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INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/16421

DOI URL: <http://dx.doi.org/10.21474/IJAR01/16421>



RESEARCH ARTICLE

COMPLICATIONS ASSOCIATED WITH CASTING OF ACUTE DISTAL RADIUS FRACTURES IN ADULTS - A PROSPECTIVE OBSERVATIONAL STUDY

Dr. S. Rajasekaran M.S. Ortho and D. Ortho

Associate Professor, Department Of Emergency Medicine, Government Theni Medical College, Theni.

Dr. T.C. Prem Kumar, M.S. Ortho and D. Ortho

Associate Professor, Department Of Orthopaedics, Government Theni Medical College, Theni.

Manuscript Info

Manuscript History

Received: 10 January 2023

Final Accepted: 14 February 2023

Published: March 2023

Key words:-

Distal Radius Fracture, Closed Reduction, Fracture Displacement, Tenosynovitis, Carpal Tunnel Syndrome, Malunion

Abstract

Aim: Closed treatment of distal radius fractures is still a controversy. In children, circumferential casting of acute distal radius fractures is found to be safe. However, research is lacking to demonstrate its safety in adults. The purpose of this study was to assess the risk of complications associated with casting acute distal radius fractures in adult patients.

Methods: Study is conducted in 60 patients with a distal radius fracture arriving at the Emergency department in Govt Theni Medical College. Patients were evaluated in the red zone and were provisionally immobilized with plaster of Paris casts. Patients were followed for a minimum of 12 weeks. Complication rates associated with casting were recorded, including rates of fracture displacement, tenosynovitis, carpal tunnel syndrome and malunion.

Results: 60 patients were included in this study. A total of 45 patients met inclusion criteria for placement of a short arm cast in the Emergency Department. The majority of patients sustained their injuries from a ground level fall. A minority of patients had radiographic evidence of intra-articular extension or underwent a reduction prior to casting. The majority of patients did not require a cast change. The data analysis showed the complications such as fracture displacement, tenosynovitis, carpal tunnel syndrome malunion were of insignificant value and closed reduction proved to be the safest and benefitted method of management in distal radius fractures with lesser complications.

Conclusion: There were no major complications associated with casting of acute, distal radius fractures in this series of 45 adult patients. While further studies with larger numbers of patients are necessary to establish safety of casting, this study suggests that casting may be a safe and effective treatment for distal radius fractures in adult patients presenting with a normal neurovascular exam.

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Corresponding Author:- Dr. S. Rajasekaran M.S. Ortho

Address:- Associate Professor, Department Of Emergency Medicine, Government Theni Medical College, Theni.

Introduction:-

Clinical and radiographic evaluation is necessary to decide whether open or closed reduction to be done for the distal radius fractures. There are a number of techniques and materials for closed management of distal radius fractures. Splinting may be done using plaster or orthoglass, while casts are most commonly performed using fiberglass or plaster of paris. However, it is not well-established that any method is superior.

There is a paucity of evidence regarding the use of a circumferential cast compared to plaster splinting in adults. Circumferential casting theoretically carries with it a risk of causing fracture displacement, tenosynovitis, carpal tunnel syndrome and malunion.

Circumferential casts carry their own advantages when applied properly. These include improved durability compared to plaster splints, and greater patient comfort due to their relatively lighter weight. Further, when applied skillfully, a patient can avoid having a cast change for several weeks, which may potentially decrease the risk of displacement.

Circumferential casting of acute distal radius fractures has been shown to be safe in children. However, to our knowledge, no studies have demonstrated its safety in adults. The purpose of this study is to assess the complication rates of casting for acute distal radius fractures treated in the Emergency Department.

Methods:-

After obtaining institutional review board approval, patients arriving at the Department of emergency medicine, Govt Theni medical college, Theni were included in the study who met the inclusion criteria from February 2022 to September 2022. Pre and post procedure x ray were checked for proper reduction. An x ray was repeated after 1 week to check for position of the fracture fragments. The patients are followed for a minimum of 12 weeks for complications and results. Data extraction was done by the treating surgeon and an assistant. They are watched for complications such as fracture displacement, tenosynovitis, carpal tunnel syndrome and malunion which are tabulated.

