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Assessment of Percutaneous Pinning Fixed by Joshi's Clamp In Distal End Radius Fractures

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Abstract

Background: Distal radius fractures are among the most common bone fractures all over the world. Close reduction and fixation by per cutaneous pinning Fixed by Joshi's Clamp is a less invasive method comparing with other open surgeries. This study aims at evaluating the functional outcome of this treatment in distal radius fractures. The outcome in distal radius fracture management is dependent on many factors and can be influenced by accurate restoration of the anatomy, minimal disruption of the surrounding tissues, and early active wrist rehabilitation.

Objectives: The aim of the study is to assess the early outcomes of distal end radius fractures managed by Percutaneous Pinning Fixed by Joshi's Clamp in adult age group.

Methods: In this prospective study, 20 patients with distal radius fractures underwent percutaneous pinning during a 2months period in Sayed Galal university Hospital and Ahmed Maher Teaching Hospital, Cairo, Egypt Follow-up for 6 months. The clinical outcomes will be calculated according to Cooney's modification of the Green and O'Brien scheme.

Results: showed that nine cases got Good score (45.0%), nine cases were fair score (45.0%), two cases were poor (10.0%) Green and O'Brien Score.

Conclusion and recommendations: Joshi clamp associated with percutaneous synthesis described add good stability to fracture of the distal radius.

Keywords: fixation, percutaneous pinning, Joshi's Clamp, Orthopedic

Introduction

Distal radius fractures are very common and comprise almost one sixth of all fracture cases in emergency department. Distal radius fractures are a common injury, particularly in the elderly population. Severity of these fractures is directly related to the bone mineral density of the patient and clinical results are dependent on this

parameter as well (Grewal et al., 2005; Liporace et al., 2009).

These fractures are limited between the radiocarpal joint up to three centimeters toward proximal portion. They are usually closed and the overlying skin is intact (Handoll et al., 2007).

This fracture is considered as a complex lesion; i.e., there are usually accompanying injuries in adjacent ligamentous and cartilaginous parts. So its prognosis is variable and the fracture may lead to dysfunction of upper extremity (Canale and Beaty, 2007; Bucholz et al., 2009).

Hence, an ideal treatment which can provide preferable anatomical reduction and fixation of fractured segments is necessary for preventing complications in the future (Souer et al., 2008).

Several options exist for treatment. Nonoperative management consists of closed reduction with casting. Operative treatment options include intrafocal pinning, nonbridging and bridging external fixation, arthroscopic-assisted external fixation and various methods of open reduction internal fixation. When operative intervention is indicated, considerations include the characteristics of the fracture and the experience of the surgeon with the treatment modalities (Liporace et al., 2009; Handoll and Madhok, 2009; Tsai and Paksima, 2009; Gofton and Liew, 2007).

Percutaneous pinning is a modern method which is believed to be an appropriate alternate for the old approach. This involves the insertion of pins through the skin (percutaneous) to hold the bones in a proper position while they heal. In most pinning methods, wires are placed across the fracture and used to fix the fragments together (Handoll et al., 2007).

Materials and Methods

In this prospective study, 20 patients with distal radius fractures were recruited in Sayed Galal university Hospital and Ahmed Maher Teaching Hospital, Cairo, Egypt, during a 6 months period between April 2016 and November 2016. These intra-or extra-articular non-comminuted fractures were type I or II according to Frykman classification (Frykman, G., 1967).

Inclusion criteria:

1. Cases with fracture distal radius.
2. Patients with extra-articular displaced and intra-articular un-displaced distal radius fractures.

3. 20 cases of adult patients
4. 6 months post-operative follow up
5. Scoring system: Green and O'Brien scoring

Exclusion criteria:

- Neglected old cases were excluded from this study.

-Pathological fracture, Fractures in pediatrics age group, Compound Fracture, Carpal fracture, Isolated DRUJD (due to ligamentous injury) open fractures, comminuted intra-articular fractures, previous fracture in the region and presence of simultaneous neurological or vascular lesions or other fractures in upper extremities.

Surgical preparations:

-Full history taking: Name, age and sex.

-Written informed consent was taken from all the patients.

-clinical examination including inspection, palpation, range of movement, neurovascular examination.

-The laboratory investigations revealed that all the patients are fit for general anaesthesia.

