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Osteochondritis dissecans of the capitellum secondary to fishtail deformity treated with osteochondral autograft

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Osteochondritis dissecans (OCD) of the humeral capitellum is usually seen in young throwing athletes.[12] The repetitive shearing forces that are exerted by the radial head cause microtrauma of the articular cartilage and eventually detachment of subchondral bone.[1] We report 2 patients with OCD that were not associated with throwing motions. Both patients showed fishtail deformity of the humeral condyle, which is a rare delayed complication of elbow trauma in children.[2-5,8,9,11] Both patients had a history of treatment for a supracondylar fracture of the humerus and uneventfully recovered. Surgical intervention was performed for both patients. Here we present these unusual cases and their surgical outcomes and then discuss the mechanism of onset.

Case reports

Patient 1

An 11-year-old, left-handed boy complained of left elbow pain. The patient belonged to a youth baseball team, but he threw with his right arm and basically performed no throwing motions with his affected arm. The patient's history revealed that he had sustained a Gartland type III supracondylar humeral fracture at age 7 (Fig. 1, *A*) that was treated by percutaneous pinning (Fig. 1, *B*). He recovered from the injury without any complications. He had a full range of motion after 6 months and was then dismissed.

At the initial examination at our hospital, his elbow motion was restricted to 40° of extension to 125° of flexion. Supination/pronation motion was not limited. Fishtail deformity of the distal humerus and abnormality of the capitellum were observed on plain radiographs (Fig. 1, *C*). A T2-weigted magnetic resonance image (MRI) showed low signal area in the capitellum apophysis, and he was diagnosed with grade III OCD[12] (Fig. 1, *D*).

Elbow arthroscopy revealed significant synovitis, loss of cartilage on the humeral capitellum, and deformity of the radial head. Cartilage was absent from the humeral trochlea area, and scar tissue had formed. Synovectomy and removal of osteochondral fragments were performed.

To reconstruct the cartilage defect in the humeral capitellum, an 8-mm-diameter osteochondral plug was harvested from the knee and transplanted to the capitellum. A long arm cast was applied for 1 week postoperatively, and then active exercise was started.

At 1 year and 5 months postoperatively, he had no pain and improved range of motion, with 15° of extension and 135° of flexion. Early epiphyseal closure was observed on the humerus and the radial head on plain radiographs (Fig. 1, *E* and *F*). Deformity of the distal end of the humerus associated with fishtail deformity remained. He is periodically monitored.

Patient 2

An 11-year-old boy presented with pain in his right dominant elbow. At the age of 3 years, he had sustained a Gartland type I supracondylar humeral fracture and was treated by cast immobilization. He recovered completely. The last radiograph was obtained 1 month later, after which he was dismissed. Later he occasionally complained of right elbow pain and consulted a local physician, but nothing abnormal was found on plain radiographs and he received no further treatment. His athletic history was mostly physical education class at school, and he had no special history of throwing.

At his initial examination at our hospital, he had severe limitation of elbow motion, from 45° of extension to 130° of flexion. Fishtail deformity and capitellum abnormality were seen on the plain radiograph (Fig. 2, *A*). Radial head subluxation was also observed. Low signal area in the capitellum apophysis was seen on a T2-weighted MRI (Fig. 2, *B*).

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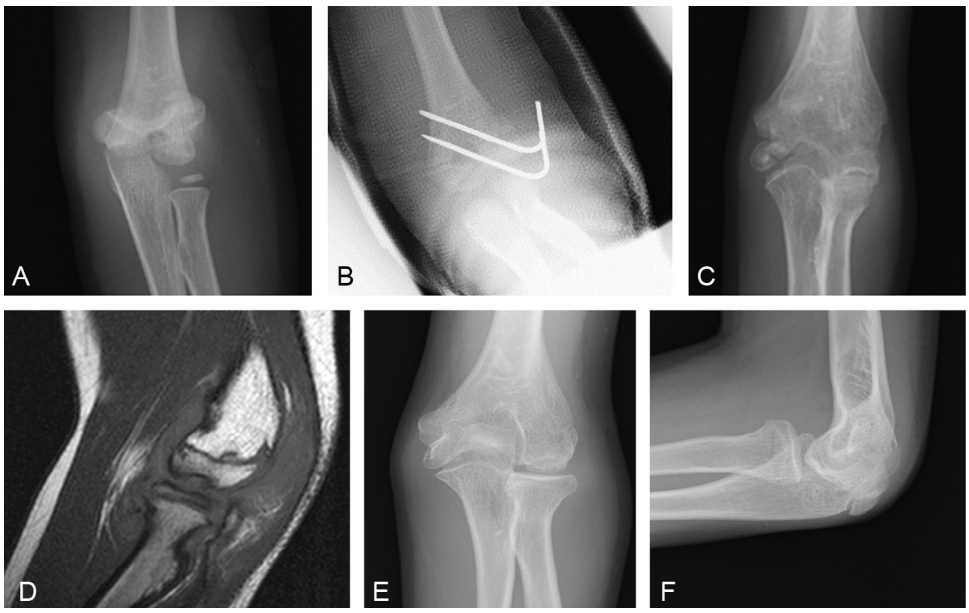

