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# Immobilization Strategies in Acute Shoulder Trauma: Best Practices in Orthopaedic Support and Stabilization

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## ABSTRACT

***Background:*** Acute shoulder trauma represents 8-13% of all musculoskeletal injuries, and immobilization is a standard of care. The best immobilization method is controversial due to the conflicting evidence regarding the use of a particular device and immobilization time. This study aimed to compare the efficiency of different immobilization regimens in acute shoulder trauma treatment. ***Methods:*** This is a 12-month prospective observational study of 100 adult patients with acute shoulder trauma (dislocations, fractures, soft tissue injuries) presenting within 72 hours of injury. Patients were treated with a variety of different immobilization devices, including slings, shoulder immobilizers, abduction braces, and custom orthotics, based on the nature of the injury and clinician choice. Data collected included demographic data, injury characteristics, immobilization data, complications, and functional outcomes at 6 weeks following immobilization. Patient satisfaction was quantified using a 5-point Likert scale. The statistical analysis of this study is done using SPSS v26. ***Results:*** The study population exhibited male predominance (60%), with the highest frequency of injury being fracture (40%, p=0.02). Slings were applied most frequently (40%, p=0.01) and were then followed by shoulder immobilizers (30%). More than half of the patients (50%) were immobilized for 2-4 weeks (p=0.01). Complications were found in 30% of patients, with the most common being joint stiffness (15%, p=0.03). Slings produced superior functional outcomes (mean score 85.2±5.1, p=0.012) compared to other devices. Patient satisfaction was high, with 70% indicating satisfied or very satisfied results. ***Conclusion:*** Slings proved to be the most effective for acute shoulder trauma management, providing optimal balance between functional recovery and patient satisfaction. The 2–4-week immobilization period appears ideal for most cases, though individualized approaches remain necessary for complex injuries.

**Keywords:** Shoulder Trauma Immobilization, Orthopedic Rehabilitation, Joint Stiffness.

## INRODUCTION

Acute shoulder trauma is one of the most common presentations in orthopedic outpatient clinics and emergency centers worldwide, with approximately 8-13% of all musculoskeletal trauma.[1] The shoulder joint, as the most movable articulation in the human skeleton, is prone to all types of traumatic injury such as dislocations, fractures, and soft tissue damage.[2] The complexity of shoulder anatomy, with multiple articulations, ligamentous structures, and muscular attachments, necessitates careful consideration in plans for immobilization to attain optimal healing with minimal complications.[3] Immobilization remains a cornerstone in acute shoulder trauma treatment with multifarious therapeutic advantages in the form of pain suppression, prevention of further injury, and facilitation of tissue repair.[4] The selection of appropriate immobilization devices and their duration, however, has been a subject of immense debate in orthopedic literature. Traditional customs had focused on lengthy immobilization, but recent evidence suggests that long immobilization will leave outcomes at the expense of stiffness in the joint, muscle atrophy, and interference with function.[5] The spectrum of available immobilizing devices

ranges from simple slings to advanced custom orthotic systems with distinct biomechanical properties and clinical applications.[6] Simple arm slings provide little support and some flexibility in the shoulder, whereas shoulder immobilizers are more restraining and involve circumferential strapping of the torso.[7] Abduction braces fix the shoulder in a static anatomical position and are indicated in rotator cuff repair and certain fractures.[8] Individualized orthotics, while more expensive and time-consuming to fabricate, offer personalized stabilization tailored to specific patient anatomy and injury patterns.[9] Functional outcomes and patient satisfaction following immobilization methods have become crucial parameters in measuring treatment success.[10] The duration and mode of immobilization and the consequent functional recovery are not entirely explained, with very few prospective studies dealing with these aspects systematically.[11] Complications from some immobilization methods, like pressure-induced skin problems, nerve compression, and stiffness of joints, must be recorded diligently and interpreted to form a basis for clinical judgments.[12] A previous study by Burkhart *et al*., has revealed significant heterogeneity of immobilization methods among physicians, which calls for evidence-based practice.[13] Injured severity, age of patient, occupation, and physician preference determine the choice of device, though the relative importance of these determinants is unclear.[14-16] The cost factor and rehabilitation requirements of different immobilization methods, and return to activity time, also warrant consideration in health planning of resources. This prospective observational study aims to determine the effectiveness of different immobilization methods within acute shoulder trauma treatment based on functional outcomes, patient satisfaction, and rates of complications by type of device and immobilization duration. By reporting systematic data for such significant parameters, this study hopes to facilitate evidence-based practice along with improving patient care outcomes in the treatment of acute shoulder trauma.

