Conservative treatment of fractures of the distal metaepiphysis of the radius

A.K. Rushay 1
ORCID 0000-0002-9530-2321

V.V. Skyba 2

Yu.S. Lisayshuk 3
ORCID 0000-0002-2231-193X

V.S. Kovalshuk 4

Bogomolets National Medical University, Kyiv, Ukraine

The research represents the results of conservative complex rehabilitation treatment of the patients with fractures of distal radius metaphysis on immobilization stage. The use of multimodal pain control, hardware repositioning of fragments, fixation by Scotchcast/Softcast semi-rigid fixation, pharmacuetic treatment using termoasymmetric index ΔТ, kineziotyherapy, massage and physiotherapy made it possible for us to achieve positive results in the majority of cases. According to the questionary scales DN4, VAS and DASH, satisfactory results of treatment have been achieved in 94.4% of cases.

Key words: fracture of distal radius metaphysis; rehabilitation.
Introduction

Distal radius metaphysis fractures (DRMF) are the most common among women over 60 and reach up to 30-40% among all other fractures. Conservative treatment is the leading one so far. The main course of improving the results of conservative treatment is a comprehensive rehabilitation treatment during initial visit, as well as at the early immobilization stage. Object. To improve the results of conservative treatment of DRMF with using a full anesthesia, painless non-traumatic; anchoring with modern systems; medical therapy, physiotherapy, and kinesiotherapy yet on early stages. Task. To define modern views on pain relief, correction of dislocation and fixation of splinters; medical therapy, kinesiotherapy and physiotherapy during the initial visit and immobilization stage of DRMF treatment. To evaluate the advantage of conducting early rehabilitation measures, to determine their effectiveness. Materials and methods. There were 36 patients under our surveillance with DRMF with dislocation. The correction was made after preliminary administration of 2% solution of lidocaine direct into the hematoma and 2% solution of dexalgin intramuscularly. In such a case, analgesia was multimodal. After pain relief there was carried out maximum non-traumatic correction of dislocated splinters and they were fixed by a bandage. The classical technique of manual repositioning of the extensor radius metaphyseal fracture of Collis type proposed by L. Böler in 1929 was the following: the patient was set sideward on a table, placed the arm bent in the elbow joint, on it. One assistant with one hand grasped the first finger of the patient, with another one - II-IV fingers. The second assistant created counter-traction by grasping the lower third of the shoulder. The splinters were being stretched slowly, for 3-5 minutes, eliminating the dislocation along the length. After the stretching of the splinters, the surgeon, still holding the traction, pressed with the first finger on a distal splinter, with giving the wrist the position of the ulnar deviation and slight bending. This technique is a traumatic one, carried out with the participation of 3 people. Applying the fixing band is made by fixing the shoulder and the elbow joint to the gypsum table and holding the wrist in the reduced position, and that is rather uncomfortable. In the group of elderly patients with constant DRMF there was a special method when eliminating splinters dislocation, due to which the technique of reposition was gentler. It was first described by Jon Charnley in 1950 in "The Closet Treatment of Common Fractures" (J. Charnley, 1950). Its core was the following: after the metered traction the distal splinter deflects toward the existing shear (fracture wedging). At the same time, the doctor eliminated the dislocation in width by pushing with the fingers on the distal splinter, and then the correction of dislocation was performed by palm flexion. The method is less traumatic, but cannot be used for unstable fractures, since applying of fixing band is uncomfortable.

Fig. 1. Classical technique of manual repositioning of the extensional DRMF of Collis type sensu L. A - Böler, 1929; B - correction of deflected splinters in stable fracture (sensu J. Charnley)

So, the method of manual reposition has a range of imperfections: many people involved; prolonged ligamentotaxis is physically difficult; atraumaticity implies prolonged, increasing efforts; applying fixing bandages is uncomfortable. Hardware methods of DRMF correction allows to compensate most of these imperfections. A practical, modern alternative is the repositioning of even unstable fractures in traction towers with using "Chinese finger traps". After analgesia, the patient was laid on his back; his arm was bended in the elbow at an angle of 90 degrees with "Chinese finger traps" on 1-3 fingers, fixed to the rack through the traction system. The plummet was installed on the lower third of the shoulder. Thus, distributed forces of traction were creating ideal dosed prolonged ligamentotaxis, which allowed eliminating the dislocation of the splinters along the length. Manipulation of angular deflection correction and imposing bandages can be carried out by one doctor and gypsum technician. The disadvantage of this system is its high cost. With this in mind, we offered a similar purpose device, which is more accessible to conditions of an injury care center in terms of cost and ease of use, carried out by traction of the fingers with adhesive plaster. (Fig. 2)
The reposition was carried out without tough manipulation. After splinters matching their immobilization of a limb with the retention of the wrist direction in the position of slight flexion was carried out using Softcast / Scotchcast polymer band. The conditions for applying a semirigid fixation system were convenient. The semi-rigid polymeric systems Softcast / Scotchcast have a feature of flexibility in the absence of stretching. Bandage with dorsal splint of a rigid Scotchcast provides necessary strength of fixing splinters and keeping them in a reduced condition. At the same time, there is a possibility of muscle movement of the immobilized limb due to the features of Softcast - flexibility in the absence of stretching. In addition, when immobilizing with Softcast and edge manipulation with the adhesive plaster, such problem as traumatization of the skin by the tough bandage edge is eliminated. Protective strip between the surface of the skin and the immobilizing bandage is under T splint stitch - Stockinet, what makes bandaging less labor-intensive and allows the bandage to closely follow the shape of the limb. As a result, the most complete and uniform load distribution and good fixation of limb splinters are achieved. There is also minimized a risk of developing compression of soft tissues while edema increase, as well as a risk of repeated shifting following edema decrease. We used prophylactic medical therapy with applying thermal asymmetry $\Delta T$ (Fig. 3)

