

A Prospective Assessment of the Role of Operative Versus Non-Operative Treatment for Acute Undisplaced or Minimally Displaced Scaphoid Fractures in Adults

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Abstract

Aim: To evaluate the effects of operative versus non-operative treatment for acute undisplaced or minimally displaced scaphoid fractures in adults.

Material & Method: A prospective cohort study of all patients presenting to our OPD/ Casualty with a suspected or confirmed injury to the scaphoid was conducted over a period of 2 years. The initial radiologic examination of the wrist included poster anterior, lateral view, scaphoid view, oblique (45 deg. Pronation) view of the wrist. If the radiology reveals no fracture, wrist was immobilized with below elbow slab & was instructed to review after 15 days.

Results: A total of 50 cases of acute scaphoid fracture (≤ 3 weeks) were seen in a period of 2 years. The average age was 34 years. Most common location of fracture was waist fracture (11 cases) followed by distal oblique fracture (8 cases). All fractures managed by operative procedure (ORIF/per cut. Screw or k-wire fixation) united eventually. But there were 7 cases of non-union with conservative management.

Conclusion: Surgical treatment is favourable for acute non-displaced and minimally displaced scaphoid fractures with regard to functional outcome and time off work; however, surgical treatment engenders more complications. Thus, the long-term risks and short-term benefits of surgery should be carefully weighed in clinical decision-making.

Keywords: Acute scaphoid fracture, Treatment options.

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Introduction

Traditionally, undisplaced, stable scaphoid fractures are treated by casting in short- or long arm-casts. Cast immobilization always involves prolonged immobilization of at least 12 weeks [1], but it has been demonstrated that union can be achieved in greater than 90% of affected individuals with this method [2]. However, prolonged immobilization disrupts collagen homeostasis resulting in loss of normal connective tissue characteristics, which normally allow tendons to glide and the joint capsule to stretch[3]. Clearly this management option can result in complications that may delay rehabilitation, as indicated by some studies in the literature that suggest poorer outcomes after prolonged immobilization[4].

Currently, there is a trend in orthopaedic practice toward early open reduction and internal fixation for the treatment of fractures that traditionally have been treated conservatively'[5-7]. Possible explanations for this trend are increased patient expectations and more complete follow-up, including the emphasis on patient based outcome measures of function and health status[8].

Scaphoid fracture is a difficult fracture to deal with. This tiny twisted bone, 80% covered with joint cartilage and lying angulated by 45° in both planes deep in the wrist, has caused great frustrations among wrist surgeons. Diagnosis is difficult; classification is controversial & there is never ending debate on appropriate treatment protocol [9].

Once diagnosed, there is no clear-cut protocol for deciding appropriate treatment technique. There is controversy regarding whether to be managed conservatively or operatively. Both have their own pros & cons. If managed conservatively, there is again no agreement in the literature as to the optimum position of immobilization (extension, ulnar deviation, neutral) or

type of cast (thumb-spica, interphalangeal [IP] free/IP included, long arm/short arm). Last but the most nuisant are the complications. Scaphoid fracture is known for its complications like AVN, Non-union, arthritis owing to its peculiar blood supply, position in wrist & shape. Management of these complications are again not free of confusions & controversies.

In this study we have tried to evaluate the effects of operative versus non-operative treatment for acute undisplaced or minimally-displaced scaphoid fractures in adults.

Material & Method:

A prospective cohort study of all patients presenting to our OPD/ Casualty with a suspected or confirmed injury to the scaphoid was conducted over a period of 2 years.

Inclusion Criteria:

1. All isolated acute scaphoid fractures (<3 weeks) irrespective of the location.
2. All scaphoid fractures as a part of other acute injuries like peri-lunate instabilities.