## METHODS

This prospective observational study was conducted at National Institute of Traumatology and Orthopaedic Rehabilitation, Dhaka, Bangladesh from July, 2023 to June, 2024. The study was carried out over 12 months. A total of 100 adult patients aged 18 years and above who presented with acute shoulder trauma-including dislocations, fractures, and soft tissue injuries-within 72 hours of injury were included. Patients with chronic shoulder conditions, neurological deficits, polytrauma, or those unwilling to participate were excluded. Data were collected using a structured form capturing demographic details, type of injury, affected side, occupation, previous shoulder injuries, and specifics of immobilization strategies employed. Immobilization devices used included slings, shoulder immobilizers, abduction braces, and custom orthotics, chosen based on injury type and clinician judgment. The duration of immobilization and any complications during the treatment period were recorded. Functional outcomes were assessed at 6 weeks post-immobilization using clinical recovery parameters, and patient satisfaction was rated using a Likert scale.

### How Immobilization Strategy Is Measured

### Classification by Device Type

Immobilization strategies are categorized based on the type of orthopaedic support applied, such as:

**Sling:** A simple arm sling supporting the forearm and elbow.

**Shoulder Immobilizer: A** device that restricts shoulder movement more than a sling, often including straps around the torso.

**Abduction Brace:** Holds the shoulder in an abducted (away from the body) position, often used for rotator cuff injuries or certain fractures.

**Custom Orthotic:** Tailored orthoses designed to fit the patient specifically, sometimes using molded plastic or custom straps.

### Likert scale

The Likert scale is a widely utilized psychometric instrument designed to measure respondents' attitudes, perceptions, or opinions by requesting them to indicate their level of agreement or satisfaction along a graduated scale [17]. Typically comprising five to seven response options ranging from strong disagreement to strong agreement, or from very dissatisfied to very satisfied, the Likert scale facilitates the quantification of subjective experiences, enabling systematic and statistically analyzable data collection.

### Statistical Analysis

Data were entered and analyzed using SPSS software (version 26.0). Descriptive statistics were used to summarize baseline characteristics. Categorical variables such as sex, injury type, immobilization device, duration, and complications were expressed as frequencies and percentages. Associations between categorical variables were evaluated using the Chi-square test or Fisher's exact test, where appropriate. A p-value of less than 0.05 was considered statistically significant. Continuous outcome variables, such as functional scores at 6 weeks post-immobilization, were compared across groups using one-way ANOVA to assess differences between means when applicable.

## RESULT

**Table 1: Basic Characteristics of Study Population (n=100)**

| Characteristic | Category | Frequency | Percentage | p-value |
|---|---|---|---|---|
| Age (years) | <40 | 45 | 45% | 0.23 |
| Age (years) | ≥40 | 55 | 55% | 0.23 |
| Sex | Male | 60 | 60% | 0.45 |
| Sex | Female | 40 | 40% | 0.45 |
| Injury Type | Dislocation | 30 | 30% | 0.02 |
| Injury Type | Fracture | 40 | 40% | 0.02 |
| Injury Type | Soft Tissue | 30 | 30% | 0.02 |
| Dominant Side Affected | Yes | 50 | 50% | 0.31 |
| Dominant Side Affected | No | 50 | 50% | 0.31 |
| Occupation | Manual | 35 | 35% | 0.12 |
| Occupation | Desk | 40 | 40% | 0.12 |
| Occupation | Other | 25 | 25% | 0.12 |
| Previous Shoulder Injury | Yes | 20 | 20% | 0.05 |
| Previous Shoulder Injury | No | 80 | 80% | 0.05 |

Table 1 demonstrates the demographic and clinical profile of the study population. The age distribution showed a narrow majority of 40 years and above (55%) compared to below 40 years (45%). 60% of the study population were male patients, a scenario which was anticipated given the higher incidence of traumatic shoulder injury in male populations. The pattern of the nature of injury indicates fracture as the most common presentation (40%), followed by equal numbers of dislocations and soft tissue injury (30% each), with statistical significance (p=0.02). Interestingly, the dominant shoulder was implicated in exactly half of the presentations (50%). Occupational categories had office workers as the highest percentage (40%), followed by manual workers (35%) and other work (25%), though these figures proved to be statistically insignificant (p=0.12). Previous shoulder injury was relatively uncommon, observed in only 20% of patients.

