

A case report of distal radioulnar joint dislocation fixed by using mini-plate-button

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ARTICLE INFO

Article history:

Received 20 November 2016

Received in revised form 22 February 2017

Accepted 23 February 2017

Available online 24 February 2017

Keywords:

GCTTS

DRUJ dislocation

Mini-plate-button

Absorbable suture

Case report

ABSTRACT

INTRODUCTION: Pathological factors may cause significant distal radioulnar joint (DRUJ) dislocation, which is a rare clinical entity in orthopedic literature, and corresponding treatments are not uniform.

PRESENTATION OF CASE: We describe the case of a DRUJ dislocation caused by giant cell tumour of tendon sheath (GCTTS) in wrist. At surgery, the stabilization of DRUJ was constructed by using mini-plate-button after removal of intraoperative removal of the tumor. Postoperative plain films showed good position, and no obvious dislocation was found.

DISCUSSION: Reduction of DRUJ dislocation was facilitated by mini-plate-button and absorbable suture. The treatment avoided intro-articular or extra-articular ligament construction and damage of adjacent tissue and bone.

CONCLUSION: For DRUJ dislocation caused by GCTTS leading to severe tendon and ligament damage, the operative treatment of mini-plate-button may be effective.

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1. Introduction

Currently, open reduction in combination with reconstruction of distal radioulnar joint (DRUJ) instability or dislocation is recommended, specially for no bone structure degeneration. Reconstruction method is divided into two categories, extra-articular reconstruction and intro-articular reconstruction [1]. Intro-articular reconstruction may do some damage to the critical tissue such as triangular fibrocartilage complex (TFCC), and extra-articular reconstruction may cause DRUJ instability and may not mimic real intro-articular anatomical structure [2]. Given this, we describe a case of DRUJ dislocation due to giant cell tumour of tendon sheath (GCTTS) invading treated with mini-plate-button for suspension fixation in the Second Affiliated Hospital of Guangzhou University of Traditional Chinese Medicine, which is rare in the literature. The method avoids the shortcomings of traditional operative reconstruction. Satisfied clinical result in short follow-up is obtained.

2. Case

A 50-year-old female presented herself to emergency room because of a fall leading to the right distal ulna fracture 10 years

ago. The exact mechanism of the injury was not clear and her forearm was immobilized with a cast. A tumor with size of about 1 cm*1 cm*1.5 cm was found in the ulnar side of her right wrist in January 2014, and then it grew gradually and the night pain was obvious. Therefore she underwent an operative resection at a local hospital. The pathological examination of the tumor showed GCTTS, and the patient refused subsequent treatment such as radiation therapy. However, the patient presented herself to our department due to severe pain on September 2015. At physical examination, a surgical scar showed on the ulnar side of the right wrist, and multiple tumors was slightly hard (Fig. 1). The biggest was about 2 cm*2.5 cm*3 cm. The wrist had limited motion of extension and flexion due to severe pain. The patient only took some unclear painkillers, and no other family member suffers GCTTS.

Laboratory findings were not specific. X-rays showed tumor invasion of radius, ulna, lunate and triangular bone. Additionally, the distal of ulna was about 8 mm long than that of radius (Fig. 2a). Magnetic Resonance (MR) suggested tumor invasion of deep and superficial flexor tendons (Fig. 2b). The color Doppler ultrasonography suggested multiple tumors in the wrist.

2.1. Surgery

The experienced chief physician, Shuchai Xu did the surgery. The primary incision (Fig. 3a) was performed under satisfied brachial plexus anesthesia. After dissection, the multiple tumors had complete capsule and soft tissue was diffuse hyperplasia (Fig. 3c), which

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Fig 1. Surgery scars and multiple tumors showed on the right wrist.