Volume of thermal asymmetry varied in case of a low probability of side effects development ($\Delta T \approx 2.2^\circ \pm 0.5^\circ$ C). Features of semi-rigid fixation and structural features of the polymer bandage allowed to carry out the kinesiotherapy even on the early immobilization period in the expanded volume (Fig. 4)
Fig. 4 Kinesiotherapy of fingers and hands with semi-rigid fixation system Scotchcast / Softcast DRMF.

Trumatic DRMF damage is not limited to bone integration infraction in the metaphysis of the radius bone. The energy of a traumatic wave expands throughout the myofascial structures, upwards the limb and causes several serious anatomical and functional disorders [2, 3, 6]. This leads to inflammation development not only in soft tissues, which consist the fracture zone and radiocarpal joint, but also to formation of muscle stresses and contractures in the elbow, shoulder joints, as well as joints of the upper shoulder girdle [1, 4, 6]. As a result of the trauma the biomechanics of movement of the whole upper limb is disordered, tunnel syndromes of the Disability of the radial, medial, and ulnar nerves are formed, blood flow changes throughout the damaged segment - the venous and lymphatic outflows in the whole limb significantly deteriorate. In the ulnar joint area disorders are presented in the limitation of flexion, extension, supination, and pronation of the forearm. The effects of edema and hypertension of supinator may lead to compression of a sensitive branch of the radial nerve, presented in pain in the back of the 1 finger. Hypertension of bicipital muscle of the shoulder creates a compression in the area between humerus head and articular surface of the shoulder blade, resulting in progression of the shoulder joint contracture. Myofascial stress may reach the clavicular-acromial and sternal-clavicular joints, modification of which may affect the function of the limb. Long traumatic muscle hypertension in the damaged limb leads to progression of hardly treated contractures in radiocarpal, elbow and often shoulder joints. Formation of myofascial trigger points; long existence of the initially reflected pain increases a risk of progression of tunnel neuropathy of the nerves. Therefore, assignment of restorative therapy with using physiotherapy, kinesiotherapy, massage of the whole upper limb and upper arm, on the early stages of treatment is extremely important and pathogenically grounded. To estimate the results, the visual analogy scale VAS was used. For unified assessment of the upper limb function, we used the DASH (Disability of the Arm, Shoulder and Hand Outcome Measure) The results achieved and their discussion.

Results and discussion

The combination of Scotchcast inelasticity and Softcast elasticity when fixing DRMF ensured the early start of kinesiotherapy and a large volume of movements. As we may see, the movement of the radiocarpal joint was possible - slight bending of palm. There were no complaints concerning bandage compression or edge pressures at all. Kinesiotherapy and massage of the whole maimed limb, and physiotherapy allowed to eliminate spastic disorders, to prevent contractures in the elbow and shoulder joints. There wasn’t observed in any single case a secondary dislocation while using of the semi-rigid fixation system of Scotchcast / Softcast, according to the DN4 questionnaire, all 36 patients had a neuropathic pain component (more than 4 positive responses to the questionnaire with a probability ≥ 86%). The initial level of the neuropathic component of a pain was of varying degrees of severity. After removing the system of semi-rigid fixation, its minor signs were observed only in 34.3% (12 out of 36). When admitted to hospital the pain index was 7.42 ± 0.31 points under VAS, corresponding to severe pain; following 1 week after fixing with a semi-rigid system - 3.33 ± 0.19 and 2.11 ± 0.22 points after removal. High domestic adaptation was already on immobilization stage of treatment (the possibility of self-service). The
dynamics of the DASH scale after removing the bandages indicated the following: unsatisfactory results after removal of the system of semi-rigid fixation - 2 (5.6%); satisfactory - 8 (22.2%); good and excellent -26 (72.2%).

Conclusion

1. The advantages of multimodal analgesia, hardware repositioning, using a polymeric bandage laid down in more optimal conditions for muscle contraction, increased volume of fingers movement of the affected limb, possibility of early massage and physiotherapy procedures.

2. The features of semi-rigid fixation and structural features of the polymeric bandage reduced the risk of progress of critical edema with compression of tissues, secondary dislocation of splinters; allowed to start kinesiotherapy yet during early immobilization period in a full capacity.

3. There was estimated the effectiveness of the proposed measures and manipulations - excellent and good functional results following removing of the polymeric semi-rigid fixation system are observed in 72, 2% (26 observations).

References