Case Report

Pediatric Radioulnar Synostosis after Olecranon Fracture: A Case Report

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Keywords

Radioulnar synostosis · Olecranon fracture · Elbow

Abstract

Radioulnar synostosis which develops after treatment of isolated olecranon fracture is a rare complication. The aim of this study was to determine the clinical findings and postoperative outcomes of radioulnar synostosis after isolated olecranon fracture in a child patient. A 14-year-old girl was evaluated after falling on her left elbow. She had pain, edema, and motion limitation in her left elbow. After radiologic examinations, diagnosis of olecranon fracture was made. Olecranon fracture was fixated by open reduction and internal fixation with tension band wiring method via the posterior approach. When the patient came to the control to remove the implants 9 months after the first operation, there was a limitation in the supination and pronation movements. In the radiographs, synostosis was observed in the proximal region between the radius and ulna. The patient was reoperated to remove the implants. In the same session, synostosis was excised by using the posterior approach, and a barrier between the bones was constituted with bone wax and early elbow range of motion exercises started. In the postoperative first month, the patient had full flexion and extension but with 30 degrees of supination deficit. Radioulnar synostosis is rare but can be seen after isolated olecranon fractures. Early elbow motion after radioulnar synostosis surgery helps the patient to increase joint movement.

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Introduction

Pediatric elbow fractures are common injuries in the orthopedic daily practice. Olecranon fractures are relatively infrequent and constitute 5% of all pediatric elbow fractures [1]. In the pediatric population, most of the olecranon has cartilaginous structure and is supported by a thick periosteum and a thin cortex. Therefore, most of the olecranon fractures are either non-displaced or minimally displaced and can be successfully treated with conservative methods, and only 10–20% of the fractures require surgery [2, 3].

Complications after surgical treatment of olecranon fracture are uncommon. These complications usually occur due to missed accompanying injuries. The most common complication is elbow stiffness [1]. Proximal radioulnar synostosis is a rare and serious complication that may occur after elbow fractures and may lead to a severe functional deficit. In the pediatric population, this complication is frequently reported after radial neck fractures. To our knowledge, radioulnar synostosis after isolated olecranon fracture in pediatric patients has not been reported in the literature. Willinger et al. [4] and Singh and Vargaonkar [5] presented radioulnar synostosis after olecranon fracture due to malposition of K-wires in adult patients.

In the symptomatic cases, surgical intervention is necessary [2]. There are numerous surgical techniques described for radioulnar synostosis after excision to prevent a recurrence. In the literature, there have been studies comparing different surgical interventions to prevent a recurrence. Daluiski et al. [6] performed anconeus interposition flap after excision of the synostosis and they found this method effective and reasonable. Sonderegger et al. [7] used pedicled adipofascial flaps and after 32 months follow-up, there was no recurrence. Jupiter and Ring [8] used free fat graft between two bones and reported satisfactory results without adjuvant treatment.

Case Presentation

A 14-year-old female patient was brought to the emergency department after falling on her left elbow. She had pain in the left elbow, limitation of elbow motion, and edema. She had no neurovascular damage. Anteroposterior and lateral radiographs of the patient were obtained and type B-varus type fracture was diagnosed in the left olecranon (Fig. 1). The patient was operated 36 h after the referral and the olecranon fracture was fixated by open reduction and internal fixation. Range of motion (ROM) exercises were started after postoperative 10 days. At the 4th week of her follow-up, the union was obtained.

She suffered from a significant loss of supination at her 9th month follow-up visit. Proximal radioulnar synostosis was noticed on her X-ray (Fig. 2). The patient was operated to remove the implants. In the same session, synostosis was excised by the posterior approach, and a barrier between the bones was constituted with bone wax (Fig. 3). Full supination and pronation arch were obtained intraoperatively. The patient started elbow movement with a brace in the forearm supination on the next day. She was discharged with oral indomethacin treatment. In the postoperative first week, immediate physiotherapy was started.