Inclusion criteria:

1. Age > 18 years < 60 years
2. Patients treated with casts (Plaster of Paris)
3. No comorbidities.
4. No associated major injuries.

Exclusion criteria

1. Age < 18years.
2. Comorbid illness.
3. Polytrauma.
4. Open fractures.

Statistical analysis:

Mean, standard deviation, t test.

Results:-

A total of 60 patients were identified for inclusion who were treated with short arm casting in the Emergency Department, with or without closed reduction. A total of 45 patients presenting with a distal radius fracture met inclusion criteria for placement of a short arm cast in the Emergency Department. Patient demographic characteristics are shown in **Table 1**. Among 45 patients 27 were male and 18 were female. The table shows that the sex distribution has no significant influence in the study. Age distribution was tabulated in **table 2** which showed more number of incidences among age group 45-60 years. Slip and fall is more common among elder age group which accounts for more number of cases in that age group. The complications are observed through an X ray evaluation 1 week after the procedure and for 12 weeks follow up of the patients and the results are tabulated. The number of fracture displacement cases found from the x rays taken after 1 week of procedure was 4 out of 45 cases which accounts to 1.8%. As the p value was >0.05 it is statistically insignificant (**Table 3**). **Table 4** shows the number of tenosynovitis resulted from the closed reduction with casts which was 2 out of 45 cases which accounts to

0.9%. As the p value is > 0.05 it was statistically insignificant. **Table 5** shows the number of Carpal tunnel syndrome resulted from the closed reduction with casts which was 5 out of 45 cases. As the p value is > 0.05 it was statistically insignificant. **Table 6** showed the number of malunions resulted from the closed reduction with casts. As the p value is > 0.05 it was not significant.

Table 1:- Sex distribution.

SI NO	Male	Female
1	27	18

Chart 1:- Sex distribution.

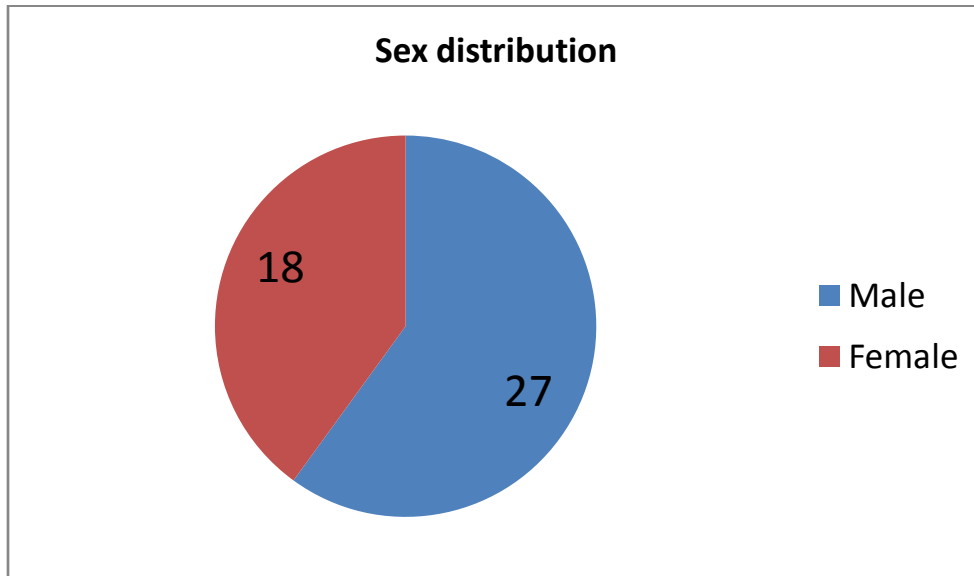


Table 2:- Age distribution.

SI No	Age category (years)	Number of patients
1	18-30	11
2	31-45	12
3	46-60	22

Chart 2:- Age distribution.

