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Original Research Paper

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FUNCTIONAL OUTCOME IN FRACTURES OF THE LOWER END RADIUS IN ELDERLY PATIENTS TREATED BY STATIC EXTERNAL FIXATOR.

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ABSTRACT

Background: Fractures of the distal end radius represent the most common upper extremity fracture in elderly. The treatment problem includes not only achieving union in right anatomical position but also good functional results as far as joint mobility is concerned. Many types of external fixation devices are described to achieve reduction and fixation of the fragments without loss of position and acceptable functional results. The ligamentotaxis is the basic principle used by external fixation. The aim of the study was to assess the functional outcome in fractures of the lower end radius in elderly patients treated by static external fixator (Modified JESS).

Materials and Methods: A total of 52 wrists in 51 patients (24 males and 27 females), aged more than 50 years with intra-articular distal end radius fracture were treated with Modified Joshi's External Stabilization System from 2003 to 2016. The patients were followed up at 2 weeks, 3 weeks, between 6 and 8 weeks, 6 months, 1 year and at 2 years after the surgery. The assessment of pain, range of motion, grip strength and activity were assessed at 6th month, one year and two years follow- up and scored according to Green and O'Brien scoring system.

Results: Result was excellent in 42 (80.76%), good in 6 (11.54%) and poor in 4 (7.69%) at 2 years post operatively.

Conclusion: Ligamentotaxis using external fixator has been the traditional mode of treating unstable distal radius fractures and is still used by many as the preferred technique due to its acceptable results, easy application and cost-effective.

KEYWORDS : Joshi's external stabilization system, distal end radius fractures, Green and O'Brien scoring

Introduction

Since the description by Poteau in 1783 and by Colle's in 1814, distal radial fractures remain a therapeutic challenge. Closed treatment and plaster application of unstable and comminuted intra-articular fractures of the distal radius may lead to various complications in the form of collapse, loss of palmar tilt, radial shortening, and articular incongruity.

The reasons to use external fixators include the continuity of reduction under fluoroscopic control, improved reduction by ligamentotaxis, and the ability to protect the reduction until healing occurs. The advantages of external fixation are the relative ease of application, minimal surgical exposure, and reduced surgical trauma. The aim of the study was to assess the functional outcomes of distal end radius fractures managed with static monoplanar modified Joshi's external stabilizing system (JESS) in elderly age group.

Materials and Methods:

A total of 52 wrists in 51 patients, aged more than 50 years with intra-articular distal end radius fracture were treated with Modified Joshi's External Stabilization System from 2003 to 2016. Out of 51 patients, there were 24 males, 27 females, 32 had a right side and 19 had their left wrist, and one had bilateral wrist involvement.

External Stabilization System: Modified JESS consists of the application of a total of 4 Kirschner wires in which 2 were placed in radius(2.5 mm), and 2 were placed in 2nd and 3rd metacarpals (2 mm) together connected by 2*2 mm clamps and inter connected rods after pre-stressed two Kirschner wires by conversing it together. Pre-stressing the wires reduces the chances of wires pulling out from the bone. Now both units made connected with 4 mm connecting rods after applying the distractor. The frame was made more stable by applying another 4 mm rod and connected with 4*4 mm clamps. The distractor was removed once all clamps were made tighten and thus converted it into the static frame.

In osteoporotic bone, we used two 3.5 mm Schanz pins in radius and 2.5 mm Schanz pins in 2nd metacarpal connected by connecting rods.

If there was any wound, swab for culture sensitivity was sent, thorough debridement was done and the wound was properly cleaned. Then the fracture was stabilized by JESS. The patients were followed up at 2 weeks, 3 weeks, between 6 and 8 weeks, 6 months, 1 year and 2 years after the surgery. The assessment of pain, range of motion, grip strength and activity were assessed at 6th months, 1 year and 2 years follow-up and scored according to Green and O'Brien scoring system.

Acceptable reduction was achieved and confirmed in the image intensifier. If articular reduction was not found satisfactory, then the depressed fragment was elevated though Kirschner wire percutaeneously. The Guidelines for acceptable closed reduction taken were:

1. Radial inclination: ≥ 15°.
2. Radial length: ≤ 5 mm shortening.
3. Radial tilt : ≤ 15°dorsal or 20° volar tilt.
4. Articular incongruity: ≤ 2 mm of step-off.

Post -operative X- ray was taken (Fig. 2, Fig. 1 is pre-operative Skiagram). The patient was given IV antibiotics for 1 day and oral for 5 days. Active finger, elbow, and shoulder mobilization were started the 1st post operative day. Patient was discharged on the same day or on the 2nd day, and pin tract care was explained to the patient (Fig. 3). Patient was followed up at 2 weeks to check for pin tract discharge or loosening. Dynamization of the frame was done at 3 weeks routinely by loosening the proximal clamps and then again retightened. At 6 weeks postoperative X-ray was taken and then distractor removal was done between 6 and 8 weeks depending on the fracture union. The wrist exercises were started after removal of the fixator.

Follow-up was done at 6 months, 1 year and 2 years for the final outcome (Fig. 4, 5, 6, 7and 8).

Outcome of the patient was assessed using Green and O'Brien Scoring system modified by Cooney, at 6th months, 1 year and 2 years after the surgery (Fig. 9).

The final score of 90- 100 was considered as excellent, 80- 89 was good, 65- 79 was fair and below 65 was considered as poor results.