-The patient was placed on the operating table in supine position, the affected limb was elevated for a while and then the hand cuff was placed over the arm and pressure was elevated to 250 degrees.

-The affected limb was placed over a side table, After scrubbing the forearm and the wrist from the middle of the forearm till the middle of the palmar surface of the hand with betadine, the sterilized covers were placed over the whole body except the scrubbed region.

The gauge of the K wires of is generally of 2 mm, K-wires of 1.8 mm in patients with small radius and K-wires of 2.2 mm in patients with larger radius .



Figure 1: surgical preparations

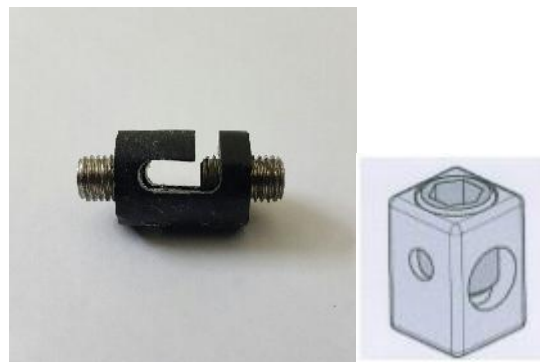


Figure 2: Joshi's Clamp



Figure 3: Joshi's clamp and its application in the synthesis of percutaneous K-wires for extra articular fractures of the distal radius

Surgical Technique:

Percutaneous Pinning Fixed by Joshi's Clamp was employed Under general anaesthesia, the fracture reduced by manual traction, aiming to restore the normal radial and volar tilt of the distal radial epiphysis. The elbow was fixed at 90 degree flexion. The quality of the reduction is then checked with fluoroscopy in A-P and lateral projections, by rotating the C-arm around the wrist while the patient's hand is held steadily. Then three K-wires were applied for osteosynthesis. The K. wires are inserted by a drill, the tip of K. Wire should not be bent. In intramedullary techniques it is better to insert K. wires by hand with a chuck bending the tip, The caliber of K. wires is generally 1.8 or 2.0 mm.

-Follow-up was done for 6 months post-operation.

-Control radiographs were taken on weeks 2 and 6 post-operation.

- Manual reduction of the fracture under anaesthesia after some days from trauma
- Under X-ray control the hand placed directly upon the C-arm
- Intravenous administration of one dose of antibiotic before surgery and in the next five days orally
- The K. wires are inserted by a drill, the tip of K. Wire should not be bent
- In intramedullary techniques it is better to insert K. wires by hand with a chuck bending the tip.

- The caliber of K. wires is generally 1.8 or 2.0 mm
- **The first** intramedullary pin is insert on the top of the radial styloid between first and second compartment of extensor tendons: 2 mm dorsal to "volar line of Lewis"

Its introduction point from the apex of the radial styloid it is not random, but it is located exactly between the first and the second compartment of the extensor tendons. the K-wire is introduced immediately dorsal subcutaneous prominence the extensor tendon of the thumb on the apex the radial styloid . After that the K-wire has penetrated into the bone, turning gradually Chuck Jacob to address the apex of the K-wire towards the fracture site and pushing it in the direction proximal easily surpassing the point fracture. It will enter into the diaphyseal channel of radius and leans on the curved peak of the K wire against the diaphyseal cortex of the ulnar side of the radius. After fluoroscopic confirmation of the position of intramedullary K wire, continue your introduction in distal-proximal direction with small movements of rotation of the spindle Jacob.

It is not advisable to beat with a hammer on the mandrel for advancing the K-wire, especially in case of osteoporotic bone and it is not necessary to pass with the K-wire half of the diaphysis of the radius. The mechanical effect on fracture, due to the introduction of this first K wire, it has been well described by **Benoist in 1995**.

- **The second** intramedullary pin is inserted at the ulnar corner of the radius without bending the tip, with intrafocale technique, between the third and the fourth compartment of the tendons extensors, just proximal to the tubercle of Lister. This being the typical home of Extra-articular fracture of the radius rhyme, the K wire is introduced directly into the outbreak of fracture in accordance with the Kapandji technique. It is essential to check that the long extensor tendon of the thumb does not be damaged by the K-wire.

