

## ORIGINAL ARTICLES

## CLOSED REDUCTION AND POP IMMOBILIZATION FOR COLLES' FRACTURE UNDER HAEMATOMA BLOCK AND SEDATION AS A DAY CARE

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## ABSTRACT

**Objective:** To assess the radiological and clinical outcome of closed reduction and cast immobilization for Colles' fracture under haematoma block and sedation

**Design:** A quasi experimental study

**Place and Duration of Study:** CMH Rawalpindi from August 2009 to November 2010

**Patients and Methods:** Fifty five patients were enrolled in our study. We used Lignocaine plain for haematoma block, Nalbupline and Midazolam for sedation. Closed reduction was done with standard technique. Post operative x-rays were evaluated for length of radius and angulation, palmar tilt and articular congruity. Follow up x-rays were conducted every week for three weeks and then at six weeks. Above elbow plaster of Paris (POP) was converted to below elbow at three weeks. Cast was removed at six weeks. After removal of the cast range of movement at wrist, joint pain and grip strength was checked.

**Results:** Good radiological reduction was achieved using this method. Radius length was within 6 - 13 mm (mean 10.4±2.1), angulation was between 13° -23° (mean 20.1± 2.6), palmar tilt was between 1°-5° in 54 patients. One patient had dorsal tilt and required revision. In patients with intra articular extension, the intra-articular step was less than 1 mm in 53 patients. Two patients had more than 2 mm intra articular step that required revision. Our functional results were acceptable. Excellent pain relief was seen in 94.5% cases as assessed by visual analogue scale. Grip strength was excellent in 45 (81.8%), good in 9 (16.4%) and fair in 1 (1.8%) patient. We achieved near normal range of movement at wrist.

**Conclusion:** Closed reduction and pop immobilization for Colles' fracture under haematoma block and sedation is a good treatment option in carefully selected cases.

**Keywords:** Closed Reduction, Colles' fracture, Plaster of Paris.

## INTRODUCTION

Colles' fracture is fracture of the distal radius with posterior displacement, radial deviation and shortening of radius. The deformity is commonly known as dinner - fork deformity<sup>1</sup>. Colles' fracture is a common fracture occurring in middle aged and elderly due to fall on an out - stretched hand. Osteoporosis<sup>2</sup> is another important cause. It is most commonly treated by closed reduction and plaster cast immobilization under general or regional anaesthesia. Other methods of treatment are open reduction and internal fixation with T-plate<sup>3</sup>, K-wire, pins and plaster,

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external fixator and arthroscopic assisted reduction.

I used closed reduction and cast immobilization for Colles' fracture under haematoma block and sedation with similar success as compared to other techniques.

The objective of this study was to assess the radiological and clinical outcome of closed reduction and cast immobilization for Colles' fracture under hematoma block and sedation.

## PATIENTS AND METHODS

This quasi-experimental study was conducted at Combined Military Hospital (CMH) Rawalpindi from August 2009 to November 2010. CMH Rawalpindi has 120 bedded orthopaedic unit. It takes elective and emergency cases from Rawalpindi and its surroundings and is also the referral center for Armed Forces of Pakistan.

All cases of Colles' fracture that reported to CMH Rawalpindi within 24 hours of injury

were included. Cases with sensitivity to Lignocaine, multiple fractures and polytrauma were excluded from the study.

Five to Ten ml of 2% plain Lignocaine was used for haematoma block after aspiration of haematoma. For sedation intravenous Nalbupline 0.3 -0.6 mg / kg and intravenous Midazolam 0.07 - 0.08 mg /kg were given.

Closed reduction was done with standard technique. Longitudinal traction was applied for 5 -10 minutes. Direct pressure was applied on the distal fragment to correct the dorsal angulations. Above elbow complete cast was applied with wrist in slight palmar flexion and ulnar deviation.

Post reduction check x -ray was done of distal radius in two views (AP and Lateral). We evaluated post operative x-ray for radius length, angulation, palmar tilt and articular congruity.

A reduction was considered satisfactory if radius length was within 2-3 mms of contra lateral wrist, less than 5 degree of angulation loss, palmar tilt of 0 degree or more and intra articular step of less than 2mm.

Palmar tilt was excellent if it was more than  $30^{\circ}$ , average if it was between  $0^{\circ}$ - $20^{\circ}$  and poor if there was dorsal tilt.

