A Report of Three Cases of Intra-Articular Corrective Osteotomies for Distal Humerus Malunion

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Introduction

The incidence of distal intra-articular fractures of the humerus is 2%[(1)] in the adult population and even less in the paediatric population. Especially in paediatric population the misdiagnosis of intra-articular lesions is frequent and conservative treatment may evolve into malunion[(2)]. If left untreated, the natural history is characterized by early arthrosis[(3)]. Posttraumatic intra-articular malunion of the distal humerus represents a major challenge when considering its surgical reconstruction and few cases are described in the literature[(4-7)].

Methods

We present the cases of 3 consecutive patients, treated with corrective osteotomy for symptomatic distal articular humerus malunion in our center. The patients underwent the surgical reconstruction at 9, 15 and 37 months after the initial trauma. The age at the time of the osteotomy was 26, 13 and 16 years old respectively. The patients were followed postoperatively for 31 and 28 months, latest case being operated 2 weeks before the study began. The initial injuries were treated conservatively in all patients. The average preoperative arc motion was 102, 125 and 120 degrees.

Pre-operative planning

The indication for correction included varus deformity, mobility deficit, pain, intra-articular incongruence and absence of advanced osteoarthritis. The pre-operative range of motion (ROM) and neurovascular status was documented. Pre-operative imaging modalities used to asses the articular status and also for the surgical planning included radiograms, 3D CT an in 2 cases MRI.

Surgical technique

The patient position and approach depended on the number of columns to access during the surgery: supine with a lateral approach and osteotomy of the lateral epicondyle for a single column approach versus lateral decubitus with classic posterior approach with chevron osteotomy of the olecranon for a bicolumnar access. Ulnar nerve was identified, protected with a vessel loop and released proximally by opening the intermuscular septum, sacrificing the first branch of the nerve (to the joint) followed by a distal release until it disappeared under the arcade of the flexor carpi ulnaris. After the aforementioned approaches were done, anterior and posterior capsular release followed. The lateral epicondyle osteotomy offers excellent access to the whole articular surface and capsule by flapping the epicondyle and lateral ligament complex distally. Intra-articular osteotomies were done through what seemed to be previous fracture lines in all three cases. After the realignment of the fragments, the fixation was done using screws (mostly HCS) and plates (DHP, LCP). The olecranon osteotomy was repaired using a tension band construct, whereas the epicondylar osteotomies where fixed using screws or transosseous suture. The ulnar nerve was transposed anteriorly in the case where the ulnar column was also accessed, but later the patient presented a neuropathy and prominent material which brought to a neurolysis and hardware removal. Postoperatively the patients were assisted by physiotherapists in gravity assisted, with a free ROM exercises. Full activities were allowed with complete radiological healing. Radiograms were obtained directly postoperatively, 6 weeks, 12 weeks regularly.

Results

Due to the fact that the third patient was operated short before the study started, we'll present the clinical outcomes of the first two patients. The clinical and radiological outcomes were satisfactory with a postoperative arc of elbow motion of 150 (symmetrical to the opposite side) and 135 degrees (140 degrees on the opposite side) in flexion/extension and full pro-/supination. The postoperative DASH score was 0.8 and 9.2. The Mayo Performance scale was 100 and 85 respectively. The patients could return to all their daily and sport activities without any limitations. No osteoarthritic changes were seen on the postoperative radiograms. One patient presented a delayed wound healing after the initial intervention probably due to the tension at the surgical site. Later on, the same patient underwent a partial implant removal and cubital nerve release due to the discomfort.

Conclusion

These cases emphasize the importance of adequate initial management of intra-articular distal humerus fractures. Surgical reconstruction of a malunited distal humerus fracture is technically challenging, but can improve function and relieve pain in the young active adult by restoring intrinsic anatomy of the elbow.