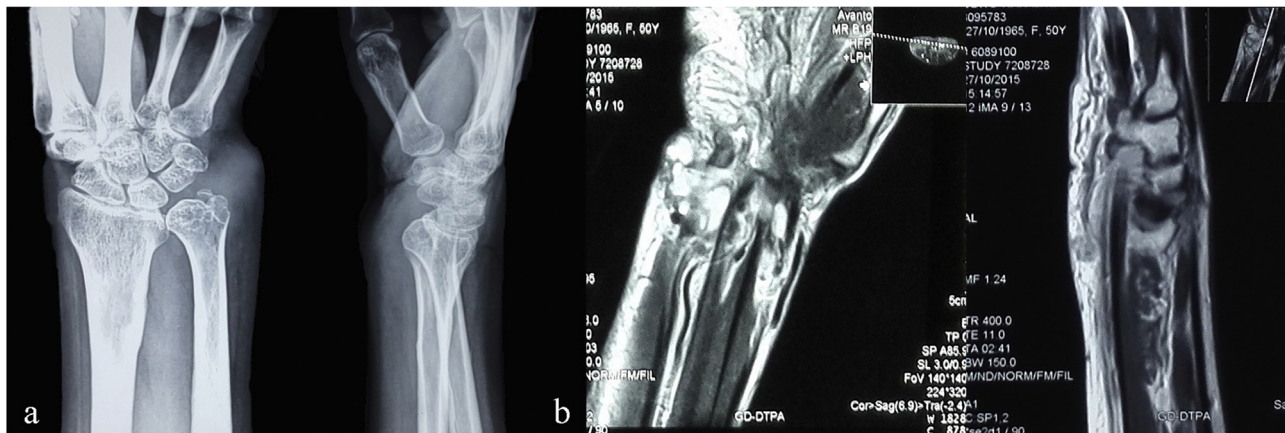


Fig. 2. a, X-rays showed multiple tumors in the ulnar and palmaris of wrist. The distal of ulna was about 8 mm long than that of radius. b, MR suggested tumor invasion of the deep and superficial flexor tendons.

was presented as ferruginous deposition and invaded ulnar nerve, the deep and superficial flexor tendons (Fig. 3b, d). Attention should be focused on protection of the median nerve in the operation. The invasion of the branch of median nerve and the deep and superficial flexor tendons was removed without preservation. Additionally, the tumors also invaded DRUJ, TFCC and distal interosseous membrane. Necrotic tissue and bone were removed by using rongeur. However, after removal of the critical constructs, DRUJ was presented dislocation. The result of stress test and forearm rotation test were positive. With the revelation of the bones, the ulna was 8 mm longer than the radius in distal end. 8 mm osteotomy was made in a position 1 cm far from the styloid process of ulna. The two ends were fixed with AO bridge plate and screws. For the DRUJ dislocation, a hole from radius to ulna was drilled with 1.6 mm kirschner wire. The AO plate was made into two 0.6cm*0.6 cm buttons with the scissor. The absorbable suture encircled one button to form four strands. And then the four strands were through the drilled hole as a whole from the radius side. The other button was closely placed at the ulna side. Then the ends of the absorbable suture was tightened and knotted to make two buttons against the radius and ulna surface and to hold the ulnar head in the concavity of the sigmoid notch (Fig. 3f). Schematic diagram of technique prin-

ciples showed as Fig. 4. The surgical technique was first in-human and never reported in the articles.

2.2. After treatment

After the operation, the stress test and forearm rotation test were negative. DRUJ stability was achieved when rotating the arm. The right wrist was immobilized with pressure bandage and plaster external fixation. The operative results were evaluated by X-rays, MR, visual analogue scale (VAS) combined with the Gartland and Werley score for wrist function.

Postoperative X-rays showed normal position between the ulna and radius (Fig. 5a). The patient was guided the exercise from the first day postoperation. Radiotherapy was performed at two weeks. At four weeks, the cast was removed and the range of motion of the right wrist was normal. There was no obvious pain and the stress test and forearm rotation test were negative, and no wound complications happened. At one year follow-up, MR showed no tumor recurrence (Fig. 5b). The Gartland and Werley score for wrist was reduced from 21 to 6. VAS scores decreased obviously. The patient was very satisfied with our treatment.

