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Case Report

Reconstruction of the elbow by Baksi sloppy hinge total elbow prosthesis following excision of a malignant fibrous histiocytoma

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1. Introduction

Limb salvage for malignant bone tumours is the current flavour in orthopaedic decision making. The fact is that the patient survival has improved from 10–20% to 50–70% with the advent of neo-adjuvant chemotherapy, surgery and adjuvant radiotherapy/chemotherapy.^{1,2} Long-term studies show that limb salvage operations, performed with wide margins and chemotherapy, did not compromise the survival or local control compared to amputation.^{3,4} Reconstruction procedures and principles have been described in literature for the resection of malignant bone tumours at various parts and now follow a standardized protocol.^{5–7} If a useful limb cannot be reconstructed while following resection, then amputation is still preferred over ill-performed resections. We are reporting a case of an extra-compartmental malignant fibrous histiocytoma of the proximal ulna, where both the radius and ulna

were to be resected in the proximal half of forearm, and the patient was considered fit for an above elbow amputation. We opted for an ingenious method of two-stage reconstruction where first the radius was lengthened by a fibular graft and an elbow arthrodesis was done. Later the radio-capitellar arthrodesis was converted into a total elbow arthroplasty (TER) using a constrained TER prosthesis (Baksi sloppy hinge total elbow prosthesis, Fig. 1).⁸ Limb salvage following excision of both proximal radius and ulna has not been described in literature. We are describing the procedure for the ingenious use of orthopaedic principles followed which resulted in a functional and mobile limb for the patient.

2. Case report

A 32-year-old female presented to us with pain and rapidly enlarging swelling of her left proximal forearm since 15 days

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Fig. 1 – Baksi sloppy hinge total elbow prosthesis.

Fig. 2 – Clinical photograph showing extra-articular swelling of proximal forearm.

(Fig. 2). There was no history of immediate trauma but the patient gave a history of removal of a bony exostosis from her proximal ulna 15 years back which was reported benign to her. The swelling was about 14 cm × 12 cm × 12 cm in size, tender, warm with ill-defined margins, irregular surface and variegated consistency (Fig. 1). An X-ray of the forearm with elbow revealed a large, osteolytic, extracompartmental destruction of Ulna from coronoid process to ulna in the proximal third with saucerization defect in the proximal radius suggesting pressure and infiltration (Fig. 3). There was no distal neurovascular deficit. The X-ray reported a malignant bone tumour of the ulna and the patient was advised above elbow amputation by several orthopaedic surgeons. The patient did not want an amputation and had come for further management to our centre. A core needle biopsy was done marking the entry point of the needle which revealed the tumour to be a malignant fibrous histiocytoma. The patient was again advised amputation, but on denial, an ultrasonography of the left arm was performed to assess the vascular status and on finding the brachial vessels anterior to the tumour without infiltration, the patient was planned for surgery.

A 15 cm long anterior midline incision was given on the elbow and forearm, and medial and lateral flaps were raised including the deep fascia in them. The brachial vessels and

Fig. 3 – Radiograph forearm and elbow showing extra compartmental osteolytic destruction of ulna with saucerization defect of proximal radius.

median nerve were identified medial to tendon of biceps. The tumour was excised en masse along with the proximal half of Ulna and Radius. During the resection, care was taken not to open the tumour, the triceps insertion had to be erased from the olecranon, the Biceps insertion had to be cut 2 cm proximal to its insertion and the brachial vessels, radial nerve, Median nerve and ulnar nerve were preserved proximally (Fig. 4). The radius and ulna were cut in their middle keeping a margin of 2 cm from the tumour. Following excision the distal radial artery pulsations were confirmed and reconstruction was planned.

A 14 cm long diaphyseal fibular graft was removed from left leg and the forearm was reconstructed by a radio-fibular

Fig. 4 – Specimen of en masse excised proximal radius and ulna.

Fig. 5 – Reconstruction of the forearm and elbow showing radiofibular union and radio-capitellar fusion.

Fig. 6 – Fracture of the fibular graft at plate-graft junction.

osteosynthesis by a 3.5 mm DCP lengthening the radius and elbow by a radio-capitellar fusion. The limb was kept in an elbow cast for 3 months for the radio-fibular union to take place and radio-capitellar fusion to consolidate (Fig. 5). A trial was given to the patient to use this limb, but the patient reported soon with a stress fracture at the plate graft junction due to the graft not being able to resist the weight of the limb (Fig. 6). Temporary support was given by removal of the plate and a “K”-wire, but it did not work (Fig. 7). The patient also had decreased excursion of fingers due to shortened forearm muscles, and it was decided to excise the arthodesised elbow with shortening of the forearm (Fig. 8) which will permit complete finger movements and reconstruct the elbow with a mobile segment to decrease abnormal loads on the graft by a Baksi sloppy hinge total elbow constrained elbow prosthesis. The elbow was approached by a standard midline posterior incision. The arthodesised elbow was excised along with the radius up to the non-union site. The elbow flexion was achieved by myodesis of biceps brachii to the proximal radius,

Fig. 7 – X-ray showing a “K” wire supporting the radius after removal of the plate with no success and proximal radial non-union.

and extension was achieved by reconstruction of triceps insertion by fascialata graft (Fig. 9). The limb was again kept in an above elbow plaster of paris cast, and permitted movements at 3 months with satisfactory hand and elbow movements (Fig. 10). Postoperative radiograph showed the Baksi TER prosthesis in acceptable position (Fig. 11). The female at a follow-up of 10 years is showing good elbow function and hand movements as per the Uyttendaele criteria.⁹

Fig. 8 – Excised elbow from non-union site.

Fig. 9 – Intraoperative photograph showing Baksi sloppy hinge TER prosthesis and reconstruction of extensor mechanism by fascialata graft.

Fig. 10 – Clinical photographs showing elbow and hand function.

3. Discussion

Malignant fibrous histiocytoma is an unusual musculoskeletal tumour classified as a soft tissue sarcoma, but it is also present in the bone. Extensive radiographic and laboratory investigations are seldom helpful in diagnosis. Scanning techniques and angiography may assist in determining the extent of the tumour, and wide local excision has been the most common

form of treatment for this lesion.¹⁰ As recurrence rates often exceed 30%, it is imperative that the tumour could be excised en-masse, and if not possible, one may resort to wide or radical amputation.^{5,6}

Limb salvage for malignant bone tumours is done with a wide or radical margins, and is the current practice of management. Limb salvage surgeries are done with the aim of en-masse excision with an adequate wide margin, the limb having an acceptable degree of function, acceptable cosmetic

Fig. 11 – Radiographs showing reconstruction of elbow by Baksi sloppy hinge TER prosthesis.

appearance, ability to withstand activities of daily living, function comparable or better than an artificial limb and finally respecting the patients desires assessing his psychological state.¹¹ Several reconstruction techniques are described in the literature keeping in view the possibility of prolonged morbidity, associated complications, local recurrence and the chances of distant metastasis associated.^{5–7} Standard techniques of treatment do not describe excision of both the radius and ulna proximally or any reconstruction, as the chances of complications including possibility to injure the radial, median and ulnar nerves and brachial vessels or opening up of the tumour mass are very high which may lead to an amputation or associated prolonged morbidity. We are describing a method of reconstruction done in two stages along with prolonged immobilisation and physiotherapy which saved the patients limb from amputation. The principles of limb salvage, bone physiology and adult reconstruction were utilised to maximum in this patient with a strong desire to live with her limb. The Uyttendaele criteria for the assessment of limb salvage for bone tumours also in this patient give a good outcome.

Conflicts of interest

The author has none to declare.

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