Radial angle was excellent if it was more than 21 degrees, average if it was between  $16^{\circ}$ - $21^{\circ}$  and poor if was less than  $15^{\circ}$ .

Radial height was excellent if it was more than 11 mm, average if it was between 8-11mm and poor if it was less than 8 mm.

Intra articular congruity was excellent if there was no step, average if there was 1 mm step and poor if there was 2 mm or more steps.

Follow up x -rays were done every week for three weeks and then at six weeks. Above elbow pop was converted to below elbow at three weeks. Cast was removed at six weeks. After removal of cast range of movements at wrist, pain at fracture site and grip strength was checked.

Pain was assessed by visual analogue scale at six weeks. It was excellent if pain relief was

more than 90, good if pain relief was between 70-90 and fair if pain relief was less than 70.

Grip strength was compared with a normal hand. It was excellent if it was within 80% of normal hand, good if it was 60-80% and fair if less than 60 percent of normal hand.

Range of motion at wrist, proximal and distal radio-ulnar joint was measured with goniometer. It was compared with contra lateral wrist and graded as excellent, good and fair.

Data was analysed using SPSS version 15. Descriptive statistics were used to describe the data i.e mean and standard deviation (SD) for quantitative variables, frequency and percentage for qualitative variables.

## RESULTS

Fifty five patients were included in my study. They were between 14-74 years of age. There were 40 (73%) males and 15(27%) females. All patients reported within 16 hours of injury.

Results were evaluated clinically and radiologically. Post - reduction x-rays at 6 weeks were evaluated for radius length, radius angulation, palmar tilt and articular congruity. Clinically pain at fracture site, range of movements at wrist and power of grip were evaluated (tables 1 and 2)(figures 1 and 2).

The radius length was within 2 mm of contra-lateral wrist in fifty one patients (table 1).

Post reduction radius angulation was within  $3^{\circ}$  compared to contra-lateral wrist in 53 patients (Table 1) (Fig. 1 and 2).

Palmar tilt was  $1^{\circ}$ - $5^{\circ}$  with the average  $2.7^{\circ}$  in 54 patients (table 1). One patient had dorsal tilt which required revision.

In patients with Colles' fracture with intra articular extension, the intraarticular step of less than 1 mm in 53 patients was seen (table 1). Two patients had poor result which required revision.

Clinically, range of motion at wrist was as follow: flexion  $30^{\circ}$ - $75^{\circ}$  with average  $58.6^{\circ} \pm 11.3^{\circ}$ , extension  $20^{\circ}$ - $60^{\circ}$  with average  $41.5^{\circ} \pm 12.1^{\circ}$ , adduction  $15^{\circ}$ - $50^{\circ}$  with average  $36.5^{\circ} \pm 9.5^{\circ}$ ,



**Figure 1** Post reduction x - ray of 30 year old man with fracture distal radius



**Figure 2** Post reduction x - ray of 43 year old man with fracture distal radius

abduction  $5^{\circ}$ - $20^{\circ}$  with average  $14.1^{\circ} \pm 3.2^{\circ}$ ), pronation  $60^{\circ}$ - $85^{\circ}$  with average  $78.3^{\circ} \pm 5.5^{\circ}$ , supination  $55^{\circ}$ - $90^{\circ}$  with average  $72.8^{\circ} \pm 9.9^{\circ}$  (table 2).

Fifty two patients (94.5%) had 90% pain relief at fracture site by six weeks (table 2).

Grip strength was excellent in 45 (81.8%), good in 9 (16.4%) and fair in 1 (1.8%) patient (table 2).

## DISCUSSION

Colles' fracture accounts for 15 -20 percent of all fractures treated in the emergency department. If not treated properly considerable morbidity occurs.

I used closed reduction and cast

immobilization for Colles' fracture under haematoma block and sedation as OPD cases. This only achieved acceptable results with this simple technique but also saved theatre time. The importance of this study is shown by the fact that no general anesthesia was given and only a few hours of hospital stay was required. The results were equal to or better than other international and national studies<sup>4-11</sup>.

