

# Protruded and nonprotruded subungual exostosis: Differences in surgical approach

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## ABSTRACT

**Background:** In subungual exostosis surgery, repair of the damaged nail bed and surgical excision of the mass without damaging the nail bed is important. The ideal method of surgery is still unclear. This study is done to qualify the effects of different surgical methods on outcome measures in different types of subungual exostosis.

**Materials and Methods:** Fifteen patients, operated with a diagnosis of subungual exostosis between January 2008 and June 2012, were evaluated. Protruded masses were excised with a dorsal surgical approach after the removal of the nail bed and nonprotruded masses were excised through a “fish-mouth” type of incision.

**Results:** The mean age of the patients in protruded subungual exostosis group was 17.3 years (range 13-22 years) and this group consisting of seven female and two male patients. The patients were followed up for a mean of  $14.1 \pm 4.8$  months. The mean age of the patients in the nonprotruded subungual exostosis group was 14.6 years (range 13-16 years) and consisting of six female patients. The patients were followed up for a mean of  $11.6 \pm 2.9$  months. The results were positively affected by changing the surgical approach depending on whether or not the exostosis is protruded from the nail bed. All patients had healthy toe nails in the postoperative period without any signs of recurrence.

**Conclusions:** In patients with a protruded subungual exostosis, the mass should be removed by a dorsal approach with the removal of the nail and injury to the nail bed should be repaired. In patients with a nonprotruded subungual exostosis, the mass should be excised through a “fish-mouth” type incision at the toe tip without an iatrogenic damage.

**Key words:** Nail bed surgery, subungual exostosis, surgical exposure

## INTRODUCTION

Subungual exostosis is a benign bone tumor. It is most commonly seen in the great toe and is common in the adolescent period.<sup>1</sup> The etiopathogenesis is not clear but it is thought to be associated with micro-trauma and infection.<sup>2,3</sup> Subungual exostosis presents with pain due to mechanical irritation under the nail bed during physical activity.<sup>4</sup> Radiographs are the main diagnostic tools. An exophytic bone growth at the dorsal surface of

the distal phalanx is seen on X-rays.<sup>2</sup> The treatment of subungual exostosis is surgical removal of the tumor. The success of surgical excision is  $>90\%$ .<sup>5</sup> A 53% recurrence rate is reported with insufficient mass excision.<sup>6</sup> The most common complication after surgery is nail deformity caused by damage to the nail bed. In subungual exostosis surgery, surgical excision of the mass without damaging the nail bed is important. The nail bed should be repaired after the removal of the mass if it has been damaged during surgery.

## MATERIALS AND METHODS

Fifteen patients, with a diagnosis of subungual exostosis, operated between January 2008 and June 2012, were included in the study. Informed consent was obtained from all patients. Excision of the masses was performed by the same surgeon with two different surgical approaches depending on whether the exostoses were protruded or not. In seven patients, there was a history of trauma to the toe.

All patients in the protruded subungual exostosis group complained of: 1) pain under the toe nail which lasted for an average of  $16.8 \pm 5.2$  months, 2) nail deformity which began at an average of  $9.3 \pm 3.4$  months ago,

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and 3) a mass protruding medially for an average of  $4.6 \pm 1.5$  months [Figure 1a]. There was severe pain over the nail on palpation. Plain radiographs showed a mass lesion on the dorsal aspect of the distal phalanx of the great toe [Figure 1b]. Excision was planned in patients who were diagnosed with subungual exostosis. The nail was removed under local anesthesia as the mass had protruded from the nail bed and had damaged the nail bed. The mass was excised together with the pedicle from the dorsal surface of the distal phalanx [Figure 1c, d]. The nail bed damage was evaluated and repaired with a 6-0 absorbable suture and the removed nail was fixed to its bed [Figure 1e].

In patients with nonprotruded subungual exostosis, there was pain under the nail that began at an average of  $8.3 \pm 3.6$  months ago and swelling at the toe tip that occurred over time. There were no deformities or any visible mass in this group of patients at the time of diagnosis. Subungual exostosis was often palpable at the nail tip [Figure 2a]. There was severe tenderness over the nail on palpation. There was a mass lesion at the dorsal aspect of the distal phalanx of the toe on plain X-rays [Figure 2b]. Excision was planned in this

group as well. As the mass did not protrude from the nail bed, it was excised with a “fish-mouth” type of incision without causing damage to the nail bed [Figure 2c]. Thus iatrogenic damage that may occur during surgery and concurrent nail deformity was prevented [Figure 2g].