Methodology

The attending orthopedic surgeon at the Emergency department or OPD examined all patients with post-traumatic radial sided wrist pain, who were suspected of having a scaphoid fracture. The clinical examinations consisted of three diagnostic tests: A. tenderness in the anatomical snuffbox (ASB); B. scaphoid tubercle tenderness (STT); and C. pain on longitudinal compression of the thumb (LTC). If any of these tests were positive, the patients were referred for a radiographic investigation of the wrist. The initial radiologic examination of the wrist included posteroanterior, lateral view, scaphoid view, oblique (45 deg. Pronation) view of the wrist. If the radiology reveals no fracture, wrist was

immobilized with below elbow slab & was instructed to review after 15 days.

The same series of x-ray was repeated after 2 weeks. All patients were thoroughly counselled & instructed regarding participation in the study. If the patient accepted the invitation, they were enrolled in a prospective database, that included a patient questionnaire that sought information on sex, age, activity when the injury occurred (sport, traffic, work, or other), type of injury (fall, blow, or other), patho-mechanism (extension, flexion, or other), and high-energy trauma (defined as a fall from > 1 m of height), nature of previous treatment received & past medical history etc.

Each patient was closely observed & managed as per the recommended protocol. The pre-operative radiograph, range of motion, intra operative photographs, immediate post-operative radiographs, and range of motion & X-Ray in subsequent follow up were collected.

Primary rigid fixation for all acute scaphoid fractures with consent of the patient. Those patients who were not agreed for operative procedure were managed with scaphoid cast (below elbow POP thumb-spica cast in glass holding manner sparing the IP joint of thumb with thumb in palmar abduction and the wrist in neutral or slight extension).

Post operatively, a posterior POP cast was used to support the wrist for the first two weeks and then, after the removal of sutures, limb was immobilized for 4 weeks in case of fresh fractures & for 6 weeks in case of non-unions. After 6 weeks removable splint was applied for 6 weeks & supervised physiotherapy was started gradually. Up to 12 weeks after surgery, patients were advised to avoid full loading of the wrist and to refrain from contact sports.

All patients were asked to attend for routine review at two and six weeks, 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 was used to assess functional out-come of individual patient after treatment. Patients who failed to attend for the six-month review were sent a questionnaire and encouraged to return for late clinical and radiological assessment. Radiological results were more rigorously defined: fractures were recorded as united, only if cross-trabeculation was present and the fracture line was no longer visible on any of the four standard views.

Results:

A total of 50 cases of acute scaphoid fracture (≤ 3 weeks) were seen in a period of 2 years. The average was 34 years. Study comprise of 82% males & 18% females with fractures. [Table 1] The average delay in presentation was 1 week. This may be due to the fact that Scaphoid fracture is usually missed in initial standard AP & Lateral X-Ray following an acute wrist injury or may be due to negligence of Patients in seeking medical consultation or both. Most common mode of injury was Road traffic accident. Other causes of injuries were sports injury, work place injuries, house hold injuries, assault injury.

Most common location of fracture was waist fracture (11 cases) followed by distal oblique fracture (8 cases). 39 patients were managed conservatively & 11 patients were treated with operative procedure (CRIF/ORIF with K-Wires / Herbert screw). [Table 2]

Mayo wrist score was calculated for all patients in follow up. Mean follow up period was 14 months. Out of all patients managed conservatively 9 patients had poor results (<65), 4 patient had fair results (65-79), 16 patients had good

results (80-89), 10 patients had excellent results (≥ 90). In patients managed operatively poor results was obtained in 1 patient, fair result was obtained in 2 patients, good result was there in 3 cases & excellent result was obtained in 6 cases. [Table 3]

All fractures managed by operative procedure (ORIF/per cut. Screw or k-wire fixation) united eventually. But there were 7 cases of non-union with conservative management.[Table 4]

Table 1: Gender Distribution:

Gender	Right	%	Left	%	Total	%
Male	31	62%	10	20%	41	82%
Female	7	17%	2	4%	9	18%
Total	38	76%	12	24%	50	100%

