Index Finger Pollicization for Functional Preservation of the Hand After Giant Liposarcoma Resection of the Thenar Eminence

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Introduction

Soft-tissue sarcomas are a large group of malignant non epithelial neoplasm that can take origin from a wide variety of structures, which are predominantly constitute by fibers and fibroblasts, like tendons, ligaments, fat and synovial membranes.

In the hand benign tumors are predominant, including ganglions, giant-cell tumors and lipomas. Malignant forms are rare and constitute only the 3 % of all soft-tissue sarcomas of the body. The most frequent are epithelioid sarcoma, synovial sarcoma, liposarcoma and fibrosarcoma. Both groups can be painless and have a slow-growing presentation, and this often may lead to a delay of diagnosis and treatment [1, 2].

It is commonly accepted that lesions larger than 5 cm in patients over 40 years old have to be considered malignant until proven otherwise. The growth in a such a small space can progressively compromise vital adjacent structures, like nerves and vessels, extending early over more compartments. Soft tissue sarcomas are also burdened by a high rate of recurrence and the literature suggests that the risk of metastasis is related to three main characteristics: high grade of malignancy, deep localization of the tumor, and diameter of the neoplasm larger than 5 cm [3–7].

Liposarcoma of the hand have been rarely described in the literature with less than 20 cases reported up to now [8]. Giant ones are even more rare and in these circumstances the great challenge of treatment is the balance between the salvage of hand function and the need of radical resection in order to avoid local recurrence and achieve patient survival [9, 10].

In this paper we report a case of giant liposarcoma localized in the thenar eminence in which an index finger pollicization was performed after tumor excision in a single surgical procedure. To our knowledge this is the first case in which such kind of reconstructive procedure has been used for functional hand preservation after tumor surgical resection for large soft tissue sarcomas of the hand.

Case Report

In August 2008 a 49 year-old man came to our department showing a large mass on the palmar aspect of his left hand. His clinical history was unremarkable and he did not report previous trauma or surgery to the affected hand. The mass appeared about 5 years before, and progressively growth without pain and neurological symptoms. During all this period the patient did not consult any physician despite of the large dimension of the mass. He was finally referred to our orthopaedic center after his first general medical consult. Clinical observation revealed a large spherical thenar mass, solid and painless to digital pressure, fixed to surrounding tissues (Fig. 1a and b). The patient complained a limitation of the range of movement of the first digital ray, with difficult thumb opposition and pinch. Radiographs excluded bone involvement, and MRI showed a lipomatous mass, occupying the first web space (Fig. 2a and b). The tumor, involving all thenar muscles, was in close contact to the neurovascular bundle for the thumb, and

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Fig. 1 **a** preoperative clinical anterior view **b** preoperative clinical lateral view

presented peripherally well-defined margins. Taking into account the size of the mass and the consequent suspicion of malignancy of the tumor, an incisional biopsy was performed before surgical resection of the neoplasm. The histopathological finding revealed a well-differentiated sclerosing liposarcoma lipoma-like.

Surgical plan included resection of tumor mass with thenar muscles and with neurovascular bundles for the thumb. Two different surgical strategies were then discussed with the patient and offered in a multidisciplinary consult involving oncological orthopaedic and microsurgical reconstructive staff. The first option regarded the preservation of the thumb: revascularization by means of a vein graft and a nerve graft to restore the sensibility. To restore the skin and thumb motion two choices were given to the patient: a functional free gracilis muscle transfer and skin graft or a local adipocutaneous flap (i.e., radial flap) associated with extensor proprius indicis tendon transfer for the opposition. The second option contemplated the excision of the thumb and the transfer of the index finger with intact vascularization and sensibility for pollicization and the use of the dorsal skin of the thumb to cover the volar skin defect, without the use of microsurgical techniques. In this case tendon transfers were also planned for the preservation of thumb opposition, adduction and flexion function.

The patient preferred the second possibility, burdened with a lower rate of possible complications, because he desired a single surgery with the shortest possible time of recovery.

