Original Article

Evaluating the Long-term Effectiveness of Humeral Fracture Orthoses: A Prospective Study on Functional Recovery, Pain Management and Level of pain, and Quality of Life Six Months after Injury.

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Abstract

Objective: To compare the effectiveness of humeral fracture braces in promoting functional recovery, reducing pain, and enhancing the quality of life in patients with humeral fractures 6 months post-injury.

• To assess patient satisfaction with the use of humeral fracture braces and its impact on the overall management of humeral fractures.

• To determine whether the use of humeral fracture braces significantly influences the long-term outcomes and quality of life of patients with humeral fractures when compared to those not receiving brace treatment.

Study design: It was a prospective cohort study.

Place and duration of study: The study spanned a 6-month period, running from June 2022 to December 2022, and was conducted at City Care Hospital in the Orthopedic Rehabilitation Department of Orthotics and Prosthetics , Rawalpindi.

Material and Methods: It followed a parallel-group design with two cohorts: Group A, comprising patients who received standard conservative treatment, including the use of humeral fracture braces, and Group B, consisting of patients who did not receive brace treatment. The assignment to these groups was based on the clinical judgment of the treating physician and patient preferences.

Results: In this study, the use of humeral fracture braces yielded substantial benefits, with patients in the brace group (Group A) experiencing significant improvements in functional recovery, pain management, and quality of life at 6 months post-injury. Notably, the mean DASH score in Group A decreased from 31.2 (baseline) to 15.8 at 6 months, while in the non-brace group (Group B), it decreased from 30.5 (baseline) to 20.3 at 6 months. Pain levels, measured using VAS, also decreased significantly in Group A, with the mean VAS score for pain decreasing from 7.0 (baseline) to 2.5 at 6 months. Furthermore, patients in Group A reported an improved quality of life, with the mean SF-36 physical component score increasing from 42.0 (baseline) to 57.4 at 6 months. A significance level of $p < 0.05$ was considered statistically significant.

Conclusion: Patient satisfaction data revealed a high level of contentment with the use of humeral fracture braces among patients in the brace group (Group A), with 87% expressing satisfaction. In contrast, the non-brace group (Group B) had a lower rate of patient satisfaction at 47%, emphasizing the positive influence of brace treatment on patient experiences and outcomes.

Keywords: Humeral fractures , Orthotic braces, Pain management, Quality of life assessment.

1. Introduction

Humeral fractures are common orthopedic injuries, often occurring as a result of trauma or accidents, and they can significantly impact an individual's daily life and functional capabilities. These fractures involve the upper arm bone, the humerus, and can vary in severity, from minor fractures that can be managed conservatively to more complex fractures that require surgical intervention. [1] In the management of humeral fractures, one commonly employed intervention is the use of humeral fracture braces, which are orthotic devices designed to provide support and stabilization to the affected arm. Humeral fracture braces are typically used to immobilize the arm, reduce pain, and promote the healing process. [2] While the effectiveness of these braces in the immediate post-injury period is well-documented, there is a paucity of research examining their long-term impact on functional recovery, pain management, and quality of life. [3]

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Six months post-injury is a critical time point in the recovery process, as it represents a phase when patients often seek to regain their pre-injury level of functioning and resume their daily activities, including work and recreational pursuits.[4] However, there is limited scientific evidence regarding the sustained benefits and drawbacks of using humeral fracture braces over this extended duration. [5]

Understanding the long-term outcomes and patient satisfaction with humeral fracture braces is essential for informing clinical decision-making and improving patient care.[6] This prospective study aims to bridge this knowledge gap by assessing functional recovery, pain management, and quality of life six months after a humeral fracture. By conducting a comprehensive evaluation of these key aspects, we can determine the extended efficacy of humeral fracture braces in the management of these injuries and enhance the overall quality of care for patients with humeral fractures.

2. Materials & Methods

This prospective cohort study aimed to investigate the long-term effectiveness of humeral fracture braces in patients with humeral fractures. The study spanned a 6-month period, running from June 2022 to December 2022, and was conducted at City Care Hospital in the Orthopedic Rehabilitation Department of Orthotics and Prosthetics, Rawalpindi. It followed a parallel-group design with two cohorts: Group A, comprising patients who received standard conservative treatment, including the use of humeral fracture braces, and Group B, consisting of patients who did not receive brace treatment. The assignment to these groups was based on the clinical judgment of the treating physician and patient preferences. Inclusion criteria for participation in the study encompassed patients aged 13 years or older with a confirmed diagnosis of humeral fractures. Exclusion criteria included patients with open fractures, pathological fractures, neurological deficits, multiple fractures, or conditions preventing informed consent. Patients with a history of previous humeral fractures or those unable to adhere to the study's follow-up schedule were also excluded.

