CASE REPORT

Macrodactyly of the Hand Managed with Digital Shortening and Nail Bed Grafting

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ABSTRACT

Macrodactyly is a rare congenital condition in which one or more digits grow disproportionately due to overgrowth of bone, soft tissue, and nerves. We report a 31-year-old woman with progressive enlargement of the long and ring fingers of her right hand, causing pain, limited flexion of the long finger, and cosmetic concern. Examination revealed disproportionate digit size, clinodactyly of the long finger, intact sensation, and normal vascularity. Imaging confirmed hypertrophy of bone and soft tissues, with enlargement of the median and digital nerves. The patient underwent digital shortening of the long finger at the distal interphalangeal joint, excision of fibro-fatty tissue, and nail bed grafting, preserving neurovascular structures. At six months, the nail bed graft had fully taken, digit size was reduced, clinodactyly corrected, sensation and circulation preserved, pain resolved, and hand function improved. The patient was satisfied, and no recurrence was observed.

Keywords: Digital shortening, hand, macrodactyly, nail bed grafting

INTRODUCTION

Macrodactyly is a rare congenital anomaly characterized by disproportionate enlargement of one or more digits due to overgrowth of bone, adipose tissue, nerves, and other soft tissues.[1,2] It most commonly follows the distribution of a single peripheral nerve and can lead to functional limitation, cosmetic deformity, and psychosocial distress.[3] The condition may be classified as static or progressive, with progressive forms posing greater reconstructive challenges.[1,4] Surgical management is individualized, aiming to improve function, restore digital proportions, and achieve acceptable cosmetic outcomes. Techniques include soft-tissue debulking, osteotomies, digital shortening, and nail complex preservation.[5,6,7] Given its rarity, case reports remain valuable.[8]

CASE REPORT

A 31-year-old female presented with congenital enlargement of the long and ring fingers of her right hand, gradually increasing in size over time. She remained largely asymptomatic until five months prior, when she developed pain and paresthesia around the wrist and affected fingers, along with cosmetic concern.

On examination, the long and ring fingers were disproportionately enlarged in length and girth compared with adjacent digits and the contralateral hand. The long finger demonstrated lateral deviation (clinodactyly). The overlying skin was intact, sensation was normal, and vascularity was preserved. Flexion of the long finger was limited, while other digits had full range of motion.

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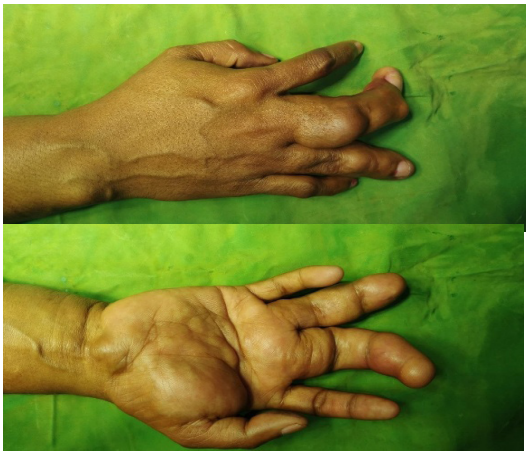

Figure 1: Macrodactyly of right hand involving long and ring fingers

Radiographs revealed hypertrophy of the phalanges and soft tissues of the affected digits, with degenerative changes of the interphalangeal joints of the long finger. MRI showed marked soft-tissue hypertrophy with fatty proliferation along the volar aspect, enlargement of the median and digital nerves, and displacement but integrity of the flexor tendons, consistent with lipomatous macrodactyly with neural involvement.

