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GIANT CELL TUMOURS OF THE HAND - THEIR VARYING LOCATIONS AND MANAGEMENT

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Abstract

Background: Giant cell tumour (GCT) of the hand is the second most commonly seen soft tissue tumour after ganglion cyst. The current standard treatment of choice is excision though related to a high rate of recurrence. In this study, the authors showcase a case series of GCTs of the hand arising from various locations and the management of each.**Materials and Methods:** The study period was from January 2015 to December 2019.All cases of GCT of the hand arising from varying locations were included in this study. Features such as the symptoms, clinical findings, X-ray findings were recorded. All cases were operated by the same surgical team in the same hospital. **Results:** The average age of the patients was 29. All 12 cases had varying locations of the tumour, 9 from the tendon sheath, 1 from the 1st metacarpal bone(MCB), 1 from the distal radius and 1 recurrent case arising from the extensor tendon sheath. The 2 cases arising from the bone also underwent excision of the involved portion of the bone, out of which, 1 case underwent an inert iliac bone graft and in the other case, the distal radius required a free fibula flap cover. Histopathological examinations of all cases were reported as Giant cell tumours with

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no evidence of malignancy. There was no recurrence noted. The average follow-up period was 36 months.**Conclusion:** Clinical diagnosis of GCTs along with an X-ray is sufficient for diagnosis and preoperative MRI is usually not required unless there is a doubt in the clinical diagnosis of a GCT. The most important factor in preventing recurrence of GCT is surgical precision and complete excision of the tumour.

Keywords: Giant cell tumour, Hand, Recurrence

Introduction

Giant cell tumours (GCTs) can arise from the tendon sheaths, bones or joints. It is a locally aggressive tumour that is mostly benign but has the capacity to metastasize.Giant cell tumour arising from the tendon sheath is the second most common soft tissue tumour of the hand after ganglion cysts [1,2,3]. It is slow-growing and usually painless. It is commonly seen in the age group of 20 to 40 years with a slight predilection for females [2].The current standard treatment for GCT is simple excision [1, 4, 5] but the main concern is the high rate of recurrence, ranging between 15 to 45%. [1,2,3].

Here, we report a case series of 12 patients, operated by the same surgical team, all being cases of GCT arising from the hand or distal radius.

Materials and Methods

From January 2015 to December 2019, 12 cases of GCT of the hand or distal radius who were diagnosed clinically and with an X-ray underwent excision by the same surgical team. Of these, 10 arose from the tendon sheath, 1 from the 1st metacarpal bone and 1 from the lower end of the radius, out of which 1 case from the tendon sheath was a recurrent case operated by another surgeon in a different hospital, and arose from the extensor tendon sheath.

All cases were operated with 4.0x magnification loupes and under tourniquet control. Incisions were planned appropriatelydepending on the location of the tumours. Tumours were exposed, dissected, taking care not to injure the digital arteries, nerves and tendons and excised in toto with the capsule intact whenever possible. Satellite lesions, if located, were also excised. Sterile dressings were done followed by application of a volar below elbow POP slab in functional position for 10 cases of finger GCT. A thumb spica was applied for GCT of the 1st MC bone & a

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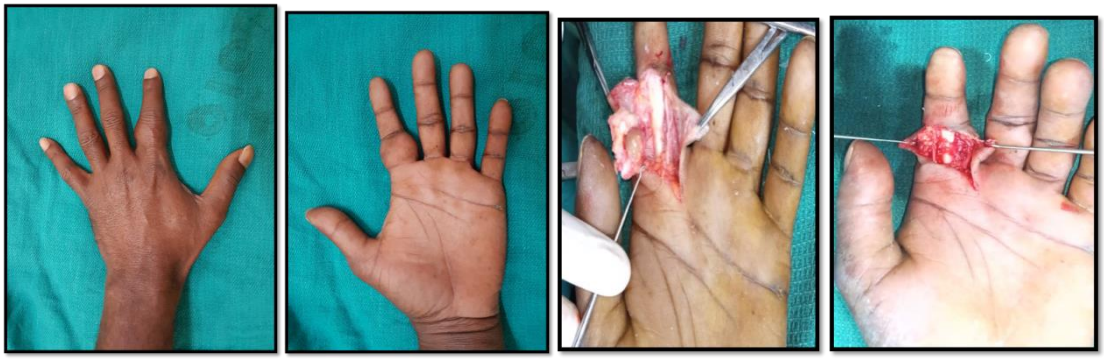
dorsal below elbow POP slab was applied for the case of GCT of distal radius. Standard postoperative management involved elevation of the operated limb to reduce edema, pain and bleeding. The POP slab/thumb spica was removed after a period of 2 weeks, suture removal was done at the same time. It was followed by active digital motion exercises and supervised rehabilitation by a physiotherapist until a full active range of motion was obtained. In cases that required excision of the bone and bone grafting, the slabs were continued for a period of 3 weeks and then removed followed by physiotherapy.