At the postoperative first month visit, the elbow flexion-extension arch was normal but with 30 degrees of supination deficit (Fig. 4, Fig. 5). At the 6th month follow-up, supination deficit remained at 30 degrees and there was no recurrence of the synostosis.

Discussion

Displaced high-energy forearm fractures, fracture of the two bones at the same level, open fractures, accompanying head trauma, and severe soft tissue damage were defined as risk factors for posttraumatic radioulnar synostosis [9]. Previous studies have shown the coexistence of displaced radial neck fractures and traumatic elbow dislocations with proximal radioulnar synostosis [2, 10, 11]. It was reported that periosteal injury between radius and ulna may lead to synostosis in the proximal forearm. Iatrogenic radioulnar synostosis is a well-recognized complication, especially after distal biceps tendon repair [12].

Proximal radioulnar synostosis is a deformity that severely restricts forearm pronosupination. Surgery is required in symptomatic cases [2, 13]. Although there is no consensus for the timing of surgery, intervention between 6–24 months is recommended [14].

It has been shown [15, 16] that a K-wire perforating the interosseous membrane and impinging on the radius can cause synostosis formation. The most commonly proposed mechanism of synostosis formation is calcification of hematoma in the interosseous membrane.

In this case, olecranon fracture was complicated by radioulnar synostosis which caused limitation of elbow joint movements. The limitation of this case was a short follow-up.

In the adult population who were treated with a tension band wiring method, cases of proximal radioulnar synostosis resulting from iatrogenic periosteal damage and interosseous ligament injury have been reported [4, 5]. In intraarticular elbow fractures, anatomic reduction and stable fixation are crucial to obtaining a good outcome. Rollo et al. [15] described trochleocapitellar index to measure the postoperative reduction quality and predict the outcome.

In pediatric olecranon fractures, especially in adolescent patients, tension band method is frequently used as a fixation method [3]. In this presented case, it can be seen that one of the Kirchner wires was penetrating the tuberositas radii on lateral X-ray (Fig. 2, Fig. 3). We think that this is a complication of iatrogenic periosteal injury. In the presented case, synostosis was treated in the postoperative 9th month.

Various methods have been proposed to prevent recurrence after excision of synostosis. Interposition with synthetic materials or local flap applications after excision is recommended to prevent recurrence [13, 14, 16]. Rollo et al. [17] described waterfall fascia lata interposition arthroplasty with allogenic fascia lata for elbow interposition arthroplasty. Allogenic fascia lata interposition can be a useful option for treating radioulnar synostosis.

There are no extensive studies on adjuvant therapy after surgery. Oral indomethacin treatment is a cheap and safe method for preventing recurrence of the synostosis. Costopoulos et al. [18] Reported significant decrease of synostosis recurrence in patients who take indomethacin prophylaxis after distal biceps repair. Rollo et al. [12] also used indomethacin postoperatively for distal biceps repair and they reported no synostosis. Postoperative low-dose radiotherapy is another recommended method to prevent recurrence. Cullen et al. [19] suggested postoperative single-dose radiotherapy and they found no recurrence in four patients of their case series. Early postoperative motion is crucial for the prevention of recurrence and limitation of movement [8, 20].

Conclusion

Radioulnar synostosis after pediatric elbow fractures is often associated with radial neck fractures but can also be seen after an isolated olecranon fracture. Inappropriate surgical

technique can cause iatrogenic periosteum injury and radioulnar synostosis. Although surgical excision of synostosis and early physiotherapy are valid treatment modalities, further evidence about adjuvant treatments is needed.

Statement of Ethics

Informed consent was obtained from the patient's parents.

Disclosure Statement

The authors have no conflicts of interest to declare.

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Fig. 1. Preoperative AP-lateral radiographs of the left elbow.

Fig. 2. Postoperative 9th month AP and lateral radiography.

Fig. 3. **a** Restricted supination in left elbow. **b** Intraoperative radioulnar synostosis formation.

Fig. 4. Postoperative 4th week AP and lateral radiography after synostosis excision.

Fig. 5. Postoperative 4th week limitation of elbow movement.