

Management of Undisplaced and Minimally Displaced Colles' Fracture with Thermoplastic Splint Versus Conventional Colles Casting

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Abstract

Background: To compare the outcome in Colles' fracture treated with thermoplastic splint versus conventional Colles cast.

Methods: In this observational study 62 patients having Colles fracture were included. Patients were placed in two groups; group A were treated with Colles' cast while group B with Thermoplastic splint. Radiographic evaluation was done, using Antero-posterior and lateral view wrist radiographs. Functional outcome assessed with Gartland and Werley Score demerit system.

Results: Out of 62 patients, 28 (45.1%) were male with mean age of 38.67 and 34(54.8%) were female patients having mean age of 47.20. The total number of patients that had excellent functional outcome was 34 out of 62 (54.8). The excellent functional outcome was achieved in 16(50%) patients treated with colles brace. However, in patients treated with thermoplastic splint the functional outcome was excellent in 18(60%) patients.

Conclusion: Best functional outcome after the treatment of Colles' fracture is achieved by the use of thermoplastic splint.

Key Words: Colles fracture, Thermoplastic splint, Gartland's demerit score, Colles' cast

Introduction

Fractures of distal radius are the one of most common fractures and it comprises 87% of all radial fractures.^{1,2} In elderly women aged between 50 and 70, these fractures account for more than 40%.³ Dublin physician Abraham Colles described this fracture first time in 1814.⁴ Since that time there are no consensus on the best treatment method.⁵ There are many treatment options for distal radius fractures which includes closed reduction and casting. Closed reduction and functional bracing, closed reduction and

pinfixation, external fixation, and open reduction and internal fixation.⁶

There is more controversy regarding best treatment option of the displaced distal radial fractures but regarding the management of stable and undisplaced fractures, it is agreed that these can be treated non-operatively and good anatomical and functional results can be obtained.⁷ Al khudairy et al, used thermoplastic splint for immobilization of the distal radius fractures and got satisfactory anatomical and functional results.⁸ However International literature lacks any data regarding our population, therefore, we conducted this study in our population to compare the outcome of management of minimally or undisplaced colles fractures treated conservatively by immobilizing the fracture with thermoplastic splint and conventional pop casting.

Patients and Methods

This Observational Study was conducted for a duration of two years, from February 2014 to February 2016 at the Ahmed Medical Complex, Rawalpindi, Pakistan. All adult patients presenting with undisplaced or minimally displaced Colles' fracture were included in the study. Fracture with minimal displacement is one that has a palmar tilt loss $<10^\circ$, radial shortening $\leq 2\text{mm}$ and intra-articular step $< 2\text{mm}$ (Figure 1).



Figure-1: Radiograph of minimally displaced Colles' fracture



Figure 2: Radiograph postcolles cast application



Figure 3: Thermoplastic Splint

Table 1: Gartland and Werley Score Demerit System

Residual Deformity	Range 0-3 points
Prominent ulnar styloid	1
Residual dorsal tilt	2
Radial deviation of hand	2-3
Subjective evaluation	Range 0-6 points
Excellent-No pain, disability or limitation of movement	0
Good-Occasional pain, limitation of motion, no disability	2
Fair- Occasional pain, some limitation of motion ,weakness in wrist, no disability if careful, activities slightly restricted	4
Poor- Pain, limitation of motion, disability, activities more or less markedly restricted	6
Objective evaluation	Range 0-5 points
Loss of dorsiflexion	5
Loss of ulnar deviation	3
Loss of supination	2
Loss of palmar flexion	1
Loss of radial deviation	1
Loss of circumduction	1
Pain in Distal Radio Ulnar Joint	1
Grip strength 60% or less than opposite side	1

Exclusion criteria was patients having open fracture or fractures in children. Patients were divided randomly into two groups; A and B. Written informed consent was taken from all the patients. Initially all patients were applied back slab for ten days. After ten days, group A was applied Colles cast (shown in figure-2) and group B applied thermoplastic splint (shown in figure-3) for the next 5 weeks.