- **The third** pin is intrafocal (dorsal buttress) or bicortical to allow greater stability, It is generally

introduced with intramedullary technique between the 4th and 5th compartment of the extensor tendons, piercing its radio ulnar corner under fluoroscopic control.

This K-wire also should be bent at its peak as the First, therefore, it should be introduced manually with spindle Jacob and with small circular movements in distal-proximal progression, sliding against the cortical bone of the diaphysis of the radius opposite. (**Figure 4**).

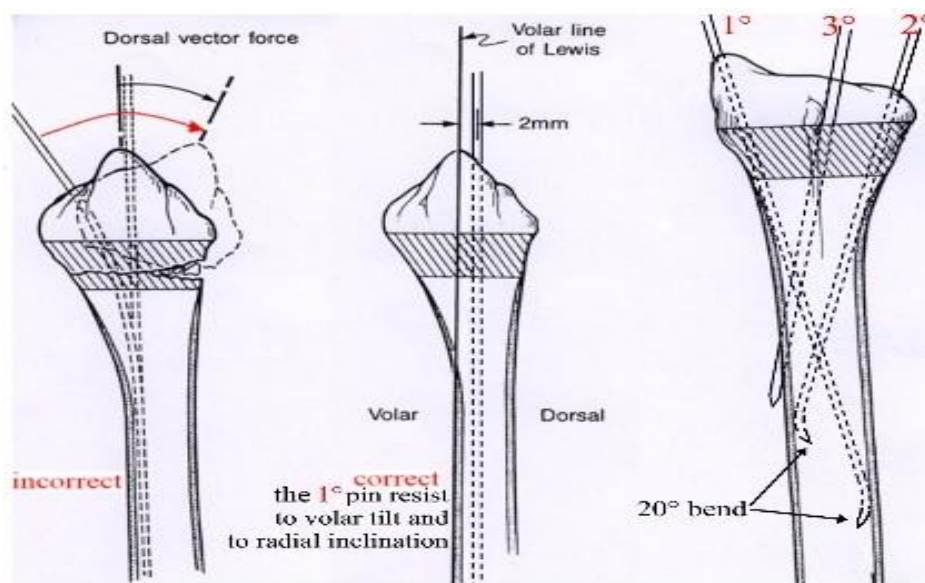


Figure 4: surgical technique

The indications for treatment were limited to unstable extra articular displaced and intra articular undisplaced fractures of the distal radius. The percutaneous osteosynthesis of distal radius was always performed with 3 Kirschner wires introduced in the direction distal-proximal, Under X-ray control and combined technique, ie intramedullary, intrafocale, and / or bicortical.

The first Kirschner wire was always introduced with technical intramedullary from the apex of the radial styloid, others two Kirschner wires instead in a variable manner. Joshi clamp was always used to lock externally Kirschner wires suitably folded toward a convergence point above the

wrist. After the intervention plaster cast has never been applied.

Post-Operative Care:

- Quality of reduction and fixation of fracture was rechecked by radiography after surgery
- No cast (splint for 3 days if needed)
- Immediate active mobilization
- Weekly dressing program (pins cleaning with betadine +dry dressing around the pins)
- Removing K. wires and Joshi's clamp in the outpatient department, usually 5-7 weeks after surgery, if x-ray show fracture consolidation.

Results

We studied 20 patients with age of a Mean \pm SD 36.45 ± 11.49 (20 – 55) years. The period of follow-up was 6 months. All fractures were stabilized with Percutaneous Pinning Fixed by Joshi's Clamp. Radiographs in the post operative period showed a mean radial height of 11.15 ± 1.31 , mean radial inclination of 22.40 ± 2.33 degrees, and mean volar tilt of 10.95 ± 1.83 degrees. physiotherapy was done in nine cases (45% of cases).

consolidation of fractures was obtained on average in 40 days, without major complications, in all cases treated except Three cases (15.0%) of

infection, three cases with wound scar (15.0%) and one case of pin loosening (5.0%) The evaluation Postoperative clinical and radiographic found no large joint limitation of the operated wrists, or significant loss of radiographic parameters with the intervention. The patients were able to use their wrist operated, for normal life, after an average of one week after surgery. nine cases (45.0%) of cases do physiotherapy.

