



Figure 1. A plantar lesion of the 3rd metatarsophalangeal joint diagnosed clinically as a corn but histopathologically as verrucae

CORN CUTTING IN THE 21ST CENTURY

Could it be that a sharp knife and a bright light is no longer enough? A histopathological and outcome study of full thickness plantar lesion excision

ABSTRACT

Background

Plantar corns are a cause of pain and activity restriction. Debridement may give temporary relief of symptoms but a surgical excision may be sought by patients looking for curative treatment. The following study reviews the effectiveness of surgical excision and the histopathological diagnosis of skin lesions which were clinically diagnosed as corns.

Methods

Forty three patients suffering from painful plantar keratosis underwent a surgical excision of the lesion under local anaesthetic. Following excision, the lesion was sent for histopathological analysis. The participants were seen for final review on average 19 months later. Recurrence of the lesion and histopathological diagnosis was recorded.

Results

In 20 (46.5%) of participants there was no recurrence of the skin lesion whilst in 23 (53.5%), the lesion recurred and was symptomatic. Initial histopathology indicated 22 cases of verruca pedis (51.2%), 19 cases of keratosis (44%) and one (2.3%) epithelial cyst and one fibro-epithelium polyp. Recurrence was noted in 64% of the verrucae and 79% of the keratosis group.

Conclusion

Full thickness excision of plantar skin lesions resolved the condition in fewer than half of the participants in this study. Over half of lesions diagnosed clinically as plantar corns were in fact verrucae when analysed histopathologically.

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These findings indicate that bone surgery should only be considered once histopathological diagnosis of the lesion has been established. Full thickness lesion excision under local anaesthetic may however be considered as a treatment option for sufferers of painful plantar corns as it is more effective than scalpel debridement and does not require specialised equipment. Podiatrists should consider full thickness excision under local anaesthetic as the second line of treatment when routine debridement fails to relieve pain sufficiently.

INTRODUCTION

Corns or keratosis on the plantar surface of the forefoot will usually develop on the weight-bearing prominence of the metatarsal heads (Figure 1.)¹⁻⁴ or sesamoids⁵ and are a significant cause of pain and activity restriction.^{1,3,4} The condition may be treated conservatively by debridement,^{6,7} topical acids,⁸ cryo-therapy⁹ and orthoses.¹⁰⁻¹⁴ If conservative measures fail, electro-surgery,^{15,16} injectable silicone placed deep to the lesion,^{17,18} lesion excision and lesser metatarsal osteotomy may be considered.^{11,19} Electro-surgery requires specialised equipment whilst injectable silicone, though successful in the hands of its originator,¹⁸ has been less effective for other researchers.¹⁷ Lesser metatarsal surgery carries a significant risk of failure as well as potential for creating new problems such as stiff, floating toes and transfer of the skin lesion to an adjacent metatarsal.^{11,19} Lesser metatarsal surgery also presupposes that the skin lesion is keratosis caused by overload of forces on the skin of a single metatarsal and that elevating or shortening the metatarsal will reduce those forces.

Recurrence of plantar corns occurs in 27% of cases following Weil osteotomy¹⁹ and 59% following a Schwartz



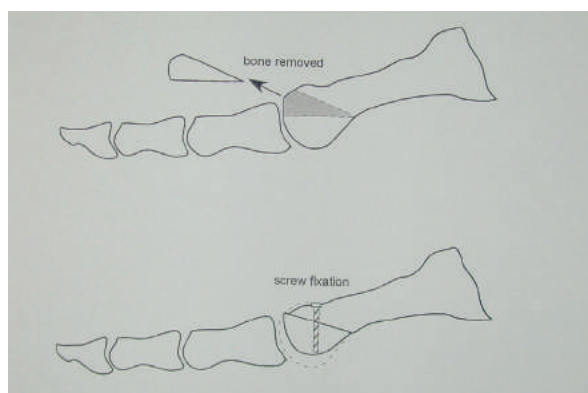
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dorsiflexion osteotomy.¹¹ (Figure. 2).¹¹ One possible reason for this failure is that the skin lesion is not keratosis of mechanical aetiology but a viral infection or other dermatological condition. Such alternative diagnoses cannot be established until the lesion is excised and histopathologically analysed. The following study explores the histopathological nature of plantar skin lesions and the effectiveness of lesion excision in resolving painful plantar skin lesions.

During pre-operative history taking it was noted that tobacco use was common among the participants. Tobacco has been found to contribute to a number of pathological skin complaints including human papilloma-virus infections, palmoplantar pustulosis,²⁰ psoriasis,²¹ malignant melanoma and epithelial tumours of the skin. The immunosuppression caused by nicotine may be a factor leading to the development of these pathologies.²² In relation to plantar skin lesions, nicotine will stimulate skin receptors that control keratinocyte adhesion and upward keratinocyte migration into the epidermis, in effect accelerating skin production,²³ The incidence of cigarette smoking and the number of cigarettes smoked daily by participants in this study was therefore recorded.