Case No 1: GCT of the tendon sheath

A 32 year old male patient presented with swelling over the palmar and dorsal aspects of the proximal phalanx of the index finger of his left hand that was insidious in onset, gradually progressive in nature, with a history of trivial trauma and restricted flexion at the distal interphalangeal joint(DIPJ). X-ray of the hand showed no bony involvement.

Under tourniquet control and with loupe magnification, he underwent excision of the tumour via a curvilinear incision over the palmar aspect of the proximal phalanx of the index finger. The tumour was found to be arising from the flexor tendon sheath, abutting the radial neurovascular bundle. The neurovascular bundle was dissected from the tumour which was excised along with the tendon sheath and sent for histopathological examination (HPE). After releasing the tourniquet and achieving hemostasis, the skin was closed with 3-0 polypropylene interrupted sutures.The regular post-operative protocol was followed.



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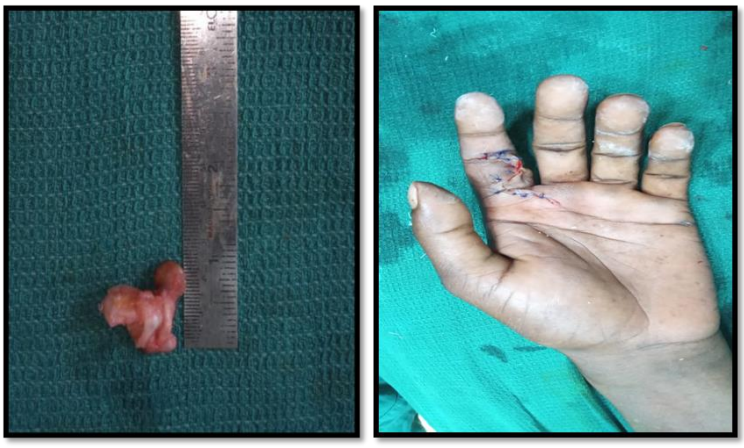

Fig. 1 a) Pre-op dorsal view b) Palmar view c) Multilobulated tumour seen arising from the fibrous sheath of the flexor tendons after dissection d) Post-excision of the tumour with intact flexor tendons e) Excised tumour f) Suture line after skin closure

Case No 3. Inert bone graft for GCT of the 1st MC bone

A 29 year old male presented with swelling, pain, difficulty in flexing and extending his right thumb and tingling and decreased sensation over the right thumb. Patient gave no history of trauma and had no comorbidities. An X-ray of the right hand showed a well-defined lytic lesion with non-sclerotic margins, eccentrically located and extending towards the proximal and distal articular surfaces of the 1st metacarpal bone. An FNAC of the swelling was done which was reported as a Giant cell tumour arising from the bone. The patient then underwent excision of the tumour under tourniquet control via a curvilinear incision made over the dorsal aspect of the base of the thumb. Dissection was done and the tumour was found to be arising from the 1st metacarpal with complete erosion, hence the entire tumour along with the eroded 1st metacarpal bone was excised and sent for histopathological examination. An iliac bone graft was harvested after taking the required measurements and was fixed to the proximal phalanx distally and to the scaphoid bone proximally with an axially placed K-wire with the thumb in 40 degrees of palmar abduction. Hemostasis was achieved. The skin was closed with 3-0 polypropylene sutures and a sterile dressing was done. A thumb spica was then placed. An x-ray of the right hand was taken post operatively. The k wire was removed after 3 weeks.

