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COMPARISON BETWEEN OPEN REDUCTION INTERNAL FIXATION AND PERCUTANEOUS FIXATION IN THE OUTCOME OF SCAPHOID FRACTURE: A PROSPECTIVE STUDY

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Abstract

Background

Almost 2-7% comprising all the fractures that included scaphoid. Mainly, they were observed in participants of the age group of 20-29 years. It occurs in 10.6 per 100,000 people in a year. Percutaneous screw fixation was possessed to be simpler which helped in the reduction of fracture as well as its fixation and not causing further injuries.

Objectives

The study aimed to compare the Open Reduction Internal Fixation approach to the percutaneous fixation technique for scaphoid fractures to examine the clinical, radiological, and functional results.

Materials and methods

The design of the study was prospective which took place at the Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, Bihar, India. The study was conducted for one year from August 2023 to July 2024. Overall, 40 patients were enrolled in the study.

Results

The average age of all the participants was 34.1±8.3. Most of the participating patients were males. The right side of the side of fracture was present in 18 (45%) participants, while the left side of the fracture was present in 22 (55%).

Conclusion

The study found that a variety of surgical techniques can be used to treat scaphoid fractures. Two of the most effective methods for treating these fractures are the ORIF technique and percutaneous screw fixation with Herbert screws.

Recommendation

The incidence of non-union in acute proximal pole scaphoid fractures managed conservatively is significantly elevated; hence, open reduction internal fixation (ORIF) is advised.

Keywords: *ORIF, Percutaneous fixation, Screw Fixation, Scaphoid fracture.*
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Introduction

Scaphoid fractures account for between 2–7% of all fractures, with men between the ages of 20 and 29 having the highest incidence. About 10.6 cases of it occur for every 100,000 person-years. [1, 2]. The majority of scaphoid fractures in adults (70%) involve the waist, with another 10–20% involving the distal pole of the scaphoid, 5–10% involving the proximal pole, and 5–7% involving the scaphoid tubercle [3].

Surgical surgery uses either an approach of open reduction internal fixation (ORIF) or a technique of percutaneous fixation, which is commonly used to treat displaced, comminuted, and unstable scaphoid fractures. It is debatable how to treat acute scaphoid fractures that are undisplaced or only slightly displaced. In a population that is primarily young and energetic, patients with undisplaced scaphoid fractures are currently thought to require cast immobilization for at least six to twelve weeks, which results in a significant loss of time and productivity [4, 5, 6, 7].

Fixation of percutaneous was observed to be superior to ORIF for these fractures in the sense of improvement rates,

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getting back to various functions, and other co-morbidities including scarring and pain in certain regions [8, 9, 10].

The most common technique for reducing and fixing fractures without further harming the scaphoid blood supply of the wrist area and ligament to be stabilized is percutaneous screw fixation [11, 12, 13, 14].

The study was done to compare the differences between the ORIF and percutaneous fixation techniques for scaphoid fractures in terms of clinical, radiological, and functional results.

Methodology

Study Design

It was a prospective study that took place at the Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, Bihar, India. The study was conducted for one year from August 2023 to July 2024.

Sample Collection

A total of 40 samples were collected in the study.

Inclusion and exclusion criteria

Participants with acute scaphoid fracture, instances of delayed union in scaphoid fractures, fractures that did not heal after twelve weeks of plaster, and scaphoid fracture cases that appeared four weeks to three months following an incident were included. The exclusion criteria were individuals who had dorsal intercalated segmental instability (DISI), osteonecrosis of the proximal scaphoid fragment, tuberosity fracture, or any other related wrist fracture.

Study Procedure

Scaphoid radiographs were taken of each of our cases utilizing both normal and special perspectives. Using the Herbert and Fisher Classification, injuries were ranked. The volar technique was initially used to try percutaneous fixation for all fractures. The ORIF which is also known as the volar approach technique was used when sufficient reduction was not attained. The only exceptions towards participation in this study were patients who were presented late after the injury and had already undergone bone grafting and ORIF. The volar route was used for both ORIF and the percutaneous fixation method.

After surgery, scaphoid casts were used in each of our instances. After the procedure, the sutures were taken out two weeks later, and the cast was immobilized for four more weeks. Six weeks later, a detachable wrist immobilizer brace was used for a further four weeks after the cast was taken off. Exercises for improving hand grips and active wrist range of motion were part of the physiotherapy that all of our patients received. Every two weeks until fracture union became apparent, all patients were assessed. Patients had radiological and clinical examinations with scaphoid profiles at every follow-up. For the presence of fracture in trabeculae with no soreness at the scaphoid tubercle or the anatomical snuff box, the union was deemed to have occurred. Modified Mayo Wrist Score (MMWS) was used for clinical evaluations. Hence, follow-up was done for twelve months.

The patient was asked to squeeze the examiner's index finger to gauge their grip strength, which was then compared to the contralateral side. Grades for grip strength were assigned using the Medical Research Council's (MRC) system. With the use of a goniometer, the range of motion was determined.