This study was approved by Derbyshire Community Health Services Research

Top: Figure 2. The Schwartz osteotomy to elevate the metatarsal head and reduce plantar pressure.
Bottom: Figure 3. Full thickness excision of multiple plantar lesions. All were confirmed as keratosis on histopathological analysis.



and Audit Committee.

PARTICIPANTS AND METHODS

The case notes of all patients undergoing surgical excision of a plantar skin lesion between 2007 and 2014 were retrospectively reviewed. All participants had previously received regular conservative care in the form of scalpel debridement and were subsequently referred for surgical excision due to limited relief of symptoms associated with the plantar lesion.

Forty three clinical case notes were reviewed, which included 34 females and nine males with a mean age of 51 years. The mean duration of symptoms was 5.5 years. A total of 35 patients underwent primary excision, with a further nine patients undergoing concomitant bony procedures. In five patients this was a tibial sesamoid planning procedure, in two cases a reverse scarf osteotomy of the 5th metatarsal and in one case a Schwartz osteotomy to dorsiflex the third metatarsal. One other case underwent scarf and Akin osteotomy for hallux valgus.

Thirty three participants smoked cigarettes and one was an ex-smoker. Six patients smoked 1-5 cigarettes per day, 16 smoked 10-15 cigarettes daily and 11 smoked more than 15 cigarettes a day.

Thirty-three participants were considered to have no obvious mechanical cause for the skin lesion. In nine patients a potential mechanical cause was identified, with an enlarged tibial sesamoid in four cases and plantarflexed metatarsal in five cases.

OPERATIVE TECHNIQUE

Surgical excision was performed under ankle block local anaesthetic.

The lesion was removed via a circumscribed full thickness skin incision excising the epidermis and dermis (Figures 3 and 4). All lesions were referred for histopathology analysis. The lesion site was then infiltrated with 10mls bupivacaine. Injecting a bolus of fluid deep to the lesion is a very effective way of controlling postoperative bleeding (Figure 5).

A postoperative dressing of a non-adherent mesh, gauze and bandage was used along with a postoperative shoe; patients were encouraged to weight-bear through the heel for the first week to minimise discomfort.

RESULTS

In the 43 cases, histopathological diagnosis was reported as verrucae pedis in 22 participants (51%), keratosis or



TOBACCO HAS BEEN FOUND TO CONTRIBUTE TO A NUMBER OF PATHOLOGICAL SKIN COMPLAINTS INCLUDING HUMAN PAPILLOMA-VIRUS INFECTIONS, PALMOPLANTAR PUSTULOSIS, 20 PSORIASIS, 21 MALIGNANT MELANOMA AND EPITHELIAL TUMOURS OF THE SKIN.

callus in 19 cases (44%), epithelial cyst in one case and fibro-epithelial polyp in one case.

At six months postop the lesion had recurred in 23 cases (53.5%). Recurrence occurred in 53% of the verrucae pedis group and 43% of the callus/keratosis group. The epithelial cyst also recurred.

Recurrence of the lesion occurred in two non-smokers and in the one ex-smoker. Two recurrences occurred in the group that smoked 1-5 cigarettes a day, 13 in the 5-15 group and five in the group that smoked more than 15 cigarettes a day. In the non-recurrence group, seven were non-smokers, four smoked 1-5 cigarettes a day, three smoked 5-15 and six smoked more than 15 cigarettes a day. Chi squared analysis indicated no statistically significant difference in tobacco use between the participants who suffered recurrence and those cured by lesion excision. The highest incidence of recurrence did however occur in the group that smoked up to 15 cigarettes a day. Unfortunately the participant numbers in this study are small and this risks a type 2 statistical error as statistical significance could not be determined because there

was insufficient statistical power in the study sample.

Among the smokers, 19 (58%) were diagnosed histopathologically with verrucae and 13 (39%) with keratosis. In the non smokers, three (30%) were diagnosed with verrucae and six (60%) with keratosis.

Two patients experienced a complication, one participant had metalwork irritation and one a painful scar.

Eight participants (19% of the study group) underwent repeat excision because of continued high levels of pain; 37.5% presented with verrucae and 62% keratosis. Five of these cases smoked more than 15 cigarettes daily.

