Trauma Case Reports xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

Trauma Case Reports

journal homepage: www.elsevier.com/locate/tcr

Case Report

Neurovascular complications after supracondylar humerus fractures in children☆,☆☆

Maximilian Leiblein [a,*], Thomas Lustenberger [a], Anne-Kathrin Schulz [b], Thomas Schmitz-Rixen [c], Ingo Marzi [a]

[a] Department of Trauma, Hand and Reconstructive Surgery, Hospital of the Goethe University, Theodor-Stern-Kai 7, 60590 Frankfurt am Main, Germany
[b] Department of Paediatric Surgery and Paediatric Urology, University Hospital Frankfurt/M., Theodor-Stern-Kai 7, 60590 Frankfurt/M, Germany
[c] Department of Vascular and Endovascular Surgery, Hospital of the Goethe University, Theodor-Stern-Kai 7, 60590 Frankfurt am Main, Germany

ARTICLE INFO

Article history:
Accepted 2 January 2017
Available online xxxx

Keywords:
Median nerve
Brachial artery
Neurovascular lesion
Percutaneous pinning
Pediatric fracture

ABSTRACT

Background: Supracondylar fractures of the humerus are a common injury in pediatric traumatology. The most common operative therapy is closed reduction and percutaneous pinning using K-wires. Common complications associated with this entity are neurovascular lesions, especially of the brachial artery and the median nerve.

Methods: We report two cases of patients treated in our trauma-center with supracondylar fracture of the humerus (AO IV°) and neurovascular complications.

Results: Both patients underwent open revision and recovered completely in their further course.

Conclusion: We recommend detailed neurovascular examination initially and after reposition of the fracture. The threshold for open reduction in cases of irreducible fractures should be low. In the presence of neurovascular impairment an open revision is mandatory, even months after the initial Trauma.

Level of evidence: Level V (case report).

Introduction

Supracondylar humerus fractures are a common injury in children and account for approximately 15% of all pediatric fractures [1]. The mechanism leading to this fracture is most often a fall on the hand with fully extended elbow [2].

Primary treatment of dislocated fractures is closed reduction and percutaneous pinning with Kirschner-wires (*K-wires*) [3].

Complications following these fractures are infection, loss of reduction, non-union, cubitus varus or valgus and neurovascular lesions [4]. The incidence of vascular complications associated with supracondylar fractures ranges from 3.2 to 14.3% [5], nerve injuries are reported with a relative incidence of 12–20% [6]. Especially the brachial artery and the median nerve are at risk due to stretch forces or entrapment [2].

We report two cases of neurological and vascular complications in terms of rupture, respectively occlusion of the brachial artery and injury of the median, respectively median and ulnar nerve after closed reduction and K-wire fixation.

☆ There has been no source of support, either pharmaceutical or industry support. No funding from any organization has been received.
☆☆ None of the authors has any conflict of interests.
* Corresponding author.
E-mail address: maximilian.leiblein@kgu.com (M. Leiblein).

http://dx.doi.org/10.1016/j.tcr.2017.01.013

The aim of this article is to point out the importance of a neurovascular examination in pre- and postoperative course to prevent missing neurovascular injuries. Furthermore, we want to emphasize the good chance of an excellent outcome even after delayed revision.

Case reports

Case I

A 5-year-old boy was admitted to our clinic with a cold and pale hand as well as paralysis and hypoesthesia of the median and ulnar nerve. 2 months before he had sustained a supracondylar fracture of the right humerus (AO IV°). Primarily, closed reduction and K-wire fixation was performed via stab incision. Control X-rays showed sufficient consolidation with persisting rotationally spur as radiographic sign of rotational error. The K-wires were removed after 4 weeks (Fig. 1a, b).

Clinical and electrophysiological examination confirmed paralysis of the ulnar and median nerve, the vascular status revealed a pulseless radial and ulnar artery. MR-Angiography showed a brief but complete closure of the brachial artery (Fig. 1c).

