A modified technique of reconstruction following excision of the distal ulna for giant cell tumor

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Introduction
Giant cell tumors (GCTs), though usually benign, can be aggressive and behave as a high-grade malignant neoplasm. They constitute 4–5% of primary bone tumor. Ulna is an uncommon site for affection. Treatment options range from curettage to radical excision. An effective treatment of GCT of the distal ulna is en-bloc resection, with significant risk of unstable wrist and ulnar stump.
Patients and methods
We present three patients with distal ulnar GCT, two males and one female. Their ages were 48, 26, and 20 years. After workup diagnosis, the tumor was resected en-bloc with safety margin, and the free ulnar stump was stabilized with one half of the tendon of extensor carpi ulnaris split longitudinally, one half left intact, and the other half detached from its insertion reflected back, threaded through a drill hole in the free ulnar stump redirected back and resutured to the intact half. In all three cases, the same technique was used. The technique was a modification from that described by Goldner and Hayes.
Results
All the three patients returned to normal activities at 6 weeks, and after a minimum follow-up of 9 months, they remain symptom free with full movements and function in the stable wrist.
Conclusion
The modification of the old technique has improved the biomechanics and function of the wrist and has stabilized the free ulna stump.

Keywords:
distal ulna, giant cell tumor, resection new technique of reconstruction

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Introduction

Giant cell tumors (GCTs) constitute 4–5% of primary bone tumors [1,2]. Although usually benign [2], they can have grades ranging from border-line to high-grade malignancy; they constitute 10% of malignant bone tumors [1]. The ulna is an uncommon site for primary bone tumors and GCTs of the distal ulna have reported incidences between 0.5 and 2.9% of all GCTs [3].

The treatment is surgical, with options ranging from curettage to radical excision, following which, recurrence is extremely unlikely [4]. However, various problems have been reported following excision of the distal ulna, including loss of ulnar support, carpal collapse, radioulnar impingement, and instability [5]. Therefore, stabilization of the ulna in its original direction, keeping its kinematic relationship to nearby structures, is desirable.

In the Darrach procedure, around 2.5 cm of the distal ulna is resected subperiosteally. The ulnar styloid is retained, then the periosteal sleeve is closed [6].

Stabilization of the ulna using one half of the tendon of extensor carpi ulnaris (ECU) after resection of a relatively large segment of the distal ulna has been described by Goldner and Hayes [7] and Kayias *et al.* [8]. In this report, we present a modification of this technique following en-bloc resection of the distal ulna for GCTs.

Patients and methods

Fully informed consent was taken from all of the patients. The treatment protocol, as well as the surgical procedure was approved by the ethical committee of our institution, and was matching with the international standards. We reviewed three patients with GCT of the distal ulna who presented to our department with pain and swelling (Fig. 1a) between February 2009 and March 2012 (Table 1). After

Figure 1

(a–c) Clinical, radiographic, and MRI appearances of giant cell tumor of the distal ulna.

