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Original Research Article

A Non-randomized Clinical Trial Comparing the Results of Surgical and Non-Surgical Scaphoid Fracture Treatment

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Abstract

Aim: to evaluate the outcome of operative fixation of acute scaphoid fractures with those of non-operative treatment. **Materials & Method:** This clinical study was carried out among 26 patients with an acute nondisplaced or minimally displaced scaphoid fracture reported to the OPD of Department of Orthopedics Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar, India. Patients were non-randomly allocated to group A (non-operative) and group B (operative). **Results:** The average age of the participants in the sample was 40.11 years. The majority of them were men, with 21 (80.7%) being male and 5 (19.3%) being female. 16 (61.5%) of the 26 scaphoid fracture cases were found on the right side, with the other 10 (38.5%) on the left. The most frequent site of fracture was the waist (B2) in 10 cases. In group B, there was complete union. **Conclusion:** Cast therapy has the drawbacks of a longer immobilisation duration, joint instability, decreased grip power, and a longer time to return to work, while operative fixation of acute scaphoid fractures results in a predictable satisfactory union performance and strong functional outcome, according to the report.

Keywords: cast treatment, scaphoid fracture

Introduction

Hand injuries are one of the commonest injuries seen in the accident and emergency department. Misdiagnosis of hand injuries may result in major morbidity from loss of hand function.[1] Hand and wrist injuries contribute a considerable workload for any individual accident and emergency department. There is little information concerning the prevalence of hand fractures and their distribution between the phalanges, metacarpals and carpal bones.[2]

The carpal scaphoid bone is known to play a key role in the function of the wrist. Therefore, pathologic abnormalities of the scaphoid may have serious consequences. It is the most common carpal to get fractured. Over the years, identification and

management of acute scaphoid fractures has generated substantial interest and research.

Scaphoid is very notorious to go into nonunion and ultimately avascular necrosis (AVN) which inevitably causes scaphoradial arthritis. Studies have shown that 95.6% of total scaphoid fractures are of waist and of these 63% are displaced fractures.[3] The incidence in Western countries is approximately five fractures in every 10,000 inhabitants[4,5] However, because of the diagnostic challenge that scaphoid fractures often present, the exact incidence is unknown.

Diagnosis is difficult; classification is controversial & there is never ending debate on appropriate treatment protocol. Once diagnosed, there is no clear-cut protocol for deciding appropriate treatment technique. There is controversy regarding whether to be managed conservatively or operatively. If managed conservatively, literature review reveled that there is insufficient evidence regarding position of immobilization (extension, ulnar deviation, neutral) or type of cast to be used in the nonoperative treatment of non-displaced scaphoid fractures.[6] As a result of the complex three-dimensional anatomy of the scaphoid, there are also technical difficulties associated with the operative management.[7]

The importance of a correct diagnosis and appropriate treatment of scaphoid fractures lies in its blood supply. The main blood supply to the scaphoid is from the radial artery. Over 80% of the scaphoid surface is covered with articular cartilage. The dorsal scaphoid branches from the radial artery enter the non-articular portion of the scaphoid at the dorsal ridge at the level of the waist and supply the proximal 70% to 80% of the scaphoid.[8] The volar scaphoid branches from either the radial artery or the superficial palmar branch enter at the distal tubercle and supply the distal 20% to 30% of the scaphoid. Thus, the vascularity of the proximal pole depends entirely on interosseous blood flow. This tenuous blood supply to the proximal pole of the scaphoid helps to explain the increased frequency of delayed union, nonunion and avascular necrosis (AVN) of scaphoid fractures. AVN is reported to occur in 13% to 50% of scaphoid fractures, with an even higher incidence in those involving the proximal one-fifth of the scaphoid.[9]

Cast therapy has the drawbacks of longer immobilisation duration, joint instability, decreased grip power, and a longer time to return to work, while operative fixation of acute scaphoid fractures results in a predictable satisfactory union performance and strong functional outcome, according to this report.

Material & Methods

Study Design

The present non-randomized clinical study was conducted for the period of 1 year among patients with a suspected or confirmed injury of the Scaphoid who had attended Outpatient Department of Orthopedics Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar, India.

Inclusion criteria

- Patients ≥ 18 years of age
- Patients with isolated scaphoid fractures and acute i.e., no more than 2 weeks gap between injury and treatment

Exclusion criteria

- Patients with acute fractures of both hands or with one hand missing
- All injuries other than isolated scaphoid fractures
- Patients with radiological signs of carpal instability
- Patients with signs of any rheumatoid, osteoarthritis or polyarthritis
- Patients with previous skeletal or severe soft tissue trauma to the same wrist

Treatment allocation

The decision on whether to choose an operative or nonoperative treatment procedure is taken by the patient together

with his treating surgeon. The participation in the study is completely independent of this decision and does not influence the choice of treatment procedure. Patients are classified as operative or non-operative according to the initial treatment decision taken during the first two weeks following injury.

Interventions

Group A: non-operative treatment with a cast.

Group B: operative treatment with Herbert screw.

Patients in both groups received 10 sessions of physical therapy.

Outcome assessment

All patients were asked to attend for routine review at three months, 6 month and one-year, additional visits being scheduled as required.

Standard Scaphoid series radiographs were taken at each visit and a full clinical assessment was recorded. Modified MAYO Wrist score[10] was used to assess functional out-come of individual patient after treatment.

Union was considered to have occurred when there was no tenderness at the anatomical snuff box or at scaphoid tubercle and there was evidence of trabeculae crossing fracture on at least three views. Grip strength was measured asking the patient to squeeze the examiners index finger, and the strength was compared on contralateral side. To avoid subjective bias two surgeons assessed grip strength separately and the average of two findings was taken as a final outcome. Grip strength was graded according to MRC grading. Range of motion was measured using goniometer.

