Immediate Toe Transfer Following Index Finger Amputation for Extensive Giant Cell Tumor of the Tendon Sheath with Intraosseous Invasion

Chun-Te Lu, MD; Hung-Chi Chen, MD, FACS; O. Koray Coskunfirat, MD

Giant cell tumor of the tendon sheath (GCTTS) is the second most common benign tumor of the hand. Although bony indentation from external compression by the GCTTS is frequently seen on x-ray film, the intraosseous invasion is relatively rare and is a sign for high recurrence. We present a woman with extensive GCTTS located in the left index finger at the level of distal interphalangeal joint. X-ray films revealed multiple osteolytic cystic cavities in the shaft of the middle phalanx. Amputation of the index finger at the base of the middle phalanx was performed because of extensive bony involvement and concern about possible recurrence from inadequate excision. Her left second toe was transferred to replace the amputated index finger in the same session. Follow-up examination at 15 months post-operative revealed good function and appearance of the reconstructed index. *(Chang Gung J Med 2004;27:312-7)*

Key words: giant cell tumor, tendon sheath, finger amputation, toe transfer.

Giant cell tumor of tendon sheath (GCTTS) that presents as a kind of synovial proliferative disorder is the second most common benign tumor of the hand after ganglion cysts.[1-5] Different names have been used to portray the GCTTS including pigmented villonodular synovitis, localized nodular tenosynovitis, xanthoma of the synovium, fibrous xanthoma, xanthomaous giant cell tumor, histiocytic giant cell tumor, benign synovioma, and sclerosing hemangioma. It reflects the fact that it has varied morphology and uncertain pathogenetic classification.[3,6-8] Although the GCTTS of the hand may compress adjacent osseous surface with x-ray presentation of bony indentation or atrophy, intraosseous invasion is relatively rare.[5,8-10] Local excision in general is considered as a treatment of choice in the majority of the patients.[1,3,8,10] However, if the lesion shows extensive spread and is combined with intraosseous invasion, local excision becomes inadequate as higher risk of recurrence has been reported in the literature.[1-3,5,6,8-10] We present a woman treated with amputation and immediate reconstruction with toe transfer.

CASE REPORT

A 47-year-old right-hand-dominant woman who was a manual laborer, presented in February 2002 with a tumor mass located beneath the skin of the left index finger over the distal interphalangeal (DIP) joint (Fig. 1). The patient suffered from a crushing injury at the tumor site by a slamming door 4 years prior to this examination. Initially, it was a small, painless subcutaneous nodule but gradually became a progressively enlarging mass, which then caused mild, intermittent pain and reduction in range of

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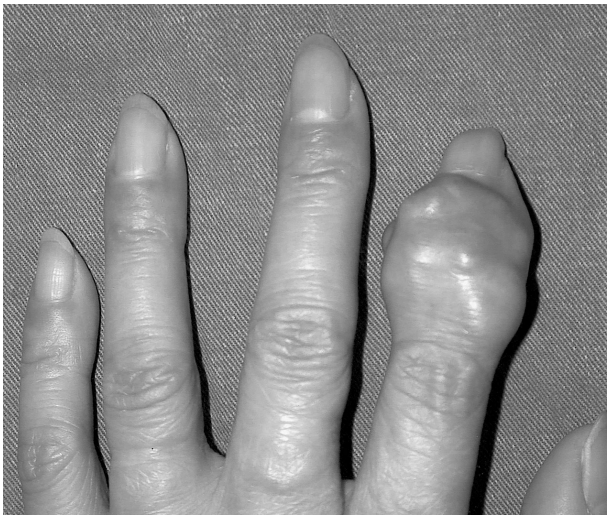

Fig. 1 An extensive, multinodular subcutaneous tumor measured 4.7×2.7×2.3 cm wrapping around all the circumference of the phalanx at the level of DIP joint of the left index finger.

