



## Late presentation of a partial median nerve palsy following a Gartland III supracondylar humeral fracture

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A 28-year-old male patient was referred to the Peripheral Nerve Injury Unit at the Royal National Orthopaedic Hospital for evaluation and treatment of a neuropathic type pain he had developed in his right arm. Some twenty years previously, he had sustained a Gartland type III supracondylar humeral fracture with what was thought clinically to be an anterior interosseous nerve palsy. The fracture was reduced and the nerve palsy subsequently recovered with non operative measures. At his subsequent delayed presentation, surgical exploration revealed that the median nerve epineurium was embedded within the bone at the level of the previous fracture. A good clinical result was obtained following neurolysis. The case report highlights a late presentation of median nerve palsy following interposition of the neural structure within the reduced distal humeral fracture site ; it shows that delayed surgery can be effective.

**Keywords :** supracondylar humeral fracture ; partial median nerve palsy ; delayed presentation.

The incidence of traumatic neural injuries with displaced supracondylar humeral fractures varies from 6% to 20% (4,13). Neurological deficits may be subtle or transient and can be missed in an agitated child. Primary nerve injuries are much more likely to occur in patients with Gartland type III supracondylar fractures (1,6). All major nerves of the forearm can be affected, however the median/anterior interosseous and radial nerves are the most commonly injured (1,6,13). The ulnar nerve is the most frequently damaged iatrogenically during percutaneous crossed K-wire fixation (1,16).

The majority of neural dysfunction occurring secondary to the initial trauma is conduction block, and function resolves spontaneously over a period of six to ten weeks without the need for any surgical exploration (6,12). Stabilisation and internal fixation should be performed at the earliest opportunity as reduction becomes technically more difficult

### INTRODUCTION

Supracondylar humeral fracture is a relatively common injury and represents the most frequent type of fracture around the elbow in children (3,6). It usually occurs between the ages of four to nine years (6). Extension-type injuries account for 99% of these fractures, with the mechanism involving falling onto an outstretched hand with the elbow in full extension (2,14).

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if surgery is delayed (19). The authors highlight a case of median nerve compression within the healed fracture site after closed reduction and cross K-wire stabilisation for a displaced supracondylar humeral fracture. The patient had initial transient median nerve palsy at the time of injury masquerading clinically as an anterior interosseous nerve injury. He then presented some eighteen years later with recurrent symptoms after having previously been completely asymptomatic.

### CASE REPORT

An eight-year-old boy fell off a climbing frame and landed onto his outstretched dominant right arm. He was assessed in his local Accident and Emergency department. Clinical examination revealed a swollen arm with the skin fully intact and there was no suspicion of an impending compartment syndrome. A good radial pulse was palpable, the fingers were warm and capillary refill was < 2 seconds. Neurological assessment revealed an isolated weakness in the flexor pollicis longus and flexor digitorum profundus to the index finger with no subjective sensory loss reported. Radiographs confirmed a Gartland type III supracondylar humeral fracture. It was treated uneventfully with closed reduction and percutaneous cross K-wire fixation. The assumed dysfunction in the anterior interosseous nerve was treated non-operatively and completely resolved within eight weeks of the injury.

The patient remained completely asymptomatic for many years following this initial injury. Aged twenty-six, working as a computer analyst, he began to experience insidious onset of paraesthesia in the hand over the median nerve distribution and pain in the forearm particularly following activity. His symptoms gradually progressed in severity. A carpal tunnel decompression was performed by his local orthopaedic department, which gave him no benefit. So he was referred to our specialist peripheral nerve injury unit for further assessment.

During initial consultation, his previous supracondylar fracture was noted in his history. Examination revealed altered sensation over the distribution of the median nerve and a positive

Tinel's test just proximal to the antecubital fossa. There was no muscle wasting. Medical Research Council (MRC) power grade for abductor pollicis brevis was 4/5. Nerve conduction studies confirmed a partial median nerve palsy but were unable to specify the level of the lesion. Radiographs of his elbow revealed a united and consolidated supracondylar fracture without evidence of a malunion.

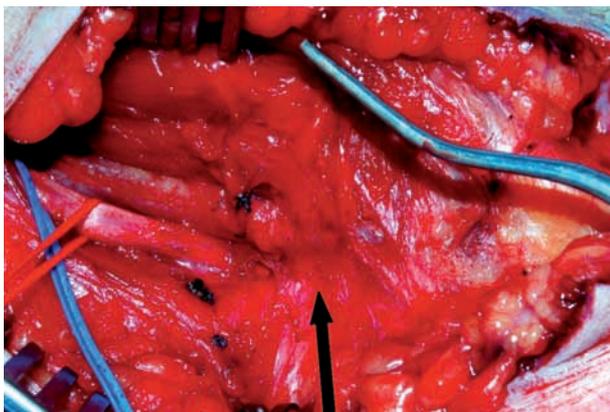
Surgical exploration revealed the median nerve epineurium was tethered within the distal humerus at the level of the old fracture site (Fig. 1). The neural structure was carefully released and decompressed. The nerve was in full continuity (Fig. 2). Intra-operative neurophysiological electro-stimulation showed good function of the nerve following decompression and distal to the lesion, therefore having the potential for a full recovery.