Figure 1 Patient 1, an 11-year-old boy. (**A**) An anteroposterior x-ray image of the right elbow showed Gartland type III supracondylar fracture at age 7. (**B**) A postoperative x-ray image showed that the fracture was fixed by 2 Kirschner wires. (**C**) An anteroposterior x-ray image at age 11 showed fragmentation of the trochlear apophysis and a concave-shaped humeral capitellum. The distal end of the humerus showed fishtail deformity. (**D**) A T2-weighted magnetic resonance image showed the low signal area at the humeral capitellum and a focal osteochondral defect. At 1 year and 5 months postoperatively, (**E**) an anteroposterior x-ray image showed ossification of trochlear was completed, the joint surface had become smooth and concave, and the radial head was slightly hypertrophic, and (**F**) a lateral x-ray showed that deformity of humeral capitellum remained.

Surgery was conducted under general anesthesia. In arthroscopic examination, significant synovitis and loss of cartilage on the humeral capitellum were observed (Fig. 2, *C*). An osteochondral fragment detached from the capitellum was removed. An osteochondral plug of 6.5 mm in diameter was harvested from the knee and transplanted into the defect of the humeral capitellum. Postoperatively, active exercise was started after long arm cast immobilization for 10 days.

At 1 year postoperatively, he had no pain, and range of motion had improved to 15° of extension and 135° of flexion. Exercise was restarted while limiting the load on his arm. Bone graft union was seen on plain radiographs, but anterior subluxation of the radial head