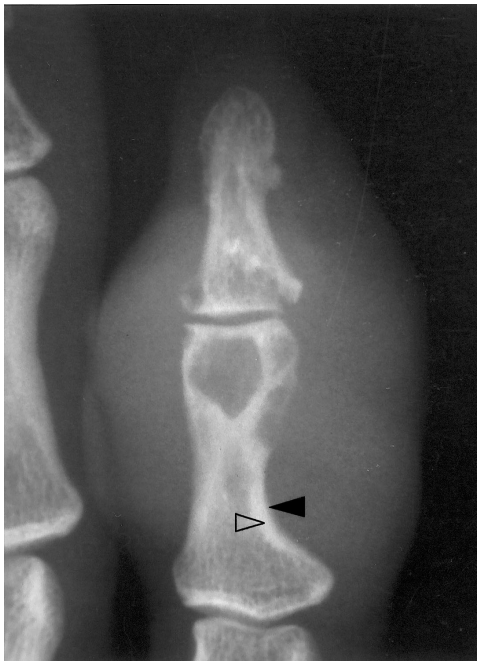

Fig. 2 X-ray film showing multiple intraosseous radiolucencies located in the distal site of middle phalanx of the index finger. These cystic, multilocular bony cavities were separated by coarse sclerotic trabeculae. Arrowhead indicates the site of bony indentation caused by the pressure of the overlying tumor. The ostoesclerotic rim (hollow arrowhead) was also found beneath the bone indentation.

motion of the DIP joint. On examination a 4.7×2.7 ×2.3 cm firm mass was found wrapping around all the circumference of the index finger at the level of the DIP joint and middle phalanx. The mass appeared multinodular and was adherent to the overlying skin and the deeper structures. The roentgenogram showed a soft-tissue mass shadow and multilocular, osteolytic lesions inside the medullary cavity of the middle phalanx (Fig. 2). Bony indentation and osteosclerotic changes of the bone cortex at the base of middle phalanx were also noted. An incisional biopsy revealed a benign GCTTS.

In order to eradicate the lesion and provide optimal reconstruction for the lost function and appearance of the index finger, distal finger amputation and immediate toe transfer reconstruction was proposed

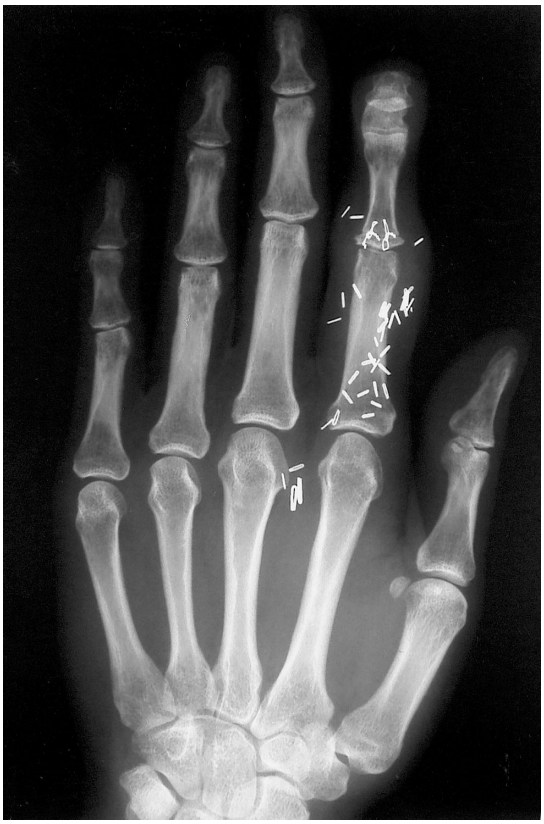

Fig. 3 Roentgenogram taken at 15 months after the operation.

