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Original research article

ASSESSMENT OF NEAR-REDUCTION UNION RATES WITH CONSERVATIVE HUMERUS FRACTURE TREATMENT

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Abstract: *This study attempts to determine near-reduction union rates with non-operative treatment of humeral shaft fractures, assess alignment and functional outcomes, and compare these with historic and surgical management approaches.* ***Methods:*** *This was a cross-sectional study at the Department of Orthopedics, Jinnah Postgraduate Medical Centre, Karachi, from January 2024 to June 2024. Twenty patients aged between 17–72 years who suffered from humeral shaft fractures were inducted through consecutive sampling. The conservative treatment mode was applied with a "U"-shaped coaptation splint, where alignment was assessed on radiographs, and functional outcome was achieved with a grading system. Data was analyzed using SPSS-20 regarding union rates, functional recovery, and factors influencing treatment success.* ***Results:*** *In this study of 20 fractures, the initial angulation was 30%, while deviations in sagittal plane alignment in the anterior or posterior direction were seen in 45%. Nineteen of these fractures united within an average time of 42 days in men and 44 days in women; one case showed a delayed union of 13 weeks. Functional results were also excellent, with 60% of patients achieving Grade V function, signifying the absence of pain or limitations, and 35% reporting Grade IV, meaning minimal limitations. Comparisons with historical studies showed that conservative management was similarly successful, with a high union rate and acceptable functional outcome in most cases noted.* ***Conclusion:*** *The conservative approach to treating humeral shaft fractures, characterized by limited immobilization with early mobilization, had a high union rate with excellent functional outcomes equal to surgical interventions. Success with treatment was considerably influenced by patient age, type of fracture, and degree of initial displacement, thus indicating that treatment has to be individualized. This study supports a conservative approach as a modality of choice in managing humeral shaft fractures, emphasizing individuated care for optimum recovery and satisfaction of patients.*

Keywords: humeral shaft fractures, union rates, conservative method, functional outcomes.

Introduction

Humerus fractures are prevalent in both proximal and mid-humeral shafts. They are either open or closed and can be treated by surgical and conservative approaches. Conservative treatment entails the use of slings, braces, or casts, or in other words, the treatment process that does not demand surgery (1). This mode of treatment is usually preferred for relatively stable fractures or patients with sternal fractures and other medical complications that make it impossible to go through surgery. Conservative treatment assessment relies on the union rate and accomplishing near reduction where the bone fragments are almost in their regular positions(2). In their study, Launonene et al. (2012) identified that rates for non-surgical management of proximal humerus fractures were reported as high as 90% in patients with minimally displaced fractures. The study indicated that this sling or functional bracing can provide adequate immobilization so that natural bone healing occurs most of the time with satisfactory alignment(3). A similar meta-analysis by Song et al. (2015) regarding non-operative management for proximal humerus fractures in older people estimated a high union rate of 85-95%, though more importantly, stated that functional outcomes were similar to those achieved with surgical intervention. This is especially important because older adults have an increased surgical risk and might derive more significant benefits from conservative treatment (4). A detailed study by Serrano et al. in 2020 claimed that functional bracing remained the usual conservative treatment for midshaft fractures, with a union rate of over 90%. The most important aspect of this is the early mobilization of the arm, which sets the stage for bone healing and, likewise, the maintenance of muscle strength and joint function. The study further pointed out that the non-surgically treated patients did not differ significantly from the surgically fixed patients on healing time, thereby establishing the effectiveness of conservative measures (5). In 2022, Hartog et al. published a paper on the functional results of non-operatively treated midshaft humerus fractures in a large cohort of patients. This resulted in a union rate of 87%, with non-union or malunion being relatively low in incidence. It was also determined that initial fracture displacement did not significantly bear on the success of conservative treatment, provided the fragments were re-aligned to within an acceptable range. Therefore, These results have led to the view that for most displaced fractures, near-reduction could be achieved without surgical interventions (6). In a 2023 study, Kandemir et al. related that variables like patient age, fracture type, and initial displacement are the most critical factors in determining the likelihood of success with non-surgical management (7). Patients who have significant co-morbidities or who would stand a poor chance of being surgical candidates benefit more from conservative management. On the other hand, this may entail surgical intervention in younger patients or those with active lifestyles and greater functional demands.