Table 2: Case Distribution according to Herbert Classification

Herbert Classification	Male	Female	Total
A1	7	0	7
A2	4	2	6
B1	8	4	12
B2	14	2	16
B3	4	1	5
B4	4	0	4

Table 3: Case Distribution according to Mayo Wrist Score

Mayo Wrist Score	Poor	Fair	Good	Excellent	Total
Conservative	9	4	16	10	39
Operative	1	1	3	6	11
Total	10	5	19	16	50

Table 4: Case Distribution according by operative procedures

Operative Procedures	Conservative	Operative	Total
Union	26	17	43
Non-union	7	0	7
Total	33	17	50
% Age of non-union	25%	0%	

Discussion:

The most plausible reason for this heterogeneity is the fact that time to union represents an inaccurate and imprecise measurement, especially for scaphoid fractures[10]. Moreover, the diagnosis of scaphoid union was ascertained with use of radiographs, which have poor reliability[11]. Computed tomography seems to be the most reliable imaging technique for predicting scaphoid fracture

union and should therefore be used as a reference standard for healing[12]. Only one of the included trials[13] involved the use of a computed tomography scan as a standard of care to determine scaphoid fracture-healing.

In contrast to classical teaching, scaphoid fractures do occur even in the elderly population [14], and elderly patients tend to have lower demands of wrist function compared with younger patients. In

addition, it was reported that the preoperative fracture pattern is significantly related to fracture nonunion and delayed union[15].

Vinnars et al[16] compared the direct and indirect costs of internal fixation and cast treatment in acute scaphoid fractures based on one of the included studies[17]and revealed that in non-manuals, total costs were lower after casting than after surgery.

In a review study conducted by Duckworth et al[18] Low-energy falls from a standing height were most common (40.4%) cause of scaphoid fracture. Contact sports comprised the next largest group (n=35, 23.5%), with football injuries being the most common (n=24, 68.5%). Major cause of injury in our study was Road traffic accident (53%) followed by sports injury (16%), work place injuries (14%), house hold injuries (10%), assault injury (7%).

Bohler et al[19] & Clay et al[20] demonstrated that leaving the thumb free clearly allows patients greater hand function. Thus, we used a below elbow POP thumb-spica cast in glass holding manner sparing the IP joint of thumb with thumb in palmar abduction and the wrist in neutral or slight extension for patients managed conservatively.

Davis et al[21] calculated that open reduction and internal fixation would be cost saving compared to casting from a societal perspective. They also found that the late consequences in the form of secondary arthritis were actually less in the operated group than in the conservatively treated group. In a Swiss study Fusseti et al[22] reported that 34% of the individuals treated conservatively could resume work with the wrist immobilized in a cast. Furthermore, Papaloizos et al[23] reported that operative treatment using a minimally invasive technique was initially more expensive than conservative treatment, but markedly decreased the work

compensation cost and was less expensive overall compared to treatment in plaster.

Adolfson [24] reported 13% mean loss of range of wrist motion in the conservatively treated group and 6% in the operated group.

Operative treatment for scaphoid fracture ensures two advantages.[25-27] Firstly, patients will have an immediate fracture stabilization which is beneficial for healing and which allows for early return to normal activity. Secondly, preoperative assessment is insufficient for diagnosing the true nature of the fracture. Displacement and instability that are strongly associated with poor outcome, are most safely diagnosed in the operating theatre.

S. L. Filan, T. J. Herbert[28] in 1996 stated in his review that apart from the one case of screw protrusion, they do not attribute any late non-unions to failure of fixation. Several of our patients sustained further injuries to their wrist within three months of surgery, but in none of these was outcome affected adversely.[29]

Conclusion:

Surgical treatment is favourable for acute nondisplaced and minimally displaced scaphoid fractures with regard to functional outcome and time off work; however, surgical treatment engenders more complications. Thus, the long-term risks and short-term benefits of surgery should be carefully weighed in clinical decision-making.

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