ORIGINAL ARTICLE

PROXIMAL RADIUS RECONSTRUCTION BY METATARSAL OSTEOCHONDRAL AUTO GRAFT

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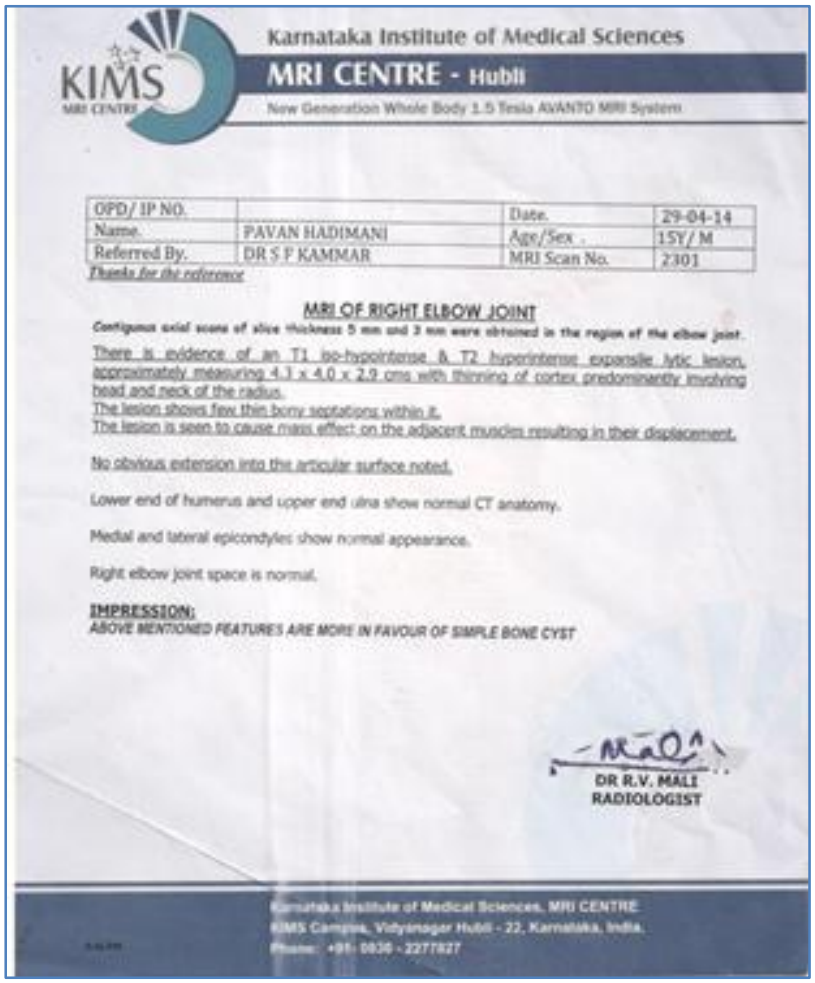
ABSTRACT: 17 Year Old student, Pavan presents with swelling since 8 months. Swelling was diffuse over forearm. Tenderness was present. No local rise of temperature. Range of movement at elbow was restricted and painful terminally. No distal neurovascular deficits. X-ray revealed it to be an aneurysmal bone cyst of proximal right radius. FNAC showed Aneurysmal bone cyst for which curettage and bone grafting was done. Post 6 months tumour recurred with a swelling around upper third of right forearm. FNAC and J-needle biopsy showed it to be aneurysmal bone cyst. MRI showed ABC of proximal radius without soft tissue involvement. Excision of proximal third of radius with reconstruction by 3rd metatarsal and augmented with fibular graft and stabilized with dynamic compression plate and screws. Tumour specimen was sent for histopathology at 2 weeks post operatively patient had good range of movements. At present patient has full range of flexion, extension, supination & pronation. He is able to carry out his ADL. In the literature proximal radius reconstruction has been tried in traumatic communited radial head fractures. Here it done for recurrent benign tumour like aneurysmal bone cyst, as the base of 3rd metatarsal anatomically coincides with radial head and hence a better radio-capital articulation.

KEYWORDS: Proximal radius reconstruction, 3rd metatarsal graft, Excision of proximal radius.

INTRODUCTION: Case of recurrent aneurysmal bone cyst arising from proximal radius where in excision of upper part of radius and reconstruction by using 3rd metatarsal bane so as to have anatomical coincidence with better radio-capital articulation.[1]

MATERIALS & METHODS: A boy named Kumar Pavan, 17yrs, student, resident of Unkal, Hubli presented with diffuse swelling in upper part of right forearm and dull aching pain since 8 months. On Examination tenderness present. No local raise of temperature. Range of movements are painful and terminally restricted. No distal neurovascular deficits. X-ray revealed gross ABC of proximal radius.

X ray of right elbow shows evidence of large osteolytic lesion in radial head, with septations.