Fig. 2 **a** MR se T1 coronal view **b** MR se T1 lateral view

Surgical Technique

Radical excision of the tumor mass was performed to achieve free margins, with resection of thenar muscle, neurovascular bundles of the thumb, the flexor pollicis longus and the flexors of the index finger (Fig. 3). After tumor resection the thumb

Fig. 3 tumor excised

Fig. 4 thumb reconstruction

showed only a poor residual vascularization from the dorsal arteries and the skeletal part up to the central part of the metacarpal bone was resected. The reconstruction of the first ray was performed as planned before by means of index finger pollicization. Stabilization of the first phalanx of index finger with the metacarpal bone was obtained with temporary K-wires. The extensor indicis proprius was transferred to the new metacarpophalangeal joint for thumb opposition and the flexor indicis superficialis was transferred for thumb adduction by means a pulley in palmar aponeurosis. The distal tendon stump of flexor digitorum profundus of the index finger was sutured to the proximal tendon stump of the flexor pollicis longus. The residual loss of substance of the thenar aspect of

the hand was then covered with the dorsal skin of the amputated thumb (Fig. 4).

Specimen was sent for pathological evaluation, showing a spherical mass of 6.5×6.5 cm macroscopically capsulated. Microscopically the proliferation index, researched by means

Fig. 5 **a** final clinical follow up: anterior view **b** final clinical follow up: grip recovery

Fig. 6 **a** final X Ray follow up : AP view **b** final X Ray follow up : oblique view

of immunoistochemical techniques (Ki-67) was about 1 % in major activity areas. The diagnosis of well-differentiated sclerosing liposarcoma lipoma-like was confirmed. Post-operative course was regular. Radiation was not required. Early active mobilization of the interphalangeal joints of the transferred index finger was allowed, and K-wires were removed after 45 days. The patient progressively returned to his daily activities in about 6 months. At five-year control the patient was free from tumor disease. Residual functional limitation was observed with a DASH score of 55.8 and residual grip strength was 40 % compared to the unaffected side (Fig. 5a and b). Final Kapandj index was seven. Final X ray showed fusion of the base of first metacarpal bone with the proximal phalanx of the transferred index finger (Fig. 6a and b).

Discussion

Soft-tissue sarcomas of the hand are difficult to manage for many reasons. They grow in a small area with many vital structures that can be early compromised and infiltrated and they may consequently extend to neighboring anatomical compartments. Frequently, at the time of presentation, soft-tissue sarcomas of the hand are not painful leading sometimes to a delay in diagnosis and treatment with the risk of a poor final functional outcome. The importance to obtain free margins of resection in order to significantly reduce the local recurrence rate and the potential metastatic dissemination of the disease is now well recognized in the literature. Nonetheless, radical excision may lead in many cases to a partial or a complete hand amputation of the hand with permanent functional impairment [11].

A particular challenge is represented by malignant soft-tissue sarcomas localized at the radial side of the hand with thumb involvement. In these cases a functional reconstruction should be always attempted in order to achieve an acceptable recovery but this may be very difficult in case of large infiltrating tumor mass.

In a recent series of five soft-tissue sarcomas of the hand, Labow reported three functional reconstructions of the partially resected thumb by means of joint transfer (two MP and one PIP joint) with associated soft-tissue procedures from the index finger [12]. One out of the three modified pollicizations required microvascular transfer highlighting the need for microsurgical skills in surgical team when facing such complex procedures, and the current trend toward functional reconstruction of the hand.

In our case the patient preferred a surgical option that allowed early return to activity and less complication compared to microsurgical repair requiring free muscular transfer and neurovascular reconstruction. Tumor resection with

thumb amputation and the pollicization of the index finger allowed in our case a favorable final outcome both for the healing tumor disease and for functional result.

As reported in the literature this procedure has proven to be a reliable technique for thumb reconstruction. The pollicization of the index finger evolved over the time, with refinements in management of skin incision, bones positioning, muscle balancing, and at present this technique constitutes one of the best option for thumb reconstruction, avoiding any morbidity outside of the hand [13]. Our case history demonstrated also the need for a careful attention in approaching and treating growing soft-tissues masses of the hand because the absence of pain and functional impairments does not correlate with the risk of malignancy. Large soft-tissue tumors of the hand require a prompt and multidisciplinary approach in order to establish an accurate diagnosis and a proper treatment of the neoplasm.

Compliance with Ethical Standards The Authors do not report disclosures and conflict of interests

The patient gave his informed consent for the publication

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