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Successful Late Correction of a Severely Displaced Radial Neck Fracture in a Child

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1. Case History

Radial neck fractures are rather rare fractures during growth. They are sometimes difficult to diagnose in very young children when the epiphyseal of the proximal radius is not yet calcified. We report on a young patient who suffered an injury to the right elbow joint when he fell while playing at the age of 5 years. No bony injury was diagnosed based on primary radiographs. A diagnosis of elbow contusion was made and the arm was immobilized for a few days to relieve pain (Figure 1).

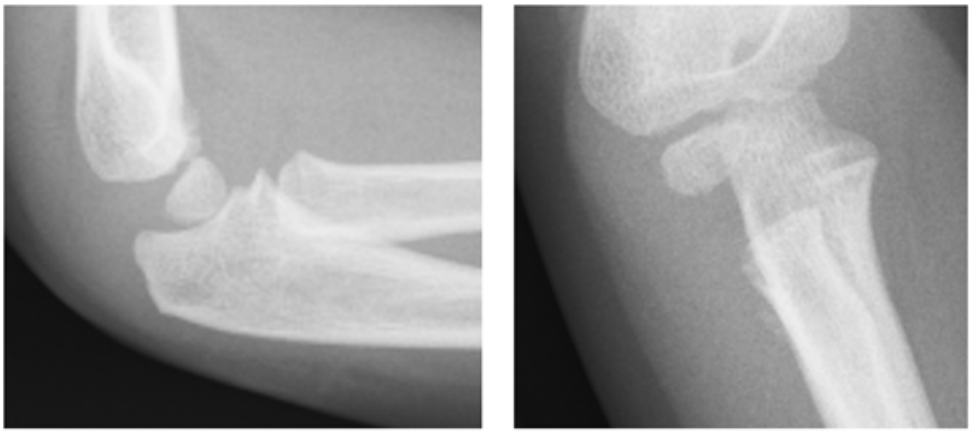

Figure 1: X-rays after elbow trauma at the age of 5. The small bone shadow lateral to the proximal radial metaphysis was overlooked.

2. Clinical Findings

It was over 4 years later that the now 10-year-old boy was admitted to our consultation hour. He complained of constant pain in the right elbow joint, limited mobility and, above all, a visible deformity. Clinically, there was a clear limitation of extension and flexion of 0-10-100 degrees and almost no pronation and supination in neutral position (10-0-10 degrees). X-rays of the elbow joint in 2 planes at this time show severe deformity of the proximal radius. The radial epiphysis is tilted by 90 degrees, including the still visible growth plate, to the side of the proximal radial metaphysis. The epiphysis still has a concave articular surface. The metaphysis has formed a neo-joint to the capitulum of the humerus (Figure 2).

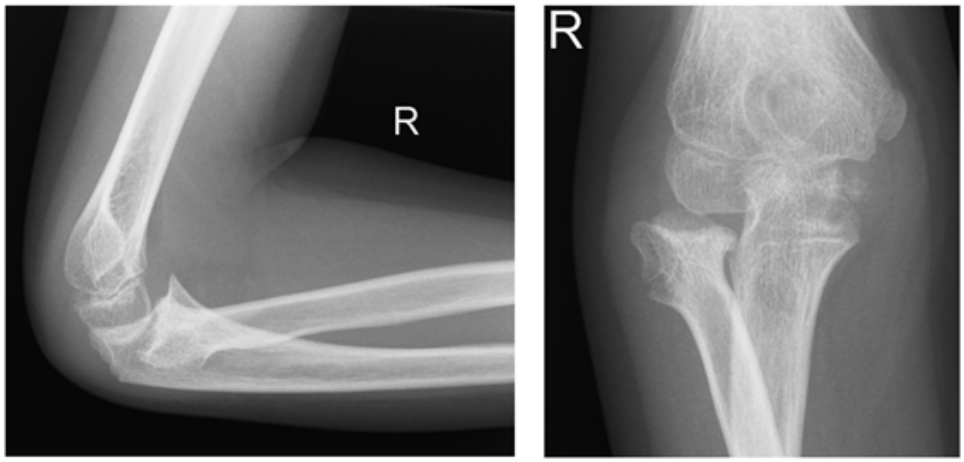

Figure 2: X-rays of the elbow joint at the age of almost 10 years. The proximal radius is clumped. The epiphysis is tilted laterally by 90 degrees and still has a concavity.

