

Case Report

Post-Traumatic Palsy of All the Three Nerves of the Upper Limb Accompanied with Vascular Deficiency in the Course of Supracondylar Humerus Fracture - Distant Results of the Treatment: Case Report

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Summary

We present a case report of a patient who at the age of 8 suffered an injury to the left elbow joint and admitted to the Department of Pediatric Orthopedics and Rehabilitation in Lublin / Poland due to a supracondylar humerus fracture in extension mechanism. As a result of the injury, in addition to the damage to the musculoskeletal system, the sensory and motor functions of the three nerves were also disturbed. A closed reduction procedure was performed within two hours after admittance, with transverse fracture pinning with K-wires. On the third day after the injury, the left elbow joint was inspected, with the release of the brachial artery and the median nerve and removal of the K-wire conflicting with the ulnar nerve. After a multimodal rehabilitation, the child regained the full function of the left upper limb.

Keywords: Crushing of the Median Nerve; Paresis of the Ulnar Nerve; Radial Nerve Paresis; Supracondylar Fracture of the Humeral Bone; Vascular Deficiency

Introduction

The supracondylar fracture of the humerus is one of the most frequent fractures in children. It accounts for 3% of all fractures and most often occurs between 5-7 years of age [1]. The most popular method of assessing the severity of the above mentioned fracture is the three-level classification according to Gartland, in which the III is described as a fracture with full displacement - without contact of the cortical layers [1,2]. The treatment of choice in these cases is the reduction of the fracture with internal fixation [2]. In the case of vascular disorders; or lack of possibility to obtain an acceptable reduction of fracture, an open reduction is used [1,2]. Fractures with postero-lateral or posterior-medial dislocations coexisting with rotational deformation without the contact of fragments are statistically burdened with a higher risk of postoperative and pre-operative vascular or nerve function disorders [1].

In 1948 Herbert Seddon divided the nerves lesions into three groups, taking as a criterion the internal structures of the nerves. The classification contains three types of damage: neuropraxy (Myelin

Sheath Injury) - temporary blockage of conduction that returns after 1-2 days, axonotmesis (Axon Damage) - drive blockage may last from several weeks to several months and regeneration is usually complete, neurotmesis (Endovascular Damage) - although the regeneration happens it is unsatisfactory [3]. Nervous disorders, usually neuropraxy, occur in 3-22% of all supracondylar fractures of the humerus [2]. The mechanism of the fracture is of great importance in the destruction of individual nerves. In the extension mechanism there is an increased risk of neuropraxy of the previous interosseous nerve, whereas in the flexion mechanism of the ulnar nerve neuropraxy is more frequent. Also, the pinning method can affect the occurrence of nerve damage. Percutaneous internal stabilization of the supracondylar fracture of the humerus on the medial side causes an increased risk of damage to the ulnar nerve, whereas percutaneous stabilization on the lateral side may increase the risk of damage to the median nerve [4].

Assumptions and Purpose

We discuss a rare medical case of post-traumatic palsy of all the three nerves of the upper limb accompanied with vascular deficiency in the course of supracondylar fracture of the humerus and present long-term results of the treatment.

Materials and Methods

We present a case report of a patient who at the age of 8 suffered an injury of the left elbow joint and was admitted to the Department of Orthopedics and Pediatric Rehabilitation in Lublin due to the supracondylar fracture of the left humerus in the extensor mechanism (Figure 1).

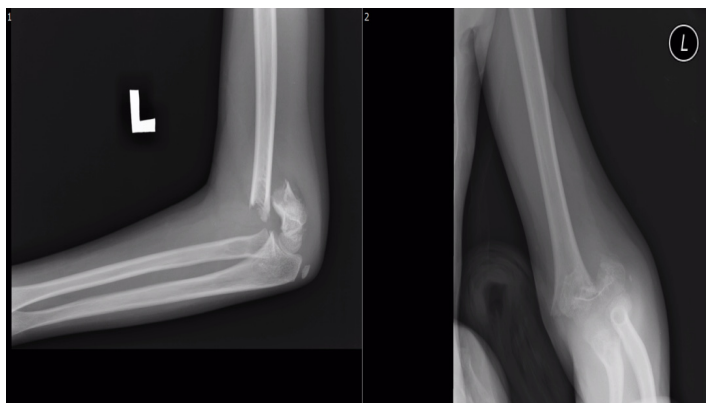


Figure 1: Supracondylar fracture of the left humerus in the extensor mechanism.

During the clinical evaluation, a large swelling of the elbow joint was observed with features of total paresis of the median nerve and partial paresis of the radial nerve. A closed reduction of the fracture was performed in emergency mode with percutaneous pinning with three Kirschner wires inserted in the lateral and medial sideways (Figure 2).