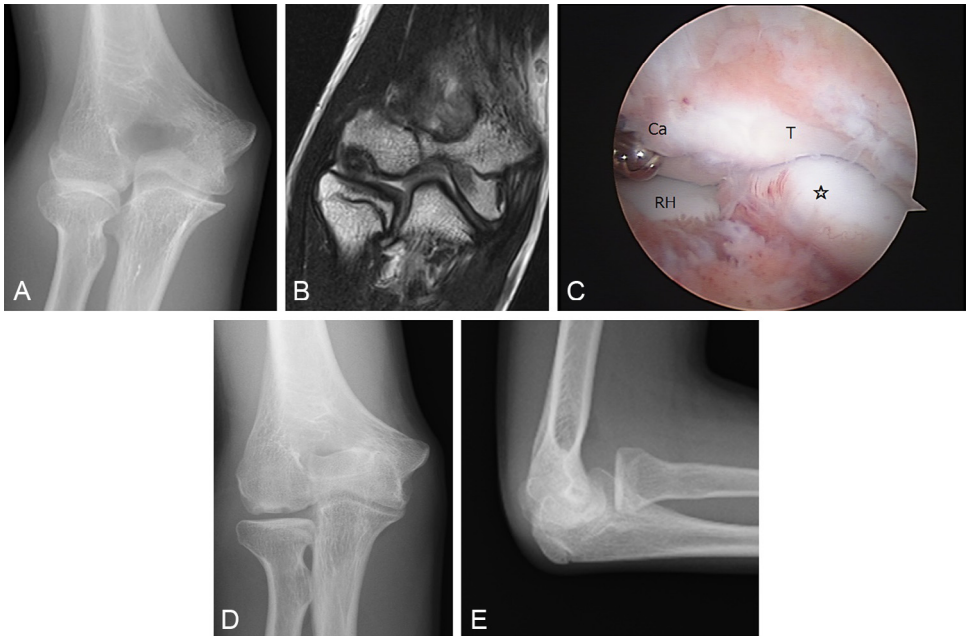

Figure 2 Patient 2, an 11-year-old boy. (**A**) An anteroposterior x-ray image at age 11 showed fishtail deformity of the distal humerus and hypertrophic radial head. (**B**) A T2-weighted magnetic resonance image showed low signal area at the humeral capitellum and a focal osteochondral defect. (**C**) Arthroscopic view. Despite the deformity on the x-ray image, the trochlea (*T*) showed a smooth joint surface. The cartilage defect and fibrillation at the humeral capitellum (*Ca*) was observed in arthroscopic examination. *RH*, radial head; ☆, coronoid process. At 1 year postoperatively, (**D**) an anteroposterior x -ray image showed the deformity at humeral capitellum remained, and (**E**) slight anterior subluxation of the radial head was observed on the lateral x-ray image.

remained (Fig. 2, *D* and *E*). His course has been good clinically, but careful observation is needed for development of future osteoarthritic changes.

Discussion

Fishtail deformity is a V-shaped deformity of the distal humerus due to concavity at the lateral trochlea. The pathology is believed to be a central physeal arrest or avascular necrosis caused by sparse vascularity between the capitellum and trochlea.[7] The incidence of this complication after pediatric elbow trauma is unknown. Bronfen et al[2] reported 6 patients with fishtail deformity in 288 displaced supracondylar fractures. Ippolito et al[5] evaluated 49 patients with pediatric fracture of the humeral condyles 18 to 45 years after the injury and then reported that a fishtail deformity was present in approximately two-thirds of their patients. Not only displaced fractures but also nondisplaced fractures, as we experienced in patient 2, possibly develop fishtail deformity.[11] Thus, despite care to avoid any damage to the epiphyseal area, fishtail deformity might develop after any type of pediatric elbow trauma and might cause secondary elbow disorders, depending on its severity.[4] The deformity is not visible until ossification of the trochlea occurs between the age of 7 and 8 years. It is important for surgeons to be aware of this potential complication, monitor patients annually, and inform patients of the possibility of this complication.

OCD occurred in these patients unassociated with throwing motion. Fishtail deformity of the distal humerus caused an alteration in the intra-articular stress distribution, and the stress was concentrated over the radiocapitellar joint during daily activities. Moreover, the development of fishtail deformity itself suggests the possibility of insufficient blood supply at the distal humerus in these particular patients.

A high incidence of OCD in fishtail deformity elbow was reported by Lehnert et al.[8] They explained that proximal migration of the ulna led to increased lateral column load and joint impingement. They recommended an MRI examination to detect pathology in the capitellum.

Treatments for patients with a post-traumatic fishtail deformity were variable.[2,4,5,8] Ippolito et al[5] reported the incidence of arthrosis was very low, and Cates et al[3] reported a patient with asymptomatic fishtail deformity. Physiotherapy and observation are indicated for mild deformity or in early stages. However, both patients were referred to our hospital with marked pain and restricted motion. For the relief of pain, synovectomy and the removal of loose bodies were effective to decrease mechanical symptoms.[4,8] In addition, because the patients were young and growing, we had to consider further reconstructive procedures for the deformed humeral epiphysis to prevent progression of arthrosis.

Descriptions of treatment options in the literature are limited. Epiphysiodesis, osteotomy, or vascularized composite graft can be challenging options, but outcomes are unpredictable.[4] The restoration of a normal joint congruity seemed to be difficult. We reconstructed the joint surface of the capitellum by autologous osteochondral plug graft.[1,10] Good outcomes with minimum complications have been reported with osteochondral graft for OCD of the capitellum.[6,10] We expected that improvement of radiocapitellar joint congruity would be advantageous in acquiring stability of the elbow itself and redistribution of stress in the joint, thereby eventually preventing progression of arthrosis to some extent.

Although the follow-up was short, both patients gained sufficient motion without pain to return to exercise. However, trochlear and radial head deformity and subluxation remained on radiographs. Careful follow-up is needed with regard to the progress of future osteoarthritic change.

Conclusion

We reported 2 patients with rare capitellum OCD, both of whom had had fishtail deformity after a supracondylar humeral fracture. Both patients had generally good clinical outcomes with arthroscopic débridement and autologous osteochondral graft to the capitellum. Damage to the epiphyseal ossification center might occur after any type of elbow trauma in children. Careful follow-up should be conducted annually to avoid overlooking any signs of growth disturbance.

Disclaimer

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