Statistical Analysis

The data was collected in Microsoft Excel and statistical software SPSS version 20 was used for the analysis. In the study, categorical parameters were presented as the number of patients along with the percentages. While continuous characteristics were shown as mean and standard deviation.

Ethical Considerations

Informed consent was taken from all participants.

Results

Table 1 depicts patients' demographics. The average age of all the participants was 34.1±8.3. Most of the participating patients were males. The right side of the fracture was present in 18 (45%) participants, while the left side of the fracture was present in 22 (55%). Approaches used for functional outcome of scaphoid fracture were ORIF Volar and Percutaneous Volar in 24 (60%) and 16 (40%) respectively. The time of surgery in days was 23.1±11.2.

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Table 1. Patient's Demographics

Characteristics	Values
Age (in years)	34.1±8.3
Male Participants	28 (70%)
Female Participants	12 (30%)
Side of Fracture	
Right Side	18 (45%)
Left Side	22 (55%)
Approach	
ORIF Volar	24 (60%)
Percutaneous Volar	16 (40%)
Time to Surgery (in days)	23.1±11.2
Time to Union (in weeks)	18.5±4.7
MMWS (in points)	95±10

Data was presented as either mean±SD or n (%)

Table 2 shows Herbert types among participants. Generally, Herbert subtypes included A2, B2, and C. Most of the participants had B2 subtypes. And, only 10 (25%) patients had the C subtype.

Table 2. Herbert Types among Participants

Herbert Type	Values
A2	12 (30%)
B2	18 (45%)
C	10 (25%)

Data was presented as n (%)

Discussion

The present study was done to contrast ORIF with percutaneous fixation in terms of the functional result of scaphoid fractures. Recurrent fractures in the scaphoid can be difficult to diagnose and treat. Scaphoid fractures are particularly common in young persons, who may experience prolonged morbidity and work-related disturbances. In this study, the average time for union of fractures was 18.5 weeks with a deviation of 4.7 weeks.

To enable early wrist mobilization in the treatment of fractures in scaphoid, McLaughlin et al. suggested the ORIF approach, which is in line with our results [15, 16]. Thirteen out of fourteen patients with acute displaced scaphoid waist fractures who had ORIF were using either the volar method or the dorsal approach and experienced fracture union with satisfactory function in 11.5 weeks, according to research by Rettig ME et al [17].

Percutaneous Herbert screw fixation reduces fractures and fixes them without harming the wrist's scaphoid blood supply or stabilizing ligament, as demonstrated by research conducted by two researchers namely Aguilella L et al and Albertsen J et al [18, 19]. In our investigation, fractures repaired with the percutaneous technique showed reduced union time and quicker radiological healing, confirming this claim. In contrast to Shin AY et al., who used the treatment method of cast with volar fixation percutaneously for stable fractures of the scaphoid, the union of fractures took place at 7.1 weeks rather than 11.6 weeks [20].

The average union time for undisplaced fractures in our investigation was 18 weeks. The research conducted by Naranje S et al reported a 100% union rate with the use of Herbert screw fixation percutaneously by dorsal approach among thirty-two patients with either acute or chronic scaphoid fractures. However, in our investigation, we achieved comparable outcomes using percutaneous Herbert screw fixation by volar approach. Additionally, compared to ORIF, patients treated with percutaneous fixation reported greater grip strength, range of motion, and less pain. Percutaneous fixation was superior to ORIF in terms of the rate of union, to get back to daily activities, pain subsidization, strength of the grip, and motions, even if the union rate was close to 100% in cases treated using either technique [21].

Conclusion

The study found that a variety of surgical techniques can be used to treat scaphoid fractures. Two of the most effective methods for treating these fractures are the ORIF technique and percutaneous screw fixation with Herbert screws. When treating fractures of the scaphoid, both percutaneous fixation or reduction in open fractures along with internal fixation tend to be effective in reducing the uniting chances of fractures in the scaphoid. However, the percutaneous

fixation resulted in the joining of the fractures of the scaphoid better than that of ORIF.

Limitations

The limitation of the study was that due to the study's small sample size and diverse patient population, which included patients with acute, chronic, and post-cast failure presentations, the results were distorted since the patients' wrist stiffness following extended wrist immobilization persisted. Additionally, none of the patients in our study had fractures of the proximal pole, which could have skewed the results.

Recommendation

The incidence of nonunion in acute proximal pole scaphoid fractures managed conservatively is significantly elevated; hence, open reduction internal fixation (ORIF) is advised.

Acknowledgment

We are thankful to the patients; without them, the study could not have been done. We are thankful to the supporting staff of our hospital who were involved in the patient care of the study group.

Data Availability

Data is available upon request.

Author contributions

All authors contributed to the design of the research. AA, NKA, and SK collected and analyzed the data. KR and AA wrote the manuscript. NKA edited the paper. All authors read and approved the paper.

List of abbreviations

ORIF- Open reduction internal fixation
MMWS- Modified Mayo Wrist Score
MRC- Medical Research Council

Source of funding

No funding was received.

Conflict of interest

The authors have no conflicting interests to declare.

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