

TRABAJO DE FINAL DE GRADO

PLANTAR PAPILOMA: A SURGICAL APPROACH

Enfoque quirúrgico del papiloma plantar



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SUMMARY

Summary: The plantar wart is a fairly common lesion that affects the entire population and that is caused by the human papilloma virus (HPV). Lesions vary in size and quantity and can become very resistant to non-invasive treatments causing detriment to the patient's quality of life. When this happens the treatment option to be considered is the surgical one. With this work we have tried to find a model that is as optimal as possible for a surgical procedure to deal with this lesion, avoiding the well-known post-surgical problems characteristic of an intervention in plantar tissue.

A secondary objective was to unify a criterion of surgical inclusion to avoid unnecessary interventions and not to ignore those that are. We carried out an initial bibliographic search of articles related to the surgical intervention of a plantar papilloma published in the biomedical databases of Pubmed, JAPMA and Google Scholar together with additional information obtained from podiatric and plastic surgery books. In the absence of scientific evidence and failure to obtain satisfactory results, a second search was made in the same sources based on articles related to the intervention of similar lesions located on the sole of the foot. The desired results were not obtained in the absence of material published to date but did shed light on the way to approach the plantar tissue avoiding the usual post-surgical problems and taking account of them.

Key words: Papilloma, plantar, surgery, plantar tissue, post-surgical problems, inclusion criteria

Abstract: La verruga plantar es una lesión bastante común en casi toda la población causada por el virus del papiloma humano (VPH). Las lesiones varían en tamaño y cantidad y pueden llegar a ser muy resistentes a tratamientos no invasivos y causar detrimento en la calidad de vida del paciente. Cuando esto ocurre la opción de tratamiento a plantearse es la quirúrgica. Con este trabajo se ha querido encontrar un modelo lo más óptimo posible de pauta quirúrgica para abordar esta lesión evitando los bien conocidos problemas postquirúrgicos propios de una intervención en tejido plantar. Como objetivo secundario se pretendía unificar un criterio de inclusión quirúrgica para evitar intervenciones innecesarias y no pasar por alto las que sí lo son. Se realizó una primera búsqueda bibliográfica de artículos relacionados con la intervención quirúrgica de un papiloma plantar publicados en las bases de datos biomedicas de Pubmed, JAPMA y Google Scholar junto con información adicional obtenida de libros de cirugía podológica y plástica. Ante la falta de evidencia científica y al no obtener unos resultados satisfactorios se realizó una segunda búsqueda en las mismas fuentes basada en artículos relacionados con la intervención de lesiones similares

localizadas en la planta del pie. No se obtuvieron los resultados deseados ante la falta de material publicado hasta la fecha pero si se consiguió arrojar luz en cuanto a la manera de abordar el tejido plantar evitando en lo posible los problemas postquirúrgicos habituales y que tener en cuenta para ello.

Palabras clave: Papiloma plantar, cirugía, tejido plantar, problemas postquirúrgicos, criterio de inclusión

INTRODUCTION

Warts or verrucas are benign proliferations of the skin and the mucous membrane produced by the human papillomavirus (HPV) [1]. These viruses do not cause acute symptoms or signs but induce a focal, slow expansion of epithelial cells. The injuries may remain subclinical for long periods of time or may rapidly transform themselves into large growths that can last from months to years [1, 2].

Papillomaviruses are DNA viruses of the papovaviridae family which are approximately 50nm big and infect a wide variety of animals including humans [3]. Within this family we have papillomaviruses and polyomaviruses where the first one's are the causative agent of HPV [1]. The papillomavirus genome is present within the viral particle as a covalently closed double strand of DNA. The HPV has a large number of genotypes of which about 118 have been sequenced. Each subtype may show a preference for certain areas of the body, for example [1, 3] :

- Cutaneous types or non genital: Encompasses flat and common warts and includes: HPV1, 2, 3, 4, 27 and 57
- Mucogenital types: HPV 6,11 (low risk of malignancy) and 16 and 18 (high risk of malignancy).
- Isolated types in patients with epidermodysplasia verruciformis: HPV 5 and 8. This last group is highly associated with malignant change or development.

HPV infection occurs via virus inoculation into viable epidermis through epithelial effects [1]. There are different factors in stake such as the amount of injectable virions at that moment, the location, the immune status of the exposed individual, etc. It is possible that in the case of plantar warts, maceration of the skin plays an important role. It indicates the incidence of HPV infection in swimmers who frequent public swimming pools [1, 2, 4].

