



Proximal radioulnar synostosis following Monteggia fracture-dislocation: a case report

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Introduction and importance: Radioulnar synostosis is a rare complication of a forearm fracture that restricts pronation-supination. This study presents a case of proximal radioulnar synostosis in an adult male after Monteggia fracture-dislocation who had a loss of pronation and supination movements.

Case presentation: Herein, we report a case of proximal radioulnar synostosis in a 43-year-old man who presented with loss of pronation and supination of the right forearm that restricted his daily activities. He had a history of Monteggia fracture-dislocation 9 months back, which was managed with open reduction and internal fixation with a dynamic compression plate. Plain radiography and computed tomography of the right forearm after 9 months of operation showed an implant in situ with proximal radioulnar synostosis. Implant removal was performed and the excess fibro-osseous connection in the proximal radius and ulna was removed.

Clinical discussion: Forearm injuries that affect the interosseous membrane may result in radioulnar synostosis. Trauma and treatment-related factors increase the risk of radioulnar synostosis. The fibro-osseous fusion between the forearm bones restricts the pronation and supination movements.

Conclusion: Loss of pronation-supination following forearm fracture should raise suspicion of radioulnar synostosis.

Keywords case report, Monteggia fracture, Nepal, synostosis

Introduction

Radioulnar synostosis involves bony or fibrous fusion of the forearm bones that restricts pronation-supination^[1]. It may occur after any forearm injury, causing damage to the interosseous membrane^[2]. Post-traumatic radioulnar synostosis is a relatively rare complication of forearm bone fracture, with an incidence ranging from 0 to 9.4% of forearm fractures, reliable being the 2% from the literature review of 2381 fractures^[3,4]. Besides trauma to forearm bones, it can result from congenital disease or treatment-related factors such as prolonged trauma-to-surgery interval, too long cortical screws extending beyond the second cortex, single approach for repair of both bones, primary bone graft, excessive immobilization, or delayed rehabilitation^[1,3,5].

Herein, we present a case of post-traumatic proximal radioulnar synostosis in a 43-year-old man following Monteggia

HIGHLIGHTS

- Radioulnar synostosis is an uncommon complication of forearm fracture.
- A fibrous or osseous band between the radius and ulna is formed.
- It restricts pronation-supination movement at the forearm.

fracture-dislocation, restricting supination and pronation movements in the right forearm. The study highlights that when a patient presents with restricted pronation and supination following trauma to the forearm bones, radioulnar synostosis should be suspected. The case report has been reported according to the SCARE criteria^[6].

Presentation of the case

A 43-year-old male, right-hand dominant patient with no known comorbidities presented to the orthopedics outpatient department (OPD) with a complaint of decreased movement of the right forearm for 9 months. This restricted his activities of daily living, such as eating and performing activities at work. There was no history of fever, pain, or swelling on the forearm.

There was no significant medical, family, drug, or psychosocial history. However, there was a history of impact from a falling stone on the right forearm 9 months ago, following which he developed pain and swelling on the right forearm. A plain X-ray of the right forearm showed a fracture in the proximal third of the ulna with proximal radioulnar joint dislocation (Fig. 1). A diagnosis of right Monteggia fracture-dislocation was made for which open reduction internal fixation (ORIF) with a small dynamic

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Figure 1. A plain X-ray of the right forearm shows a fracture in the proximal third of the ulna with proximal radioulnar joint dislocation (Monteggia fracture-dislocation).