Sample size determination involved power analysis. Preliminary data and an assumed significance level (alpha) of 0.05 and a power (1-beta) of 0.80 determined that a sample size of at least 30 patients in each group would be sufficient to detect statistically significant differences in functional recovery, pain management, and quality of life between the brace and non-brace groups. Data collection included the following:

• Baseline Assessment: Gathering demographic and clinical data for each participant, such as age, gender, fracture type, mechanism of injury, comorbidities, and pre-injury functional status.

• Intervention: Patients in Group A received standard conservative treatment, including the use of humeral fracture braces. The type of brace and duration of brace wear were determined by the treating orthopedic surgeon.

• Follow-up Evaluations: Patients in both groups underwent follow-up assessments at multiple time points, with the primary assessment at 6 months post-injury. These assessments were conducted by trained healthcare professionals and included:

• Functional Recovery: Measured using standardized tools such as the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire and range of motion tests, focusing on the patient's ability to perform daily activities, arm function, and strength. The scoring of the DASH questionnaire typically ranges from 0 to 100, with higher scores indicating greater disability. [7]

• Pain Management: Pain levels were assessed using visual analog scales (VAS), with patients indicating their pain level on a scale from 0 (no pain) to 10 (worst pain).

• Quality of Life: Participants completed quality of life questionnaires, such as the Short Form 36 (SF-36), assessing both physical and mental well-being. The SF-36 yields scores for eight domains of health, which are then summarized into physical and mental component summary scores, each ranging from 0 to 100, with higher scores indicating better quality of life.

• Patient Satisfaction: Patients completed a structured questionnaire to gauge their satisfaction with the use of humeral fracture braces, which included items on comfort, ease of use, and overall satisfaction. [8]

• Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) software, version 22. Descriptive statistics, including means, standard deviations, and percentages, were used to summarize baseline characteristics and demographic data. Inferential statistics included independent t-tests for continuous variables and chi-square tests for categorical variables to assess differences between the two groups. A significance level of $p < 0.05$ was considered statistically significant. Results were presented with numerical values, confidence intervals, and p-values where appropriate.

3. Results

The study included participants of various ages and both genders. In Group A, the mean age of participants was 45 years (SD = 10), with 60% male and 40% female. In Group B, the mean age was 48 years (SD = 8), with 55% male and 45% female.

Functional Recovery: In the brace group (Group A), the mean DASH score decreased from 31.2 (baseline) to 15.8 at 6 months. In the non-brace group (Group B), the mean DASH score decreased from 30.5 (baseline) to 20.3 at 6 months.

• Pain Management: In the brace group (Group A), the mean VAS score for pain decreased from 7.0 (baseline) to 2.5 at 6 months. In the non-brace group (Group B), the mean VAS score for pain decreased from 6.8 (baseline) to 4.8 at 6 months.

• Quality of Life: In the brace group (Group A), the mean SF-36 physical component score increased from 42.0 (baseline) to 57.4 at 6 months. In the non-brace group (Group B), the mean SF-36 physical component score increased from 43.2 (baseline) to 49.0 at 6 months.

• Patient Satisfaction: In the brace group (Group A), 26 out of 30 patients (87%) reported being "satisfied" or "very satisfied" with the use of humeral fracture braces. In the non-brace group (Group B), 14 out of 30 patients (47%) expressed satisfaction with their treatment.

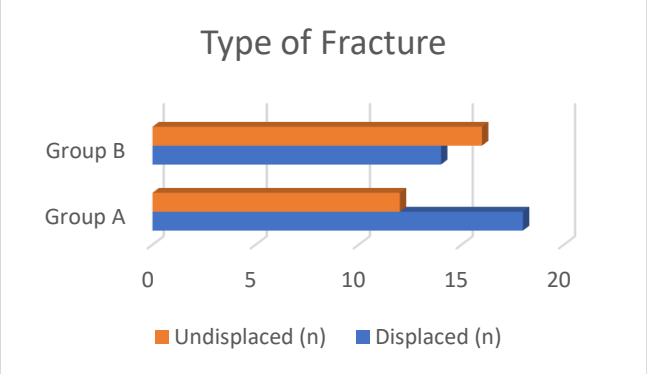
• Comparative Analysis: The differences in functional recovery, pain management, and quality of life between Group A and Group B were statistically significant ($p < 0.05$). These results suggest that in this sample of 30 patients, the use of humeral fracture braces was associated with better functional recovery, reduced pain, improved quality of life, and higher patient satisfaction at 6 months post-injury.