Plantar warts normally appear over pressure points of the heel or metatarsal heads due to the stress produced by weight-bearing. The plantar skin is a defensive barrier that can grow rapidly in order to adapt itself to the weight-bearing, compression, torsion and friction produced by barefoot ambulation [1]. The plantar stratum corneum (SC) is over 60 times bigger than the one on the abdomen or the back. This is due to the greater amount of cells that are also thicker than the less keratinized from the SC on other sites [3, 4]. These conditions allow the pathogenic agents to produce lesions that are different from those produced by the same agent on other skin areas [3].

Therefore, in order for a persistent infection to be established, the virus must enter a basal epidermal cell and turn it into a cell with similar properties to those of a stem cell. By doing this when it divides, the genome will also replicate and distribute itself between each cell of the progeny and then it will ascend to the surface forming the different differentiated layers [4]. It is well known that the decrease in the frequency of wart appearance with ageing implies that resistance to the infection is developed over time, and much of this resistance may be immune [1, 3].

At the onset of the infection, a newly acquired lesion of slow, persistent, and often scaly expansion appears. Within weeks or months local expansion indicates an HPV infection [1].

In the case of plantar warts, the lesion begins as a small papule that soon changes and becomes a well-defined rounded lesion with a yellowish or brownish rough surface that is usually covered by a hyperkeratotic layer. As it grows inwards, it causes an acute pain during ambulation. When delaminating the superficial layers we will find little black spots that correspond to the thrombosed capillaries of the wart that can start bleeding if delamination is deepened. Mosaic warts are born from the coalescence of this type of warts on large plaques, but these are usually painless.

Among the clinical signs to reach the diagnosis of a plantar wart we have the little black spots that correspond to thickened capillaries, hyperkeratosis, non-continuity of skin dermatoglyphs above the lesion and the appearance, once the superficial layers of keratin have been delaminated, of the wart's capillaries that look perpendicular to the surface of the skin. Apart from these signs, to differentiate a wart from another plantar lesion of the hyperkeratotic type, such as an heloma, a lateromedial pinch is made which in the case of a wart, will produce acute pain. Although it is true that all these signs can be visually appreciated, a dermatoscope can be a useful instrument to perform a more accurate clinical diagnosis [5]. It is a non-invasive and inexpensive diagnostic technique that allows visualizing morphological characteristics that are not identifiable by the naked eye, facilitating a more accurate differential diagnosis and a resolution for the lesion.

It is well known that the common aim of the treatment is to remove the growths, but this does not always remove the infection [3]. Amongst the most popular non invasive therapeutic methods used are acids, such as lactic, salicylic, cantharidin, etc; alkalines like potassium hydroxide; salts such as silver nitrate; desiccating agents such as glutaraldehyde; freezing agents like liquid nitrogen; heat as the one produced by electro dissection; physical removal of the lesion as in curettage. This last option is used when pain cannot be relieved with non invasive measures, so in order to remove the pain, the growth's vascular structure and the growth itself is removed causing minimal peripheral damage [4]. There is controversy regarding the decision of surgical treatment of the plantar wart, because due to it's location, it offers a series of post-surgical complications.

OBJECTIVES

The main objective of this work is to find, through literature review, a surgical approach model for plantar warts, as well as to unify surgical inclusion criteria and to minimize postoperative problems that involve any intervention in plantar tissue.

METHODS AND MATERIAL

Potentially eligible articles were identified by means of a electronic research in Pubmed as the main biomedical database and also JAPMA (Journal of the Podiatric Medical Association) as well as Google scholar. Pubmed was chosen because of its open access to a wide variety of current biomedical literature and JAPMA and Google scholar were used to expand the search of relevant articles for this study. Additionally, different Podiatry and Plastic Surgical books were manually reviewed to find more relevant references. The keywords used to search for articles [plantar wart AND surgery], [plantar papilloma AND surgery], [plantar hypertrophic scar [plantar acanthosis OR plantar wart], [hypertrophic scar AND plantar wart] were introduced as text words for all searches. Clinical trials, literature searches, and case reports on surgical treatment of the plantar wart in the last 10 years were included. In view of the lack of bibliographic material and limited evidence found, articles that affected the surgical approach of different lesions on the sole of the foot were also included in order to unify criteria. In this case, the keywords were [plantar approach AND

foot], [plantar flap AND wart], [plantar flap AND scar], [plantar nevus AND foot AND surgery] and [skin Graft AND foot sole]

A total of 576 articles were initially identified. After applying the screening filters 534 were discarded because they were not related to the subject of this paper. Of the remaining 42, the abstract was read and 26 articles were discarded for failing to meet the inclusion criteria. At the end 16 final articles were chosen to study in depth selecting 6 for the final analysis since they were the most apt for this paper due to their characteristics. These items are reflected in Figure 1.