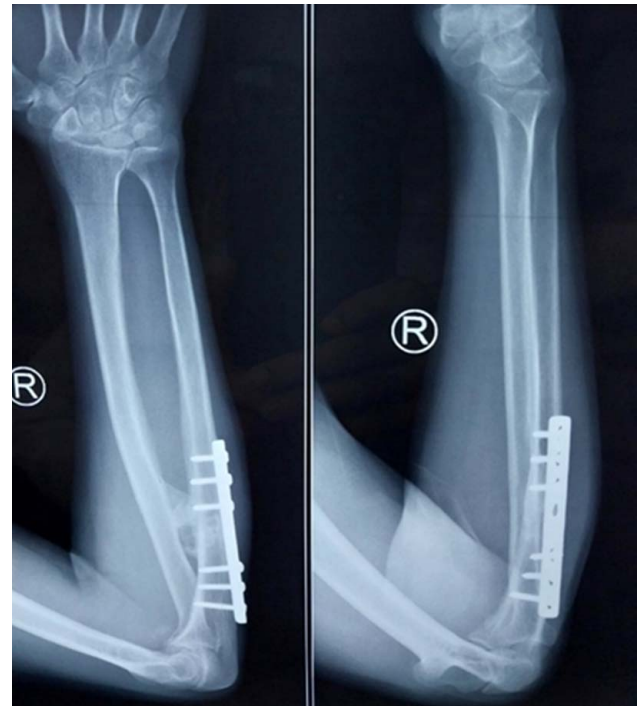


Figure 3. Plain X-ray of right forearm showing united proximal ulna fracture with synostosis and implant in situ.

compression plate (DCP) was done. His postoperative stay was uneventful and he received physiotherapy during the post-operative period. After two and a half months of operation, he had difficulty in supination and pronation.

On local examination of the right forearm, a linear scar from the previous operation was present and there was a decreased range of supination and pronation, ~45° of supination and pronation (Fig. 2).

A plain X-ray of the right forearm showed a united right proximal ulnar fracture with radioulnar synostosis and implant in situ (Fig. 3). Synostosis can also be seen in the axial view of the right forearm on computed tomography (CT) (Fig. 4).

Excess fibro-osseous connection in the proximal radius and ulna (Fig. 5) along with the implant was removed by a team consisting of orthopedic surgeons. Intraoperative near full supination and pronation were achieved. A drain was kept intraoperatively, which was removed on the second postoperative day. During his postoperative stay, he continued physiotherapy with an improved range of motion. The wound was healthy with no discharge.

The patient believed that his limitation of pronation-supination might be a complication of his forearm fracture and is hopeful that the recent operation, along with physiotherapy, will

improve his range of movements of the forearm. During his follow-up visits to the orthopedics OPD, near-complete supination and pronation were achieved (Fig. 6).

Discussion

Radioulnar synostosis is characterized by the formation of a fibrous or osseous band between the radius and ulna, clinically characterized by restriction in pronation-supination, considered to be because of unconfined callus formation and defective remodeling^[1,7,8]. It can result from a congenital disease or trauma to forearm bones^[7]. Congenital radioulnar synostosis is a rare forearm anomaly presenting in early childhood as restricted forearm movement due to failure of segmentation between radius and ulna^[9]. Similarly, post-traumatic radioulnar synostosis is a rare disabling complication of forearm fracture^[7]. Our case presented in adulthood with a history of Monteggia fracture-dislocation 9 months earlier, ruling out congenital radioulnar synostosis and making post-traumatic radioulnar synostosis the most likely cause in our case. Factors predisposing to post-traumatic radioulnar



Figure 2. Decreased range of pronation and supination of the right forearm with normal range of motion on the left forearm (preoperative range of motion).

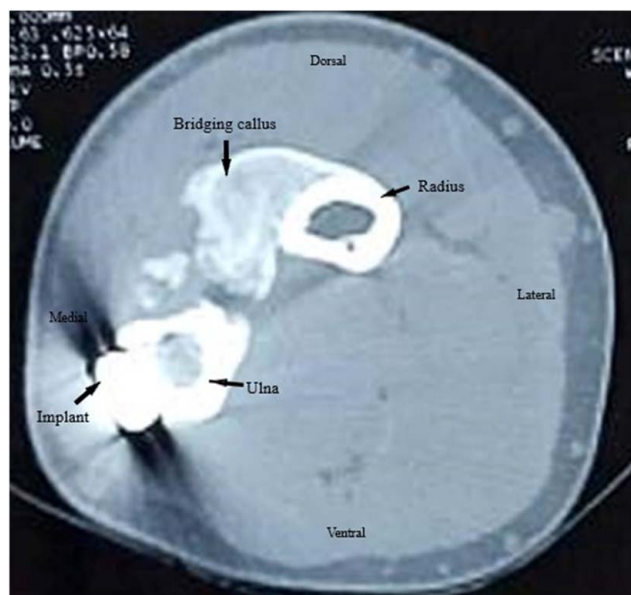


Figure 4. Axial computed tomography view of the right forearm showing implant in-situ and synostosis formation between the radius (posteromedial) and the ulna.

synostosis include open fracture, significant soft tissue injury, high-energy kinetic fracture, excessive trauma-to-surgery interval, and prolonged immobilization^[1]. Such conditions favor the formation of interosseous bridges that form synostosis.