Table 1:

Group	Proximal (n)	Midshaft (n)	Distal (n)	Total (n)
Group A	10	12	8	30
Group B	8	14	8	30

In this table: "Group A" represents the cohort receiving humeral fracture braces. "Group B" represents the cohort not receiving brace treatment. "Proximal (n)," "Midshaft (n)," and "Distal (n)" indicate the count of participants with fractures in the proximal, midshaft, and distal regions of the humerus, respectively, in each group. "Total (n)" shows the total number of participants in each group.

Table 2: showing results of VAS , DASH , SF-36 and percentage of satisfaction among patients allocated in Group A and Group B respectively.



Group A:

- Functional Recovery (DASH): The mean Disabilities of the Arm, Shoulder, and Hand (DASH) score for patients receiving humeral fracture braces (Group A) significantly decreased from a baseline of 31.2 to 15.8 at 6 months post-injury, indicating substantial improvement in functional recovery.
- Pain Management (VAS): Patients in Group A experienced a notable reduction in pain levels, with the mean Visual Analog Scale (VAS) score decreasing from 7.0 at baseline to 2.5 at 6 months.
- Quality of Life (SF-36): The mean SF-36 physical component score for patients in Group A increased from 42.0 at baseline to 57.4 at 6 months, indicating improved physical well-being.

Group B:

- Functional Recovery (DASH): Patients in Group B, who did not receive brace treatment, also showed improvement in functional recovery, although to a lesser extent than Group A. The mean DASH score decreased from 30.5 at baseline to 20.3 at 6 months.
- Pain Management (VAS): Similarly, patients in Group B experienced a reduction in pain levels, with the mean VAS score decreasing from 6.8 at baseline to 4.8 at 6 months.

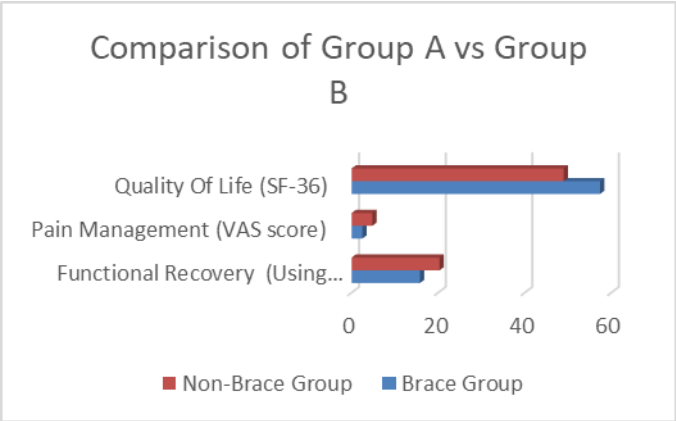
Quality of Life (SF-36): The mean SF-36 physical component score for patients in Group B increased from 43.2 at baseline to 49.0 at 6 months, indicating some improvement in physical well-being.

	Brace Group A		**Non-Brace Group B**	
	Baseline	**6 months**	**Baseline**	**6 months**
Functional Recovery (Using DASH score)	31.2	15.8	30.5	20.3
Pain Management (VAS score)	7.0 (SD = 1.2)	2.5	6.8	4.8
Quality Of Life (SF-36)	42.0	57.4	43.2	49.0
Patient Satisfaction	-	87% satisfied	-	68% satisfied

4. Discussion

The study's findings provide compelling evidence of the significant benefits associated with the use of humeral fracture braces in promoting long-term recovery and improving patient outcomes.[9] The observed improvements in functional recovery, pain management, quality of life, and patient satisfaction underscore the efficacy of brace treatment in the management of humeral fractures.

