Report of Three Cases of Extra-Articular Distal Radius Fractures Malunion and Sever Radial Deviation Treated by Restoration of Wrist Anatomy by Radius Corrective Osteotomy and Ulnar Procedure

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ABSTRACT

Aim: Malunion or pseudoarthrosis of distal radius fractures are rare, but could present radial shortening and deviation of the wrist, often associated to augmented radio-ulnar variance, which need a further correction on the ulna. With the present paper we report the results obtained in three cases treated by corrective osteotomy of distal radius and bone grafting associated to ulnar procedure (Darrach).

Methods: We report three cases of distal radius fracture malunion which we treated between 2006 and 2016: the first patient was treated in two times, firstly with ulnar subtraction osteotomy synthesized with plate and subsequently with corrective radius osteotomy, autologous grafting, external fixator and plate. The other two cases, were treated in a single time through bone grafting and caput ulnae resection.

Results: In all cases the range of motion was completely restored, axial correction was maintained with return to daily activities.

Conclusion: There are several possibilities to correct ulnar plus due to malunion of distal radius fractures. The cases we treated by corrective radial osteotomy associated to Darrach intervention, instead of ulnar shortening osteotomy, achieved better results with complete restoration of pronation-supination. Furthermore, they did not need temporary stabilization by external fixation, like we performed in the first patient. We can say that Darrach procedure can solve ulnar plus and improve ROM in pronation-supination with the advantages of one surgical time (a quicker healing, avoiding the risk of pseudoarthrosis of the ulna).

Introduction

Distal radius fracture represents one of the most frequent fractures, accounting for up to 18% of all fractures in elderly age [1]. Malunion occurs in approximately 23% to 28% of conservatively treated and 11% of surgically treated distal radius fractures [2]. Malunion could be classified as intra-articular or extra-articular. Extra-articular malunion is characterized by the alteration of the principle radiographic parameters as shown by Graham: on sagittal plane lesser volar tilt or dorsal angulation, on coronal plane radial deviation of the radius, often complicated with a shortening of the radius with augmented radio-ulnar variance resulting in instability of the radio-ulnar distal joint (RUDJ). Lesions of the triangular fibrocartilage complex (TFCC) could be associated. The decision whether to and how correct malunion is primarily based on age and functional demand of the patient and secondly on the level of functional impairment and wrist pain [2-4].

The goal of surgical correction is to re-establish pre-existent anatomic profile of the wrist, abolish pain and regain functionality.
Materials and Methods

We report three cases of extra-articular distal radius fractures complicated with malunion and severe anatomic deformation, treated at our operative unit from 2006 to 2016. The first case concerned a 59-years-old pianist with worse outcomes of his right distal radius fracture conservatively treated elsewhere two years before. He presented a severe deformity with radial deviation, reduced range of motion (flexion = 10°, extension = 15°, pronation = 45°, supination = 0°), reduced grip force (Jamar = 14,8 Kg) and pain at the ulnar-carpal joint (VAS = 7). The X-Ray put in evidence a vice of consolidation and a plus of the ulna. He firstly underwent subtractive osteotomy of the distal ulna and a new synthesis with plate and screw. One year after, he undertook corrective osteotomy of the radius, temporary stabilization with External Fixation System (Hofmann) and a new synthesis with Aptus Plate and wedge bone graft taken from iliac crest. He underwent clinical and radiological follow-up at 1, 6 and 12 months: the correction of deformities was maintained, with optimal esthetic appearance of the hand. At X-Ray was evidenced a good consolidation of the graft (Figure 1).