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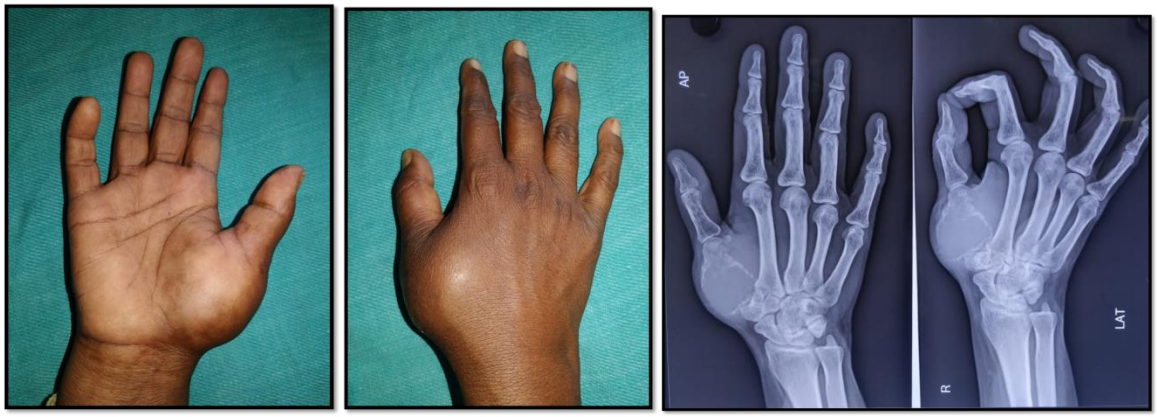

Figure 2.a) & b) Pre-op palmar and dorsal view c)& d) X-rays of the right hand antero-posterior and oblique views showing an irregular osteolytic lesion over the entire 1st metacarpal bone.

