Double tension band osteosynthesis in transcondylar distal humerus fractures and non-unions in adults

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Abstract: Aim The aim of this study was to evaluate the results achieved after double tension band fixation in extra-articular transcondylar distal humerus fractures and nonunions in osteoporotic elderly individuals.

Methods Materials Totally five patients were treated from Nov 2011 to July 2012 out of which three were fresh fractures, one failure case following bicolumn plating and one nonunion, treated with double tension band wiring prospectively evaluated. All five lesions had a transverse orientation with type A2, that passed through the olecranon fossa, in a direction parallel to the joint line except one case which had intercondylar extension. Patients age averaged 60 years all patients were females.

Results Follow-up averaged 6 months. All fractures and nonunions united there were no infections, elbow stiffness or heterotopic bone formations. Elbow range of motion averaged 100 (range, 100-120). Flexion averaged 120 and elbow extension loss averaged 15.

Conclusions The results achieved with double tension band fixation in transcondylar distal humerus fractures and nonunions are comparable to the results that can be expected when using other available fixation methods this technique is faster, less demanding and cheaper. It is an alternative to LCP fixation bicolumn plating in distal humerus providing good fixation, functional results in osteoporotic elderly individuals.

Keyword: Double Tension band wiring, distal humerus

INTRODUCTION
Distal humeral fractures in adults are frequently complex and technically demanding to manage. Although these lesions are rare, operative treatment is indicated in most cases.

There are previous reports in the literature of comparable results achieved using double tension band osteosynthesis or combining tension bands with other fixation methods in supra and intercondylar humeral fractures instead of double plating for fixation of the condylar block to the shaft.

The objective of this study was to evaluate the results achieved after double tension band fixation in extra-articular transcondylar distal humerus fractures and nonunions in adults.
METHODS

Totally five patients were treated, out of which three were fresh fractures, one failure case following bicolumn plating and one nonunion, treated with double tension band wiring prospectively evaluated. Patients were placed in lateral decubitus under regional anaesthesia in all cases; the arm was placed hanging over a bag support with the elbow hanging free in 90° of flexion, a tourniquet was not used. A posterior approach was used in all cases—CAMPBELL’S APPROACH. Either 1.8- or 2-mm K-wires were used; they were placed entering through the epitrochlea and epicondyle distally to the fracture line, without detaching soft tissues (other than the ulnar nerve, which was released, mobilized and protected throughout the surgical procedure). Two K-wires were used for each column; they were placed exiting through the opposite cortex, proximal to the fracture line in all cases. Once the K-wires were placed, a hole with a 2.7-mm drill was performed proximal to the fracture line on each side, and a 1.6- or 2-mm wire was driven through it, then crossed to make a figure of eight, and passed through the distal soft-tissues, distally to the entry point of the K-wires. Once both tension bands were in place they were adjusted simultaneously to achieve a compression as symmetrical as possible.

Once the reconstruction was tensed elbow range of motion was checked to assess construct stability. The ulnar nerve was transposed anteriorly and subcutaneously in all cases. The arms were immobilized postoperatively in neutral position with a plaster splint. Controlled active and passive elbow joint motion was started between the second and sixth postoperative day; Final evaluation was performed using antero-posterior and lateral X-rays. Objective evaluation of range of motion was performed using a goniometer.

RESULTS

Follow-up averaged 6months. All fractures and nonunions united; there were no infections, elbow stiffness, heterotopic bone formations or ulnar nerve symptoms. One patient suffered an osteoporotic fracture proximal to the distal humeral fixation on second POD. Patient was treated with U-slab for a period of time. Elbow range of motion averaged 100° (range, 100–120°). Flexion averaged 120° (range 115–130°) and elbow extension loss averaged 15° (range, 10–25°).

CASE ILLUSTRATIONS

CASE-1 PRE OP post op AP&LAT
Soft-tissue dissection than tension band wiring; placement of precontoured locked plates needs more extensive stripping and muscle damage than plate fixation, while allowing symmetrical compression, with also the advantages of being technically less demanding, faster and cheaper than plate fixation. The main limitations of this series are not having a control group, and having a small number of patients. In elderly patients open reduction and internal fixation of these lesions is justified and different fixation methods can be used. Although the use of percutaneous K-wires is the fixation method of choice for supracondylar distal humerus fractures in children, the use of K-wires alone in distal humerus fractures in adults has given bad results and is not recommended. On the other hand, there is evidence supporting the use of tension band wiring in supracondylar distal humerus fractures with good functional results; Houben et al. reported comparable results in ten patients with type C distal humerus fractures, five treated with double tension band osteosynthesis and five with double plate, for fixation of the condylar block to the shaft of the humerus. In our group of patients, the average age was 65 years, all fractures and nonunions united, and the fixation achieved was adequate to allow prompt postoperative motion in all cases, as early motion was one of the main objectives in the treatment of these injuries.

Controversy remains regarding postoperative management of the ulnar nerve at the time of fixation, but it is generally accepted that it should be transposed anteriorly because if left in place it will be in contact with the fixation performed and can be irritated by it during motion. In our patients the nerve was routinely transposed subcutaneously anterior to avoid contact with the tension band. Locked plates have not yet proved to be superior to other fixation methods for distal humerus fractures, and their use remains controversial; there is currently insufficient evidence to recommend for or against their use in the management of distal humerus fractures and they are probably recommended for comminuted and osteoporotic lesions but again there is no strong evidence to confirm this belief. There are some drawbacks in the use of these plates: the placement of precontoured locked plates needs more extensive soft-tissue dissection than tension band wiring; they are expensive, more time consuming, and technically more demanding; they do not always match precisely the anatomy of the reconstructed distal humerus; and differing from 3.5-mm reconstruction plates, they do not allow being moulded to adapt to the reconstruction achieved. When using tension bands, during wire tightening symmetrical compression is achieved at the lesion site and this compression will continue postoperatively. There is only one biomechanical study comparing tension band wiring with double plating for distal humerus fractures; this study favours the use of double plating, but it has many important drawbacks as it was performed in dry cadaveric bone in which the mineral density of the specimens used was not determined, the specimens were detached of all soft tissues and joints, it was performed using only one K-wire on each column, the wire was passed around the tip of the K-wire proximally and distally and not through a hole drilled in the bone as used in the series we report. Our series shows that transcondylar fractures and nonunions in adults should not be systematically treated with double plating, and double tension band fixation can be a reliable, easy and cost effective technique for the management of these particular lesions and should remain an option to be considered when planning the stabilization of these fractures and nonunions.

REFERENCES
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