Results

Table 1: Distribution of subjects as per Gender

Gender		Group		Total
		A	B	
	Male	12	9	21
		80.0%	81.8%	80.7%
	Female	3	2	5
		20.0%	18.2%	19.3%
Total		15	11	26
		100.0%	100.0%	100.0%
Mean±SD (Age Years)		40.11±1.14		

Test applied: chi-square test (p≥0.05)

Table 2: Distribution of subjects as per Laterality of the Fracture

Laterality		Group		Total
		A	B	
	Right	9	7	16
		60.0%	63.6%	61.5%
	Left	6	4	10
		40.0%	36.4%	38.5%
Total		15	11	26
		100.0%	100.0%	100.0%

Test applied: chi-square test (p≥0.05)

Table 3: Distribution of subjects as per Herbert Classification

Herbert Classification		Group		Total
		A	B	
	A1	1	1	2
		6.6%	9.1%	
	A2	1	1	2
		6.6%	9.1%	
	B1	3	2	5
		20.0%	18.2%	
	B2	6	4	10
		40.0%	36.3%	
	B3	2	2	4
		13.4%	18.2%	
	B4	2	1	3
		13.4%	9.1%	
Total		15	11	26
		100.0%	100.0%	100.0%

Test applied: chi-square test (p≥0.05)

Table 4: Distribution of subjects as per Modified MAYO Wrist score

Modified MAYO Wrist score		Group		Total
		A	B	
	Poor	6	1	7
		40.0%	9.1%	26.9%
	Fair	2	2	4
		13.3%	18.2%	15.4%
	Good	4	6	10
		26.7%	54.5%	38.5%
	Excellent	3	2	5
		20.0%	18.2%	19.2%
Total		15	11	26
		100.0%	100.0%	100.0%

Test applied: chi-square test (p≤0.05)

Table 5: Distribution of subjects as per Fracture Union

Fracture Union		Group		Total
		A	B	
	Union	11	11	22
		73.3%	100.0%	84.6%
	Non-union	4	0	4
		26.7%	0.0%	15.4%
Total		15	11	26
		100.0%	100.0%	100.0%

Test applied: chi-square test (p≤0.05)

Discussion

One of the main areas of discrepancy in the scaphoid fracture literature is the prevalence of scaphoid fractures, which varies from 1.47 to 121 per 100,000 of the population per year. Poor capture rates, limited population sampling sizes, the absence of an established captive population, and the inability of certain datasets to differentiate between actual and suspected fractures are all possible factors.
In a prospective study conducted by Saeden B et al.[11] compared Herbert screw fixation versus short arm cast for acute scaphoid fracture in 61 patients with 62 fractures and found that the operative group returned to work in a shorter period of time. Hence there has been a trend towards surgical fixation of these fractures.[12] Even the primary treatment demands expertise and familiarity with different treatment options. If those requirements are met a good prognosis can be expected. Open reduction and internal fixation of acute fracture of the scaphoid using a compression lag screw was recommended by McLaughlin[13] and Maudsley[14] to allow early mobilization of wrist. Herbert and Fischer first described the technique in 1984, since then the Herbert screw has become widely accepted as a mode of treatment.[15]

The average age of presentation in our study was 29.21 years. This was found in agreement with the study conducted by Parajuli NP et al.[16] found only two (13.3%) patients were above 30 years, rest 13 (86.7%) patients were below 30 years. This finding suggests that scaphoid fracture is common in young adults.

In the present investigation Most common location of fracture was waist fracture (B2) 10 cases followed by distal oblique fracture (B1) 5 cases, proximal pole fracture (B3) 4 cases, Trans scaphoid perilunate dislocations (B4) 3 cases. This was found in agreement with the results of the study conducted by Leslie & Dickson.[17]

In a review study conducted by Duckworth et al.[18] Low-energy falls from a standing height were most common cause of scaphoid fracture. Contact sports comprised the next largest group, with football injuries being the most common. Major cause of injury in our study was Road traffic accident (51%) followed by sports injury (18%), work place injuries (16%), house hold injuries (8%), assault injury (7%).

In randomized clinical trials comparing the conservatively and surgically treated patients Bond and Saeden with co-workers found a significantly shorter period of sick leave in patients treated by percutaneous osteosynthesis. Differences in grip strength compared to the uninjured wrist between both groups were statistically insignificant with a better outcome in the surgically treated patients.[9] Adolfson reported 13% mean loss of range of wrist motion in the

conservatively treated group and 6% in the operated group.[19]

Our findings show that internal fixation produces improved functional outcomes and fracture union than conservative care. At the time of the check-up, the surgically treated party saw more complain-free patients and fewer patients with resting discomfort and pain during sports and physical exercises, indicating a significant change in functioning condition with operative treatment. After sufficient screw fixing, a high effective union rating of about 95% can be achieved; however, mispositioning can result in nonunion of scaphoid fractures.[20,21] Nonunion occurs in around 5% to 10% of all fractures, with a higher rate of displaced fractures and proximal pole fractures. The scaphoid's shaky blood circulation is thought to be the cause of this occurrence.[22]

Limitation

We did not compare the time to union in the conservatively and surgically treated patients because, we did not perform CT examination routinely for all patients at the time of follow up evaluation. This was, along with a small sample, the main limitation of our study.

Conclusion

Our research shows that cast treatment has drawbacks such as longer immobilisation period, joint stiffness, decreased grip power, and a longer time to return to work, while operative fixation with Herbert screws has a predictable satisfactory union rate and strong practical outcome.

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