Intractable plantar keratosis (IPK) is defined as a discrete lesion that appears as a corn within a callus usually under a metatarsal head. It is generally accepted that these lesions are attributable to pressure overload from a structural or rigidly adapted osseous deformity of the involved metatarsal. The treatment of IPK is difficult as evidenced by the multiplicity of treatments, which usually include an osteotomy of the involved lesser metatarsal. However, it is not clear what role the skin plays in these lesions and if skin disorders can be a causative factor for the development of IPK.

Inclusion cysts are benign lesions that appear as a consequence of traumatic inclusion of epidermal cells into the dermis. They can be painful if they appear under pressure areas, especially the metatarsal heads. We report a case of a 36-year-old woman with an intractable plantar keratosis lesion under the third metatarsal head of 3 years' duration. Ultrasonography revealed the presence of a subcutaneous mass with a growing epidermoid. It was surgically excised, and pathology confirmed the diagnosis of a plantar epidermoid cyst. All symptoms disappeared after the excision of the lesion. This case should alert the clinician about the existence of keratotic lesions in the metatarsal heads commonly diagnosed and treated as intractable plantar keratosis, although they are not directly derived from metatarsal overload. Some of the lesions could be directly derived from skin problems aggravated by pressure from the metatarsal head. This should be taken into consideration when addressing the management of these lesions. (J Am Podiatr Med Assoc 99(2): 148-152, 2009)
sion elicited pain. Trimming of the callus revealed a
discrete corn with a whitish soft hyperkeratotic ring
(Fig. 1). The remainder of the physical examination
findings were essentially unremarkable. Radiographic
examination was performed on her right foot. Antero-
posterior radiographs were taken of the right foot,
with a marker under the lesion and with the beam ori-
ented 90° to the supporting surface. The radiographs
showed that the lesion was located between the third
and fourth metatarsal heads. An ultrasound was or-
dered preoperatively in an attempt to explore the pres-
ence of soft-tissue masses. The ultrasound revealed a
well-defined cystic image with fine and delineated
borders and also confirmed that the location of the le-
sion was between the third and fourth metatarsal
heads.

The patient was brought to the operating room for
removal of the lesion. The procedure was performed
under posterior tibial nerve-block anesthesia with an
ankle tourniquet. A plantar semi-elliptical incision
was planned for the excision of the whole lesion. The
mass was isolated using sharp and blunt dissection
until the complete excision of the subcutaneous mass
was achieved (Fig. 2). Wound closure was performed
with 4-0 nonabsorbable nylon sutures. Vertical mat-
tress sutures were inserted with simple interrupted
sutures. The excised mass was sent to the laboratory
for pathologic study. The laboratory determined that
the cutaneous piece had laminar content. Slides iden-
tified a cystic formation covered with polystratified
and keratotic epithelium with content that came from
the desquamation of the cover (Fig. 3). Some inflam-
atory changes surrounding the lesion were also
noted. The laboratory findings allowed us to establish
a definitive diagnosis of epidermoid inclusion cyst.

Postoperative visits were routinely performed
until complete healing of the wound. Sutures were re-
moved at 25 days, and the postoperative course de-
volved without any incident. The patient was in-
structed to remain nonweightbearing for 3 weeks,
followed by total weightbearing. The patient was fol-
lowed clinically for 1 year after surgery without any
recurrence of the symptoms or the lesion (Fig. 4).

Discussion

Intractable plantar keratoses are discrete hyperkera-
totic lesions formed by a corn within a callus and usu-
ally develop on the sole under weightbearing promi-
ences. They are a major cause of metatarsalgia and
generally appear under metatarsal heads or sesa-
moids. Because of this location, it seems reasonable
that overpressure from the metatarsal head is the eti-
ology of these lesions. However, the present case pro-
vides a new explanation of some cases of IPK that
may be created by an inclusion cyst. Inclusion cysts
represent less than 10% of all soft-tissue masses of
the lower extremities, and the sole of the foot is
the most common location probably because it is ex-
posed to pressure and microtrauma. They can also

![Figure 1. External appearance of the plantar keratosis before (A) and after (B) debridement of the callus.](image-url)
Although they are generally painless, inclusion cysts can be very painful when located in a high-pressure area, such as the plantar foot. In these cases, they can generate intense pain on weightbearing, damage adjacent bone, and even calcify.

In the case presented, the IPK lesion did not have any obvious structural or functional origin as its main etiology. It could be suggested, therefore, that skin processes such as inclusion cysts or foreign bodies could play a central role in the development of some cases of IPK. These primary dermatologic lesions would be aggravated from metatarsal overload instead of metatarsal overload forming an IPK lesion by itself. This case illustrates how some occurrences of IPK are attributable to primary skin conditions that are aggravated by pressure from the metatarsal heads. It is our opinion that under these circumstances, conservative measures and off-loading of the involved metatarsal result in poor outcomes. However, more studies are required to determine what the role of the skin is in the pathogenesis of IPK development.

Diagnostic accuracy is key to avoiding the general tendency to treat these lesions with metatarsal osteotomies. Determining if the plantar lesion is the re-
moid cysts are usually benign lesions, cases have been described of malignization into basal cell carcinoma and squamous cell carcinoma.6, 7, 14 The case presented here was treated by simple surgical excision without osteotomy procedures. Signs and symptoms were completely eradicated after surgery. At 1-year postoperative follow-up, the patient had a complete resolution of symptoms and an absence of hyperkeratosis.

Plantar incisional approaches on the feet have been a controversial subject for many years. 20 It is a common belief that plantar incisions predispose to painful hypertrophic scars. However, in a retrospective study, Richardson et al21 reported good results (96%) using plantar incisional approaches for forefoot surgery. In our experience, plantar incisions heal satisfactorily if a strict postoperative regimen of absolute nonweightbearing during the first 3 weeks is followed. Therefore, this could be a good approach for removal of these lesions. In the case presented, the lesion was excised surgically by plantar semi-elliptical incision and healed without complications following an absolute nonweightbearing regimen for the first 3 weeks.

Conclusions

A clinical case of IPK under the third metatarsal head caused by an epidermoid inclusion cyst has been presented. Epidermoid inclusion cysts are cystic benign injuries of rare occurrence in the foot. These cysts are usually benign lesions, cases have been described of malignization into basal cell carcinoma and squamous cell carcinoma.6, 7, 14 The case presented here was treated by simple surgical excision without osteotomy procedures. Signs and symptoms were completely eradicated after surgery. At 1-year postoperative follow-up, the patient had a complete resolution of symptoms and an absence of hyperkeratosis.

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are generally asymptomatic, except when they occur in high-pressure areas. This case should alert the clinician to the presence of keratotic lesions plantar to metatarsal heads that are commonly diagnosed in IPK and do not have a biomechanical etiology. Instead, they are the result of a primary dermatologic condition, which is aggravated from metatarsal pressure. Simple excision of the lesion is an optimum treatment for these cases.

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References