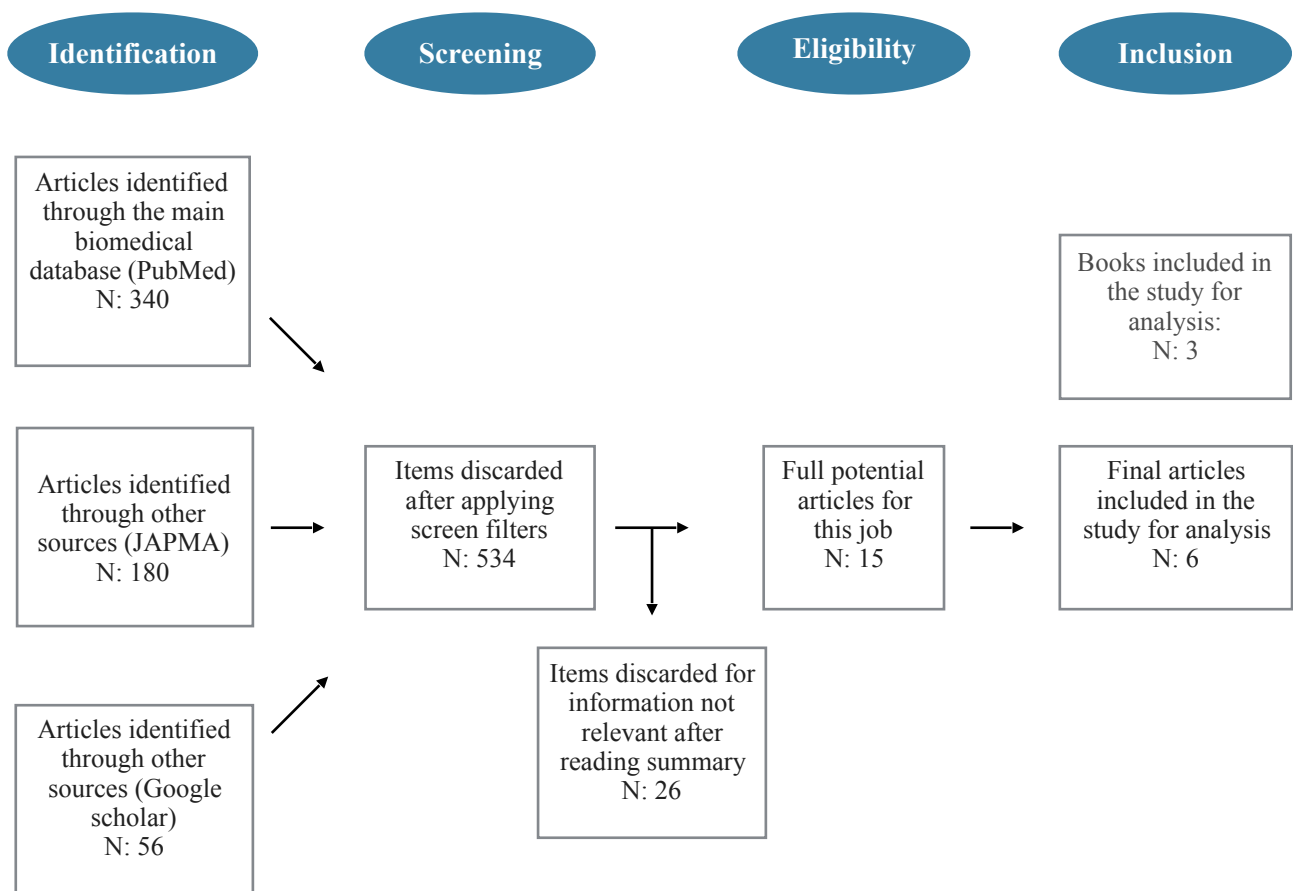


Fig 1. Flow diagram showing the selecting process

RESULTS

Relevant information for this work was extracted out of each bibliographic source previously evaluated. Since there is little bibliographical evidence found about the subject that interests us, we proceeded to investigate other surgical approaches of similar lesions, especially those located in the sole of the foot, that made reference to the cicatrization and its possible complications. The data and information obtained shed light on the choice of an optimal approach although there is no consensual technique. Therefore the main objective of the our research is not fulfilled in this case since it hasn't been possible to find a surgical model. However, according to the information gathered, a series of guidelines or recommendations can be drawn that can serve to help us to go into the subject in greater depth and develop a new technique. The summary of the results of the analyzed sources can be found in Table 1 and 2.