Post-operatively light-weight dressings were applied, mobilisation as comfort allowed, and sutures were removed at 2 weeks. At the 6 week follow-up, motor function had returned to full power and his subjective symptom of altered sensation was already improving.

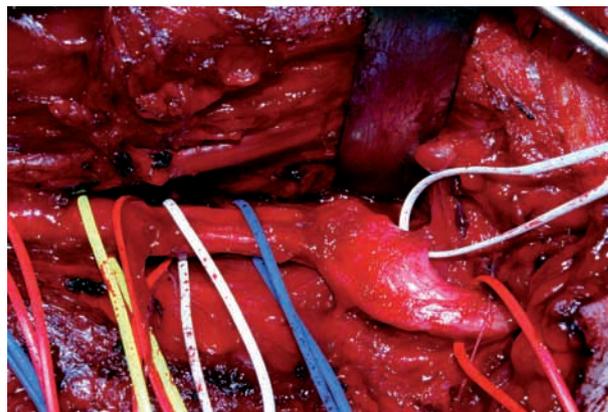
### DISCUSSION

Isolated neurological dysfunction associated with a supracondylar fracture is reported to recover spontaneously if treated conservatively (11). There has been a shift in consensus as to which nerve is most commonly damaged. Initially it was thought to be the radial nerve however the median or anterior interosseous nerve now appears to be most susceptible in extension-type injuries (1,3,11,15).

Several theories have been postulated for the mechanism of initial nerve injury. Spinner and Shreiber concluded the anterior interosseous nerve is fixed in a position proximally, so is susceptible to traction and possible tethering from the displaced distal fragment (17). Geutjens suggested that a transient ischaemia may be an added factor in causing this nerve palsy (5). However it is the authors' opinion that proximal humeral fragment causes nerve tenting or contusion to the median nerve, above the origin of the anterior interosseous nerve. The superficial aspect of the nerve is commonly involved causing a partial medial nerve lesion,



**Fig. 1** — Anterior approach to the right antecubital fossa showing the epineurium of the median nerve pinched within the old supracondylar humeral fracture site.



**Fig. 2** — Anterior approach to the right antecubital fossa, with the median nerve exposed and neurolysed.

which can clinically masquerade as an anterior interosseous nerve palsy. Iatrogenic injury usually affects the ulnar nerve, with placement of the medial K-wire in percutaneous cross pin fixation (16). The clinician needs a high index of suspicion for any nerve injury while evaluating patients with completely displaced supracondylar fractures.

Even though the majority of nerve injuries are a temporary conduction block, there are selected cases when early surgical peripheral nerve exploration is indicated. Bache *et al* postulated that in patients with anterior interosseous or median nerve palsy with a coexisting pulseless but pink hand, this suggests entrapment or tethering of the neurovascular structures at the fracture site (9). In this subgroup of patients full circulatory and neural function can be restored with exploration and release of the median nerve and brachial artery (7). Louahem *et al* suggested non-conservative measures are also justified in the following circumstances: suspected nerve entrapment at the fracture site due to inadequate closed reduction with an inter-fragmentary gap; onset of nerve palsy post-operatively caused by intra-operative closed / open reduction and percutaneous stabilisation; total rupture of the radial nerve, suggested by both motor and sensory loss (8). The authors' also believe that any dense paralysis needs to be explored, as complete nerve compression or discontinuity have a better outcome with early surgical input in specialist unit.

A previous retrospective review of patients referred to our peripheral nerve injury centre concluded that delayed operative intervention is indicated when there is a complete degenerative lesion diagnosed on neurophysiology study or failure of the anticipated clinical recovery (15). This group of patients need prompt exploration and neurolysis in a specialist unit. The majority of these patients have an excellent outcome after neurolysis if the nerve is in continuity (4,15).

Persistent neuroparalysis can be caused by nerve entrapment within the callus or fibrous scar tissue, formation of a traumatic/iatrogenic neuroma, complete nerve laceration or tethered within the reduced fracture site (15). Complete transection of the nerve is rare and inevitably always affects the radial nerve (8,11). The median nerve can also be compressed by surrounding soft tissues pinched by the reduced fracture ends. Mangat *et al* reinforce our own concerns that it is possible to achieve anatomical reduction even with interposition of neural structures within the fracture site (9). If the median nerve itself becomes entrapped within the fracture site, the post-operative nerve palsy usually remains permanent (18). However in our case study, the median nerve dysfunction fully resolved, then unusually remained asymptomatic for almost eighteen years before becoming symptomatic again. The only other previous case report highlighting a delayed median nerve neuropathy after a supra-

condylar humeral fracture was 4 months post-injury. The nerve became gradually entrapped under the proximal origin of pronator teres due to healing of the fracture in slight extension (10). It is therefore important to be aware that median nerve compression within the fracture site following adequate reduction and percutaneous cross K-wire fixation can potentially re-present late, and that surgery, even if delayed is effective in treating symptoms.

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