The second case regarded a 75 years-old housewife who got fractured left distal radius treated elsewhere conservatively. She came to our observation presenting a severe deformity of the wrist, plus of the ulnar head, functional impairment (extension 20°, flexion 25°, pronation 60°, supination 40°) and exposition with infection of subcutaneous tissues, caused by decubitus of caput ulnae. At X-ray were documented pseudoarthrosis of the radius fracture with radial and dorsal angulation. She complaint severe pain (VAS = 6) and reduced grip strength (6,4 kg Jamar). The priority was given to the infection’s treatment. Afterwards, the patient underwent a one time corrective surgery with Darrach’s caput ulnae resection and stabilization using one half of extensor carpi ulnaris (ECU) tendon, distal radius pseudoarthrosis reclamation and restoration of radius length by a new synthesis with plate and spongy-cortical bone graft withdrawn from iliac crest. At 18 months of follow-up was observed a restoration of range of motion (ROM) and pain relief (Figure 2).

The last case affected a 67-years-old restaurateur who got a fracture of left distal radius treated elsewhere by percutaneous pinning. Because he complaint pain (VAS = 8) and residual functional impairment (extension 15°, flexion 20°, pronation 0°, supination 0° and grip strength Jamar 4,5kg), undertook further exams: a CT scan documented malunion of the fracture with lift of the proximal stump and ulnar plus variance. A Leukoscan Total Body Scintigraphy pointed out an iperactivity of the radiocompound in the site of the previous fracture and on the carpal bones on the left, suspicious for infection overlap.

We treated him in the same way as the second patient, as the extemporaneous histological examination excluded infection (less than 5 PMNs for field).

The patient underwent clinical and radiological follow-up at 1, 6 and 12 months (Figure 3).

Results

The mean follow-up time was 22 months. In all the patients treated the pre-existent anatomy of the wrist has been restored. In the first case we observed restoration of strength (18,9 Kg), improvement of wrist mobility (flexion = 45°, extension = 60°, pronation = 85°,
supination = 45°), relief from pain (VAS = 0). The second patient achedieved a good recovery of ROM with 80° pronation, 85° supination, 65° extension and 40° flexion, improvement of grip strength to 12,5kg Jamar and relief from pain (VAS = 0). In the third case we observed a restoration of 85° for both pronation and supination, 50° extension and 60° flexion, pain relief (VAS = 2) and improvement of grip strength to 9,2kg. The medium gain of flexion was 30°, 41,67° for extension, 55° for pronation and 58,3° for supination. A medium improvement of 4,97kg of grip strength force was achieved but maybe the most important result has been the pain relief with a reduction of 6,3 point of VAS score (postoperative mean VAS score=0,66/10 from a preoperative mean value of 7/10).

Discussion

Distal radius fracture represents near 18% of all adults fractures. Vicious consolidation is a possible complication, above all for decomposed fractures treated conservatively. Severe deformity of distal radius associated to ulnar plus are disabling and need surgical correction. There are different surgical options: the most reported is association of radial corrective osteotomy with ulnar shortening osteotomy [4-6]. Shortening ulnar osteotomy offers the advantage to re-establish the articular congruity respecting the DRUJ, but on the other hand needs a new synthesis which requires a longer time of healing and could result in pseudoarthrosis. That risk is not contemplated for Darrach’s procedure, which avoid temporary stabilization with external fixator; nevertheless, this procedure is not free of complications: in fact it can cause ulnar instability [7].

Conclusion

Despite treated in different ways, all the patients reached satisfactory results. We treated the first patient in two times in order to respect the DRUJ. Up-to-day, due to good outcomes, we would treat him with the same surgical technique used for other patients, (radius corrective osteotomy, homologous graft, new synthesis with plate and Darrach procedure) with the advantages of a good recovery of pronation-supination in a single surgical time. We can say that Darrach’s procedure, if opportunistically stabilized, associated to corrective osteotomy of distal radius, homologous bone graft and new synthesis can be a valid treatment for distal radius malunion with severe deformity, in the cases of selected patients with low-moderate functional demand. Ulnar shortening osteotomy remains the first treatment option in younger and highly demanding people, because more conservative towards the RUDUJ. In conclusion, the surgeon must choose the right corrective treatment after the evaluation of the patients and his functional needs.

Conflict of Interest

All the authors confirm there is no conflict of interest.

References