ORIGINAL ARTICLE

A Randomized Study of Dynamic vs Static External Fixation of Distal Radial Fractures

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ABSTRACT

Aim: To evaluate the treatment outcome of comminuted intra-articular fractures of distal radius with adynamic external fixator and dynamic external fixator.

Methods: This comparative study was carried out at King Abdullah Teaching Hospital, Mansehra from 1st June 2016 to 31st December 2016. A total of 60 patients in both groups were included in the study.

Results: Out of the 60 patients, 43(71.7%) were male and 17(28.3%) were female with the right hand 35(58.3%) and left hand 25(41.7%).

Conclusion: It is concluded that dynamic external fixator is a better method of treatment for the comminuted fractures of the distal radius than adynamic external fixator because it allows early motion of tendons, muscles and adjacent joints and later, of the wrist itself while reduction and especially radial length were maintained in bridging external fixation.

Key words: Distal Radius, Comminuted fracture, Dynamic external fixator.

INTRODUCTION

Colles in 1814[1], revealed distal radial fracture as a therapeutic challenge and it remained the same[1]. Radial shortening, loss of palmar tilt, collapse and articular incongruity is found commonly after closed treatment of comminuted intra-articular fractures of the distal radius and leads to permanent pain, deformity, and loss of function[2]. Immobilization and closed reduction of displaced fractures by using cast may cause early displacement, which needs skeletal fixation for maintaining reduction is recommended[3,4]. For severely comminuted fractures, use of external fixation or incorporation of K-wires within the plaster is recommended[5]. Various external fixation devices are available for achieving reduction and fixation of fragments for acceptable functional results in addition to no loss of position[6]. For external fixation, the ligamentotaxis is the a basic principle[7].

Periarticular fibrosis and decreased blood supply of soft tissues and bones are commonly found due to prolonged rigid immobilization of wrist by using an external fixator. It leads to poor motion, osteoporosis and a compromised functional outcome. Commonly, intense physiotherapy is inevitable for rehabilitation in these cases[8].

The early mobilization of the wrist leads to earlier resolution of wrist swelling, hastened functional recovery, normalization of blood supply and decreased joint stiffness[9,10].

MATERIAL AND METHODS

This comparative study was carried out at King Abdullah Teaching Hospital, Mansehra from 1st June 2016 to 31st December 2016. A total of 60 patients were included in the study. These patients were divided in two groups (group A was treated by adynamic external fixator and group B with dynamic external fixator) under anaesthesia.

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RESULTS

Average radial length on post injury film was 4.3 mm, which was brought to 9 mm on post reduction films in group-A and in group-B average length in pre-reduction film was 4 mm, which was brought to 9.2 mm (Table 1). Table 2 showed that most of the patients i.e., 14 (46.7%) in group-A, 14 (46.7%) patients had good in group-B, 15(50%) good end results. Functional end results both groups are shown in Table 3. Pin tract infection developed in 4(13.3%) patients in group-A and 2(6.7%) in group-B as shown in table 4.

Table 1: Average radiological measurements

	Average pre-reduction	Post-reduction	Final
Group-A			
Radial angle	8.6°	18.5°	17°
Dorsal angle	+ 18°	2.4°	2.2°
Radial length	4.2 mm	9 mm	8 mm
Group-B			
Radial angle	8.2°	19°	17.2°
Dorsal angle	18.4°	3.6°	2.4°
Radial length	4 mm	9.2 mm	8.4 mm

Table 2: Anatomical end results in both groups

Group	Excellent	Good	Fair
A	12 (40.0%)	14 (46.7%)	4 (13.3%)
B	12 (40.0%)	15 (50.0%)	3 (10.0%)

Table 3: Functional end results in both groups

Group	Excellent	Good	Fair	Poor
A	10 (33.3%)	14 (40%)	5 (16.7%)	3 (10%)
B	11 (36.7%)	15 (50%)	3(10%)	1 (3.3%)