At 6th week splint and cast were removed. Patients were again assessed at 6th week and finally at three months' interval. Loss of reduction was assessed by standard antero-posterior and lateral radiographic views. Patients' functional outcome was assessed in terms of subjective evaluation according to Gartland and Werley Score demerit system⁹ (Table 1).

Score was termed as excellent if between 0 - 2. Data entered into SPSS version 23. Comparison of mean and standard deviation was done. Chi-square test was applied. 95% confidence interval and p-value were significant if ≤ 0.05 .

Results

In this study,64 patients with undisplaced or minimally displaced Colles fracture were included. Two patients were lost to follow-up, so they were excluded from the study. Out of 62 patients, 28 (45.1%) were male with mean age of 38.67 and 34(54.8%) were female patients with mean age of 47.20 (Table 2) .32 patients were placed in group A, while 30 in group B (Table 2). The total number of patients that had excellent functional outcome were 34 out of 62 (54.8%).One patient had loss of reduction in group A and two patients had loss of reduction in group B (Table 3). Excellent functional outcome was achieved in 16(50%) patients ($p<0.001$) treated with Colles brace. However, in patients treated with thermoplastic splint the functional outcome was excellent in 18(60%) patients ($p=0.001$). (Figure 4).

Table 2: Gender distribution

		Gender		Total
		Male	Female	
Group	A	15	17	32
	B	13	17	30
Total		28	34	62

Table 3: Loss of reduction in groups

		Loss of reduction		Total
		No	Yes	
Group	A	31	1	32
	B	28	2	30
Total		59	3	62

Table 4: Functional outcome

Result		Group A (Colles cast)	Group B (Thermoplastic splint)
Excellent	Yes	16 (50%)	18(60%)
	No	16 (50%)	12 (40%)
p-value		<0.001	=0.001

Discussion

Distal radius fracture is the one of the commonest fracture in the body especially in the old age. Despite evolution of many sophisticated methods of treatment for this fracture conservative treatment that is immobilization in pop cast is the main stay of treatment and undisplaced, stable fractures are exclusively treated conservatively.¹⁰

We used in our study the thermoplastic splint as it has many advantages over pop like its light weight,application is easy and clean, water proof, adjustable, it is radiolucent,can be converted to volar splint, easy to remove and convenient to the patient in terms of daily routine activities like bathing personal hygiene and food intake.

Other types of splint like futura splints had been used in some studies, but it provides little stability and rotation of forearm is not prevented.¹¹In our study, mean age of male patients was 38.67 with females having 47.20 as their mean age. The results were comparable to a study done by Nellans et al. which showed mean age in young adults to be 31 years and in elderly to be 61 years.¹² Study by Khudairy et al. also had a mean age of 45.1 years.⁸Our study had more female patients (54.8%) presenting with colles' fracture as compared to males. This was in accordance to a study done by Brogren et al. that also showed an increased incidence in females.⁷

In a study by Shah et al, 50% excellent results were obtained with pop cast.¹³ The study conducted by Lendingham excellent results were obtained in 43 % of patients.¹⁰ In our study 50% excellent results in pop cast and 60% in splint group were obtained.

In our comparison acceptable out come was obtained in 60% of patients of splint group and 50% in pop cast group. These results were consistent with Alkhudairy et al in which they have shown that patient managed with thermoplastic splint are more satisfied.⁸ Another

study done at a tertiary care hospital, showed no at significant difference in undisplaced or minimally displaced distal radius fractures treated by Colles cast or splint.^{14,15}

Conclusion

Patients with undisplaced or minimally displaced Colles' fractures treated with thermoplastic splint had better outcome as compared with patients treated with conventional pop casting. Therefore, thermoplastic splint should be adopted on regular basis for treatment of Colles fracture.

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