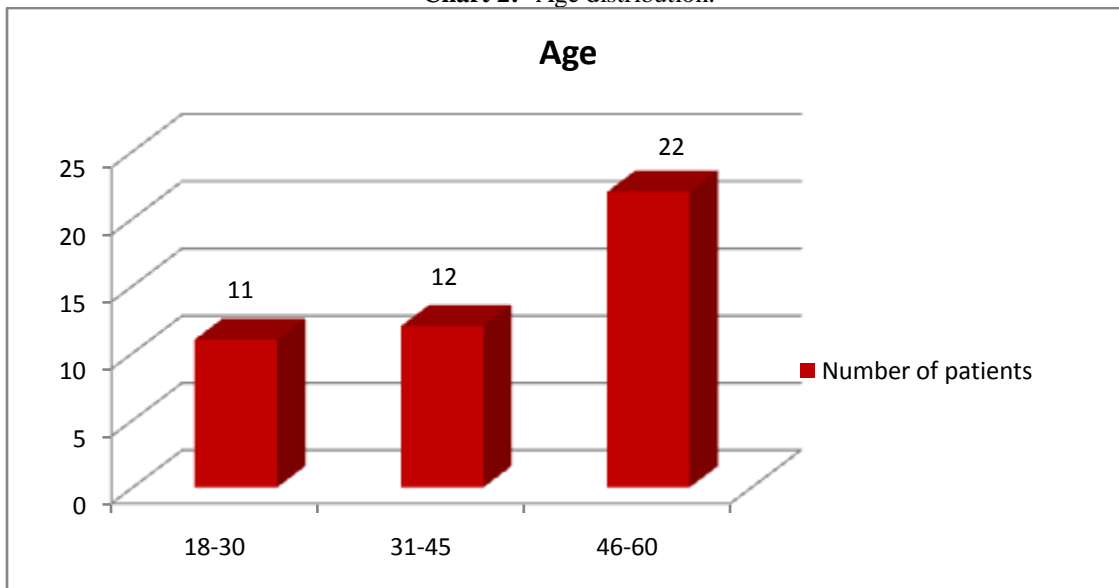


Table 3:- Complications – Fracture displacement.

SI No	Fracture displacement	Percentage	P value
1	4	1.8	p>0.05

Chart 3:- Complications – Fracture displacement.

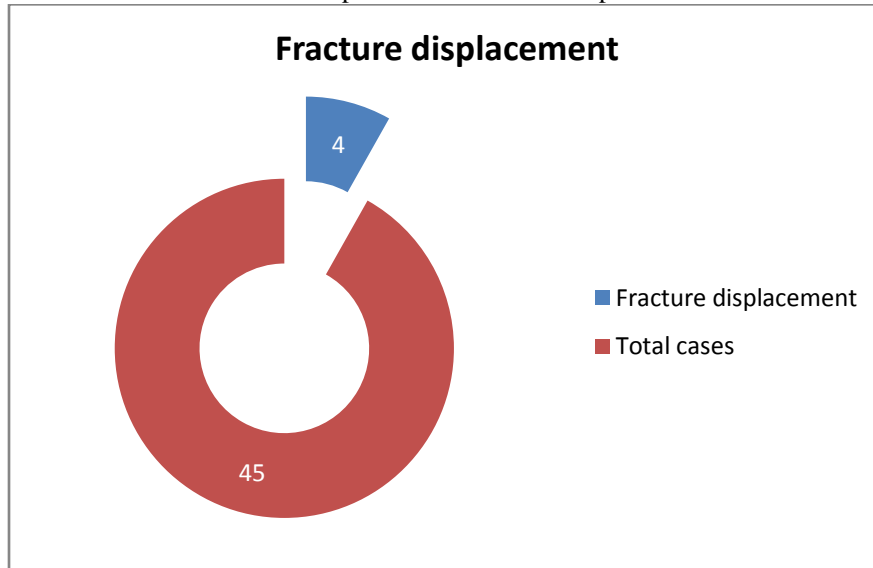


Table 4:- Complications – Tenosynovitis.