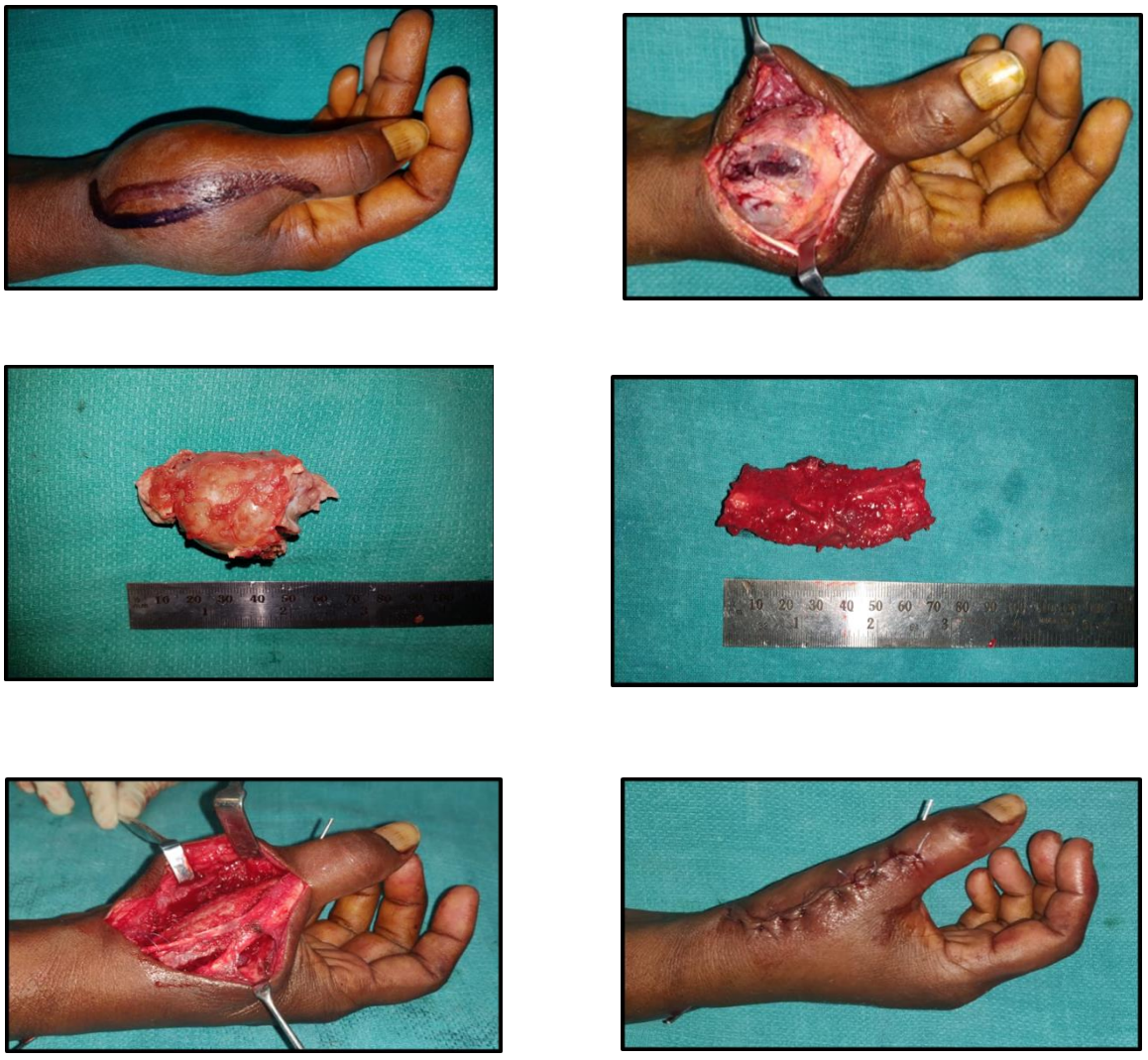

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Figure 3. a) Intra-op photo showing marked curvilinear incision over the base of the thumb. b) After exposing the tumour arising from 1st metacarpal bone. c) Excised specimen of tumour with 1st metacarpal bone d) Harvested iliac bone graft e) After fixing of the iliac bone graft with K-wire in between scaphoid and proximal phalanx f) Skin closure with K-wire in-situ

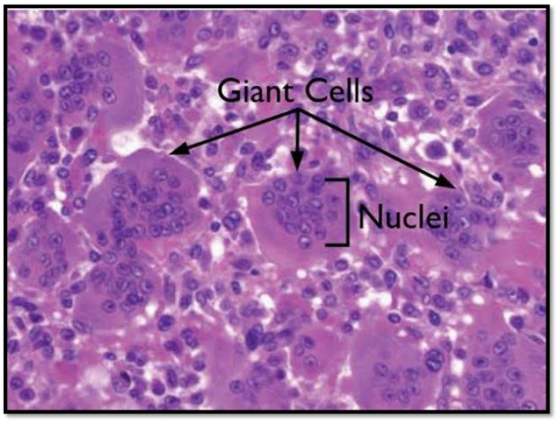

Figure 4.Histopathological examination of the tumour showing abundant giant cells, benign spindle cells, nuclei of spindle cell identical to the giant cell, histiocytes

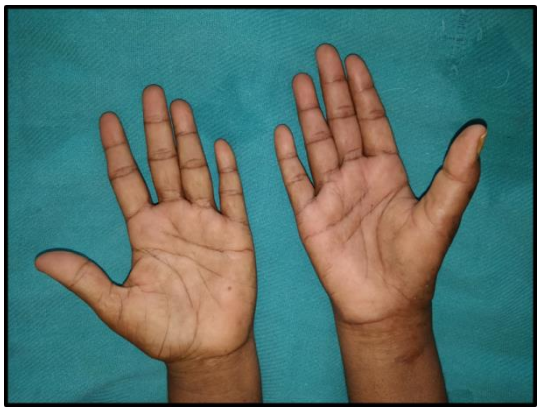

Figure 5. Late postoperative picture of the right hand being compared with the normal left hand

Case No 4: Vascularized bone graft for GCT of the lower end of the radius

A 17 year old female presented with a swelling over the radial aspect of her left wrist for 2 years which was insidious in onset and gradually progressive in nature. There was a history of painfully restricted radial deviation and minimal restriction in flexion and extension at the wrist. There was no history of trauma or any local injections. On examination, the swelling was

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nodular, non-tender and firm to hard in consistency and was found arising from distal radius and the skin was found to be free. An X-ray and CT scan of the left wrist were done that showed an osteolytic lesion of the distal end of the radius with bony erosion. The patient was clinically and radiologically diagnosed with a GCT of the distal end of the radius and was advised regarding excision of the tumour along with the distal end of the radius followed by a free fibula flap to fill in the bony gap, without which there was a definite risk of recurrence. The patient consented and underwent surgery. Intraoperatively, the findings were confirmed and a free fibula flap including the head of the fibula was harvested from the right leg and fixed in the gap of the distal radius with a titanium plate and screws. The recipient vessels, the radial artery and the cephalic vein, were anastomosed end-to-side with the peronealvessels(donor vessels). Post operative regular free flap monitoring was done. A dorsal POP slab was applied and kept for 3weeks following which it was removed and physiotherapy was initiated.