Age of patients with a Mean \pm SD 36.45 ± 11.49 (20 – 55) years. The dominant hand was involved in twelve (60%) patients. 12 patients right side and 8 left side but all right handed. twenty cases with fracture distal radius, seven males (35.0%) and thirteen females (65.0%). (Table 1).

Table 1: Age and Sex distribution of cases

		No.= 20
Sex	Female	13 (65.0%)
	Male	7 (35.0%)
Age	Mean \pm SD	36.45 \pm 11.49
	Range	20 – 55

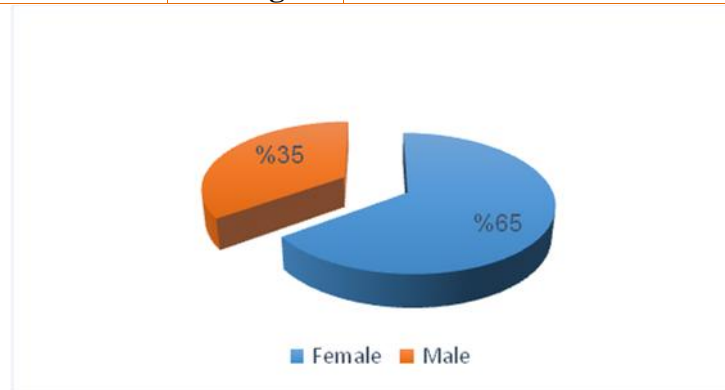


Figure 5: Percentage of cases sex

This table denotes that twelve (60%) patients out of twenty had right side fracture, eight (40%)

patients had left side fracture, and the right hand was dominant in all patients.