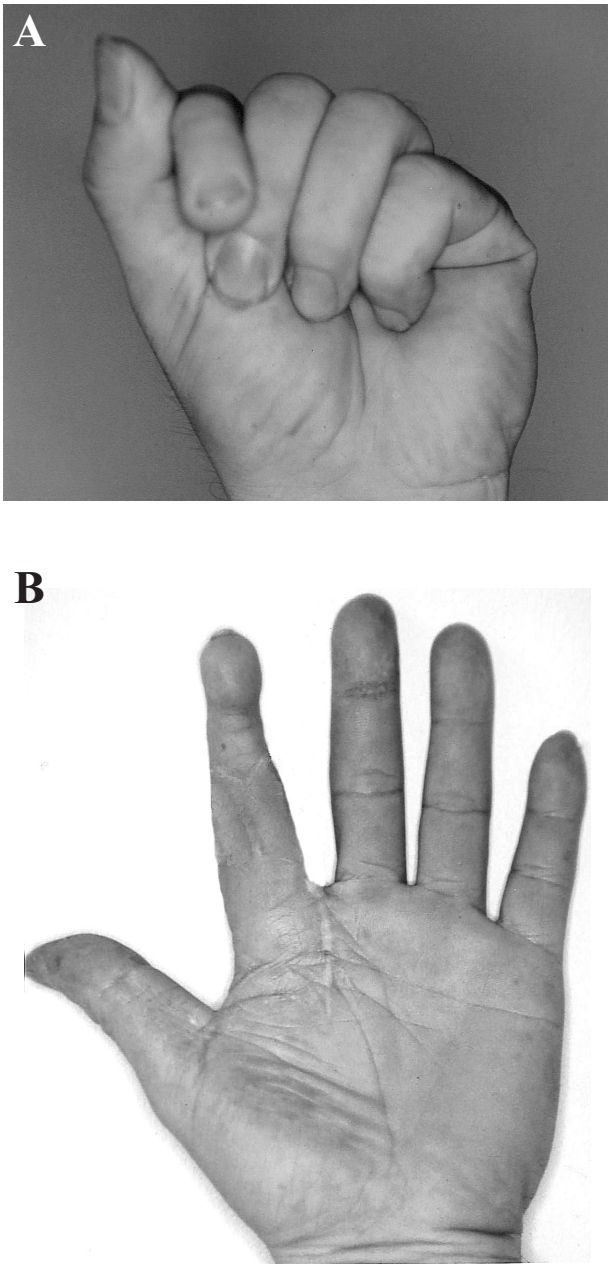

Fig. 4 Appearance 15 months after surgery (A) (B).

and agreed to by this highly motivated and well-informed patient. Because of the osteosclerotic changes over the proximal site of the middle phalanx, the level of the amputation was done at the base of the middle phalanx about 3 mm distal to the proximal interphalangeal (PIP) joint and just proximal to the insertion of flexor digitorum superficialis tendon for total ablation of the tumor. Simultaneously, her left second toe was harvested following the technique of retrograde dissection of the vascular pedicle. The toe was disarticulated at the metatarsophalangeal joint. The proximal base of the proximal phalanx of the toe was removed to make the total length of the toe equal to that of the index amputee. Interosseous wires were used for the fixation. Extensor and flexor tendon repairs were performed, then digital nerves anastomosis were performed; digital arteries and dorsal veins were used as the recipient vessels and microvascular anastomoses were done. The donor site was primarily closed.

The postoperative course was uneventful. Follow-up at 15 months after the operation revealed no recurrence (Fig. 3). Sensory recovery disclosed 6 mm of two-point discrimination. The active range of motion (extension/flexion) of the DIP joint, the PIP joint, and the metacarpophalangeal joint were 10/35, 0/40, and -10/90 degrees respectively, with a total active motion of 165 degree (Fig. 4). The pulp-to-pulp pinch strength between the thumb and the reconstructed index finger was 1.0 kg, which was 60% of the non-operated right hand. The grip power was 6.0 kg, which was 50% of the right hand. There was no cold intolerance, and no significant foot problems in the daily activities except slight soreness after prolonged walking. The patient was pleased with the functional and cosmetic results.