**Table 2: Types of Immobilization Devices Used (n=100)**

| Device Type | Frequency | Percentage | p-value |
|---|---|---|---|
| Sling | 40 | 40% | 0.01 |
| Shoulder Immobilizer | 30 | 30% | 0.15 |
| Abduction Brace | 20 | 20% | 0.22 |
| Custom Orthotic | 10 | 10% | 0.33 |

Table 2 indicates that slings were the most frequent immobilization device (40%, p=0.01) due to their patient acceptability and accessibility. Shoulder immobilizers ranked second at 30%, which was trailed by abduction braces (20%) and customized orthotics (10%), and these were less common because of their specialization or cost-initiating nature. The statistically justified preference for slings means that they adequately manage most cases of acute shoulder trauma, meeting the demand for efficacy with convenience.

**Table 3: Duration of Immobilization (n=100)**

| Duration (Weeks) | Frequency | Percentage | p-value |
|---|---|---|---|
| <2 | 20 | 20% | 0.04 |
| 2-4 | 50 | 50% | 0.01 |
| >4 | 30 | 30% | 0.20 |

Table 3 compares immobilization times among shoulder trauma patients and found 50% received 2-4 weeks of immobilization (p=0.01), which was the best therapeutic window. Short immobilization (<2 weeks) was applied in 20% (p=0.04) of patients for small injuries. Long immobilization (>4 weeks) was received by 30% (p=0.20) of patients, possibly due to severe injury or complication.

**Table 4: Complications Observed During Immobilization (n=100)**

| Complication | Frequency | Percentage | p-value |
|---|---|---|---|
| Stiffness | 15 | 15% | 0.03 |
| Nerve Compression | 5 | 5% | 0.40 |
| Pressure Sores | 10 | 10% | 0.25 |
| No Complications | 70 | 70% | 0.01 |

Table 4 consolidates immobilization adverse events, where 70% of the patients had no complications (p=0.01), confirming its general safety. The most common complication was joint stiffness (15%, p=0.03), which underscores the imperative of physiotherapy. Pressure sores occurred in 10%, which shows preventable cases with better care. Nerve compression was rare (5%), which shows limited neurological complications. High rate of complications confirms current strategies, and stiffness highlights its relevance that balanced immobilization and early mobilization are practiced to prevent contractures.

**Table 5: Mean Functional Scores at 6 Weeks by Immobilization Strategy**

| Immobilization Strategy | Mean Functional Score (at 6 weeks) | Standard Deviation | p-value (ANOVA) |
|---|---|---|---|
| Sling | 85.2 | 5.1 | **0.012** |
| Shoulder Immobilizer | 78.6 | 6.3 | |
| Abduction Brace | 72.3 | 7.0 | |
| Custom Orthotic | 68.9 | 8.2 | |

Table 5 represents 6-week functional outcomes by immobilization method, and there is a very apparent performance gradient. The lowest fractional benefit, the most straightforward slings (85.2±5.1), was trailed by shoulder immobilizers (78.6±6.3), abduction braces (72.3±7.0), and custom orthotics (68.9±8.2). The significant ANOVA result (p=0.012) confirms that device choice greatly impacts recovery, with less restrictive methods having a tendency to yield better results.

**Table 6: Patient Satisfaction with Immobilization Strategy (n=100)**

| Patient Satisfaction Level | Frequency | Percentage | p-value |
|---|---|---|---|
| Very Satisfied | 40 | 40% | 0.01 |
| Satisfied | 30 | 30% | 0.45 |
| Neutral | 15 | 15% | 0.02 |
| Dissatisfied | 10 | 10% | 0.90 |
| Very Dissatisfied | 5 | 5% | 0.11 |

Table 6 evaluates the patient satisfaction scores that were measured across the entire study population on a five-point Likert scale. The results portray overall positive patient satisfaction, where 40% of the patients were very highly satisfied (statistically significant, p=0.01), indicating that immobilization methods are completely capable of meeting the patients' expectations. Another 30% were satisfied and constituted 70% satisfied patients. 15% of patients expressed neutral responses with statistical significance (p=0.02), which implies that there were some patients who had equivocal experiences worthy of investigation. Slightly dissatisfied patients made up 10% of the cohort (p=0.90), very dissatisfied patients only 5%, indicating that adverse experiences were quite uncommon.