The present study aims to assess near-reduction union rates with conservative humerus fracture treatment.

Methodology

After the ethical approval from the institutional review board, this cross-sectional study was conducted at the Department of Orthopedics, Jinnah Postgraduate Medical Centre, Karachi, from January 2024 to June 2024. Through non-probability consecutive sampling, 20 patients aged 17–72 years of either gender who were diagnosed with humeral shaft fractures were included in the present study. Patients with previous humeral shaft fracture history were excluded from the present study. This humeral shaft fracture management study emphasized the meticulous treatment of the humeral neck and epicondyles. The humerus was conceptually divided into five different areas for this study and better elaboration: upper, middle, and lower. Standard treatment included the application of the "U"-shaped coaptation splint to the fractured limb. The patients with low activity did not have general anesthesia administered to them. The following day, checks were carried out on the humeral shaft, plaster cast, limb positioning, circulation, and neurological status. The patient was instructed to keep the coaptation splint for 14 days. Afterward, patients were returned for clinical and radiological follow-up after 14 days to analyze the healing process of the fracture and the functional recovery. A plaster of Paris splint was the last resort, and it was applied under specific guidelines that required 90° flexion at the elbow. After these, clinical and radiological follow-up examinations were conducted every fortnightly. When there is no complication or pain related to the fracture, the recovery strategy involves progressively increasing functional support. Initial and final radiographs were studied to determine the alignment of two planes of the humerus. The union rate was assessed by the disappearance of bony pain and tenderness, absence of abnormal movement at the fracture, and radiological evidence of callus formation in the X-ray. The clinical union was assumed not to have occurred if this had not been achieved within 12 weeks following the injury. The function of the limb was recorded in terms of pain, mobility, and use in daily living and graded as follows: Grade I: Very severe pain with complete restriction and inability to undertake any activities; Grade II: Some reduction in pain but with severe disablement and a significant limitation in daily living; Grade III: disablement preventing regular work or normal activities; Grade IV: slight disablement not restricting any work or everyday responsibilities and being painless; Grade V: No pain or no limitation in activities. They were defined in 1982. SPSS-20 was used for data analysis. Standard deviation was calculated for age, BMI, and crack span. Recurrence and extent were evaluated for orientation, age groups, side of the arm (left/right), residence status, etiology, monthly family pay, Diabetes, hypertension, heftiness, and association.

Results and Discussion

This research took 20 humeral shaft fractures for review, among which six (30%) showed initial fixed front and back angulation, two (10%) had posterior angulation, and twelve (60%) had no significant angulation at the time of their injury. In the sagittal plane, one of the fractures showed anterior angulation (5%), eight showed posterior angulation (40%), and eleven remained unchanged. Nineteen of those fractures achieved union within 42 days for men and 44 days for women, while one case took 13 weeks to unite, representing the delayed union in a patient over 30 years old and 5% of the total unions seen.

Functional outcome was assessed using a grading system in which twelve fractures showed Grade V function, meaning no pain or limitations at all, seven managed 35% Grade IV—minimal limitations—and one fracture in the shoulder of an older woman had Grade III, with marked restrictions and some limitation of daily activities. The younger group recovered without sequelae in ten weeks, but older patients took longer to recover and were less wholly restored to full function.