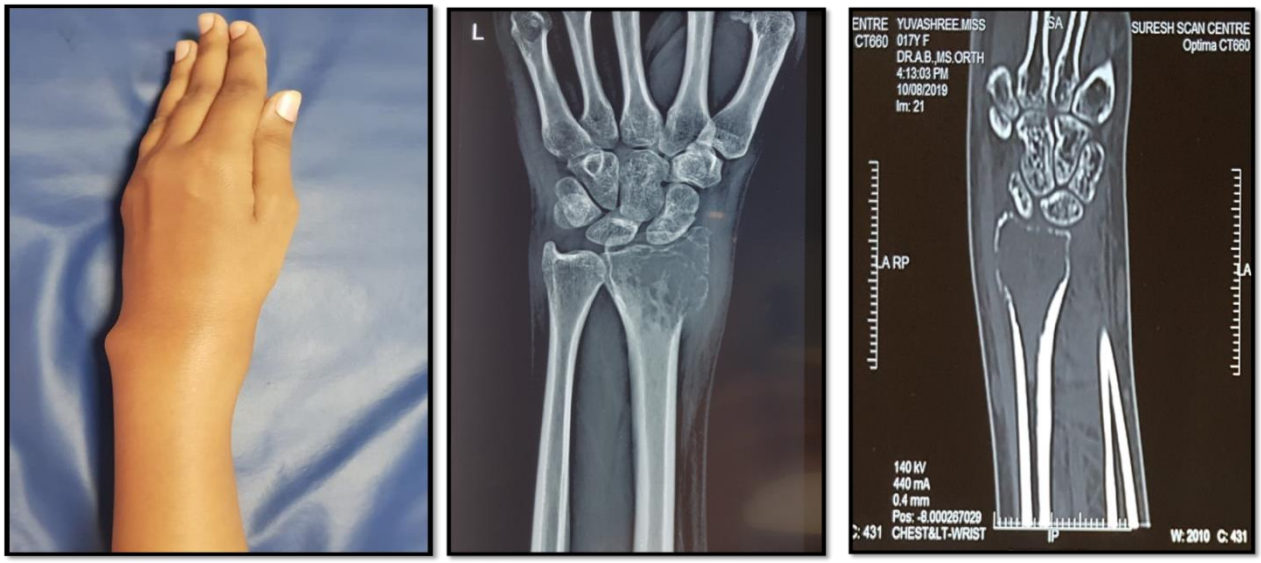
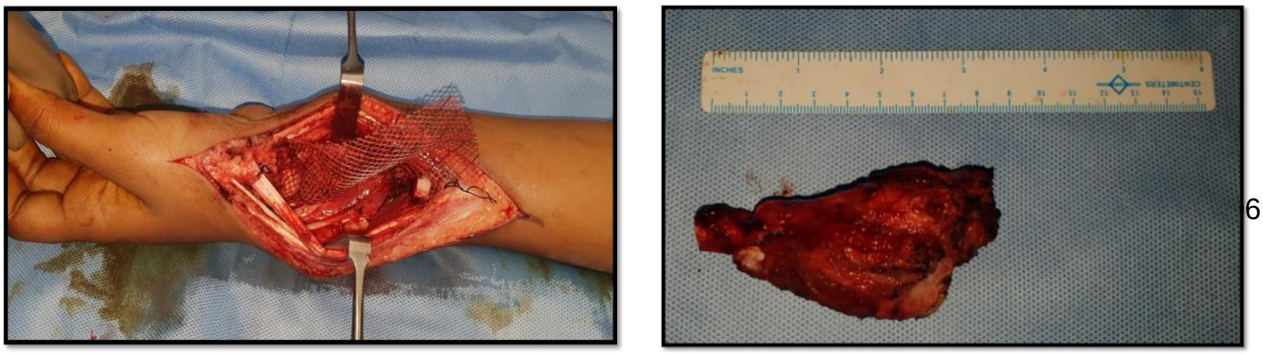


Figure 6. a) Preoperative photo of the left hand showing a swelling in the radial aspect of the left wrist b) X-ray of the left wrist showing an irregular osteolytic lesion with cortical destruction involving the distal end



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of the radius c) Plain CT of the left wrist showing a tumour involving the distal end of the radius