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New Generation Whole Body 1.5 Tesla AVANTO MRI System

OPD/ IP NO.		Date.	29-04-14
Name.	PAVAN HADIMANI	Age/Sex .	15Y/ M
Referred By.	DR S P KAMMAR	MRI Scan No.	2301

Thanks for the reference

MRI OF RIGHT ELBOW JOINT

Contiguous axial scans of slice thickness 5 mm and 3 mm were obtained in the region of the elbow joint.

There is evidence of an T1 iso-hypointense & T2 hyperintense expansile lytic lesion, approximately measuring 4.1 x 4.0 x 2.9 cms with thinning of cortex predominantly involving head and neck of the radius.
The lesion shows few thin bony septations within it.
The lesion is seen to cause mass effect on the adjacent muscles resulting in their displacement.

No obvious extension into the articular surface noted.

Lower end of humerus and upper end ulna show normal CT anatomy.

Medial and lateral epicondyles show normal appearance.

Right elbow joint space is normal.

IMPRESSION:
ABOVE MENTIONED FEATURES ARE MORE IN FAVOUR OF SIMPLE BONE CYST

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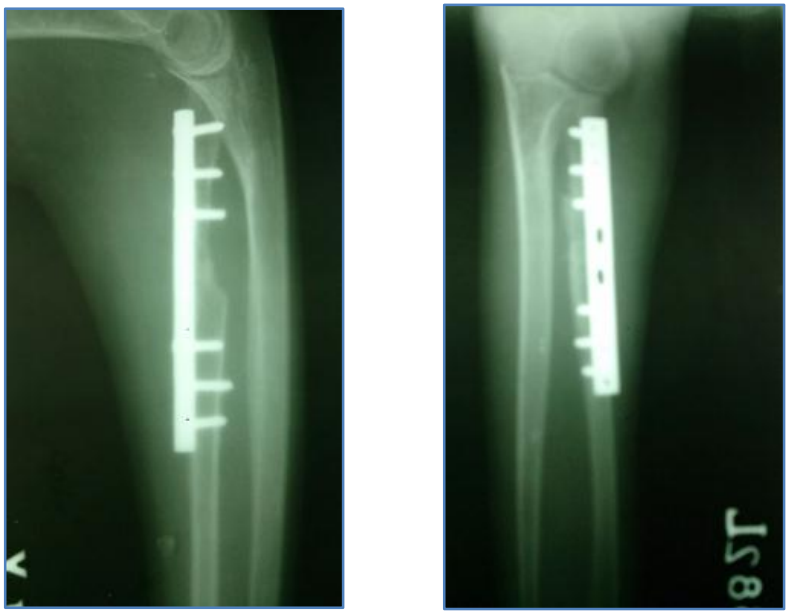
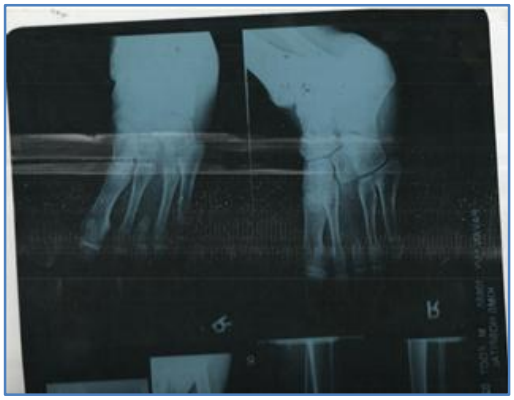
FNAC showed aneurysmal bone cyst for which curettage and bone grafting was done. Post 6 months, tumour recurred as gross circumferential swelling at upper third of forearm. Routine hematological investigations were normal including CRP. Repeat FNAC and J-Biopsy showed ABC. X-ray revealed lytic lesion with thinned out cortex of proximal radius. Chest X-ray was normal (without signs of metastasis). MRI showed ABC without soft tissue involvement. Planned for excision proximal radius with epiphysis and reconstructed by using 3rd metatarsal bone, including the base.[1] The excised part of upper radius was sent for HPE and confirmed it to be aneurysmal bone cyst. We did not take 2nd metatarsal as mentioned in literature for radial head reconstruction because it may hamper tarso -metatarsal coalition.[2]

Since metatarsal graft was insufficient as tumour was large, we took fibular graft for augmentation, stabilized by DCP and screws.[3,4] Soft tissue closure done. Limb immobilized in above elbow pop slab for 2 weeks.[5]



Post op x-ray right elbow at 6 weeks, AP and lateral views



X-ray left foot, AP and oblique (At 6 weeks)

At 6 weeks follow up-patient had good range of movements and X-ray showed consolidation of metatarso-radial junction. At 12 weeks patient had nearly full range of movements and X-ray showed complete union. At 6 months follow up patient was able to carry out his ADL.