DISCUSSION

Scalpel debridement for plantar keratosis has been demonstrated to reduce forefoot pain in patients with rheumatoid arthritis²⁴ though the relief tends to be limited to just seven days.^{25,26} When compared with sham scalpel debridement in rheumatoid patients, it was found that debridement reduced forefoot pain but the effect was as short lived as the sham treatment.²⁷ Similarly, a randomised trial on the effectiveness of scalpel debridement for painful calluses in older people indicated little benefit when compared with sham scalpel debridement.⁷

With scalpel debridement providing only limited relief when reviewed in controlled circumstances, could surgical intervention be more effective? Anderson & Burrow¹⁵ in a study of 30 patients undergoing electro-surgery, reported

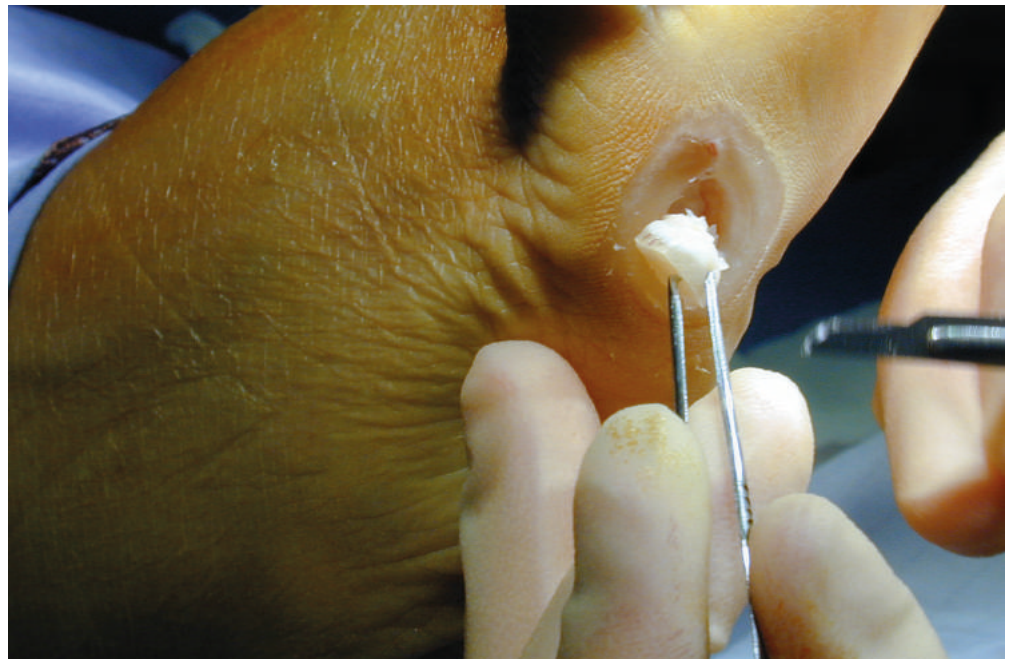


Figure 4. An excised lesion demonstrating full thickness excision of a histopathologically diagnosed corn.

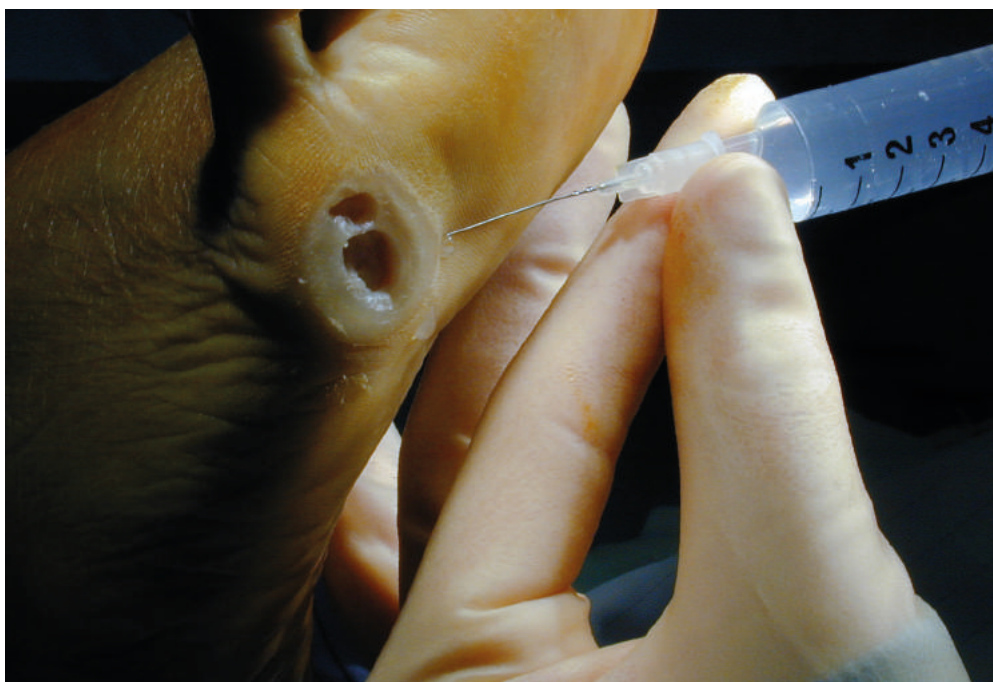
complete resolution in 52% of cases with a further 34% remaining asymptomatic though callus still developed in the area of electro-surgery treatment. Bevans & Bosson¹⁶ compared electro-surgery with debridement and found statistically significant reduction in pain at six months with a complete resolution in 26% and partial resolution in a further 50%, compared with complete resolution in 4% and partial resolution in 28% following scalpel debridement only.