The patients were followed up at 1<sup>st</sup> month, 2<sup>nd</sup> month, 3<sup>rd</sup> month and 6<sup>th</sup> month [Figures 1f and 2d-f]. At each followup visit, patient-perceived functional outcome, cosmetic outcome, and level of pain were assessed using three separate 10-point analog scales.<sup>7</sup> On the functional outcome scale, scores ranged from 0, which indicated complete loss of digit function during the activities of daily living activities, to a score of 10, which indicated no functional limitation, with the patient using the digit without difficulty. The cosmetic result was evaluated using the scale published by Zook.<sup>8</sup>

### Statistical evaluation

Statistical evaluation of the data was performed using the Chi-square testing for categorical data and unpaired Student's *t*-tests for the continuous data. Significance was defined as a  $P < 0.05$ .



**Figure 1:** Clinical photograph showing (a) protruded subungual exostosis (arrow) (b) X-ray anteroposterior and oblique views of fore part of great and 2nd toe showing mass at dorsomedial aspect of the distal phalanx of the great toe. (c) Clinical photograph showing damage caused by subungual exostosis at dorsomedial aspect of the nail bed. (d) Subungual exostosis excised with pedicle (e) Clinical photograph showing the nail bed repaired with 6-0 absorbable suture and fixation of removed nail (f) Clinical photographs at 1st, 3rd, 6th, 12th months followup showing normal appearance. (g) X-ray anteroposterior and oblique views of fore part of great and 2nd toe at 12 months followup showing no mass over distal phalanx of great toe



**Figure 2:** (a) Clinical photographs shown nonprotruded subungual exostosis. (b) X-ray anteroposterior and oblique views of fore part of great and 2nd toe showing mass in the dorsal aspect of the distal phalanx of the toe (c) Clinical photograph showing exposure with a transverse incision at fingertip excised mass damaged caused by subungual exostosis (d) Clinical photograph at 1<sup>st</sup> week followup (e) Clinical photograph at 2<sup>nd</sup> week control (f) Clinical photograph at 2<sup>nd</sup> month followup (g) Clinical photograph showing that the nail was seen to grow in a healthy way at 12<sup>th</sup> month followup

## RESULTS

The mean age of the patients in the protruded subungual exostosis group was 17.3 years (range 13-22 years) and consisting of seven female and two male patients. Patients were followed up for a mean of  $14.1 \pm 4.8$  months after surgery. The mean age of the patients in nonprotruded subungual exostosis group was 14.6 years (range 13-16 years) and consisting of six female patients. Patients were followed up for a mean of  $11.6 \pm 2.9$  months after surgery.

At 1 month, 3 month, 6 month, and final followup controls, no pain or functional impairment was noted in both groups [Figures 1g and 2g]. The cosmetic results of protruded subungual exostosis group at 1 month was fair in three cases and mild in six cases.<sup>8</sup> At 3 months this improved to good in

six cases and very good in three cases. At 6 months there was further improvement to very good in two cases and excellent in seven cases. At the last followup, the results were excellent in all cases. The cosmetic results of nonprotruded subungual exostosis group at 1 month was good in two cases and very good in four cases. At 3 months, this improved to very good in four cases and excellent in two cases. The results were excellent in all cases both at 6 months and at the last followup [Figures 1g and 2g].

Comparison of the cosmetic outcome between the two treatment groups was done. Nonprotruded group gave significantly better results than the protruded group at early followup ( $P < 0.05$ ). But the final outcome between the two treatment groups demonstrated no significant difference ( $P > 0.05$ ). There was no significant difference

in pain, or ability to use the digit in activities of daily living between protruded and nonprotruded patient cohorts at early and final followup ( $P > 0.05$ ).

Our results improved by changing the surgical approach depending on whether the exostosis is protruded from the nail bed or not. During the followup of patients in both groups after surgery, there were no wound infections, tumor recurrences, or nail deformities Figures 1g and 2g).

## DISCUSSION

Subungual exostosis is a rare osteocartilaginous tumor which is twice more common in females.<sup>3</sup> Subungual exostosis, as in our cases, is often seen in the adolescent age group.<sup>1</sup> The disease, as seen in our patients, is often located at the distal phalanx of the toe.<sup>6</sup> In seven patients, there was a history of toe trauma. In the literature, this condition was found to be associated with trauma and chronic infection.<sup>3</sup> Patients with the diagnosis of subungual exostosis present with complaint of pain over the nail and are diagnosed by radiographic evaluation. In some cases, in addition to pain, there is a mass protruding from under the nail bed. Protrusion was present in seven of our patients.