SI NO	Tenosynovitis	Percentage	P value
1	2	0.9	p>0.05

Chart 4:- Complications – Tenosynovitis.

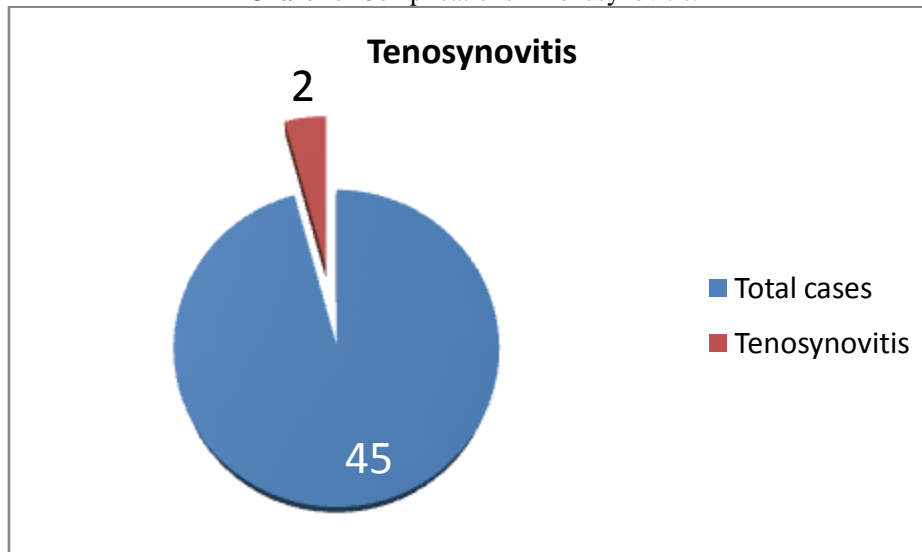


Table 5:- Complications – Carpal tunnel syndrome.

SI NO	Carpal Tunnel syndrome	Percentage	P value
1	5	2.25	p>0.05

Chart 5:- Complications – Carpal tunnel syndrome.

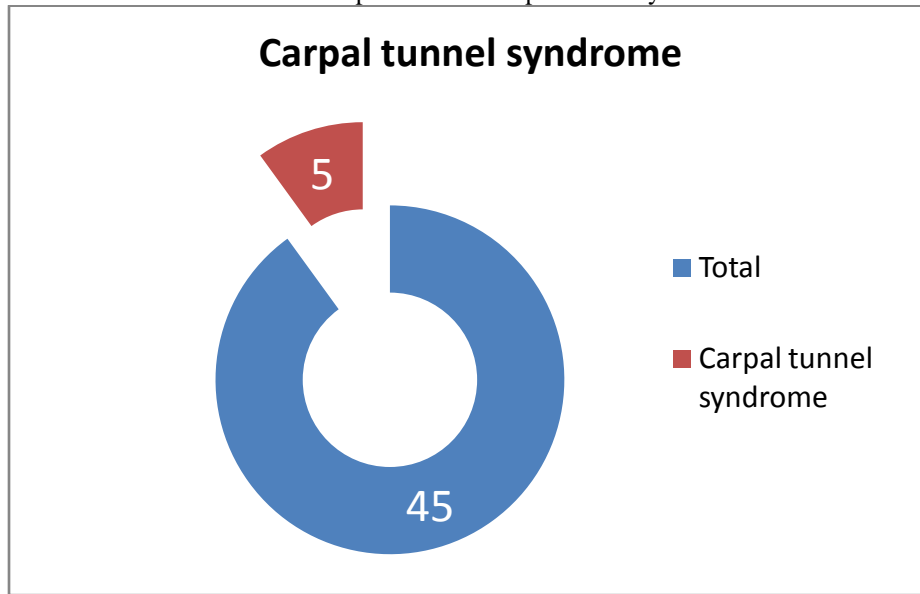
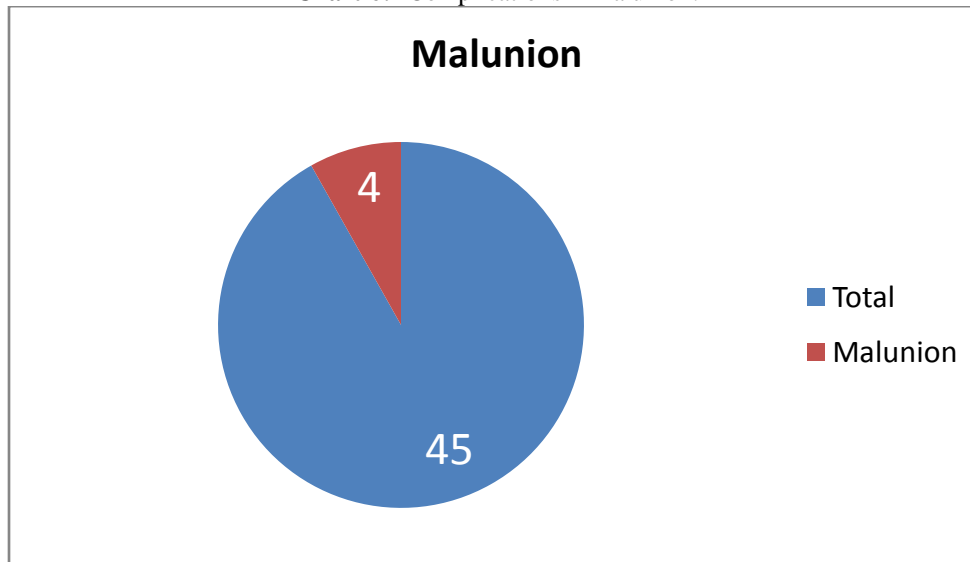