Table 4: Complications of distal radius fracture management

Complication	Group-A	Group-B
Pin tract infection	4	2
Stiff wrist	1	0
Re-displacement	0	1
Radial nerve superficial branch	1	0
Implant failure	0	1
Total	6 (20%)	4 (13.3%)

DISCUSSION

Distal radius fracture is not a trivial injury as used to be wrongly considered earlier. It needs a distinguished treatment depending upon the different types of injuries: intra/extra articular, simple/ compound and stable/unstable. There is consensus that the goals of distal radius fracture treatment should be to allow early functional recovery of the upper extremity and to improve the long term function of the wrist. The limitation of external fixation to achieve articular congruity in the comminuted intra-articular fractures of the distal radius has been documented previously. This could be because external fixation alone does not expand crushed cancellous bone and cannot work without soft tissue hinges[11].

The average radial height in AP view is 11 to 14 mm and a height of less than 4 mm corresponds to poor Haddad et. al in his study of 43 patients showed that all but two of the patients (5%) had a volar tilt of up to 16°, the radial length was restored in 77% and excessively shortened by 3-4 mm in 9 patients (23%)[12].

Posteromedial fragments, indirect control of fragments, No accurate reduction of intra-articular fragments, Excessive distraction. Reduction and maintenance of reduction is more difficult using bridging external fixation because there is indirect control of the distal fragment, which depends on ligamentotaxis; this may not be successful in restoring the volar tilt or the radial length[13].

Papadonikolakis et al in their study concluded that more than 5 mm of wrist istraction increases the load required for the flexor digitorum superficialis to generate MCP joint flexion for the middle, ring, and small fingers. For the index finger, however, as much as 2 mm of wrist distraction significantly increases the load required for flexion at the MCP joint[14].

Sex and age distribution in various series is different. In our study patients were included between 40-65 years of age. In older age groups the results are comparable with other studies mentioned in the literature because bone mineral density of distal forearm decreases with age. In group-A average age of 47.71±5.55 years was among the males and 49.89 ± 3.33 was among the females. In group-B the average age of 49.68± 5.45 years in the males and 50.38±3.58 was among the females.

Some series showed male predominance while others showed female predominance. In females the incidence rises at 40 to 60 years of age due to post menopausal osteoporosis. In our study, 43(71.7%) patients were male and 17(28.3%) were female. Male to female ratio is 2.53:1, while in another study, male to female ratio was 1.5:1[15]. It might be due to our different socio-economic setup in which male is the dominant and active member of our society and female has to go outside to earn livelihood for his family, so exposed to more chances of the trauma.

It is observed that right hand is affected in almost all series because it is the dominant hand. It is reported that 55% right radius involvement in a study[16]. In another study is reported 52% involvement of right wrist[76]. In our society where the use of right hand in routine manual activities, is religious obligation, therefore, in our study, the fracture of the right distal radius was found to be 58.3% in prevalence.

In our study, pint traction infection occurred in 6(10%) patients which were about the same as observed in other studies. In a study it is also noted almost the same percentage of pin tract infection in his study[18]. Fortunately in our study the in tract infection was superficial and was treated by short course of antibiotic therapy and blood sugar control in diabetic patients. No joint infection or oteomyelitis occurred in any patient.

Range of movement, recorded at different stages of evaluation showed better results in dynamic external fixator groups. Independently there was no significantly difference in outcome among male and female patients[19].

In our present study few patients had their ulnar styloid fractured at the time of injury but is did not have any adverse effect on the final outcome therefore these fractures were not particularly mentioned. This is comparable with the literature. In a study it is noted that fracture of ulnar styloid process, a frequent injury in concominance with fracture of the distal end of the radius. He observed to have no impact upon long term wrist function. In other series associated fractures of scaphoid had also been discussed with fracture distal radius but we have excluded such patients from the study.

CONCLUSION

It is concluded from the study that the best anatomical and functional results can be obtained with dynamic external fixator in comparison to adynamic external fixator.

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