Type III Monteggia fracture with posterior interosseous nerve injury in a child

A case report

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Abstract

Rationale: Elbow injury in children by improper treatment or a delay of more than 3 weeks could lead to old unreduced Monteggia fracture, which are difficult to manage. Conservative or normal surgical methods usually fail.

Patient concerns: Herein, we present a 6-year-old boy with sustaining injury approximately 1 month to his left elbow. Activity in his elbow was restricted, and his ability to extend his wrist and fingers was impaired.

Diagnoses: Type III Monteggia elbow fracture-dislocation consisting of radial head dislocation and malunion of the ulna associated with posterior interosseous nerve palsy were confirmed, which requiring surgical treatment.

Interventions: A closed reduction was performed with hyperplastic scar tissues erased and the radial head relocated.

Outcomes: Follow-up 4 months later showed satisfactory recovery of function.

Lessons: Forearm fractures in children may be misjudged, and that early anatomical reduction rather than conservative treatment may be required.

Abbreviation: PIN = posterior interosseous nerve.

Keywords: closed reduction, elbow trauma, Monteggia fracture dislocation, posterior interosseous nerve palsy

1. Introduction

Monteggia fracture dislocation is an uncommon elbow injury in children.1 Because of the complex local anatomy of the elbow and/incorrect determination of the pathological changes due to fractures, the rate of misdiagnosis of fracture dislocation has increased.2,3 Improper treatment or a delay of more than 3 weeks could lead to old unreduced Monteggia fracture.4 Old Monteggia injuries are difficult to manage, and conservative or normal surgical methods usually fail. These injuries have been classified into 4 types,3 with type III often accompanied by injury to the posterior interosseous nerve (PIN).6 This report describes a 6-year-old child with misdiagnosed Monteggia fracture of Bado type III accompanied by PIN injury.

2. Case report

A 6-year-old boy presented to our institution approximately 1 month after sustaining an injury to his left elbow. Activity in his elbow was restricted, and his ability to extend his wrist and fingers was impaired. His elbow injury was initially treated with cast immobilization at another hospital. Following cast removal, persistent deformity of the elbow and weakness of the hand were observed. Clinical examination was consistent with PIN palsy. The left elbow was swollen, with a flexion angle of 30° to 95° and dysfunctional forearm rotation. The strength of the thumb dorsal extensor was level III+, and that of the other left forearm extensors was level IV. Hypoesthesia was observed in the left hand. Radiographic examination showed malformation of the left ulna and radial head dislocation, consistent with type III Monteggia fracture dislocation (Fig. 1A and B).

The patient underwent closed reduction under general anesthesia. C-arm X-ray examination showed outward angular deformity of the proximal ulna and dislocation of the radial head. Hyperplastic scar tissues were erased, and the dislocation of the radial head was relocated by a posterolateral Kocher approach and fixed with an ulna plate. Postoperatively, the arm was immobilized with a cast, and the patient started wrist joint functional exercises and was treated with neurotrophic drugs. Three weeks later, the cast was removed and the patient was started on elbow exercises. Radiographic examination 4 months later showed healing of the fracture and dislocation. The range of motion of the left elbow was 0° to 130° of flexion, 85° of pronation, and 100° of supination. The strength of the thumb dorsal extensor reached level IV+.

3. Discussion

The optimal treatment of Monteggia fracture in children remains unclear.7 Conservative treatment, including manual reduction, has a low success rate, and surgical treatment is always recommended.8 Monteggia fracture is defined as “a traumatic lesion distinguished by
a fracture of the proximal third of the ulna and anterior dislocation of the proximal epiphysis of the radius. Thus, the purposes of surgical treatments include reduction of the radial head and correction of ulnar deformity. Among the surgical methods available to treat Monteggia fracture are ulnar osteotomy, arthroscopic repair, and annular ligament reconstruction. 

Reconstruction of the annular ligament in patients with old Monteggia fractures is difficult because of the long duration of dislocation and the severe adhesion to surrounding scar tissue. This is complicated in children by the rapid growth of their bones, making the tightness of annular ligament reconstruction hard to control. Reconstruction that is too loose may easily result in dislocation, whereas too tight reconstruction may affect the rotation of the forearm. The reconstructed ligament is not suitable for the growth of the radial head in childhood and may result in abnormalities. Kirschner wires may prevent dislocation, but they were not indicated in our patient, because these wires could increase surgical trauma and the risk of epiphyseal injury. Because of the dislocation, the hyperplasia of scar tissues in the radio-humeral joint and the ulnar fracture malunion made it difficult to reset the dislocations of the radial head. Thus, reliable stability of the radial head requires clearance of soft tissue in the radio-humeral joint and orthopedic ulna osteotomy. Repair of the joint capsule can effectively increase radial head stability, preventing dislocation. These findings suggest that ligament reconstruction and Kirschner wires are not necessary for treatment of Monteggia fractures.

Injury to the PIN is a severe neurologic complication of Monteggia fracture. Following the anterior dislocation of the radial head, the PINs can be easily injured by compression and excessive traction. Patients who experience PIN injury at the time of Monteggia fracture should undergo surgery immediately, to reset the dislocation and correct ulnar deformity, thereby releasing the compression or traction of the PIN. If PIN injury is complete and irreversible, tendon transfer can be performed to restore the functions of the wrist, finger, and thumb. In the current patient, surgery released the compression of the PIN, resulting in complete functional recovery at follow-up.

Because the pathological changes accompanying Monteggia fracture and dislocation are complex, a single surgical method is insufficient. The combination of surgery and a personalized treatment program may be effective. Ulnar osteotomy accompanied by radio-humeral joint debridement has obvious advantages in the treatment of Monteggia fracture in children. Joint debridement should include removal of the scar tissues to reduce the impact on radial head reset. Relocation and stability in various directions of the radial head can be monitored directly; once confirmed, annular ligament reconstruction and the use of Kirschner wire are unnecessary. A satisfactory outcome can result from simultaneous treatment of the nerve and skeletal injuries.

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