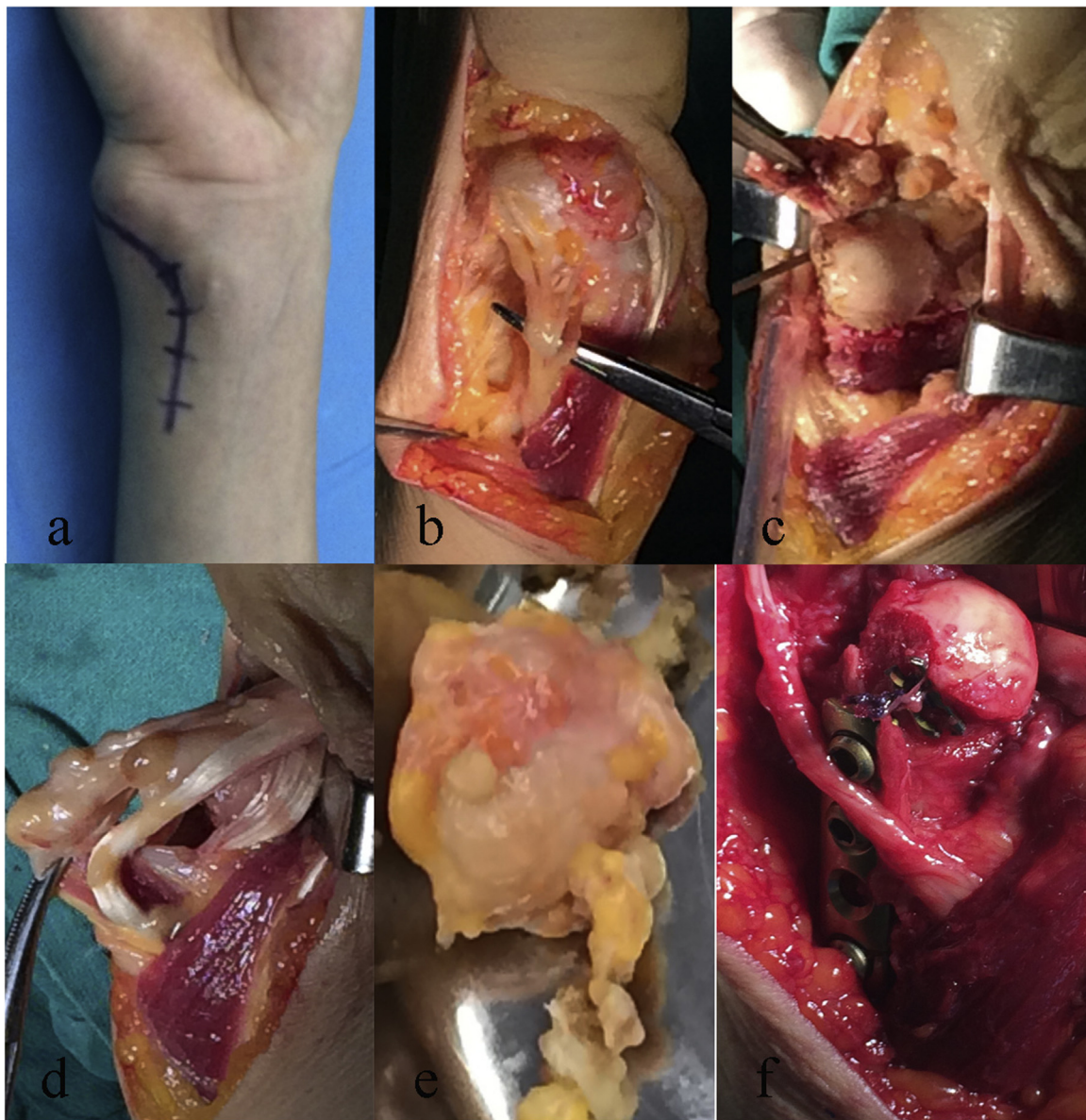


Fig. 3. a The primary incision; b Invasion of the ulnar nerve; c Diffuse hyperplasia and ferruginous deposition; d Invasion of the deep and superficial flexor tendons; e The released tumors; f The absorbable suture and the postoperative image.