Open revision showed immurement of the median nerve in an osseous canal of 2.5 cm length beginning at the level of the fracture. The brachial artery appeared ruptured and the ulnar nerve showed massive strictures by scar tissue. Callus was removed and extended microsurgical neurolysis of the median and ulnar nerve was performed, which both showed preserved continuity. Afterwards the brachial artery was reconstructed using a reversed segment saphenous vein graft (Fig. 2a–d).

The postoperative course was uneventful. The patient was discharged from hospital on postoperative day 2. 6 months later extensive examination detected only moderate hypoesthesia of the ulnar nerve and a limited spreading of the fingers (50% motoric recovery, partial sensory recovery). Neurological examination by electromyography (EMG) and nerve conduction velocity (NCV) study confirmed the clinical findings with gradually recovery of the nerves. Ultrasound showed an excellent flow in the distal arteries. In further course the patient recovered completely.

Case II

A 5-year-old boy presented in our emergency department 6 days after he sustained a supracondylar fracture of the right humerus (AO IV°) and underwent closed reduction and K-wire fixation (Fig. 3a–c) in an outside hospital. He complained about progressive pain, fever (37.9 °C) and postoperative hypoesthesia and impaired flexion of the index finger.

Surgical revision revealed radial fluid retention - *Staphylococcus aureus* could be isolated microbiologically and the patient was started on antibiotics. Another 10 days later pain exacerbated and impaired function of the median nerve was found.

In further open revision, a kinking of the median nerve, caused by scarred adhesions, could be found. Also, the brachial vein and artery appeared attached to the fracture gap with an arterial occlusion due to a long-distance intimal lesion. Intraoperative Doppler-sonography confirmed these findings.

The vessels were released and after a failed Fogarty-maneuver in the artery a reversed saphenous vein graft was implemented. After neurolysis of the median nerve the continuity could be preserved.

The K-wires were removed 4 weeks after the initial osteosynthesis after radiological conformation of consolidation. The infection was successfully managed by antibiotic therapy. Follow-up 3 months after discharge showed a range of motion of the elbow of 0/0/130° (extension/flexion), normal fist-closure and a persisting hypoesthesia of the index finger.

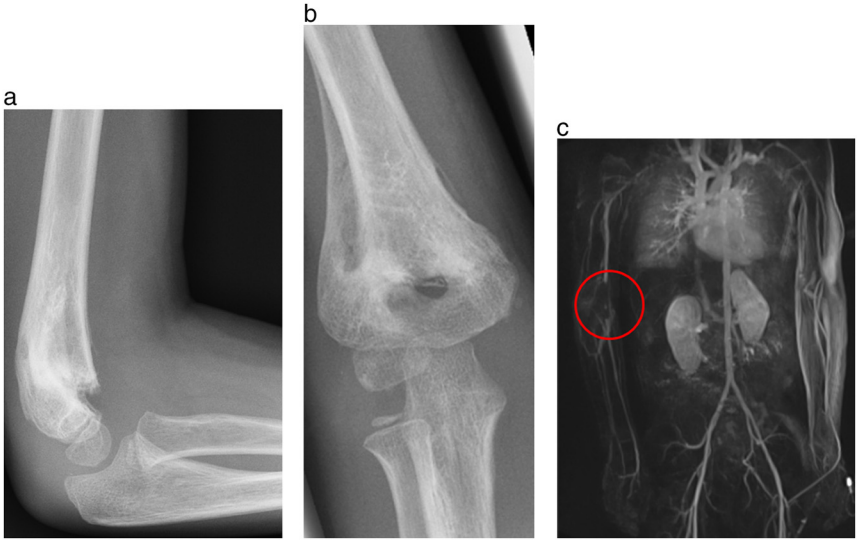

Fig. 1. a, b: postoperative X-ray after 2 months and removal of the K-wires; c: closure of the brachial artery in MR-Angiography.

Please cite this article as: M. Leiblein, et al., Neurovascular complications after supracondylar humerus fractures in children, Trauma Case Reports (2016), http://dx.doi.org/10.1016/j.tcr.2017.01.013