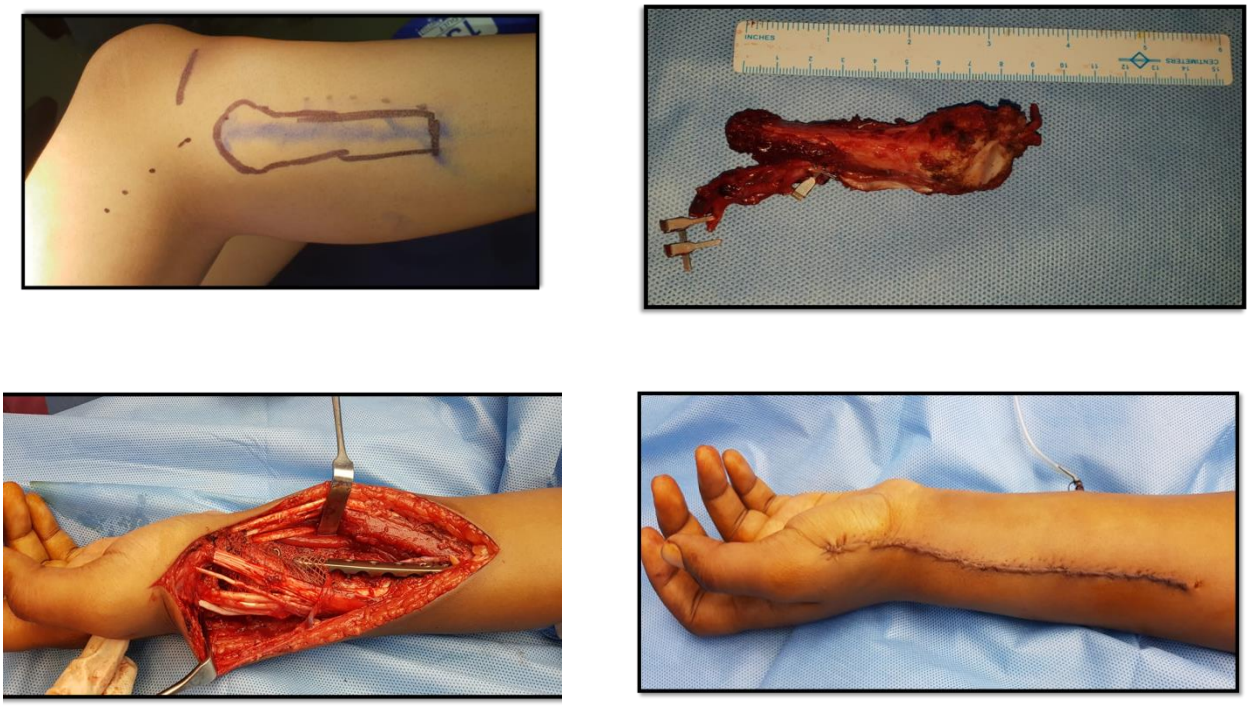

Figure 7.a) Intraoperative photo post excision of the tumour along with the distal end of the radius leaving a gap of 4.5cm b) Excised specimen c) Preoperative marking for free fibula flap on the right leg d) Harvested free fibula flap e) Fixation of free fibula flap to the gap in the distal radius and vessel anastomosis f) Suture line post closure

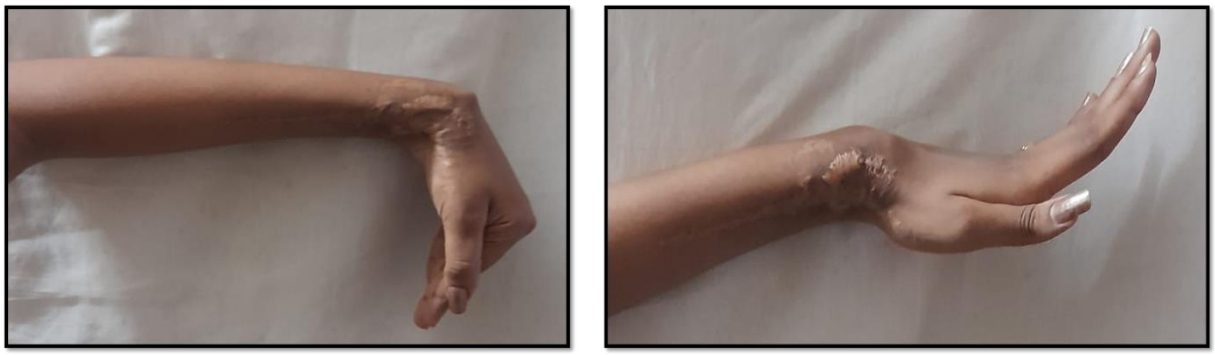

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Figure 8. a) 6 months post surgery with ability of the patient to flex the wrist joint b) Extension of all fingers and the thumb with restricted extension at the wrist