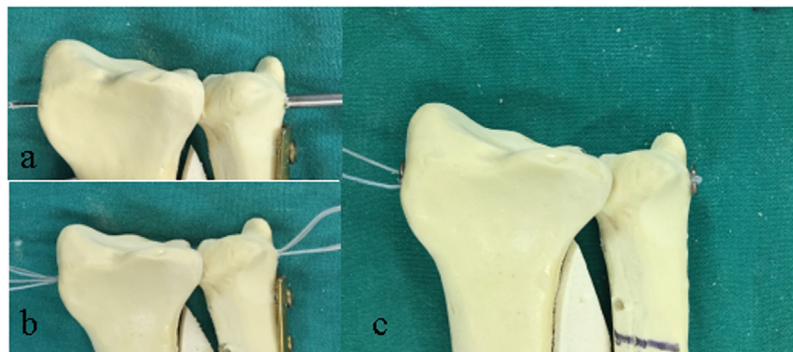


Fig. 4. a Drill the hole; b The four strands were through the drilled hole; c Tighten the ends of the absorbable suture to make the two buttons against the radius and ulna surface.

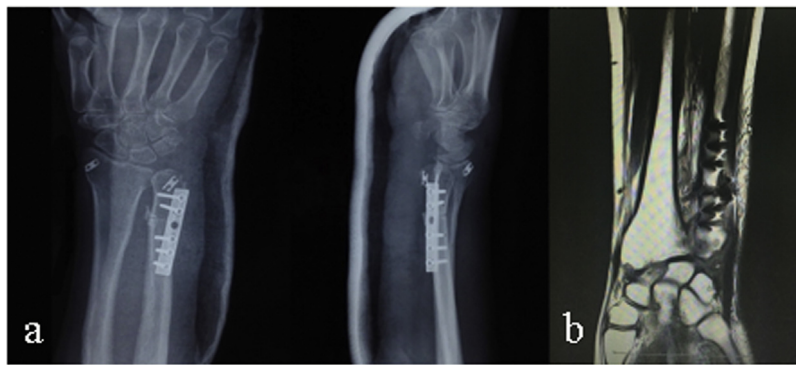


Fig. 5. a Postoperative X-rays showed normal relation between the ulna and radius. b At one year follow-up, MR showed no tumor recurrence.

The patient was asked if the data concerning the case could be submitted for publication, and he consented. The article is compliant with the SCARE Guidelines [3].

3. Discussion

The DRUJ is the distal articulation that consist of ulna and radius creating pronation and supination of the forearm. During supination, the ulna head translates palmarly and during pronation dorsally. The DRUJ contributes to the stability and function of the wrist as well as stabilization of the ulnar carpus. The complex structure of TFCC is formed by the concavity of the sigmoid notch, the dorsal and volar radioulnar ligaments and extended parts of the joint capsule, and the distal aspect of the interosseous membrane. The DRUJ is maintained by intrinsic interosseous ligments, extrinsic radiocarpal and ulnocarpal ligaments, intracapsular ligaments, and the TFCC is the most important stabilizer. Meanwhile, the ulnar carpal ligaments, the infratendinous extensor retinaculum, the pronator quadratus muscle and the interosseous membrane provide additional stability [1]. An understanding of these relationships is essential for safe and effective surgery.