Range of movements at 6 weeks

DISCUSSION: Proximal radius reconstruction has been attempted for traumatic fractures of radial head[2] and this may be the first time in recurrent tumour. Proximal radius reconstruction with an osteochondral auto graft from third metatarsal base appears to be an effective alternative for treatment of unreconstructable proximal radial lesions.[2]

Under general anesthesia, the patient was placed on the operating table in the lateral position and the surgical limb was placed in a tourniquet.

Skin incision, dissection and excision of radial head was performed as in the usual lateral approach technique, and the cuff of the proximal end of the radius was trimmed perpendicular to the axis of the radius using an oscillating saw. After measurement of the distance between the capitellum and the proximal end of the radius, the space was packed with a wet sponge and the tourniquet was deflated during the procedure in order to harvest the osteochondral autograft from the foot.[2]

The base of the third metatarsal bone of the non-dominant foot was selected as a substitute for the radial head, and the articular surface of the proximal part was slightly concave and perpendicular to the shaft of the metatarsal bone.[2]

After locating the base of the third metatarsal bone using a fluoroscope, a dorsal, longitudinal incision was made over the third metatarsal base and cuneiform bone. Branches of the superficial and deep peroneal nerves and dorsalispedis artery were preserved, and the toe extensor tendons were retracted in order to expose the third metatarsocuneiform joint.

The third metatarso-cuneiform joint capsule was incised transversely. The medial and lateral border of the proximal part of the third metatarsal bone was isolated subperiosteally from

the recess formed by three cuneiform bones using a beaver blade and a curved mini-osteotome. The measured length of the third metatarsal bone, including articular base, was harvested using an electrical saw. Because the articular surface of the third metatarsal bone is triangular in shape, the three corners should be trimmed in order to mimic the round radial head. The incised periosteum and skin were closed meticulously.

We used two small incisions for cutting the upper and lower end of proposed length of fibula. Here, utmost care was taken to avoid the damage of large and constant branches of peroneal vessels. As there are two constant major branches of peroneal vessel supplying the soleus running at a distance of 6-12 cm from fibular head, so the proximal incision was made 6-12 cm away from fibular head decreasing the chance of inadvertent injury to the same. Otherwise, if any vessel inadvertently came in the way was ligated.

Conventional periosteal elevator was used to elevate the periosteum from the anterior (extensor), lateral (peroneal) and posterior (flexor) surfaces except its medial part blended with interosseous membrane. The proposed periosteal stripper is indigenously designed by the author, it has a longitudinal slit of 2 mm between two flanges, which embrace the fibula. As the stripper remains adjacent to the bone during its advancement upward with gentle 20 to 30° rotation; all the neurovascular structures remain protected with global elevation of the periosteum from the harvesting fibula.

The 'roof head cut' of proximal and distal end of fibular graft ensured in easy and safe introduction of newly designed periosteal stripper and allowed less periosteal stripping of the medial aspect, thereby preserving the periosteum on interosseous border and facilitated easy delivery of graft preferably through distal incision.[3]

Osteochondral metatarsalautograft, fibular graft and radius were fixed with 3.5 DCP and screws. Third base of metatarsal was used instead of second metatarsal to maintain tarso-metatarsal congruity.[2]

Elbows were immobilized at 90º of flexion with the forearm in the neutral position using a dorsal block, and a long-arm splint for a period of two weeks. Active finger, wrist, and shoulder motion was encouraged immediately after surgery.

After two weeks, the splint was removed, and active and assisted passive motion exercise of the elbow was started, and patients were allowed to perform light activity, such as writing, using chop sticks, computer typing, or picking up newspapers. From six weeks, gradual strengthening exercises of the elbow and forearm were allowed, and the patients attempted to perform their activities of daily living. Sports activity as well as their previous occupational activity was permitted after six months.[2]

Regarding the donor foot, patients were instructed to begin active ankle motion without weight-bearing for two weeks, and then partial weight-bearing in a short-leg walking brace. Full weight-bearing was allowed at four to six weeks.[2]

Little information is available to provide a consensus for reasonable treatment of unreconstructable fractures of the radial head. Early or late excision of the radial head has been advocated. However, several complications, including valgus or posterolateral rotatory instability, proximal migration of the radius, and distal radioulnar and radiocarpal joint problems have been proposed.[2]

A recent study reported that radial head excision resulted in a change in elbow kinematics and an increase in varus-valgus laxity in specimens with intact ligaments, which were corrected after radial head arthroplasty. Considering that the aim of treatment is to restore a stable elbow joint, radial head arthroplasty would be more desirable than radial head excision alone. [1, 2]
However, radial head arthroplasty with a precise replication of the normal anatomy of the radial head is difficult to achieve, and complications, including loosening, wear, and capitellar erosion, have not yet been settled.[2]

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