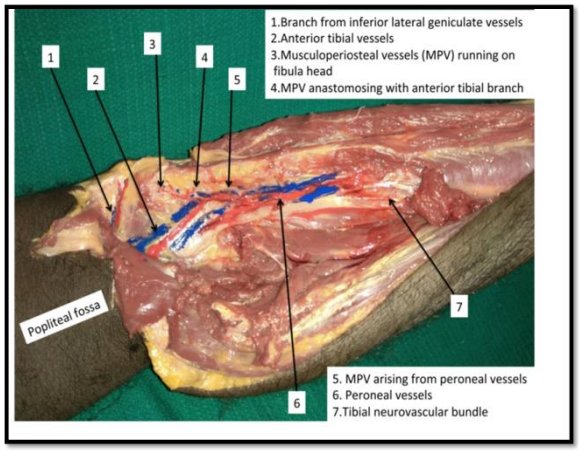
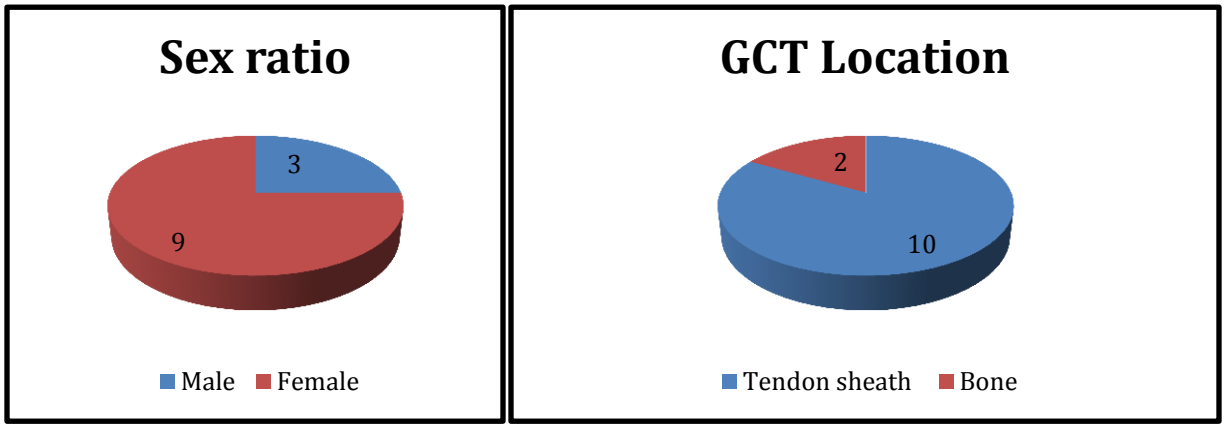


Figure 9.Photo of cadaveric dissection of the leg showing communication between the anterior tibial and peroneal vessels supplying the head of the fibula. Photo courtesy: Dr. T.M. Balakrishnan M.Ch, Department of Plastic, Reconstructive and Faciomaxillary Surgery, Madras Medical College, Chennai, India.[15]

Results



Females are affected more than males. Tendon sheaths are most common source of origin for GCT in hand.

The average age of the patients was 29 (Table 1). An X-ray was found to be sufficient as a radiological investigation andthe authors did not require the use of an Ultrasound or an MRI to confirm their diagnosis prior to surgery unless there was a doubt with the clinical diagnosis. FNAC prior to surgery was performed only in case of GCT arising from the 1st MCB which was reported as GCT arising from the bone.

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Table 1.

S.no.	**Age/ Sex**	**Location of the tumour**	**X-ray finding**	**Surgery done**	**Histopatholo gy**	**Follow-up period(months)**	**Post operative ROM(Range of movement)**
1.	32/ M	GCT of flexor tendon sheath	No bony involvement	Excision	GCT of tendon sheath	48	Full
2.	34/F	GCT of extensor tendon sheath	No bony involvement	Excision	GCT of tendon sheath	50	Full
3.	29/ M	GCT of 1st metacarpal bone	Erosion of 1st metacarpal bone	Excision + inert iliac bone graft	GCT arising from the bone	52	Decrease in movement over CMCJ(carpo metacarpal joint) and MCPJ of thumb

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4.	17/F	GCT of distal radius	Erosion of distal radius	Excision + free fibula flap cover	GCT arising from the bone	38	Absent wrist extension, full ROM over all IPJs(interphal angeal joints),MCPJs and wrist flexion
5.*	29/ M	Recurren t GCT of the thumb	No bony involvem ent	Excision	GCT arising from the tendon sheath	28	Full
6.	32/F	GCT over 3rd MC head flexor tendon sheath	No bony involvem ent	Excision	GCT arising from the tendon sheath	46	Full
7.	28/F	GCT of index finger extensor tendon sheath	No bony involvem ent	Excision	GCT arising from the tendon sheath	25	Full