X-rays are the main diagnostic tools. These reveal an outgrowth with trabeculated pattern of cancellous bone with or without a defined cortex.<sup>9,10</sup> Other differential diagnoses include ordinary verrucae, mycoses, pyogenic disease, enchondroma, glomus tumour, melanoma and squamous cell carcinoma.<sup>9-11</sup> The pathological diagnosis verification is important for followup. Complete excision of the subungual exostosis does not need additional treatment.

Many surgical techniques have been described in the literature for subungual exostosis.<sup>2,6,12-14</sup> In these techniques surgical approaches are usually by a direct dorsal surgical incision or fish-mouth-type of incision. After the mass excision, surgical approach varies vis-à-vis repair of the nail bed. Some authors preserve the nail bed as we did. Others excise the nail bed partially or totally (cold-steel matrixectomy, Kaplan's matrixectomy, Zaddick's matrixectomy, Frost's matrixectomy). Total or partial nail bed resection may cause nail deformities, delay in return to daily activities with difficulty in wearing shoes and unacceptable cosmetic outcome.<sup>15</sup> We chose one of the two surgical approaches depending on whether exostosis had protruded or not. Integrity of the nail bed and phalangeal covering was preserved; our patients returned to normal daily activity in a short time with a good cosmetic outcome.

Rapid recovery and excellent cosmetic appearance are achieved using a fish-mouth approach. But the local recurrence rate (about 30%) is more than dorsal surgical

approach after the removal of the nail bed.<sup>16</sup> No local recurrence was diagnosed in patients operated by a fish mouth type of surgical approach in our study.

To conclude, in patients with a protruded subungual exostosis, the mass should be excised by a dorsal approach by the removal of the nail and the impaired the nail bed should be repaired after tumor excision. In patients with a nonprotruded subungual exostosis, the mass can be excised through a "fish-mouth" type incision without causing any iatrogenic damage to the nail bed.

## REFERENCES

1. Hoehn JG, Coletta C. Subungual exostosis of the fingers. *J Hand Surg Am* 1992;17:468-71.
2. De Palma L, Gigante A, Specchia N. Subungual exostosis of the foot. *Foot Ankle Int* 1996;17:758-63.
3. Flores VH, Judit-Cherit JD, Memije ME, Ocariz MS. Subungual Osteochondroma: Clinical and Radiologic Features and Treatment. *Dermatol Surg* 2004;30:1031-4.
4. Ilyas W, Geskin L, Joseph KA, Seraly MP. Subungual exostosis of the third toe. *J Am Acad Dermatol* 2001;45 (6 Suppl):200-1.
5. Warren KJ, Fairley JA. Stump the experts-case. *Dermatol Surg* 1998;24:287-9.
6. Miller-Breslow A, Dorfman HD Dupuytren's (subungual) exostosis. *Am J Surg Pathol* 1988;12:368-78.
7. Strauss EJ, Weil WM, Jordan C, Paksima N. A prospective, randomized, controlled trial of 2-octylcyanoacrylate versus suture repair for nail bed injuries. *J Hand Surg Am* 2008;33:250-3.
8. Zook EG. Reconstruction of a functional and aesthetic nail. *Hand Clin* 2002;18:577-94.
9. Webber JM, Miller MV. Subungual exostosis in a young woman. *Pathology* 1994;26:339-41.
10. Wu KK. Subungual exostosis. *J Foot Ankle Surg* 1995;34:96-8.
11. Ippolito E, Falez F, Tudisco C, Balus L, Fazio M, Morrone A. Subungual exostosis. Histological and clinical considerations on 30 cases. *Ital J Orthop Traumatol* 1987;13:81-7.
12. Davis DA, Cohen PR. Subungual exostosis: Case report and review of the literature. *Pediatr Dermatol* 1996;13:212-8.
13. Letts M, Davidson D, Nizalik E. Subungual exostosis: Diagnosis and treatment in children. *J Trauma* 1998;44:346-9.
14. Cohen HJ, Frank SB, Minkin W, Gibbs RC. Subungual exostoses. *Arch Dermatol* 1973;107:431-2.
15. García Carmona FJ, Pascual Huerta J, Fernández Morato D. A proposed subungual exostosis clinical classification and treatment plan. *J Am Podiatr Med Assoc* 2009;99:519-24.
16. Suga H, Mukouda M. Subungualexostosis: A review of 16 cases focusing on postoperative deformity of the nail. *Ann Plast Surg* 2005;55:272-5.

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