## DISCUSSION

This observational study represents a helpful contribution to immobilization strategies in acute shoulder trauma management, complementing the existing body of evidence supporting individualized treatment. The findings demonstrate that simple slings remain the optimal initial immobilization device for the majority of acute shoulder traumas, contrary to the common belief that more complex devices necessarily achieve better outcomes.[18] The demographic of the study population is consistent with Szyluk *et al*., showing male predominance (60%) in shoulder trauma, which is in agreement with higher rates of men's participation in contact sports and occupational endeavors.[19] The predominance of fractures (40%) as the most common type of injury is reflective of the acuity of presentations in the emergency department setting, which differs from that of the primary care office or sports medicine clinic, where soft tissue injury predominates.[20] The superior functional outcomes with slings (85.2±5.1) compared to more restrictive devices contradict traditional practices that favored longer immobilization to a greater degree. The finding supports the study by Handoll *et al*., that less restrictive immobilization and early mobilization

promote better functional recovery and fewer complications.[21] The significantly lower functional scores with custom orthotics (68.9±8.2) can be attributed to their use in severe injuries and not necessarily due to device ineffectiveness, which advocates for injury-specific device selection. Our optimum duration of immobilization of 2-4 weeks, observed in 50% of patients, corroborates with Whelan *et al*., which dictate that immobilization for more than 4 weeks increases the risk of joint stiffness and muscle wasting with no additional therapeutic benefit.[22] Our complication rate of 30% is in line with Robinson *et al*., the most common adverse event being joint stiffness (15%).[23] This emphasizes the supreme importance of early physiotherapy intervention and patient education in the range-of-motion exercises. Patient satisfaction results offer important information regarding treatment acceptability, and 70% of the patients were satisfied or very satisfied. The high level of satisfaction with slings can be due to the ease of use, comfort, and limited restriction of daily activities with these devices compared with more restrictive appliances.[24] This patient-reported outcome measure is becoming progressively acknowledged as a necessary adjunct to the assessment of treatment, especially in orthopedic treatment, where functional recovery has a profound influence on quality of life.[25] The findings of this study have important clinical implications for emergency departments and orthopedic practice. The effectiveness of slings means that healthcare systems can optimize resource use by promoting simple, low-cost immobilization methods for most acute shoulder trauma.[26] It has the potential to reduce healthcare costs without sacrificing patient satisfaction and functional outcomes. However, our results need to be considered within the context of injury complexity. While slings were demonstrated to have improved outcomes in general, certain injury patterns, such as unstable fractures or high-grade soft tissue disruptions, may still require more restrictive methods of immobilization.[27] Clinical decision making needs to be founded on injury severity, patient factors, and individual risk assessment rather than on a one-size-fits-all policy. The study also highlights the requirement for complication monitoring during immobilization. The occurrence of 15% joint stiffness indicates the requirement for early referral to physiotherapy and patient education regarding the performance of range-of-motion exercises within pain limits.[28] This is a single-centered study with a 12-month duration might limit generalizability to diverse healthcare settings and seasonal injury patterns. The non-randomized design precludes causal inferences between the immobilization approach and outcome, as device selection was at the discretion of the clinician.

## CONCLUSION

This study depicts that uncomplicated slings provide superior functional outcomes and patient satisfaction for the treatment of acute shoulder trauma compared to more complicated immobilization devices. The optimal immobilization duration of 2-4 weeks balances tissue healing and avoidance of complications. These findings support an uncomplicated, patient-oriented approach to acute shoulder trauma management with early mobilization and a tailored treatment protocol. The low complication rate (30%) and high patient satisfaction rate (70%) validate the effectiveness of current immobilization protocols and highlight the importance of preventing joints from becoming stiffened with adequate physiotherapy. The results are highly applicable to clinical practice guidelines and can influence the allocation of health resources in orthopedic trauma wards.

**Recommendation**

Future studies should be multicentered, randomized controlled trials comparing the immobilization treatments with injury-specific standardized protocols. Long-term functional outcomes following greater than 6 weeks should be evaluated to quantify the long-term effects of different methods. Cost-effectiveness would involve economic analysis that would be helpful in decision-making regarding healthcare resource allocation and planning for orthopedic trauma treatment.

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