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Case Report

Management of pediatric open supracondylar humerus fracture using external

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Abstract: Open supracondylar fractures of the humerus are rare in children, and the treatment strategy for these fractures is yet to be standardized. We present the case of an 8-year-old boy with open supracondylar humerus fracture that was managed with an external wrist fixator. A good clinical outcome was achieved in this case, without the development of any complications over a 6-month follow-up period.

Keywords: Humerus, open supracondylar fractures, radiography

Introduction

Supracondylar fractures of the humerus are common in children, accounting for 65% of elbow fractures and 3% of all fractures [1]. However, open supracondylar fractures of the humerus are rarely observed in the pediatric age group, and the treatment protocol for these fractures is yet to be standardized [1-3]. In this report, we present the case of an 8-year-old boy with open supracondylar humerus fracture that was managed using an external wrist fixator. A good clinical outcome was achieved with this treatment method, without the occurrence of any complications.

Case report

An 8-year-boy was brought to our department with pain in the right arm after a fall from a height about 6 hours before admission. On examination, the elbow was found to be markedly swollen with restriction of movement of the right arm. A 4-cm-wide wound was also observed on the flexural aspect of the elbow, indicating severe contamination of the fractured site (**Figure 1A**). Neurological examination revealed restriction of hand movement and decreased sensations, which suggested the possibility of nerve injuries. Radiography performed at admission showed severe displacement of the right humerus fracture (**Figure 1B**, **1C**). The fracture was classified as Gartland type II [4] and Gustilo-Anderson type IIIb [5].

General anesthesia was induced and wound cleaning and debridement were performed. Further, the fracture was reduced under fluoroscopic guidance. Two lateral Schanz pins were inserted through the humerus and ulna. An external wrist fixator (Orthofix Srl, Italy) was attached to the Schanz pins. The right radial nerve was also found to be severely injured, and therefore, the nerve was anastomosed along with the fracture reduction. Antibiotic-impregnated polymethylmethacrylate beads were implanted to prevent infection. Additionally, the patient was administered postoperative antibiotics.

Radiographic examination was performed every week after the surgery. The patient was encouraged to practice movement of the hand and arm with a static load. The elbow joint was alternatively fixed at the position of maximum flexion or extension after physical therapy every day. The external fixator lock was removed at postoperative week 3. At postoperative week 6, the polymethylmethacrylate beads and the external fixator were removed.

At the follow-up examination, the wound showed signs of primary healing. No radiological or biochemical evidence of infection was obtained