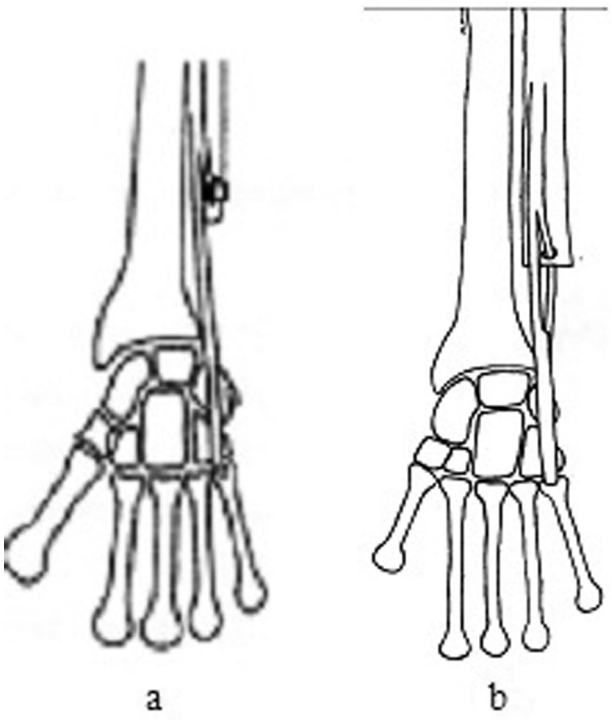
Table 1 Patients' details and outcomes

	Case 1	Case 2	Case 3
Age (years)	48	26	20
Sex	Male	Male	Female
Occupation	Nurse	Org player	Student
Side of the involvement	Left	Right	Left
Duration of symptoms	6 months	2 years	1 year
Date of surgery	10 February 2009	24 March 2009	March 2012
Size of resected piece (cm)	9	8	9.2
Functional outcome	Excellent	Excellent	Excellent
Duration of follow-up (months)	39	38	9

Figure 2

Intraoperative photograph following en-bloc resection to show half of the tendon of extensor carpi ulnaris threaded through a hole in the ulnar stump and then sutured distally to the intact half of the tendon.

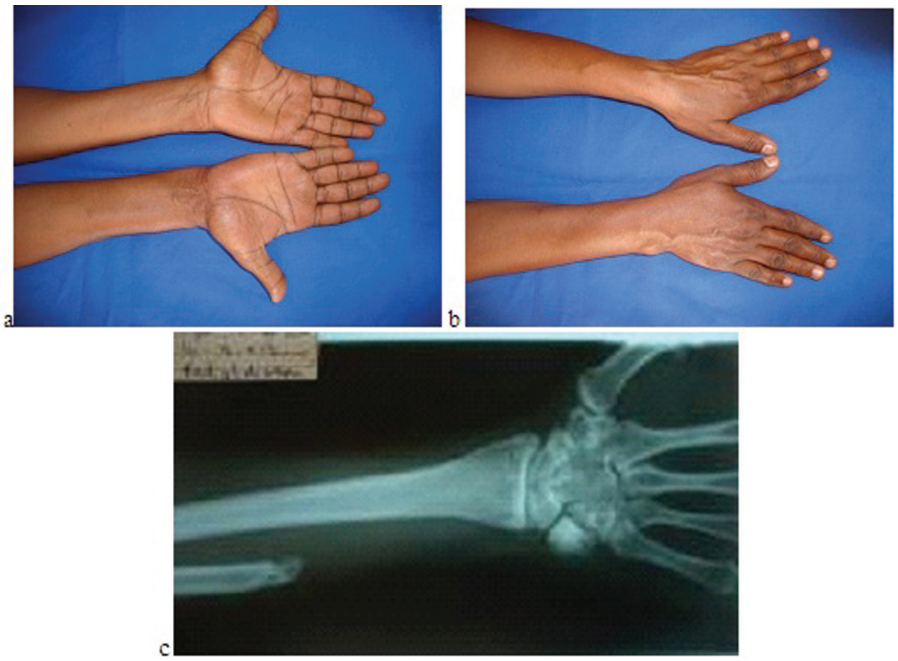
Figure 3



(a) Tenodesis as described by Goldner and Hayes [7] and Kayias *et al.* [8]. (b) Tenodesis in authors' modified version.

confirmation of the diagnosis with radiographs (Fig. 1b), MRI (Fig. 1c), and histopathology, they underwent extraperiosteal en-bloc resection with a good safety margin proximally by the first author. The lengths of bones that were excised from the distal ulna in the three cases measured 8, 9, and 9.2 cm. To stabilize the distal ulnar stump, the tendon of ECU was split longitudinally; one half was divided distally, and then threaded through a drill hole in the ulna before being sutured back to the intact half of the tendon (Fig. 2). This was a further modification of the Darrach procedure, which was modified by Goldner and Hayes [7] and Kayias

Figure 4



(a, b) Postoperative photographs showing active range of movement and (c) radiograph.

et al. [8] (Fig. 3a and b). The outcome was graded according to Cooney *et al.* [9] as excellent, good, fair, or poor by the assessment of pain, stability, grip strength, and activities. All the wounds healed uneventfully, and after 6 weeks, all the patients had returned to normal. The outcome in all cases was excellent (Table 1 and Fig. 4).