The aim of treating these fractures is to achieve painless range of movements at the wrist. The alignment of fracture should be such that it allows the patients to do delicate work as typing and writing as well as heavy manual work. Chances of osteoarthritis of wrist are minimized. Four were used radiological and three clinical parameters for quantification of

**Table 1** Results of radiological parameters in our study (n=55)

Radiological	Excellent	Average	Poor
palmer tilt	30 (54.5%)	24 (43.6%)	1 (1.8%)
radial angle	25 (45.5%)	28 (50.9%)	2 (3.6%)
radial height	23 (41.8%)	28 (50.9%)	4 (7.27%)
intraarticular congruity	41 (74.5%)	12 (21.8%)	2 (3.63%)

**Table 2** Results of clinical parameters in our study (n=55)

Clinical	Excellent	Good	Fair
Pain relief	52 (94.5%)	1 (1/8%)	2 (3.6%)
Grip strength	45 (81.8%)	9 (16.4%)	1 (1.8%)
Flexion at wrist	30 (54.5%)	23 (41.8%)	2 (3.6%)
Extention at wrist	20 (36.4%)	25 (45.5%)	10 (18.2%)
Abduction at wrist	20 (36.4%)	33 (60%)	2 (3.6%)
Adduction at wrist	26 (47.3%)	24 (43.6%)	5 (9.1%)
Supination at radio- ulnar joint	30 (54.5%)	22 (40%)	3 (5.5%)
Pronation at radio -ulnar joint	28 (50.9%)	24 (43.6%)	3 (5.5%)

results.

Radial height is the most important radiological parameter. It is measured by PA view of wrist joint. It is measured by two lines drawn perpendicular to the long axis of radius. One is drawn from the tip of radial styloid and other from distal articular surface of Ulna. It is normally 11-12mm and decreased in communitated or impacted distal radius fracture. Loss of radial height results in intraarticular joint incongruity of radiocarpal and radio ulnar joints. These result in loss of power of grip, decreased range of movements and pain at wrist joint. Later on osteoarthritis changes at radiocarpal joint also develop. Various studies have emphasized the importance of radial height.<sup>12,13</sup> In this study radius length was within 6 -13 mm (mean 10.4, S D 2.1). This result was similar to a study conducted by Li who had radial length of (8.3 +/- 1.3) mm<sup>8</sup>.

Radial angle is measured by PA view of wrist joint. It is the angle between line drawn perpendicular to the long axis of radius and line drawn between tip of radial styloid and ulnar corner of articular surface of distal radius. It normally measures 15<sup>0</sup>-30<sup>0</sup>. I measured radial angle between 16<sup>0</sup>-23<sup>0</sup> in 53 patients. Two patients had radial angles less than 15<sup>0</sup>. My results were better than the study conducted at Dow University of Health Sciences, Karachi<sup>7</sup> which showed excellent restoration of radial angle in 7 (21.2%), good in 25 (75.8%), and fair in 1 (3%) cases. Loss of radial angle causes normal configuration to be lost. This not only results in decrease in power of grip but also subsequent osteoarthritis of wrist joint<sup>14</sup>.

Palmar tilt is measured on lateral film of wrist. It is the angle between a line drawn perpendicular to the long axis of radius and a line drawn parallel to the articular surface .It normally measures between 0<sup>0</sup>-28<sup>0</sup> with an average around 11<sup>0</sup>. Gartland and Werley<sup>15</sup> in a study concluded that dorsal tilt has more profound effect on clinical parameters such as power of grip and pain at fracture site. Another study showed that this adverse clinical effect due to dorsal tilt was because of carpal mal-

alignment<sup>16</sup>. Later on osteoarthritis of wrist also develops. At the end of reduction the tilt should be neutral or palmar ward. My study I had palmar tilt ranging from 1<sup>0</sup>-5<sup>0</sup> in 54 patients. One patient had dorsal tilt which required revision under general anesthesia and fluoroscopic control. Salvi AE achieved palmar tilt correction in all his cases using hand shake technique<sup>4</sup>. That is why my short term outcome was good and they are less likely to have osteoarthritis of wrist later on<sup>17</sup>.

Intra-articular step is measured on PA view of wrist. Intra-articular distal radius fractures should have intra articular step of less than 2 mm to have good functional outcome. I achieved this in 53 patients. These patients have less chances of developing osteoarthritis of wrist. Two patients had intra articular step of more than 2 mm which required revision under general anesthesia and fluoroscopic control. These results were comparable with a local study which showed 95% reduction in intra-articular distal radius fractures<sup>5</sup>.