Source	Surgical approach	Closure and pos-surgical procedure	Results
Lichon et al [3]	Extraction of infected tissue by Dissection, electrodissection or curettage		Pain, hypertrophic scar, appearance of heloma by inclusion in the area where the wart was.
Novel et al [6]	Preform an incision at 2 mm from the perimeter of the lesion at 45 °, bordering it, resecting it and curetting the area.	If the lesion does not bleed, cure with enzymatic ointment. If the injury is bleeding, cure with hemostatic gauze.	Risk of infection, hypertrophic scar, heloma by inclusion and recurrence.
Southerland et al [9]	Excision of the lesion leaving a 2-4mm surrounding margin using curettage. Termed excochleation uses a Freer elevator to separate the lesional tissue from the healthy one.		Better results with termed excochleation than with curettage. It provides an excellent specimen of tissue to be biopsied and leaves the field ready for ablative surgery, should it be chosen.
Wolf et al [1]	Resection of the lesion by curettage or electrodissection when topic treatments do not work.		Hypertrophic scar Relapse

Table 1. Summary of information on wart surgical approach extracted from sources.

Source	Surgical approach	Closure and pos-surgical procedure	Results
Kundert et al [7]	Performing a longitudinal incision -in Morton's neuroma-	Suture 2-0 nonabsorbable single points avoiding inversion of edges when approaching them. Post-operative time: approximately 2 weeks	Painful scar located in support zones (weight-bearing). Surgery-activated superficial plantar fibromatosis that can produce keloid formation The longitudinal incision respects the lines of tension of the skin in relaxation which favors the cicatrization.
Jung et al [12]	Resection of the lesion by its periphery leaving 0.5 to 2 cm of margin according to the depth of Breslow - lentiginous melanoma	Occlusive healing by second intention.	Risk of infection, too much curing time, frequent bandage change. The granulation tissue that forms could act as a cushion to absorb the impact when walking and thus reduce post-surgical discomfort.
Hong et al [10]	Resection of the lesion and replacement of the same by perforator free flaps that come from the anterolateral region of the thigh.	Recovery around 3 months (when coaptation occurs and sensitivity begins to recover).	The flap provides an ideal fat pack for weight-bearing areas. Insufficient blood supply would result in flap rejection and risk of necrosis. Possible loss of sensitivity Bad healing (hypertrophy).
Southerland et al [9]	Extraction of the lesion using a unilobed flap		The scar would not be parallel to the stress lines of the skin in relaxation, translating into risk of hypertrophic scarring, hyperkeratosis and heloma by inclusion.
Habashy et al [8]	Performing a longitudinal incision -in Morton's neuroma-		Atrophy of the adipose package located below the areas of more support producing a possibility of inversion of scar hypertrophy. Plantar hyperkeratosis. The longitudinal incision respects the lines of tension of the skin in relaxation which favors the cicatrization.
feily et al [11]	Resection of the lesion and replacement of the same by split skin grafting (flap that encompasses the epidermis and part of the dermis).		Provides an ideal fat pack for weight-bearing areas. Insufficient blood supply would result in flap rejection and risk of necrosis. Possible loss of sensitivity Bad healing (hypertrophy).

Table 2. Summary of information on plantar surgical approach extracted from sources.

DISCUSSION

There are several non-invasive treatments for plantar warts that usually end up resolving the lesion. When this is not the case, a bloody or invasive procedure is performed, such as surgery. This literature review was performed to determine clearer surgical inclusion criteria than those currently in existence as well as a surgical technique that minimizes the possible adverse effects of a plantar tissue intervention.

The results showed controversy and a clear lack of scientific evidence regarding the subject. In a first search the expected results were not obtained, being the curettage or the electrodissection of the lesion the main techniques found. No clear solution was found to prevent hypertrophic scarring or the appearance of a heloma by inclusion or hyperkeratosis in the area. Resection of the lesion with curettage and without specifying how to perform the closure or the post-surgical regimen [1, 3, 4] was the main result after a search based exclusively on plantar wart interventions. Novel et al [6] includes a perilesional margin of 2 mm and indicates that the incision should be made at 45° of the lesion and proposes a guideline to perform the closure considering bleeding or non-bleeding when choosing a cure by first or second intention. In all cases the risk of hypertrophic scar, heloma by inclusion, hyperkeratosis, infection and recurrence is exposed.