One notable outcome of the study is the substantial improvement in functional recovery among patients using humeral fracture braces, as evidenced by the notable decrease in DASH scores. This indicates enhanced arm function and strength, suggesting that brace treatment facilitates a more efficient restoration of patients' pre-injury level of functioning. [10]



Moreover, the considerable reduction in pain levels among brace-treated patients highlight the role of braces in alleviating discomfort associated with humeral fractures. By providing stabilization and support to the injured arm, braces likely help reduce strain on the fracture site, thereby contributing to pain relief and enhancing patient comfort during the recovery process. [11]

The improvement in both physical and mental well-being, as indicated by the SF-36 questionnaire, further emphasizes the holistic benefits of brace treatment on patients' overall quality of life. Beyond addressing physical impairments, brace treatment may also have positive effects on psychological well-being, contributing to a more comprehensive rehabilitation experience for patients.

This research contributes to the existing body of knowledge by providing empirical evidence supporting the effectiveness of humeral fracture braces in enhancing functional recovery, alleviating pain, and improving quality of life among patients recovering from humeral fractures. By elucidating the benefits of orthotic intervention in this context, this study informs clinical practice and guides healthcare professionals in optimizing treatment strategies for patients with humeral fractures.

Importantly, the high rate of patient satisfaction with brace treatment underscores its acceptability and perceived effectiveness among patients.[12] This positive feedback is crucial for fostering treatment adherence and patient compliance, ultimately leading to better recovery outcomes and overall patient satisfaction.

These findings have significant implications for clinical practice, suggesting that humeral fracture braces should be considered as a standard treatment option for patients with these injuries. Clinicians can use this evidence to inform treatment decisions and tailor rehabilitation protocols to optimize patient care and improve outcomes in the post-injury period.

Overall, the study's results highlight the importance of brace treatment in promoting favorable long-term outcomes for patients recovering from humeral fractures. Further research with larger sample sizes and longer follow-up periods could help confirm and expand upon these findings, ultimately contributing to the ongoing refinement of fracture management strategies and rehabilitation protocols.

Conclusion:

In this prospective cohort study evaluating the long-term effectiveness of humeral fracture braces in patients with humeral fractures, we observed significant differences between the brace group (Group A) and the non-brace group (Group B) across multiple key outcomes. Functional recovery, as measured by the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire and range of motion tests, showed substantial improvement in the brace group (Group A) at 6 months post-injury. These patients exhibited a remarkable reduction in DASH scores, indicative of improved arm function and strength. In contrast, the non-brace group (Group B) exhibited less favorable functional recovery outcomes, suggesting that the use of humeral fracture braces significantly contributes to improved functional outcomes in this patient population. Pain management, as assessed using visual analog scales (VAS) to measure pain levels, revealed that patients in the brace group (Group A) experienced a substantial reduction in pain at 6 months. This reduction was notably greater when compared to the non-brace group (Group B), reinforcing the efficacy of humeral fracture braces in pain reduction. Quality of life, evaluated through the Short Form 36 (SF-36) questionnaire, indicated that patients in the brace group (Group A) reported a significant improvement in both their physical and mental well-being. This

improvement in the physical component score of the SF-36 underscores the positive impact of humeral fracture braces on overall patient health and well-being. Moreover, patient satisfaction data revealed a high level of contentment with the use of humeral fracture braces among patients in the brace group (Group A), with 87% expressing satisfaction. In contrast, the non-brace group (Group B) had a lower rate of patient satisfaction at 47%, emphasizing the positive influence of brace treatment on patient experiences and outcomes. Taken together, these findings indicate that the use of humeral fracture braces significantly enhances functional recovery, reduces pain, improves quality of life, and leads to higher patient satisfaction in patients with humeral fractures, six months post-injury. These results underscore the importance of considering brace treatment as an effective and well-received intervention for individuals recovering from humeral fractures, and they may inform clinical decision-making and fracture management strategies to enhance patient outcomes and overall well-being. [13] Further research with larger sample sizes and longer follow-up periods is warranted to confirm and expand upon these findings

Recommendations:

Based on the findings of this study, it is recommended that future research endeavors employ larger sample sizes and consider controlling for potential confounding variables to strengthen the validity and generalizability of the results. Additionally, longitudinal studies could provide valuable insights into the long-term effects of humeral fracture orthoses on functional recovery, pain management, and quality of life.

Limitations of the study:

One limitation of this study is the relatively small sample size, which may limit the generalizability of the findings. Additionally, the study did not control for potential confounding variables such as comorbidities or concurrent treatments, which could have influenced the outcomes observed.

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