Table 6:- Complications – Malunion.

SI NO	Malunion	Percentage	p value
1	4	1.8	p>0.05

Chart 6:- Complications – Malunion.



Discussion:-

In 2009, the American Academy of Orthopedic Surgeons established distal radius practice guidelines. There is a lack of evidence even after 29 publications, which is superior method of management of distal radius fractures. A meta-analysis of 37 trials concluded that insufficient evidence exists to guide the best method and duration of immobilization during nonsurgical treatment of distal radius fractures.

Fracture displacement, tenosynovitis, carpal tunnel syndrome and malunion are the complications that have been associated with closed management of acute distal radius fractures. Chaudhury et al. found that circumferential fiberglass casting generated the highest intracast pressure compared to plaster casts or splints in a lower extremity

biomechanical model. Of note, in a Swedish study of 430 patients with uncomplicated forearm and lower extremity fractures there were no cases of compartment syndrome due to fiberglass casting.

Malunion is the highest reported complication accounting to 0-33%. Tenosynovitis is a less common complication which was reported to 0-6%. Acute carpal tunnel syndrome, with a reported incidence ranging from 1.1% to 8.6%, is more likely to occur with high energy fractures, multiple closed reduction attempts, associated radiocarpal dislocation, and immobilization in excessive wrist flexion. Fracture displacement found to occur in certain cases, which needs recasting when identified. Certain cases can go for surgical fixation when the displacement is severe. While less common, young males who suffer high energy trauma, or those with an ipsilateral upper extremity injury are the most at risk of compartment syndrome.

In this study it was found that the percentage of complications observed from the patients were fracture displacement – 1.8%, tenosynovitis – 0.9% and carpal tunnel syndrome – 2.5% and malunion – 1.8%. The p values calculated showed that there is no statistical significance in the complications. Thus it is inferred that immediate closed reduction with casts offer lower rate of complications in the management of distal radius fractures.

Conclusion:-

From this study it was found that there were no major complications associated with casting of closed distal radius fractures in a series of 45 adult patients. Incidentally surgical fixation was not required for any of the cases in this study. Though, larger studies may determine safety, this study suggests that short arm casting may be considered as an acute means of management of distal radius fractures with lesser complications.

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