Based on the anatomic location of the synostosis, Vince and Miller initially classified radioulnar synostosis into three types: type I occurs in the distal intra-articular part of the forearm, type II located in the non-articular middle and distal thirds, whereas type III in the proximal thirds of the forearm^[7,10]. The proximal third synostosis was further classified into three subtypes by Jupiter and Ring: type IIIA being at the level or distal to bicipital tuberosity, type IIIB at the radial head, and type IIIC as a continuation of heterotopic bone from the elbow or distal humerus^[10,11].

The main clinical finding is a restriction of supination-pronation on the right forearm. Both active and passive movements are affected, analogous to our finding in this case^[1,7]. Usually, the patient is pain-free unless the synostosis is incomplete^[1]. Radiographs are required to corroborate the diagnosis and help localize the synostosis. CT scans provide precision in the location and extent of synostosis, thus providing clues on appropriate surgical techniques^[1]. In our case, the diagnosis was based on the clinical presentation of restricted pronation-supination of the right forearm, with a history of Monteggia fracture-dislocation on the same forearm and a radiograph showing radioulnar synostosis. An axial view of the right forearm in CT also confirmed our diagnosis and helped in the precise localization of the lesion.

Not a single accepted consensus is available for the management, but different varieties of surgeries have been explained along with adjuvant treatment^[1]. A case series of 12 surgically treated post-traumatic proximal radioulnar synostosis patients had promising results in more than 90% of cases with a low recurrence rate, and the study showed that synostosis excision can be done in most of the cases^[7]. The surgical management of



Figure 5. Intraoperative view showing removal of proximal radioulnar synostosis.

radioulnar synostosis aims to restore the full range of movement with surgical removal of the bridges and to reduce recurrence in the future^[12,13]. Interposition on inert material is considered helpful to prevent recurrence after excision of the synostosis^[12]. In our case, the implant kept for the Monteggia fracture-dislocation was removed and the excess fibro-osseous connection was excised in the proximal radius and ulna.

Hastings and Graham described the treatment of post-traumatic radioulnar synostosis based on the location of the synostosis. Type I with the Darrach procedure (if the synostosis is located in the distal radioulnar joint) or Sauve-Kapandji (if degenerative changes in the distal radioulnar joint and the synostosis under the pronator quadratus), types II and IIIA with synostosis excision with or without interposition graft, type IIIB with excision or replacement of the radial head, and type IIIC with radial head arthroplasty^[14]. Recently, a triple therapy combination (preoperative radiotherapy, tissue interposition after heterotopic ossification resection, and postoperative adjuvant indomethacin) showed good results, preventing recurrence among 10 patients with post-traumatic radioulnar synostosis in Kuwait^[15]. Early rehabilitation after the surgery is considered in the postoperative period, although a defining protocol on this is lacking^[16]. Our patient did physiotherapy during the postoperative periods and his range of motion improved during follow-up visits.



Figure 6. Near full supination and pronation of right forearm during the second month of follow-up visit (postoperative range of motion).

Conclusion

Radioulnar synostosis is an uncommon complication of forearm fracture. The key clinical message of the study is that radioulnar synostosis should be suspected when a patient with a history of forearm fracture presents with a loss of pronation-supination.

Ethical approval

This anonymized case report is exempt from ethical approval.

Consent

Written informed consent was obtained from the patient to publish this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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None.

Author contribution

M.K.: conceptualization, literature review, and writing – original draft, review and editing; S.P., M.K.C., and A.K.: literature review and writing – original draft, review and editing; R.B.: conceptualization, literature review, writing – review and editing, and supervision; A.P.: literature review, writing – review and editing, and supervision. All authors were involved in manuscript drafting and revising and approved the final version.

Conflicts of interest disclosure

There are no conflicts of interest.

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Data availability statement

Data supporting the study are presented in the article.

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