Comparatively, the non-operative approaches had similar results to those of historical studies. Mendelson followed up 103 humeral shaft fractures with ONE case of delayed union; otherwise, the results were generally quite successful (8). According to Hunter, 60 fractures treated by coaptation splints emphasized adequate healing, with all under 40 recovering within ten weeks (9). Balfour et al. (1982) treated 42 fractures with functional bracing, with 90% earning entire shoulder and elbow motion after four months from injury; the pre-treatment angulation anomalies reduced (10).

In contrast to non-operative management, Heim et al. (11) and Stern et al. reviewed outcomes of surgical interventions for humeral shaft fractures. Heim et al. treated 127 fractures with plates and screws due to a restoration of upper limb function in 85% of patients despite complications like radial nerve palsy, infections, and non-unions. In a report, Stern et al. mentioned complications in 67% of 70 surgically treated fractures, with 64% requiring revision surgery for at least one complication about non-union and adhesive capsulitis; higher complication rates were noted in a series of patients treated with surgical fixation compared to non-operative means (11).

Table 1:Alignment progression in the sagittal plane

Displacement	Number of Fractures	Range of Initial Angulation (degree)	Average	Range of Final Angulation (degree)	Average
Initially Undisplaced					
No change	5	0	-	0	-
Final ant.	0	0	-	2	-
Final post.	1	-	-	-	-
Initially ant.					
Decrease	2	9-15	12	0-10	5
Ant. to post.	0	0	0	0	0
Initially post.					

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Decrease	9	5-45	13	0-10	3
No change	1	5	-	5	-
Increase	2	5-15	10	7-19	13

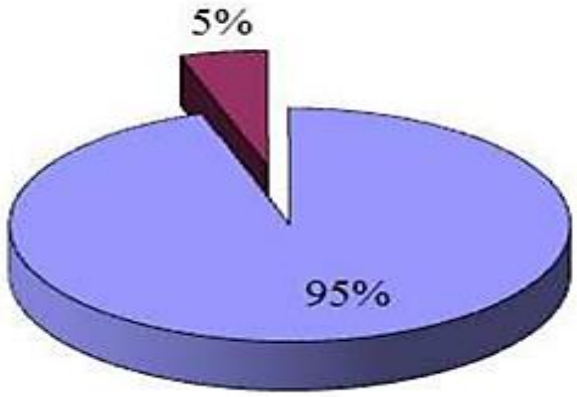

Figure 1: The rate of unionization is depicted in a pie chart

Table 3: Patients by functional grade.

Grade	No. of Patients	Percentage
I	0	0%
II	0	0%
III	1	5%
IV	7	35%
V	12	60%

Conclusion

Due to its anatomy, the successful treatment of humeral shaft fractures requires an approach different from that employed for other long bone fractures. The humerus is forgiving of alignment and rotational discrepancies as it has inherent flexibility because of its anatomy and its relation to scapular movement. There is minimal axial loading at rest, unlike bones that tend to compress. Gravitational forces are helpful. Subtle malunions in soft tissues, especially muscles, occur, which leads to aesthetically pleasing results. Adequate blood supply to the humerus provides better healing in an immobilized setting, avoiding central infections or soft tissue problems. Acceptable aligning criteria for non-operative management, respecting minimal deviation, in anteroposterior 20 degrees and varus/valgus angles 30 degrees. Functional significance and growth potential of the upper limb make the deformities resulting from poor alignment quite consequential to function. Rigid immobilization is, therefore, not generally required in most cases, unlike other fractures. Mild, conservative treatment methods for humeral shaft fractures have high union rates and excellent functional outcomes, advocating for their preferred use when not otherwise dictated by severe indications. This ensures a tailored approach that gives the best result regarding the patient's recovery and satisfaction with humeral shaft fracture management.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate.
It is approved by the department concerned.
Consent for publication
Approved
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Not applicable

Conflict of interest

The authors declared an absence of conflict of interest.

Authors Contribution

ABDIRASHID A JAMA (RMO MS orthopedics)
Final Approval of version
Revisiting Critically
Data Analysis
Drafting & Concept & Design of Study

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