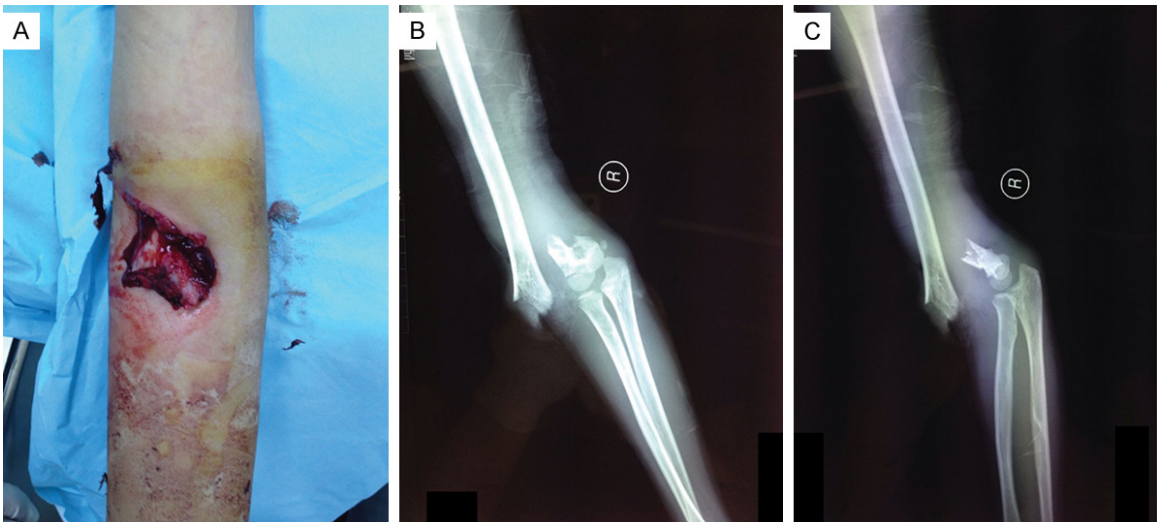

Figure 1. A: Preoperative view of the fracture. The right elbow was markedly swollen. A 4-cm wound is seen on the flexural aspect of the elbow, indicating severe contamination of the fracture site. B and C: Preoperative radiography shows Gartland type II supracondylar humerus fracture with severe displacement.

Figure 2. A and B: Radiography at postoperative week 1 shows good reduction of the fracture. C and D: Radiography at postoperative week 6 shows good union of the fractured ends without any deformities.

during the 6-month follow-up period (**Figure 2A**, **2B**). At the last follow-up examination, the patient showed radiographic evidence of good union (**Figure 2C**, **2D**); had a range of movement of 0°-145 at the elbow; and did not have any signs of osteomyelitis or varus or valgus deformity.

Informed consent has been obtained from the patient or appropriate persons for publication, including photographs.

Discussion

The standard treatment protocol for the type I supracondylar humerus fractures in children is conservative management with closed reduction, percutaneous pin fixation, and the application of a long arm cast. However, the treatment for type II supracondylar humerus fractures in children remains debatable. The American Academy of Orthopaedic Surgeons recommends closed reduction and pin fixation for the management of type II, type III, and displaced supracondylar humerus fractures in children [6]. However, the treatment protocol for open supracondylar humerus fractures in children is yet to be standardized. Open supracondylar fractures are usually accompanied by severe displacement and extensive vascular and nerve injuries, which cannot be optimally managed

with the application of a long arm cast alone. In addition, open fractures are often severely contaminated, whereby the risk of infection remains very high even after thorough wound cleaning and debridement. Therefore, the use of internal fixation in open supracondylar humerus fractures should be avoided because they are associated with an increased risk of infection [6]. Percutaneous pin fixation may also increase the risk of infection in cases of severely contaminated open fractures.

The Schanz pin used in external elbow fixators is large and can cause inadvertent iatrogenic fractures in children. Therefore, instead of the external elbow fixator, we used an external wrist fixator, which has smaller Schanz pins that can provide adequate fixation without increasing the risk of infection. Further, since most external elbow fixators are hinged, they prevent the rotation of the forearm. On the other hand, the external wrist fixator used in our case enables movement in multiple planes, which stabilizes the fractured humerus.

The external wrist fixator offers several advantages to the treatment of open supracondylar humerus fractures in children, including stable fixation for bone union and promotion of the recovery of soft tissues, such as vessels, nerves, and muscles. The use of this device precludes the use of K-wires, thereby minimizing the risks of decreased circulation, infection, and osteomyelitis. In addition, the external wrist fixator is light and does not cause much discomfort for the patient.

One of the risks associated with the use of the external wrist fixator is pin-tract infection, which can be managed well with iodophor. Another possible complication is fracture displacement because the bone is not directly fixed by the external wrist fixator. Therefore, weekly radiological examination is recommended to monitor the patient for possible displacement.

In conclusion, we presented a case of pediatric open supracondylar humerus fracture in which a good clinical outcome was achieved with the use of an external wrist fixator. The patient did not develop any postoperative complications such as osteomyelitis, nonunion, and varus/valgus deformity, and the elbow joint showed a good range of movement. On the basis of our experience in the case, we recommend the use of the external wrist fixator in the management of open supracondylar humerus fracture in children. Further large-scale studies need to be conducted to confirm its safety and efficacy.

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Disclosure of conflict of interest

None.

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