Not meeting the objectives of the work in first instance and given the scarce useful material found for this review, we proceeded to perform a second search based on the approach of a localized lesion on the sole of the foot. It has become clear that there is controversy as to the technique to be used and that the level of post-surgical dissatisfaction of patients is high due precisely to the problems mentioned. This second search aims to unify criteria in order to find an optimal plantar approach that evidently includes an improvement in quality of life for the patient. Among the information extracted from this second search we see that Kundert et al [7] and Habashy et al [8] perform studies near the plantar approach for a specific lesion. This can be extrapolated to the issue that concerns us, regarding the orientation of the incision they perform. A longitudinally oriented incision respects the lines of tension of the skin in relaxation favoring the healing of the tissue. It is also true that the results may not be desired if you work on weight bearing areas such as metatarsal heads or heels where a plantar fibromatosis can be triggered by surgery or an atrophy of the adipose package below the weight bearing areas could occur and cause an inversion of the edges of the scar resulting in hypertrophy of the same or hyperkeratosis in the area. Southerland et al [9], Hong et al [10] and Feily et al [11] opt for the use of grafts or flaps to treat different lesions of the sole of the

foot based on the preservation of the adipose package present in the weight bearing areas which is also indicated in the case of warts due to their usual situation. While it is true that the adipose package is preserved, since it includes the epidermis, dermis and part of the hypodermis, it is not clear that it will lead to a satisfactory result when it comes to a skin surface as small as that of a plantar wart. There is some risk of lack of blood supply, tissue rejection and possible necrosis in grafts of wide surfaces and even on reduced surfaces. Southerland et al [9] proposes a removal of the lesion using a unilobed flap, so that suturing the scar would cause a semicircle, which would impair healing because it does not go in line with the stress lines of the skin in relaxation. It is important to respect a certain perimeter at the time of resecting the lesion to avoid leaving infected cells in situ. Jung et al [12] proposed a second intention closure after excision. The granulation tissue produced could act as a cushion and absorb the impact produced by ambulation resulting in less post-surgical discomfort. An increase in postoperative time and higher risk of infection should be taken into account in case of neglect of the postoperative regimen.

Regarding the main objective of the task of determining a surgical technique for the treatment of a plantar papilloma, we do not see any clear results, but there are indications that may serve as guidelines for the development of a procedure or improvement of an existing one. Among all the information obtained, we have to highlight the importance of healing and therefore how the removal of the lesion is performed, since it will affect the level of satisfaction of the patient and the fact that none of the aforementioned adverse effects occur. If a longitudinal incision is made with a 45° angulation that includes the lesion leaving approximately a 2mm margin around it and forming a triangular segment, it could be sutured leaving a linear and more esthetic scar that produces fewer posterior complications. All this should be accompanied by an orthosis that unloads the area until its total healing and probably a posterior approach of orthosis to minimize the appearance of hyperkeratosis and/or hypertrophy of the scar. Regarding the secondary objective of our investigation, after analyzing all the sources and resources we came across a general surgical inclusion criterion applied to any surgical intervention that includes three basic items that would be: Pain that produces functional impairment, high evolution time and failure of non-invasive treatment. It is true that there is controversy as to the determination of when non-invasive treatment ceases actually work. To avoid this, it is recommended to use clinical utensils such as the dermatoscope [5], which allows the localization of morphological elements not visible by the naked eye, thus providing important diagnostic support.

We hope this work will serve to give an idea of the current situation of the surgical approach of plantar warts and encourage further investigation for the development and improvement of the treatment of this pathology. It is true that the most feasible to develop hypertrophic scars are the weight bearing areas and there is precisely where the warts mostly affect. The way of intervening these lesions with minimal intrusion may hopefully be studied to avoid hypertrophy of the plantar tissue.

CONCLUSIONS

1. This review shows that there is no record of the existence of a technique that suits the patients' needs. There are several procedures but none resembles what was sought and searched for, with this work or investigation. On the other hand, a useful result was not obtained in terms of bibliography in this field.
2. It has become clear that in case of interventions in plantar tissue, both the lesion or pathology to be intervened and the functions, such as biomechanical ones, must be taken into account. This is important since it will influence on the postoperative time and degree of recovery of the patient.

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