

Subungual Exostosis of the Hallux: A Solution Through Percutaneous Surgery

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Abstract

Background: Subungual exostosis of the hallux is an osteochondral tumor that causes pain and deformity, requiring surgical resection in many cases. Although several specialities treat this tumor, orthopaedic surgeons seem to be poorly versed in its management. Several removal techniques have been described, all of which are open, aggressive and with high complication rates. We present a percutaneous removal technique with minimal soft tissue injury and a low complication rate. Surgical technique: 12-year-old male presented with a painful exostosis of the hallux with severe deformity. Percutaneous forefoot surgery was used to marginally resect the lesion preserving the integrity of the nail matrix. With millimetric wounds, the tumor is detached from its bed, its base was resected and burned. The patient had no complications, unpainful recovery and no recurrences within two years.

Discussion: Multiple techniques have been described for the removal of this exostosis. The main difference between them is the way the wound is closed, ranging from healing by secondary intention to direct suturing between the skin and the nail. The complication rate is 40%, the most frequent being residual nail deformity, infection and recurrence. Our technique applies percutaneous surgery, performing minimal damage to the soft tissue and nail bed while achieving the marginal excision of the tumor with debridement of the implantation bed.

Conclusion: The excision of the subungual exostosis of the hallux can be performed safely and with a low complication rate through percutaneous surgery, ensuring minimal incisions with little soft tissue damage.

Keywords: Subungual Exostosis of the Hallux; Percutaneous Surgical Technique; Forefoot Surgery; Tumor of the Hallux

Background

Subungual exostosis is a benign bone tumor located in the distal phalanx of the toes and fingers and usually presents with pain and nail deformity. The exact aetiology is unknown although its origin is thought to be due to repeated microtrauma [1] and there are cases associated with syndromes such as hereditary osteochondromatosis, with autosomal dominant inheritance. It appears to be associated with the t (X;6) (q22; q13-14) translocation [2,3], involving the COL4A5 and COL12A1 genes but the relationship between these two genes and the pathogenesis of subungual exostosis remains unknown. However, from the anatomopathological point of view, they are fibrocartilage-covered lesions, a circum-

stance that reinforces the theory of secondary origin to trauma or infection.

This finding also differentiates them from osteochondromas, which are covered with hyaline cartilage resulting from endochondral ossification [4,5]. We must also differentiate subungual exostosis from tumors such as the atypical parosteal osteochondromatous proliferation known as Nora's lesion [3,6].

Clinically, subungual exostosis causes pain of months of evolution, associated with nail deformity that can limit daily activities. Physical examination may reveal a subungual tumor causing de-

formity of the nail. Radiographically it behaves as a pedunculated bony lesion depending on the cortical area where it arises, which is usually the distal phalanx of fingers or toes, but mainly the toes.

The treatment of subungual exostosis is surgical, by resection of the lesion, given that its natural history involves an increase in size and pain, making conservative treatment unfeasible [1,6,7]. There are many surgical techniques described in the literature. The main objective is the total resection of the tumor, without damaging the nail matrix and with the least damage to soft tissues, thus avoiding tumor recurrence and deformity of the residual nail. All the techniques described have in common the use of large incisions with injury to the nail bed and, therefore, a high rate of involvement of the posterior growth of the nail. We present a minimally invasive technique with millimetric soft tissue damage with excellent results.

Presentation of the case

The patient was a 12-year-old boy, with no medical history, who consulted for the appearance of a subungual tumor that caused significant pain in the distal area of the hallux of the right foot. He complained of pain with footwear and with the slightest friction that prevents him from practising sport. He reported no fever or constitutional symptoms. Physical examination revealed a medial subungual tumor slightly distal to the nail root, 1 cm in diameter, hard in consistency and adherent to deep planes with nail deformity (Figure 1). There was pain on palpation, no signs of infection or fever.

Figure 1: Subungual exostosis of the hallux.

The radiological study included anteroposterior and lateral radiographs of the foot (Figure 2A) identifying a dependent exostosis of the distal phalanx of the first toe and MRI (Figure 2B) where subtle bone oedema was found at the level of the phalanx. A CT scan (Figure 2C) was performed to confirm the diagnosis. Once the

study was completed, subungual exostosis was identified as the first diagnostic possibility and it was decided to surgically resect the lesion.

Figure 2: (A) Anteroposterior and oblique foot radiograph. (B) T2 magnetic resonance where oedema is observed at the base of the tumor. (C) 3D reconstruction of the lesion with computed tomography.

