. penetrans* to the closure of the wound. One infection could be expected since it is described that, in the skin lesions by tungiasis, cases of erysis, tetanus, cellulite, gaseous gangrene, necrosis, septicemia, and even death of the patient can be expected [22]. This finding shows that the application of mixing of eggs and abdominal membrane of *T. penetrans* is a safe treatment in patients with cutaneous wounds.

LIMITATIONS

Histopathological studies were not carried out, nor were chemical mediators related to the inflammation process characteristic of wound healing.

CONCLUSION

In this small experimental trial, the properties of a mixture of eggs and abdominal membrane of *T. penetrans* were demonstrated to stimulate the effective healing of a cutaneous wound. Studies must be carried out to clarify the possible mechanisms by which the mixture of eggs and abdominal membrane of *T. penetrans* contributes to healing.

Reference

1. Avila RM, Rodríguez BL, Sánchez ML (2018) Collagen: A review on its sources and potential cosmetic applications. *J Cosmet Dermatol* 17: 20-26.
2. Meléndez, Plenge TL, Gatica CA, Cruz PM, Aguilar YJ, et al. (2020) Functional mining of the crotalus spp venom protease repertoire reveals potential for chronic wound therapeutics. *Molecules* 25(15): 3401.
3. Miller H, Rodríguez G (2010) Tungiasis en población indígena del departamento de Vaupés: epidemiología, clínica, tratamiento y prevención. *Biomédica* 30: 215-237.
4. Heukelbach J, Sahebali S, Van Marck E, Sabóia Moura RC, Feldmeier H, et al. (2004) An unusual case of ectopic tungiasis with pseudoepitheliomatous hyperplasia. *Braz J Infect Dis* 8: 465-468.
5. Kamau TM, Ngechu RN, Haile ZT, Mwitari J (2014) An exploration of factors associated with jigger infestation (Tungiasis) among residents of Muranga North District, Kenya. *Int J Health Sci Res* 4(3): 1-8.
6. Feldmeier H, Eisele M, Saboia Moura R, Heukelbach J (2003) Severe tungiasis in underprivileged communities: case series from Brazil. *Emerg Infect Dis* 9: 949-955.
7. Audy JR, Radovsky FJ, Vercammen Grandjean PH (1972) Neosomy: radical intrastadial metamorphosis associated with arthropod symbioses. *J of Medical Entomology* 9: 487-494.
8. Goff ML, Loomis RB, Welbourn WC, Wrenn WJ (1982) A

-
- glossary of chigger terminology (Acari: Trombiculidae). *J of Medical Entomology* 19: 221-238.
9. Linardi PM, Família Tungidae, (2000) *Sifonápteros do Brasil* (ed. by P. M. Linardi and L. R. Guimaraes): 48-53.
 10. Heukelbach J Tungiasis (2005) *Rev Inst Med trop. S Paulo* 47(6): 307-313.
 11. Nagy N, Abari E, D Haese J, Calheiros C, Heukelbach J, et al. (2007) Investigations on the life cycle and morphology of *Tunga penetrans* in Brazil. *Parasitol Res* 101(2): 233-242.
 12. Feldmeier H, Eisele M, Van Marck E, Mehlhorn H, Ribeiro R, et al. (2004) Investigations on the biology, epidemiology, pathology and control of *Tunga penetrans* in Brazil: IV. Clinical and histopathology. *Parasitol Res* 94(4): 275-282.
 13. Franck S, Feldmeier H (2003) Investigations on the biology, epidemiology, pathology and control of *Tunga penetrans* in Brazil: I. Natural history of tungiasis in man. *Parasitol Res* 90: 87-99.
 14. Quirós D (1916) *Biología de la nigua*. *Anales del Hospital de S José de Costa Rica* 2: 1-17.
 15. Geigy R, Herbig A (1949) Die Hypertrophie der Organe beim Weibchen von *Tunga penetrans*. *Acta Tropica* 6: 246-262.
 16. Heukelbach J, De Oliveira FA, Hesse G, Feldmeier H (2001) Tungiasis: a neglected health problem of poor communities. *Trop Med Int Health* 6(4): 267-272.
 17. Schott D, Ribeiro PR, de Souza VK, Eichenberg LS, Blaese de Amorim D, et al. (2020) Clinical and pathological aspects of first report of *Tunga penetrans* infestation on southern brown howler monkey (*Alouatta guariba clamitans*) in Rio Grande do Sul, Brazil. *J Med Primatol*. 2020; 49: 315-321.
 18. Verardi S, Schianchi R, Cremonesi R (2005) Bullous tungiasis. *Int J Dermatol* 44: 1067-1069.
 19. Vergara MC, Barthel ME, Labarca ME, Neira OP, Espinoza ER, et al. (2009) "Tungiasis afecta a un turista chileno". *Rev Chilena Infectol* 26(3): 265-269.
 20. Heukelbach J, Bonow I, Witt L, Feldmeier H, Fischer P, et al. (2004) High infection rate of *Wolbachia* endobacteria in the sand flea *Tunga penetrans* from Brazil. *Acta Tropica* 92: 225-230.
 21. Fischer P, Schmetz C, Bandi C, Bonow I, Mand S, et al. (2002) *Tunga penetrans*: molecular identification of *Wolbachia* endobacteria and their recognition by antibodies against proteins of endobacteria from filarial parasites. *Experimental Parasitology* 102: 201-211.
 22. Leiro V, Novac V, Olivares L, Maronna E (2010) Tungiasis inusual: forma clínica ampollar. *Dermatol Argent* 16(5): 344-348.