I used three clinical parameters to assess the functional outcome of the patients. They were pain at fracture site, grip strength and range of movements at wrist. I achieved acceptable functional results. My results were better than Faraz Ahmed et al who achieved excellent functional score in 41% , good functional score in 42% cases , fair functional score in 13% cases and poor functional score in 4% cases<sup>5</sup>. I found that there was co-relation between ultimate functional outcome and post-reduction x-ray<sup>18</sup>. Pain free wrist and grip strength are most important clinical factors leading to patient satisfaction<sup>19</sup>.

## CONCLUSION

Closed reduction and pop immobilization for Colles' fracture under haematoma block and sedation is a good treatment option in carefully selected cases. Radial height, radial inclination, palmar tilt and intra articular joint incongruity should be assessed properly in post reduction x-rays to achieve acceptable clinical and functional results. This will ultimately result in increased patient satisfaction and decreased chances of osteoarthritis later on.

## REFERENCES

1. Colles A: On the fracture of the carpal extremity of the radius. *Edinburgh Med Surg J* 1814; 10: 1 182-6.
2. Solgaard S, Petersen VS. Epidemiology of distal radius fractures. *Acta Orthop Scand*. 1985 ;56:391-3.
3. Herron M, Faraj A, Craigen MA. Dorsal plating for displaced intra-articular fractures of the distal radius. *Injury* 2003;34:497- 502.
4. Salvi AE. The handshake technique: proposal of a closed manual reduction technique for Colles' wrist fracture. *Am J Emerg Med*. 2011 ;29:115-7.
5. Ahmed F, Nizami A, Shah M A, Khan TB. Definitive treatment of closed bilateral distal radius fractures with mini external fixator: *J Pak Orthop Assoc* 2009;21:52-7.
6. McFadyen I, Field J, McCann P, Ward J, Nicol S, Curwen C. Should unstable extra-articular distal radial fractures be treated with fixed-angle volar-locked plates or percutaneous Kirschner wires? A prospective randomised controlled trial. *Injury*. 2011; 42:162-6.
7. Baig A, Ahmed K, Humail M. Closed reduction and percutaneous Kirschner wire fixation of displaced Colles fracture in adults: *Pak J Surg* 2008;24:31-7.
8. Li S, Chen Y, Lin Z, Feng Z, Zhao J, Su W. [A comparison of open reduction and closed reduction in treating distal radius fractures in elderly patients]. *Zhongguo Xiu Fu Chong Jian Wai Ke Za Zhi*. 2010 ;24:438-42
9. Aktekin CN, Altay M, Gursoy Z, Aktekin LA, Ozturk AM, Tabak AY. Comparison between external fixation and cast treatment in the management of distal radius fractures in patients aged 65 years and older. *J Hand Surg Am*. 2010 ;35:736-42.
10. Mushtaq F, Nadeem D, Ahmed A, Aziz A. Non-Bridging External Fixation of unstable distal Radial fractures *Pak Postgrad Med J* Sep 2001;12:81-4.
11. Anjum R, Pervaiz M, Hussain F N, Ali A, Mehboob I. Postoperative wrist movements in percutaneous fixation by k-wire of Colles fracture *Med Channel* 2010;16:331-3.
12. Solgaard S. Classification of distal radius fractures. *Acta Orthop Scand* 1984;56:249-52
13. Batra S, Gupta A. The effect of fracture-related factors on the functional outcome at 1 year in distal radius fractures. *Injury* 2002;33:499-502.
14. Kopylov P, Johnell O, Redlund-Johnell I, et al. Fractures of the distal end of the radius in young adults: a 30-year follow-up. *J Hand Surg* 1993;18:45-49.
15. Gartland J, Werley C. Evaluation of healed Colles' fractures. *J Bone Joint Surg* 1951;33:895-907
16. McQueen MM, Hajducka C, Court-Brown C. Redispaced unstable fractures of the distal radius: a randomised, prospective study of bridging versus non-bridging external fixation. *J Bone Joint Surg* 1996;78:404-09.
17. Knirk J, Jupiter J. Intraarticular fractures of the distal end of the radius in young adults. *J Bone Joint Surg* 1986;68:647-59.
18. Leung F, Ozkan M, Chow SP. Conservative treatment of intra-articular fractures of the distal radius-factors affecting functional outcome. *Hand Surg* 2000;5:145-53.
19. Karnezis IA, Fragkiadakis EG. Association between objective clinical variables and patient-rated disability of the wrist. *J Bone Joint Surg [Br]* 2002;84: 967-70.