3. Which treatment options are now available?

Conservative further treatment with physiotherapy and medical pain therapy. This suggestion is not an option due to the young patient's suffering. Resection of the proximal radius. This option would eliminate the visible deformity, relieve pain and probably significantly improve forearm turning movements. However, the loss of the proximal radius would result in instability of the elbow joint with increasing valgus and possibly disintegration of the distal radioulnar joint [1,2]. Resection of the proximal radius and implantation of a radial head prosthesis. Here too, elimination of the deformation, pain relief and an improvement in the range of motion can be expected. However, there is not yet sufficient experience with the implantation of a radial head prosthesis with growth plates still open. The possibilities of later replacement operations if the prosthesis loosens are undetermined. Attempt of an almost anatomical reconstruction. The aim here is also to achieve visual improvement, pain relief and an increase in the range of motion. The option of later switching to a resection or resection with prosthesis implantation remains. However, the development of radial head necrosis [3] or radial neck pseudoarthrosis [4] must be expected after osteotomy and position correction. Also the development of a radioulnar synostosis cannot be ruled out [1,2,5]. After extensive, repeated discussions of the procedure and its risks with the patient and his family, we decided to take the latter route.

4. Therapy

During the operation the lateral radial epiphysis was exposed. It was intraarticular. An annular ligament could not be visualized. The neojoint to the capitulum of the humerus had a cartilage covering on the radial side. There were no corrosions on the humeral cartilage surface. The osteotomy of the radial metaphysis proximal to the epiphysis was now carried out using K wire drilling and the chisel. The neoarticular surface was freed from cartilage and cortex and the resulting fragment was rotated by 90 degrees. This caused the concavity of the epiphysis to lie opposite the capitulum. A small osteophyte at the edge of the ulnar articular surface was removed. Two 2.0 mm Kirschner wires, slightly pre-bent at the tip, were now implanted via the usual distal radial approach, advanced and anchored under visualization in the newly placed proximal metaphysis according to the recommended technique for acute radial neck frcatures [6,7,8] (Figure 3).

There was no subsequent necrosis of the proximal radius. The osteotomy also healed completely. Neither a nonunion nor a radioulnar synostosis developed. However, there was a clumping of the radial head. The osteosynthesis material could be removed after 6 months. At this point, the visible deformity of the elbow joint was almost eliminated. The young patient was pain-free. The range of motion was 0-0-120 degrees for extension and flexion and 40-0-30 degrees for pro- and supination. Even after 24 months there was no evidence of radial head necrosis with no change in shape. Pronation and supination remained unchanged. There was a slight extension inhibition at 0-10-120 degrees (Figure 4).

Figure 3: Postoperative documentation after osteotomy, rotation and intramedullary osteosynthesis of the proximal radius.

Figure 4: Radiological findings 24 months after the operation. The radius head is clumsy and moderately tilted. The growth plates except for the apophyseal plate of the ulnar epicondyle are closed. The range of motion is limited, but subjectively sufficient.

5. Conclusion

Overlooking or misjudging displaced radial neck fractures during growth poses a problem. What is unusual in the present case is that the radial epiphysis was preserved for over 5 years in its malposition and retained its concavity. The consideration of the therapeutic approach had to take various aspects into account. The corrective osteotomy was successful, even if restitutio ad integrum could not be achieved. The result leaves all options open for the further course, so that offers for further treatment steps can be made in the future, especially after growth has been completed and if the clinical findings worsen.

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