Discussion

Resection of the distal ulna for GCT or other conditions was first described in 1880 followed by the first detailed description in 1912 [10]. Although the procedure may manage the pathology successfully, there are conflicting reports of postoperative disability. Although Dhillon *et al.* [3] found no complication in his seven cases with the stump left free, Bieber *et al.* [11] reported that in his series of 20 patients almost all had serious disabilities after Darrach resection of the distal ulna and Newmeyer and Green [6] reported digital extensor tendon ruptures as a complication of leaving the distal end of the ulna free. They recommend stabilization of the distal ulna to prevent this problem. Similarly, Goldner and Hayes [7] reported that snap and pain during supination and pronation can be caused by movement of the remaining distal end of the ulna and hypermobility of the tendon of ECU and concluded that stabilization using one half of this tendon can prevent these problems. Kayias *et al.* [8] also reported an excellent result after resection of the distal ulna for GCT followed by stabilization with ECU.

From the kinematic point of view, we believe our technique is an improvement, as it retains the ulna in its original direction and prevents unwanted mobility of the free edge of the ulna during supination, pronation, and ulnar or radial deviation. The technique also deserves consideration when the Darrach procedure has been undertaken for conditions where the radius has been foreshortened, for example, by trauma or Madelung deformity.

Conclusion

The modification of the old technique has improved the biomechanics and function of the wrist and has stabilized the free ulna stump.

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Nil.

Conflicts of interest

There are no conflicts of interest.

References

1 Khalil el SA, Younis A, Aziz SA, El Shahawy M. Surgical management for giant cell tumor of bones. J Egypt Natl Canc Inst 2004; 16: 145–152.

2 Hoch B, Inwards C, Sundaram M, Rosenberg AE. Multicentric giant cell tumor of bone. Clinicopathologic analysis of thirty cases. J Bone Joint Surg Am 2006; 88:1998–2008.

3 Dhillon MS, Saini R, Gill SS. Is there a need for reconstruction after excision of the distal ulna for giant-cell tumour? Acta Orthop Belg 2010; 76:30–37.

4 Campanacci M, Baldini N, Boriani S, Sudanese A. Giant-cell tumor of bone. J Bone Joint Surg Am 1987; 69:106–114.

5 Sotereanos DG, Gobel F, Vardakas DG, Sarris I. An allograft salvage technique for failure of the Darrach procedure: a report of four cases. J Hand Surg Br 2002; 27:317–321.

6 Newmeyer WL, Green DP. Rupture of digital extensor tendons following distal ulnar resection. J Bone Joint Surg Am 1982; 64:178–182.

7 Goldner L, Hayes G. Stabilization of the remaining ulna using one-half of the extensor carpi ulnaris tendon after resection of the distal ulna. Orthop Trans 1979; 3:330–331.

8 Kayias EH, Drosos GI, Anagnostopoulou GA. Resection of the distal ulna for tumours and stabilisation of the stump. A case report and literature review. Acta Orthop Belg 2006; 72:484–491.

9 Cooney WP, Damron TA, Sim FH, Linscheid RL. En bloc resection of tumors of the distal end of the ulna. J Bone Joint Surg Am 1997; 79:406–412.

10 Dingman PV. Resection of the distal end of the ulna (Darrach operation); an end result study of twenty four cases. J Bone Joint Surg Am 1952; 34A:893–900.

11 Bieber EJ, Linscheid RL, Dobyns JH, Beckenbaugh RD. Failed distal ulna resections. J Hand Surg Am 1988; 13:193–200.