Table 2: Distribution according to side of fracture

Right (dominant)	Left
12	8
60.0%	40.0%

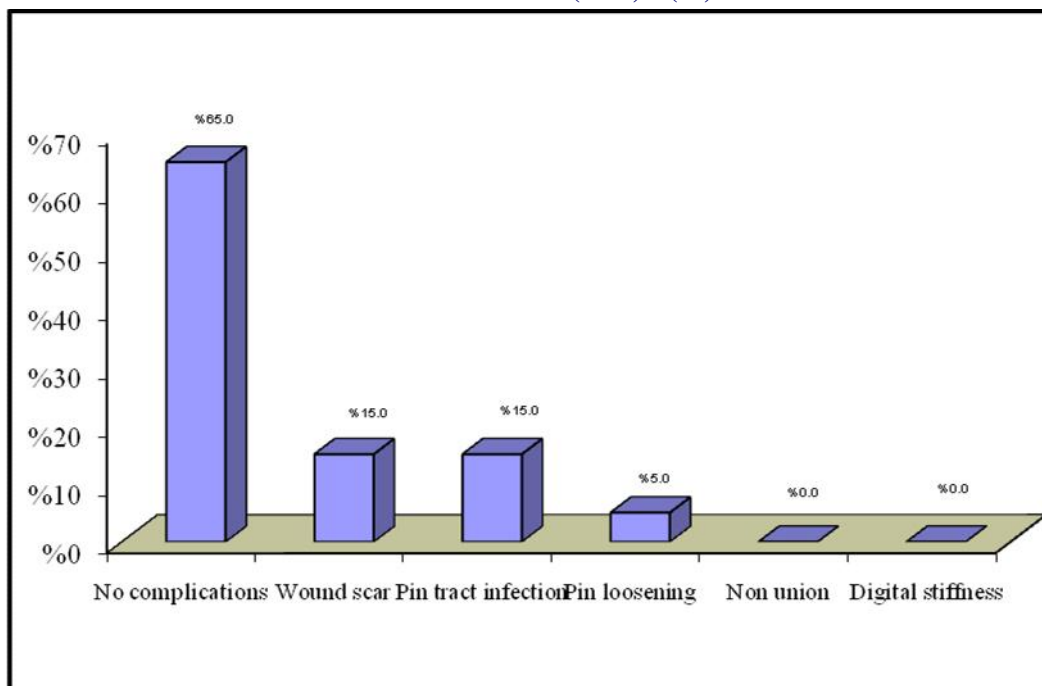


Figure 6:Percentage of Post-operative complications

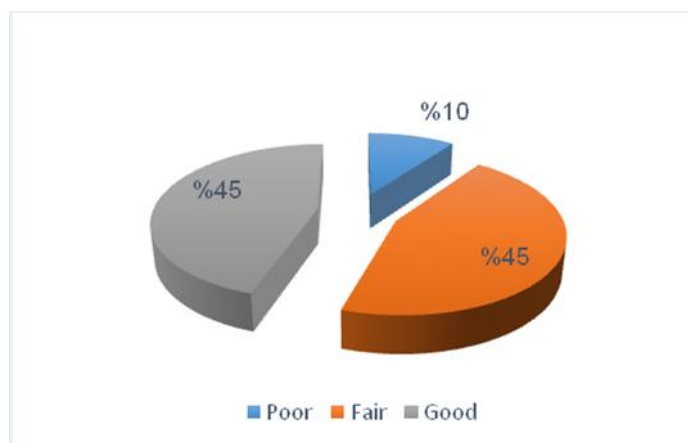
- 7 patients achieved post operative complications:
- 3(15.0%)cases suffered from wound scar managed by local cream
- 3(15.0%)cases suffered from wound infection managed by daily dressing with intravenous antibiotics.

- 1(5.0%) case suffered from pin loosening managed by wires removal and replaced by cast. Mean time of radiological union was 8 weeks.

Table 3: Results according to Clinical scoring system of Green and O’Brien (1978) modified by Cooney et al. (1980) score

		No.	%
Pain	None	3	15.0%
	Mild, occasional	14	70.0%
	Moderate, tolerable	3	15.0%
	Severe or intolerable	0	0.0%
Range of motion	0-24	0	0.0%
	25-49	0	0.0%
	50-74	1	5.0%
	75-99	5	25.0%
	100	14	70.0%
Grip strength	0-24	0	0.0%
	25-49	0	0.0%

	50-74	10	50.0%
	75-99	10	50.0%
	100	0	0.0%
Activities	Unable to work because of pain	0	0.0%
	Able to work but unemployed	8	40.0%
	Restricted employment	3	15.0%
	Returned to regular employment	9	45.0%



- 90-100 Excellent
- 80-89 Good
- 65-79 Fair
- <65 Poor

Figure 7: Percentage of clinical results at the end of follow-up period according to Cooney’s modification of the Green and O’Brien scheme

Final score results	No.	%
Poor	2	10.0%
Fair	9	45.0%
Good	9	45.0%
Total	20	100.0%



Figure 8: 48 years old female, post-operative AP & lateral x-rays



Figure 9: Functional results in a 48 year old female post 6 months.



Figure 10: Plain x ray (PA & LAT) 6 months after fixation

Discussion

Theorized benefits, especially for more simple dorsally displaced fractures, include:

- (1) ease of anatomic reduction
- (2) early return of hand and upper-limb function,
- (3) diminished frequency and duration of formal occupational therapy,
- (4) potentially less overall pain,
- (5) a decreased risk of displacement.

Results showed that nine cases got Good score (45.0%), nine cases were fair score (45.0%), two cases were poor (10.0%) Green and O'Brien Score.

The poor results in this case was due to late intervention ,osteoporosis due to old age and poor general condition of the patient which results in incomplete union.

Good condition which was 45.0% of the patients showed that gives great results in cases with extra-articular undisplaced distal radius fractures. we think so that the Joshi clamp associated with percutaneous synthesis described add good stability to fracture of the distal radius.

A. Mantovani (Riv Chir Mano 2009) studied percutaneous osteosynthesis fixed by Joshi's Clamp Between 2000 and 2007, 42 patients aged between 28 to 89 years old were treated using this technique, of which 35 where women and 7 were men consolidation of fractures was obtained on average in 40 days, without major complications, in all cases treated except one case of infection. The evaluation Postoperative clinical and radiographic found no large joint limitation of the operated wrists, or significant loss of radiographic parameters restored with the intervention. The patients were able to use your wrist operated, for normal life, after an average of one week after surgery and without the need for physiotherapy.

Conclusion

The percutaneous distal radius, fracture fixed with three Kirschner wires introduced in intramedullary manner, intrafocale and / or bicortical together, it ensures good stability and

reduction of Extra-articular distal radius fractures. This stability is further reinforced by the clamp which locks between Joshi and their externally Kirschner wires, so that it is not necessary to apply the plaster cast.physiotherapy was done in nine cases(45.0% of cases)

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