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Abstract: Glomus tumor is a benign rare neoplasm. They are distributed throughout the body, mainly in the digits, palm and toes. Glomus tumor is frequently described as "painful subcutaneous digital nodule" with classic clinical manifestations including paroxysmal pain, pinpoint tenderness and cool intolerance as triad. For treatment, surgical extirpation is the only curative method, nevertheless nail bed deformity is somehow inevitable after tumor resection. Grooving defect is normally left after tumor has been removed which interferes normal growth of nail for the nail bed is no longer even.

Thus, an avenue to refill the defect after nail bed tumor resection is highly necessary. In order to achieve an even nail bed, we propose using fat graft to refill the nail bed defect to avoid nail deformity afterwards.

Cover letter

Glomus tumor is a benign rare neoplasm. They are distributed throughout the body, mainly in the digits, palm and toes. Glomus tumor is frequently described as "painful subcutaneous digital nodule" with classic clinical manifestations including paroxysmal pain, pinpoint tenderness and cool intolerance as triad. For treatment, surgical extirpation is the only curative method, nevertheless nail bed deformity is somehow inevitable after tumor resection. Grooving defect is normally left after tumor has been removed which interferes normal growth of nail for the nail bed is no longer even. Thus, an avenue to refill the defect after nail bed tumor resection is highly necessary. In order to achieve an even nail bed, we propose using fat graft to refill the nail bed defect to avoid nail deformity afterwards.

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Title page

Autologous Fat Graft to Restore Nail Bed Contour Following Resection of a Subungual Glomus

Running title: Fat Grafting for Defect after Glomus Tumor Resection

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Derived from neuromyoarterial cells, the glomus tumor is a benign rare neoplasm that arises during the third or fourth decade of life and shows female predominance. The normal glomus body (histologically an arteriovenous anastomosis functioning without an intermediary capillary bed^{1,2}) functions as cutaneous microvasculature thermoregulator. They are distributed throughout the body and are located mainly within the digits, palm and toes³.

The glomus tumor is frequently described as a “painful subcutaneous digital nodule”, upon presentation. The classic clinical manifestations include the triad of paroxysmal pain, pinpoint tenderness and cold intolerance. The pain is occasionally exacerbated at night⁴ and frequently a small bluish discoloration may be seen deep to the nail plate.

For treatment, surgical excision is the only method of cure⁴ with an incidence of recurrence reported between 5-50%^{1, 5, 6}. To reduce recurrence, different surgical approaches have been proposed to achieve complete tumor resection. Transungual, lateral subperiosteal and Keyser-Littler approaches⁶⁻⁹ have been described.

For complete tumor excision, the authors favor the transungual approach. It involves making a longitudinal incision parallel to the rete ridges through the nail bed^{10,11} following removal of the nail plate. Following ‘scooping out’ of the tumor, the defect in the sterile (and also, if present, the germinal) matrix is repaired using absorbable suture; however, postoperative nail deformity results frequently. Some authors have reported improved results with respect to post-resection deformity

by utilizing different techniques and approaches⁸. We propose using a fat graft to achieve an even nail bed to avoid post-operative nail deformity.

Surgical Technique

After appropriate local anesthesia was obtained, the hand was prepped and draped. A longitudinal sharp incision was carried from the proximal midline nail bed to the fingertip and reversed to digital pulp, creating a composite hemidorso-ventral flap, which comprised skin, germinal tissue, digital vessels and nerve. Nail bed and pulp were meticulously dissected to fully expose distal phalanx and the tumor. The tumor was carefully dissected with a small curette and forceps.

The patient then has an autologous fat grafting harvested by sharp dissection from the periumbilical area. The fat graft is transplanted into the nail bed defect in order to achieve a uniformly even surface (Fig. 1A). The wound is approximated using interrupted silk suture (Fig. 1B). A silicone sheet is placed on the nail bed as a splint and is fixed to the sutured line. A dressing and antibiotic ointment are then applied. All specimens were sent for pathology. The surgical outcome in each patient was evaluated by analysis of photographs pre-operatively and at twelve months following surgery.

Figure 2 shows nail condition twelve months after operation. No nail deformity is noted.

Discussion

Transplantation of autologous fat graft has been a well-accepted method for restoring contour in soft tissue reconstruction. Whereas this method had first been described for a nasal reconstruction

over 3000 years ago in India¹², fat grafting is currently applied mainly to breast reconstruction. In addition, fat grafting has also been used for gluteal, facial, lip, and vocal cord^{13,14} augmentation, as well as hand 'rejuvenation' and penile enlargement¹⁵.

Fat is abundantly available throughout our body, has no monetary cost, no immunogenicity or allergenicity, and has no potential of transmitting infectious disease. It therefore makes a promising soft tissue filler. The unpredictable time course of fatty resorption and its replacement by fibrous tissue or an oil cyst^{16,17,18} are drawbacks that limit its usefulness. We have found that tissue viability was highest following sharp excisional harvest versus blunt or needle harvest¹⁹. We therefore recommend sharp excision as method of fat harvest rather than using sharp needle and blunt cannula. In the study by Rohrich et al body part demonstrated no significant benefits over one another in terms of donor site characteristics²⁰. However, we recommend the periumbilical area as a customary site for fat harvest due to aesthetic considerations and a low rate of infection.

The following points bear repeat mention: 1) Glomus tumors are benign neoplasms derived from neuromyoarterial cells, 2) They arise frequently during the third or fourth decade of life, and show a female preponderance, 3) The classic location is within the sterile nail matrix, and it causes paroxysmal pain, cold intolerance, and the presence of a localized blue discoloration visible through the nail plate, and 4) Application of a fat graft (sharply harvested from the periumbilical area) may lead to improved nail plate aesthetic contour following nail regrowth.

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A



B

FIGURE 1. Using autologous fat grafting to refill nail bed defect. A. After tumor resection, the patient was treated with autologous fat grafting that was harvested with plain excision and single saline wash. The fat graft was transplanted into the nail bed defect until even nail bed was achieved. B. The wound was seamed using silk interrupted suture line.



FIGURE 2. Nail condition one year after operation.