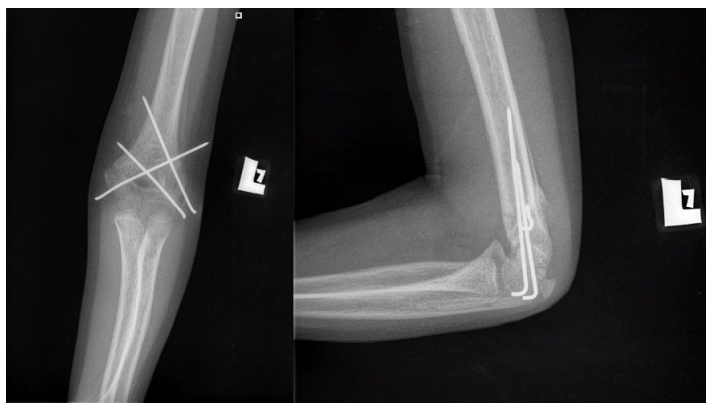


Figure 2: Percutaneous pinning with three Kirschner wires inserted in the lateral and medial sideways.

On the third day after the injury, significant cooling of the left upper limb was observed accompanied by features of total ulnar, median and radial nerve paresis. Ultrasound examination with Doppler mode showed a reduction in perfusion of the distal part of the limb, with no disturbances in the peripheral tissue saturation. There were no abnormalities in the ulnar nerve continuity, only

its conflict with the assembly material. The radial nerve showed no damage to the continuity, but the median nerve was swollen and obliterated. Angio-CT examination confirmed the features of brachial artery injury. An immediate open revision of the elbow joint was performed. During the procedure, the medial nerve was found to be crushed, stuck together with the brachial artery between fracture fragments (Figure 3).

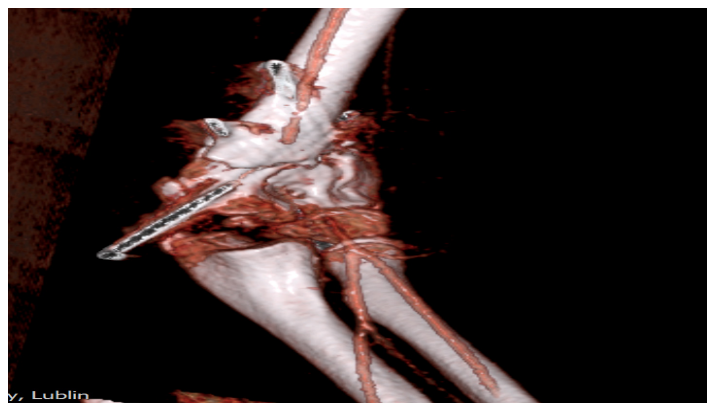


Figure 3: Open revision of the elbow joint.

The brachial artery was released and neurolysis was performed. The median nerve was anesthetized and the Kirschner wire was removed from the vicinity of the ulnar nerve. Despite the correct alignment of the fragments, there was no return of disturbed nerve functions. In the clinical trial, the function of active dorsal flexion of the wrist was observed, the lack of finger extension function in the MCP and PIP joints (Figure 4).

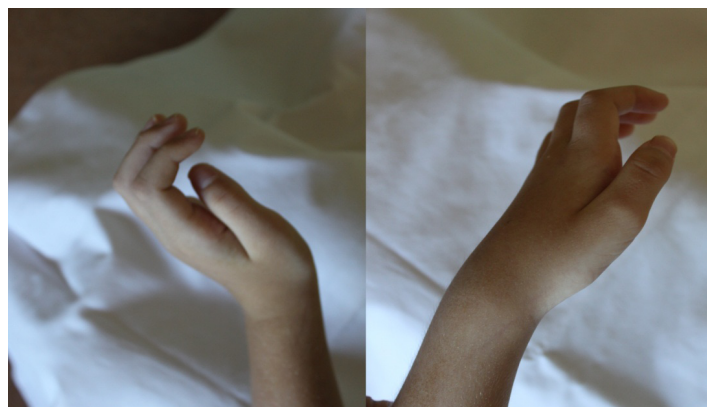


Figure 4: Lack of finger extension function in the MCP and PIP joints.

The pulse on the radial artery was palpable, the hand slightly cooler with visible vegetative disorders. The girl underwent to long-lasting, two years rehabilitation process. The patient underwent multiple galvanization, electro stimulation, vortex baths, manual massage, mobilization and passive exercises of flexion and extension movements in the DIP, PIP and MCP joints of the left upper limb.

Results

Despite poor post-operative prognosis and prolonged persistence of the median, ulnar and radial nerves paresis, complete resolution of the above-mentioned symptoms and the return of full limb function were obtained (Figure 5).



Figure 5: Complete resolution of the above-mentioned symptoms and the return of full limb function were obtained.