DISCUSSION

The GCTTS may occur at any age but is most commonly seen in patients between the ages of 30 and 50 years with a peak incidence during the fifth decade.[3,11] It has a female preponderance although there was a study reported an equal sex distribution.[2,3,5,6,8-11] Although the etiology is still unclear, traumatic inducement and truly neoplastic origin are two possible etiologies,[3,6,12] and recent studies, including DNA analysis method, support the neoplastic origin.[2,13] Tumors preferentially occur adjacent to the DIP joints with a favored side of flexor tendon compared with the extensor tendon.[3,10,11] Generally, the majority of patients have no particular symptoms other than a painless and palpable mass that gradually increases in size over a long period,

although sometimes it will cause pain,[10] and may restrict the ROM when located adjacent to a joint.[10,11]

The lesion may vary from solitary to multiple discrete soft-tissue nodules.[2,3] There is a statistically significant association between the number of tumor nodules and recurrence.[2] Although bony indentation by pressure from the tumor is more commonly seen, intraosseous invasion that presents as multiple osteolytic cavities on x-ray film such as our reported case is relatively rare.[1,5,9] Intraosseous invasion not only indicates the aggressive expansion of the tumor but also implicates the higher recurrence rate after excision.[1-3,5,6,8-10] To deal with intraosseous invasion, some authors have suggested excision of the tumor, curettage of the involved bone, lavage with 0.25% phenol, and cancellous bone graft to preserve maximal dexterity.[5] If bony involvement is too extensive to be curetted completely, excision of the tumor, total removal of the involved phalanx segment with preservation of the neurovascular bundles, skin, nail and pulp, then reconstructed with conventional bone graft would be a good option. However, for our case, the tumor had extended to all the circumference of the index finger at the level of DIP joint and middle phalanx, and adhered to the covering skin. As excision of such an extensive tumor with preservation of skin was both difficult and tedious and postoperative function would have been poor because of involvement of both flexor and extensor tendons. Amputation was a viable choice. This approach allows complete eradication of the tumor, which can lower the risk of recurrence.

Although loss of a single index finger may not cause significant functional impairment, the cosmetic concern may greatly affect the patient's psychology. Among various options for distal finger reconstruction, toe transfer provides the best function and appearance.[14] Demirkan et al. described 19 cases of second toe transplantation for reconstruction of isolated index finger amputation distal to the PIP joint.[15] All had satisfactory aesthetic and functional results. The authors also mentioned specific job requirements and strong cosmetic concern as two indications for single distal finger reconstruction.[15] In our case, the patient strongly desired to have the best reconstruction with toe transfer mainly for cosmetic considerations. Although toe transfer can be done as a secondary procedure, our approach of immediate toe transfer eliminates emotional trauma after finger loss and reduces patient's suffering and disability time.

To the best of our knowledge, this case is the first report of using immediate toe transfer for isolated index finger amputation for GCTTS. We feel the indications for both the amputation and toe transfer reconstruction are justified.

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利用立即指趾移植來重建因廣泛性腱鞘巨細胞瘤合併骨內侵襲的手指截肢

盧純德 陳宏基 O. Koray Coskunfirat

腱鞘巨細胞瘤是手上第二常見、手指最常見的良性腫瘤。雖然它對其下的骨頭所造成的凹陷壓跡頗爲常見，但造成X光多囊狀溶骨樣變化表現的骨內侵襲卻頗爲罕見，而這正是高復發率的表徵。本文報告一位病患在左手食指遠端指間關節處長了一個巨大的腱鞘巨細胞瘤，X光可看到骨內侵襲的表現，食指的中段指骨呈現了溶骨樣的囊狀空洞。由於此腫瘤擴展的範圍很大，且有較高的復發機會，因此我們選擇了截斷食指手術；同時在同一次手術中用第二指趾移植來重建失去的食指。這種一階段的切除與重建手術不僅消滅了這個腫瘤，且又可以使病人同時獲得良好功能與美觀的手。(長庚醫誌 2004;27:312-7)

關鍵字：手巨細胞瘤，腱鞘，手指截肢，指趾移植。

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