Figure 1: Pre-operative skiagram

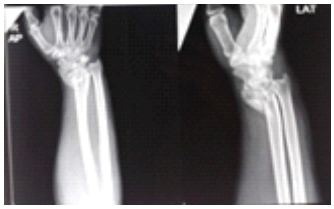


Figure 2: Post-operative skiagram



Figure 3: Fixator in situ



Figure 4: Skiagram after 2 year



Figure 5: Final result: Wrist dorsiflexion



Figure 6: Final result: Palmer flexion



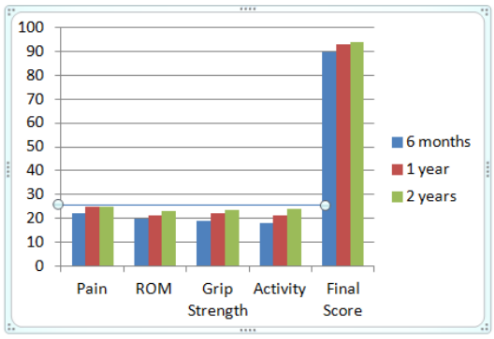
Figure 7: Final result: Pronation



Figure 8: Final result: Supination



Figure 9: Modified Green and O'Brien Score at 6 months and 2 years.



Results:

A total of 52 wrists in 51 patients of displaced distal end radius fracture were treated with JESS during the study period. Out of 51 patients, 24 (47.05%) were male, and 27 (52.94%) were female. Out of 52 wrists, 32 were right, and 19 were left wrist, and one had both wrist involvement. According to Green and O'Brien criteria pain, muscle strength, range of motion, and functional status of the patient were recorded for evaluating the final functional results of our study. The mean age of patients was 67.50 ± 17.50 years. Mean interval between injury and surgery was 3.4 days. The average operative time was 35 min (range: 20 – 50 min). Mean duration of fixator application was 7.2 weeks. Mean time of radiological union was 7.5 weeks. Five patients (9.61%) developed pin tract infection which was managed successfully by antibiotic treatment. Swelling, inflammation, and occasional pain were observed in 6 patients (11.53%).

One patient with a compound fracture (Type 4), which required skin grafting later had only a minimal functional range of wrist movement. Four patients had restricted finger movement; which was due to unco-operation with early post-operative rehabilitation. No patient had an extensor lag of the index finger. Result was excellent in 42 (80.76%), good in 6 (11.54%) and poor in 4 (7.69%) at 2 years post operatively. Seven patients (13.46%) had a residual deformity of the wrist; in 6 distal ulna were prominent.

Discussion:

Management of comminuted intra/juxta articular fractures has always posed a challenge to the orthopedic surgeon in the terms of reduction of fracture, maintenance of reduction while the fracture unites and mobility of joint after the fracture union. Different surgical strategies are available for treating unstable intra-articular distal radius fractures, including external fixator, open reduction, and internal fixation with locking or non-locking palmar plates. External fixator is versatile in managing both intra- and extra-articular fractures with acceptable functional results.

Many external fixation devices are described to achieve reduction and fixation of the fragments without loss of position and acceptable functional results [1]. The ligamentotaxis is the basic principle used by external fixation [16].

Many external fixation devices are described to achieve reduction and fixation of the fragments without loss of position and acceptable functional results. The use of an external fixator in the treatment of unstable intra-articular fractures of the distal radius has received support [7, 9, 13, 19]. Dynamic external fixation was first introduced by Clyburn in 1987 [6]. He proposed to reduce the final disability associated with an unstable fracture of the distal radius by facilitating early motion of the wrist. Similar results were obtained by Penning and coworkers using their design of a dynamic fixator.*et al*. in their small study showed that dynamization of the wrist at 3 weeks may lead to improved function. Prolong immobilization of the wrist in an external fixator leads to decreased blood supply to the bone and soft tissues and causes peri-articular fibrosis. This can be minimized by dynamization of the frame after 3 weeks post-operatively.

Many earlier experience of treating these fractures by closed reduction and immobilization in plaster, with or without transfixing pins, gave indifferent results. Gartland and Werley, Boyd and Horne, and Kongsholm and Olerud [4, 10,14] reported different results with the same technique. Full open reduction of severely comminuted fractures is technically difficult and method requires excessive stripping of soft tissues giving a poor functional result [8, 21]. Others have advocated open reduction and internal fixation with multiple Kirschner wires, followed by early mobilization [2, 17, 22, 23]. Melone failed to achieve adequate anatomical reduction reporting an average loss of radial length of 3.2 mm, and an average loss of volar tilt of 8.5°. 93% of his patients had some joint irregularity or degenerative change. Bradway [5] using similar methods reported a 25% incidence of joint incongruity and an 18% infection rate. Others consider that it has a high incidence of complications, most of which are related either to pin problems or inadequate reduction [22].

Modified JESS fixator application allowed good fracture union with excellent functional mobility in our study.

Conclusion:

Treatment of unstable distal radius fractures with external fixator is a very old technique and is still used by many surgeons due to its acceptable results, easy application and cost-effective. The results are comparable to volar or dorsal locking plates as reported in literature. In our study of 51 patients (24 males and 27 females), aged more than 50 years, the result was excellent in 42 (80.76%), good in 6 (11.54%) and poor in 4 (7.69%) at 2 years patients. However the result depends on the achieving the good articular congruity post-operatively. If we can't achieve so by close reduction or distraction alone, then one should have no hesitancy to minimal open the joint to get it anatomical.

In conclusion, modified JESS or simply JESS is a good option in patients with displaced distal end radial fractures.

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