Etiological factors of DRUJ dislocations include traumatic causes and pathological causes. The involved bone and soft tissue due to trauma and chronic inflammation may cause DRUJ instability or dislocation. DRUJ dislocations show that the results of the stress test and the forearm rotation test are positive [2,4]. The diagnosis is confirmed with positive signs and symptoms combined with a standard lateral X-ray, CT and MR [5]. Additionally, the arthroscopy surgery of wrist may directly support the diagnosis. About fifty percent of all DRUJ dislocations are not recognized at the first time [6]. The risk of a missed DRUJ dislocation is particularly high if no fracture is present. Unrecognized DRUJ dislocations may lead to secondary DRUJ instability.

In term of an acute DRUJ instability, plaster external fixation and TFCC repair may be effective. Improper handling of DRUJ instability may cause pain of the wrist and limited supination or locked pronation. S. Wassink reported a case of recurrence of the DRUJ dislocation treated with cast immobilization and received good results [7]. However, the chronic DRUJ instability is often combined with the important stabilizer failure of TFCC, interosseous membrane and joint capsule. At this time, simple TFCC repair may be out of control. Currently, the multiple soft tissue construction will be effective for the DRUJ instability without the forearm fracture malunion or DRUJ osteoarthritis.

The reconstructive methods of DRUJ can be divided into the internal approach and external approach. Kakar reported four types according to the principle of the DRUJ reconstruction: DRUJ ligament anatomical reconstruction, extensor retinaculum and joint capsule reefing, ulnar-wrist suspension tenodesis and the exter-

nal DRUJ fixation [7]. According to biomechanical research, only joint capsule reefing can effectively reconstruct the joint trajectory and physiological state [8]. The ulnar-wrist suspension tenodesis surgery may achieve poor stabilization [9]. Additionally, extensor retinaculum and joint capsule reefing is currently applied to slight repair of the instability or combined with other soft tissue reconstruction.

Therefore, the most effective reconstructive methods are DRUJ ligament anatomical reconstruction and the external DRUJ fixation. Adams & Berger surgery is a kind of the DRUJ ligament anatomical reconstruction. The method requires the incision of retinaculum and joint capsule, which likely leads to the injury of TFCC [10]. In addition, the anatomical reconstruction is unable to indeed simulate the anatomy and biomechanical characteristic of the DRUJ ligaments. Currently, there is no uniform conclusion for DRUJ reconstructive methods due to the defects and restrictions respectively.

The author suggested the external DRUJ fixation should be adopted due to little influence on the TFCC. While the K-wires are incapable of allowing the early exercises for rehabilitation and is likely to break. In the article, we utilize the mechanical properties of suspensory fixation of mini-plate-button and absorbable suture to externally reconstruct DRUJ. In the new device, four strands replace the K-wires and ligaments for fixation. The hole is drilled with 1.6mm K-wires, which not only decreases the size of the bone tunnel to avoid the risk of fracture but reduces the injury of TFCC. Additionally, the creep deformation of four strands is a quarter of one strand under the knotting and drawing tension. Compared to the free tendon transplantation, the min-plate-button and absorbable suture have no side effects on the donor site, especially for severe DRUJ instability or dislocation caused by pathological or post-traumatic factors. The simple adjustable-length loop device can provide timely functional rehabilitation exercises and get around internal fixation break or ankylosis due to inflexible fixation such as K-wires. Herein, reduction of DRUJ dislocation was facilitated by mini plate-button and absorbable suture. At the follow-up, X-rays showed normal position between the ulna and radius and no obvious dislocation or subluxation. The reconstructed method not only avoid injury of the adjacent structures but support early exercises for rehabilitation. Thus, the plate-button may be reliable and effective for DRUJ reconstruction.

Conflict of interest

None declared.

Funding

None.

Author's contribution

Hongliang Liu collected the data; Lili Sang wrote the paper and collected the data; Shuchai Xu organized the study design; Bojian Chen and Jian Liu investigated the literature.

Ethical approval

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Guarantor

Shuchai Xu is the one who accept full responsibility for the work and the conduct of the study.

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