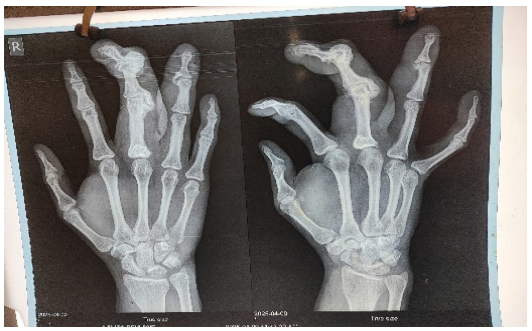

Figure 2: X-ray image of the hand

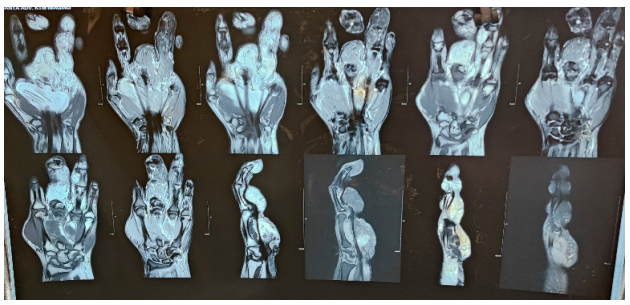

Figure 3: MRI of the hand

Surgical intervention was planned. Under tourniquet control, a volar approach was used. Intraoperatively, marked hypertrophy of fibro-fatty tissue was noted along the course of the digital neurovascular bundles. The median nerve was diffusely enlarged and thickened within the carpal tunnel and distal forearm, with excessive epineural and perineural fatty infiltration. The nerve fascicles were splayed but remained in continuity. Microsurgical decompression of the median nerve was achieved by meticulous excision of excess fibro-fatty tissue surrounding the nerve while preserving its fascicular architecture and vascularity.

The digital nerves of the long and ring fingers were similarly found to be markedly thickened and elongated. These nerves were decompressed along their course by careful debulking of the surrounding fibro-fatty tissue, relieving constriction while maintaining nerve continuity and blood supply. These intraoperative findings were consistent with significant neural involvement.

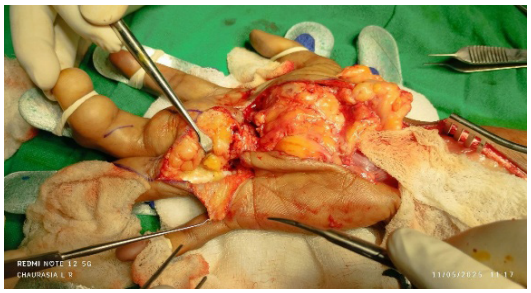

Figure 4: Intraoperative picture showing markedly thickened median nerve with excessive fibrofatty tissue infiltration

For the long finger, digital shortening was achieved by disarticulation at the distal interphalangeal joint level, as the overgrowth was predominantly distal. Following disarticulation, the nail complex, including the germinal matrix and nail bed, was carefully harvested from the amputated distal segment of the same digit. The outline of the nail unit was marked at the appropriate position on the distal end of the amputation stump, and the marked area was de-epithelialised to create a suitable graft bed. A pocket was made with proximally based flap to create the eponychium. The composite nail graft was then anatomically positioned and secured with fine sutures. Excess fibro-fatty tissue was meticulously excised with preservation of vascularity. Wound closure was achieved without tension, and a bulky dressing with splintage was applied.

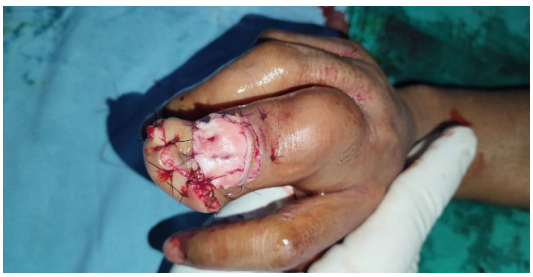

Figure 5: Nail bed grafting at long finger

Histopathological examination of the excised tissue revealed hyperplastic nerve bundles associated with proliferation of fibroblasts and mature adipose tissue. Areas of fibrocollagenous tissue were also noted. There was no evidence of cellular atypia or malignancy. These findings were consistent with a diagnosis of macrodystrophia lipomatosa with prominent neural involvement. The patient was maintained in a bulky dressing and splint, and gentle range-of-motion exercises for the fingers and wrist were initiated once wound healing was adequate.