Discussion

Supracondylar fracture of the humerus is a severe damage to the upper limb with high risk of vascular and nervous disorders. Such fractures of the distal part of the humeral bone, coexisting with vasculature or nerves damaged effected 3-11% of patients. Large displacements should be set in emergency mode and final treatment should be carried out within 24 hours [2]. Jessica Babal conducted research on a group of 5148 people, including 5154 injuries of humeral bone. She observed neuropraxy of nerves in 11.3% of cases. The damage of the previous interosseous nerve was noted in the extension mechanics and constituted 34.1% of all cases of neuropraxy present. The neuropraxy of the ulnar nerve was more frequent in the flexion mechanism and accounted for 91.3% of neuropraxy. Percutaneous internal stabilization from the lateral side contributed to 3.4% to nerve damage, while medial side to 4.1% [4-6]. Lyons describe a group of 210 children with a third type of supracondylar fracture of the humeral bone in which 19.1% of patients had vascular, neurological or both disorders. 13.3% were nerve damage, 2.9% nerve injuries coexisting with vascular disorders and 2.9% isolated vascular disorders. 80% of the median nerve injuries were related to the previous interosseous nerve. Damage to the median nerve and vascular disorders occurred in fractures with postero-lateral dislocation, while damage to the radial nerve coexisted with fractures with posterior-medial dislocation

[5,7,8]. We would also like to remind that children with well-perfused hand but absent radial pulse usually do not necessarily require routine exploration of the brachial artery. Most of authors notice that, exploration of the cubital fossa should be performed only if circulation is not restored by closed reduction. Some authors as White et al. reviewed 19 papers in the English literature where pulseless and perfused supracondylar fractures were managed. A total of 331 such fractures were recorded. Of these, 157 remained pulseless post reduction. In this group, 90% underwent surgical exploration and 82% was found to have isolated brachial artery injury [9]. We present the case of supracondylar fracture where blood circulation was not totally disabled but demanded revision of the brachial artery and median nerve. However most authors believe that nerve injuries in the region of the elbow joint do not require surgical intervention and very well react to conservative treatment [5].

Conclusions

Coexistence of radial, medial and ulnar nerve paresis with vascular disorders is extremely rare and the literature does not indicate the frequency of their joint occurrence. Nerve dysfunction is more often described as neuropraxy than axonotmesis [1,4,10-12]. While maintaining nerve continuity, long-term occupational therapy and physical therapy may result in the return of the function of the above-mentioned nerves.

References

1. Flierl MA, Carry PM, Scott F, Georgopoulos G, Hadley-Miller N (2015) Rotation and Displacement Predict Adverse Events in Pediatric Supracondylar Fractures, *Orthopedics* 38: 690-695.
2. Canale S, Beaty J (2013) Złamania i zwichnięcia u dzieci in Cambell. *Ortopedia Operacyjna, network*. Kusz D, Elsevier 2013: 1371-1524.
3. Trumble T, Budoff J, Cornwall R (2006) Physiology and nerve regeneration in Hand, elbow, shoulder. Red Gaździk T, Elsevier 2006: 243-256.
4. Babal J, Mahman C, Klein G (2010) Nerve injuries associated with supracondylar humeral fractures: A meta-analysis, *Journal of Pediatric Orthopedics* 30: 253-263.
5. Lyons S, Quinn M, Stanitski C (2000) Neurovascular Injuries in Type III Humeral Supracondylar Fractures in Children, *Clinical Orthopedics & Related Research* 376: 62-67.
6. Flynn JC, Matthews JG, Benoit RL (1974) Blind pinning of displaced supracondylar fractures of the humerus in children. *JBJS Am* 56: 263-272.
7. Hedström EM, Svensson O, Bergström U, Michno P (2010) Epidemiology of fractures in children and adolescents. *Acta Orthop* 81: 148-153.
8. Hefti F, Brunner R, Hasler CC, Jundt G (2007) *Pediatric orthopedics in practice*. Heidelberg, New York : Springer Medizin 2007.
9. White L, Mehlman CT, Crawford AH (2010) Perfused, pulseless, and

- puzzling : a systematic review of vascular injuries in pediatric supracondylar humerus fractures and results of a POSNA questionnaire. J Pediatr Orthop 30: 328-335.
10. Price KR, Hunter JB (2011) Lower limb injuries in children. Surgery (Oxford) 29: 162-166.
11. Matuszewski Ł (2014) Evaluation and management of pulseless pink / pale hand syndrome coexisting with supracondylar fractures of the humerus in children 24: 1401-1406.
12. Ramachandran M, Birch R, Eastwood DM (2006) Clinical outcome of nerve injuries associated with supracondylar fractures of the humerus in children: the experience of a specialist referral center. J Bone Joint Surg Br 88: 90-94.