The intervention was performed by percutaneous surgery. A regional anaesthetic block was performed and, with truncanal ischaemia using a sterile glove, a 2-mm longitudinal incision was made with a Beaver No.64 scalpel, slightly inferior to the base of the tumor in the inferomedial area of the distal phalanx of the hallux. The tumor was detached from the nail bed with a Penfield periosteal elevator to prepare the working area. The osteotomy of the exostosis was performed at its base with a short Shannon burr under radiographic control. We checked through the scope that the cut allowed a complete resection of the tumor. By pulling the tumor, the remaining soft tissue adhesions were released with the periosteal elevator and the tumor was completely resected, leaving the nail matrix intact. Finally, under radiological control, the implantation bed of the exostosis was debrided with a short pine tree-shaped burr. We washed to remove the milled bone debris and put three stitches: one for the wound and two to anchor the nail to the nail bed (Figure 3).

In the postoperative period, immediate loading with a wide shoe was allowed. After two weeks the stitches were removed and no complications of the surgical wound were identified. The control X-ray was satisfactory. After 3 months, the patient resumed his usual sporting activity without any limitations, and no recurrence of exostosis was observed in the control X-ray (Figure 4). Two years after surgery, no recurrence of the tumor or complications of the surgery have been identified.

Figure 3: (A) Incision and cut with a Shannon bur. (B) Control scan of the cut with a bur. (C) After deperiostization en bloc resection of the tumor. (D) Complete tumor with its capsule. (F) Cruentation of the implantation bed of the exostosis with a pine bur and (G) Postoperative appearance. (H) Control X-ray.

Figure 4: (A) X-ray after two weeks postoperatively. (B) X-ray one month postoperatively. (C) Result one month postoperatively.

Discussion

The subungual exostosis of the hallux is an osteochondral lesion that is treated by various medical specialities such as dermatologists, plastic surgeons and podiatrists and, to a lesser extent, by orthopaedic surgeons, although, given that it is a bone tumor, the latter should be the main referents for treatment. The principles of tumor surgery must be respected in their excision. Therefore, and also taking into account that the main complications of subungual exostosis resection are nail matrix damage, infection and tumor recurrence [8] the basic principles for a successful resection of subungual exostosis should be the least possible soft tissue damage, preservation of the nail matrix, and adequate debridement of the implantation bed sufficient to avoid recurrence and complications. Percutaneous surgery can successfully meet all these objectives.

The technique presented here requires minimal incisions, respecting the soft tissues. Classical resection surgery employs wide approaches with direct debridement of the resected exostosis bed. Berker's technique [7] uses gouges to debride the bed while Co-

hen [9] uses curettes. Both types of debridement require wide approaches for proper exposure of the lesion. Somewhat smaller is the approach described by Suga [10], which employs a fishmouth technique to reduce damage to the subungual bed with closure by secondary intention, or the Lokiec technique [11] which involves removal of the exostosis with preservation of the bone matrix with skin-to-nail closure stitches, however, the wounds are still large. In our technique, the wound is millimetric and intraoperative radiographic control allows both resection of the exostosis and debridement of the wound bed with a burr to reduce the risk of recurrence. Thus, this technique allows en bloc resection of the tumor and almost total respect of the soft tissue, including the nail bed. Aggressive resections, such as those mentioned above, are associated with the development of onychodystrophies [4,7,9,10]. due to nail root damage.

The immediate postoperative period following classic extensive surgeries requires extensive time for the wound to close, increasing the risk of infection [4,12]. There is no difference between the various techniques in the healing time of the wound, in many cases being a closure by secondary intention. However, the small size of the wounds described in our technique allows them to be closed in approximately 7-10 days, thus reducing the risk of infection.

When excising the tumor, a balance must be found between the surgical damage necessary for a complete resection to reduce the risk of recurrence and the preservation of the nail bed. DaCampa [4] in his systematic review reported a nail deformity frequency of 16% and a recurrence frequency of 4%. Recurrences were attributed to incomplete tumor resection. Given that our technique allows adequate debridement of the tumor implantation bed, the recurrence rate is expected to be low, although we need a series of cases to confirm the frequency of occurrence.

The main drawback of percutaneous forefoot surgery is the high learning curve and the need for specific equipment to perform it [13,14]. In our case the surgery was performed by a senior surgeon specialising in percutaneous forefoot surgery. However, its use is currently increasing and it is likely to become the technique of choice for the resection of subungual exostosis in the coming years.

Conclusion

In conclusion, the removal of subungual exostosis of the hallux can be performed by percutaneous foot surgery through minimal incisions, with little soft tissue damage, without injury to the nail matrix and removing the bony tumor marginally, completely and adequately debriding the exostosis bed. Complications and recurrences are scarce.

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