At 6 months follow-up, the nail bed graft of the long finger had successfully taken, with evidence of normal nail growth. The pain previously experienced by the patient had resolved, and there was a noticeable reduction in the size of the affected digits. The lateral deviation (clinodactyly) of the long finger was corrected. Sensation and vascularity to the fingers were preserved, and overall hand function had improved. The patient expressed satisfaction with the cosmetic and functional outcomes.

However, complete flexion of the long finger was not achieved, which was a pre-existing limitation present before surgery. No signs of recurrence were observed during the follow-up period, and the patient was able to perform daily activities comfortably.

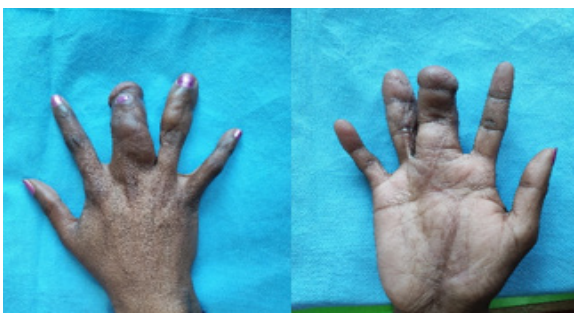

Figure 6: 6-month post-operative picture of the hand

DISCUSSION

Macrodactyly is a rare congenital condition characterized by disproportionate enlargement of one or more digits involving bone, adipose tissue, nerves, and soft tissue. Most cases are sporadic and commonly involve the median nerve in the hand. Although present at birth, symptoms such as pain, functional limitation, or cosmetic concern may manifest later in life, as seen in our patient.[1,2]

The etiology of macrodactyly remains incompletely understood. Tsuge proposed that hypertrophy of the digital nerve with associated fibrofatty overgrowth plays a central role in disease progression.[3] More recently, somatic *PIK3CA* mutations have been implicated in progressive overgrowth, providing a molecular explanation for continued enlargement and frequent neural involvement on imaging.[9]

Macrodactyly is classically classified as static or progressive.[4] Our patient demonstrated the progressive form, with gradual enlargement of the long and ring fingers and late-onset symptoms. This wide variation in presentation highlights the need for an individualized approach to management, as emphasized by Barsky, who observed that the degree of bony, soft-tissue, and neural involvement can vary greatly between patients.[4]

Imaging plays a critical role in surgical planning. While radiographs demonstrate osseous enlargement, MRI allows precise delineation of soft-tissue and neural involvement, facilitating safe debulking while preserving neurovascular structures.

In adults, surgical treatment focuses on pain relief, functional improvement, and acceptable cosmetic outcome rather than growth control.[5] In this case, soft-tissue debulking combined with digital shortening and nail bed grafting was performed, guided by principles described by Sabapathy et al. in toe macrodactyly.[6] Although originally applied to the foot, the technique proved equally effective in the hand, allowing size reduction while preserving nail growth, sensation, and vascularity. Alternative approaches, including nerve-directed procedures, have been described but may be associated with sensory deficits.[10] Our outcome supports a digit preserving strategy that balances functional improvement with sensory preservation. At

six months, the patient achieved pain relief, reduction in digit size, preserved sensation, and satisfactory cosmetic outcome. Nevertheless, progressive macrodactyly carries a risk of recurrence, and long-term follow-up remains essential.[8]

CONCLUSION

Individualized surgical management can yield favorable functional and cosmetic outcomes in adult macrodactyly. Soft-tissue debulking with nail bed grafting offers a reliable, digit-preserving option that relieves symptoms while maintaining sensation and nail appearance.

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