Réferences

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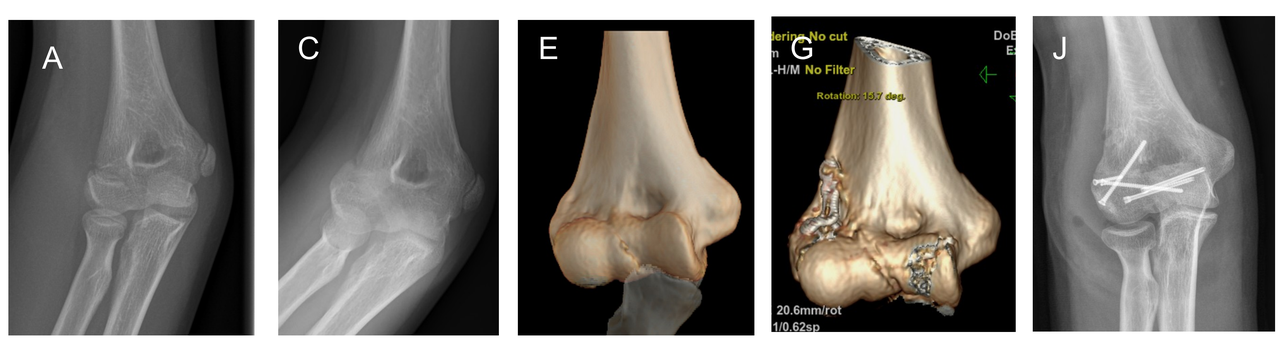
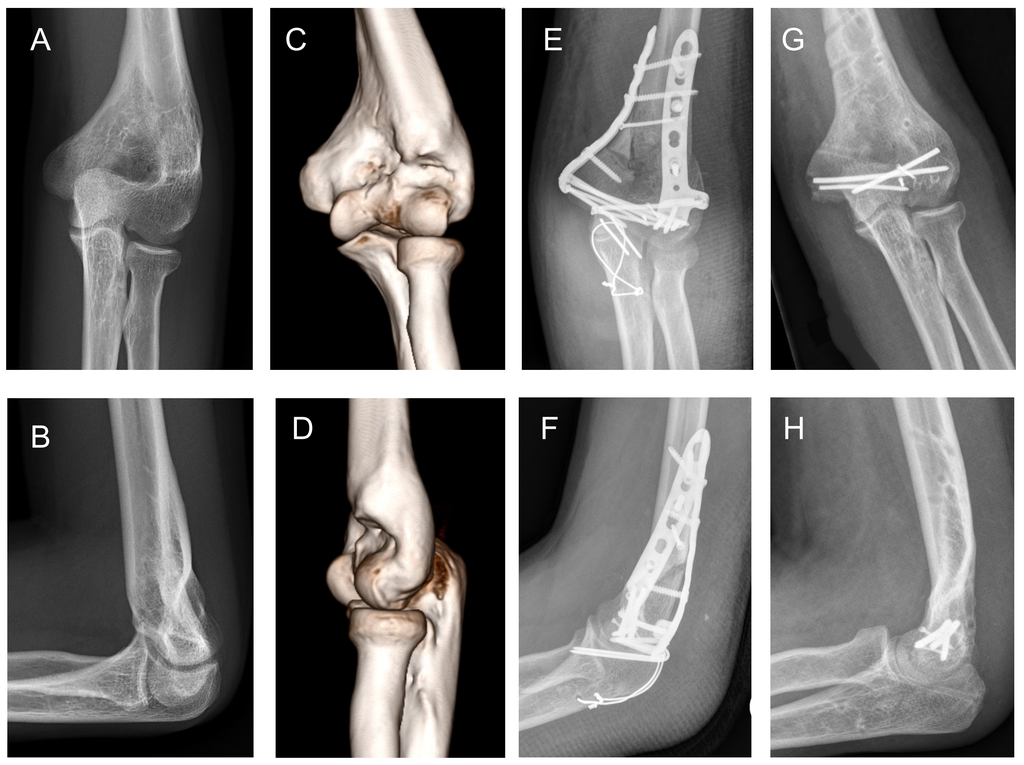
Initial frontal (**A**) and lateral (**B**) radiographs of a 13-year-old girl who presented a minimally displaced lateral condylus fracture, treated conservatively. One should note the malunion on control radiographs **(C, D).** Preoperative CT-scan (**E,F**) showing malunion and intra-articular incongruence. Postoperative CT scan (**G,H**) with deformity correction. Postoperative radiographs after reconstruction **(J, K).**



Frontal (**A**) and lateral (**B**) radiographs of a 16-year-old girl, basketball player, who presented a secondary displacement of a radial condylus fracture treated conservatively. The patient was lacking a full extension due to the osteophytes in olecranon fossa marked with a *white arrow* in image (**F)** and an articular incongruence visible on 3D CT reconstruction (**E**). Postoperative 3D CT reconstruction showing no intra-articular step (**G**), but new callus in olecranon fossa 3 months after osteotomy **(H**). Frontal (**J**) and lateral (**K)** radiographs after partial hardware removal and callus trimming.



Frontal (**A**) and lateral (**B**) radiographs of a 24-year-old man who presented 8 months after a Y-type intercondylar fracture that was treated conservatively. One can note the articular incongruence in trochlea region (**C**), an extension position of the trochlea and capitellum (**B,D**). Postoperative frontal (**E**) and lateral (**F**) radiographs after osteotomy and internal fixation with interfragmentary screws across the articular components and a lateral and posterior plate supporting both columns. (**G, H**) showing the postoperative result after partial hardware removal due to proeminent material.

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