In the present study, full thickness skin excision was found to be more effective than scalpel debridement but similar in effect to electro-surgery with complete resolution of the plantar lesion occurring

in 20 (46.5%) of the 43 patients. In the absence of the specialised equipment required for electro-surgery, full thickness lesion excision under local anaesthetic should be considered as a partially effective treatment option sufferers should be made aware of.

Fifty-one percent of the excised skin lesions were misdiagnosed as plantar corns when in fact they were verrucae. The inaccuracy of clinical diagnosis is alarming because plantar corns have often been treated surgically by metatarsal osteotomy with the intention of reducing forces on the skin in the area of the lesion. If, however, the skin lesion is of viral origin such intervention is doomed to failure whilst at the same time exposing the patient to risk of transfer metatarsalgia and stiff floating toes.^{3,5,11,19} Failure of lesser metatarsal surgery is not uncommon. In a review of failed foot surgery cases, Kilmartin²⁸ found that lesser metatarsal osteotomy accounted for 13% of a group of 262 cases who suffered a poor surgical outcome. The present study indicates that lesser metatarsal osteotomy for plantar keratosis should not be undertaken until histopathology has determined whether the lesion is of viral origin. It is now our approach that all lesions are excised under ankle block local anaesthesia and sent for histopathology before considering lesser metatarsal osteotomy. If the lesion recurs and is proven to be of viral origin, we perform Falkner's needling technique.²⁹ If the lesion is diagnosed as keratosis then lesser metatarsal osteotomy is considered. We would recommend this treatment pathway to all podiatrists caring for patients with

Figure 5. Injecting a bolus of bupivacaine deep to the lesion.



plantar lesions. We would suggest that excision under local anaesthesia should be considered a routine approach for podiatrists that will achieve greater comfort for patients even though in many cases it may be only short term in effect. Another outcome of such an approach may be enhanced status for podiatrists as the patients appreciate the high skill levels required for such intervention.

Could tobacco use be a contributory factor in the development of plantar skin lesions? Not only has nicotine been shown to accelerate skin production²³ but also we have observed clinically some loss of plantar fat pad thickness in smokers, our hypothesis being that smoking accelerates fat pad aging in the same way it accelerates skin aging.³⁰ In combination with the reduced immune resistance to viral infection it could be suggested that smokers are more at risk of plantar skin lesions. Unfortunately this study does not have sufficient statistical power to confirm that hypothesis but further epidemiological investigation is encouraged.

In this study, all lesion excisions were allowed to heal by secondary intention rather than by primary closure. By allowing the lesion to granulate it was hoped this would allow regrowth of normal skin and prevent painful scar formation. Whilst no plantar scarring did occur in this study, it has not been established whether healing by secondary or primary intention is superior following lesion excision. Other weaknesses of this study include lack of inter and intra observer error testing of the histopathological diagnosis leaving the specificity and sensitivity of the diagnosis uncertain. Also in nine cases, other surgical procedures were performed concomitant to the lesion excision, including reduction of sesamoid thickness and lesser metatarsal osteotomy which could have a confounding effect on plantar lesion excision success rate. In this group the skin lesion recurred in three of the five cases undergoing sesamoid planning, and in one of the two cases undergoing 5th metatarsal scarf osteotomy.

CONCLUSION

Full thickness lesion excision is an effective treatment for plantar skin lesions in just under 50% of cases and as such should be considered as a treatment option when symptoms are severe and disabling. When a plantar skin lesion is excised, it should be sent for histopathology as verrucae pedis may be misdiagnosed as plantar corn. When conservative measures fail,

surgery can be considered but lesser metatarsal osteotomy is an inappropriate treatment that is unlikely to succeed in the presence of viral infected tissue. In this study, full thickness lesion excision in isolation is effective in 36% of verrucae pedis and 21% of plantar corn cases. Excision of a plantar corn is approximately three times as successful when combined with a Weil lesser metatarsal osteotomy but lesser metatarsal osteotomy carries significant risks compared to excision only. Histopathological diagnosis of plantar lesions represents best practice as it provides the aetiology and likely prognosis of the lesion. Whilst full thickness excision of plantar lesions under ankle block anaesthesia is a more aggressive treatment than scalpel debridement, it is certainly an option that should be considered by 21st Century podiatrists. ■

The authors do not know of any competing interests.

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