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8.	29/F	GCT of index finger flexor tendon sheath	No bony involvement	Excision	GCT arising from the tendon sheath	26	Full
9.	31/F	GCT of index finger flexor tendon sheath	No bony involvement	Excision	GCT arising from the tendon sheath	28	Full
10.	26/F	GCT of index finger flexor tendon sheath	No bony involvement	Excision	GCT arising from the tendon sheath	32	Full
11.	28/F	GCT of index finger flexor tendon sheath	No bony involvement	Excision	GCT arising from the tendon sheath	28	Full

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12.	33/F	GCT of index finger extensor tendon sheath	No bony involvement	Excision	GCT arising from the tendon sheath	31	Full

*Recurrent GCT

All patients had good wound healing and the sutures were removed 2 weeks after surgery. No cases had skin necrosis or local infection.

Postoperatively, all patients showed the same range of motion as compared to the contralateral hand except for a decrease in movement over CMCJ (carpometacarpal joint) and MCPJ of thumb in the case of excision & iliac bone graft for GCT of the 1st MCB and absent wrist extension but full range of movements over all finger joints in the case that underwent excision and free fibula flap for distal radius GCT. There was no sensory deficit noted post-operatively. Patients were followed up for an average of 36 months. No recurrence was noted on follow-up in any of the cases.

Discussion

GCTs have a propensity to penetrate into joints, cortices of bones, tendon sheaths and enclose neurovascular structures, therefore, establishing a balance between complete excision of the tumour and preservation of vital tissues pose a major problem.

Recurrence rate for Giant cell tumours is 15-45%[1-4,6]. Anatomical sites such as IPJ of the fingers and thumb have been shown to have a higher incidence of recurrences.[2,4,7,8] According to Williams et al., the overall recurrence rates ranged between 7 and 44% in multiple studies.[9] A recurrence rate of 58% has been reported by Reilly et al.[8] with tumours near the PIP or DIP joints. Based on a study by Kitagawa et al.[10], tumour proximity to neurovascular structures rendered complete tumour excision difficult which was associated with a higher rate of recurrence. In a study by Ozben et al.[11], neurovascular dissection did not increase recurrence risk in tumours adjacent to joints and in all recurrent cases, the primary tumour was localised to

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either side of the digits with no extension into tendon sheaths, which meant that no recurrences were seen in cases where tumours were dissected from flexor or extensor tendons. Al Qattan et al.[6] have stated that intra-osseous invasion of GCTs may carry a higher risk for recurrence. Other studies[8,12,19] state that bone involvement is due to simple erosion or invasion by the pressure effect of the GCT. The usual period during which recurrence can occur is 12 – 24 months post the first surgery.[11] Hence a follow-up of a minimum of 36 months is required to rule out recurrence as per the authors and as per a study by Ozben et al.[11]

Byers classified GCTs into localised nodular type and diffuse type, the former being more common in the hand and the latter in the joints, which has a higher incidence of recurrence [6]. Al-Qattan's new classification is useful to predict recurrence as satellite lesions are often missed in Type IIa and Type II b lesions when loupe magnification is not utilised in these [6, 13]. A nodular tumour could be easily excised since there is clear margin, whereas a diffuse tumour excision is difficult due to its tendency to infiltrate. Even when the tumour may appear nodular, there can be a portion that is diffuse, and hence Ikeda et al. recommend excision with loupe magnification or a microscope [6,12]

In GCT of the bone, options for removal of the tumour are by resection of the bone or curettage, with or without local adjuvant therapy. Surgical outcomes are optimal when the tumour is removed to tumour-free margins, with minimal surgical morbidity and an acceptable functional outcome.[14] Curettage has a higher rate of recurrence(12–65%) when compared with resection but has lesser risk of morbidity and impairment of function for the patient.[16-18]

In cases of recurrence, surgery should be followed by adjuvant therapy. Bisphosphonates, eg.Zoledronate, Pamidronate, target Giant cells, induce apoptosis and limit tumour progression. Monoclonal antibodies, eg.Denosumab, bind to RANKL (receptor activator of nuclear factor kappa beta) cytokines, prevent osteoclastogenesis and bone resorption.[19,20]

Conclusion

The most important factor in preventing recurrence of GCT is a meticulous and precise surgical excision of the tumour under loupe or microscopic magnification to render the patient free from

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the tumour, with a follow-up of up to 36 months. Limitations in this study would be the low number of cases included but the authors would like to state the advantage of avoiding expensive investigations such as MRI(unless absolutely necessary when in doubt of diagnosis), without which they could achieve 0% recurrence in the cases operated.

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