

## ORIGINAL ARTICLE

**Comparison of Conservative and Surgical Treatment of Grade III Acromio-Clavicular Dislocation**ADNAN LATIF MALIK<sup>1</sup>, SAIF UR REHMAN<sup>2</sup>, SAFDAR IQBAL<sup>3</sup>, MUHAMMAD ZAIN-UL-ABIDIN<sup>4</sup>, FARHAN ASLAM<sup>5</sup>, ABRAR-UL-HAQ<sup>6</sup><sup>1</sup>Associate Professor of Orthopedic Surgery, Sir Ganga Ram Hospital, Lahore<sup>2</sup>Senior Registrar of Orthopedic Surgery, Sir Ganga Ram Hospital, Lahore<sup>3</sup>Clinical fellow at HULS Combined Military Hospital, Lahore<sup>4,5,6</sup>Post Graduate Resident (PGR) at Orthopedic Department of Sir Ganga Ram Hospital, LahoreCorrespondence to: Adnan Latif Malik, Email: [dr.adnanmalik@hotmail.com](mailto:dr.adnanmalik@hotmail.com), Cell: +923335518794**ABSTRACT****Objectives:** To compare the mean of constant score between conservative and surgical treatment in patients with Grade-III acromio-clavicular dislocation.**Design:** This was an RCT (randomized controlled trial).**Study Settings:** It was conducted at the Orthopedic Department of Sir Ganga Ram Hospital Lahore over 1 year from July 2020 to June 2021.**Study Procedure:** This study involved 94 both male and female patients aged between 18-60 years presenting in orthopedic emergency with Grade-III AC dislocation. These patients were assigned into two treatment groups randomly. Patients in Group-A were managed conservatively while those in Group-B were managed surgically with hook plate. Outcome variable was functional shoulder outcome which was assessed after 6 weeks of treatment using constant score. An informed written consent was gained from every patient.**Results:** The mean age of the patients was 29.9±9.5 years. Majority (n=44, 46.8%) of the patients were young and were aged between 18-30 years followed by 31-40 years (36.2%) and 41-50 years (17.0%). There were 89 (94.7%) male and 5 (5.3%) female patients in the study group with a male to female ratio of 17.8:1. The mean BMI of these patients was 25.2±2.2 Kg/m<sup>2</sup>. Right side was more frequently involved (54.3%) as compared to the left side (45.7%). Upon follow-up, the mean constant score was significantly higher in patients treated surgically as compared to conservative treatment (86.72±6.75 vs. 67.43±8.93; p-value<0.001). Similar substantial difference was observed through different subgroups based on patient's age, gender, BMI and side involved.**Conclusion:** Surgical treatment of patients with Grade-III acromioclavicular dislocation was associated with better functional shoulder outcome as compared to conservative treatment and should be preferred in future practice if there is no contraindication to surgery.**Keywords:** Grade-III AC Dislocation, Conservative Treatment, Surgical Treatment, Shoulder Function**INTRODUCTION**

Acromioclavicular (AC) joint is a diarthrodial joint which is formed between the lateral end of clavicle and the acromion process of scapula.<sup>1</sup> It serves as an important link between shoulder girdle and axial skeleton while allowing a complex range of motion thanks to complex musculoligamentous structure of shoulder and AC joint.<sup>1,2</sup> Due to its pivotal role in the stabilization of sternoclavicular, scapulothoracic and glenohumeral joints,<sup>3</sup> injury of the AC joint frankly affects the function and stability of these joints altogether.<sup>1,3</sup> The injury of the AC joint usually results from a direct blow to the outer aspect of shoulder in an adducted arm.<sup>1</sup> Tossy et al. and Allman initially described the classification of acromioclavicular injuries as types I, II, and III in the 1960s. In 1984, Rockwood modified this classification to include types IV, V, and VI.<sup>4</sup> Grade I and II dislocations can be treated non-operatively with an appropriate sling while surgery is recommended treatment option for Grade IV, V and Grade VI injuries.<sup>4</sup> Treatment of Grade-III injuries is an area of controversy where most of the surgeons prefer conservative treatment. However, Mouhsine et al.<sup>5</sup> (2003) observed that 27.0% of patients with AC joint injuries suffered chronic shoulder and AC joint pain after conservative treatment at median follow-up of 26 months. Although, there are many reports on surgical management of these injuries, availability of multiple techniques and variable results in the literature makes the treatment choice difficult.<sup>3,4</sup>

Gstettner et al.<sup>6</sup> (2008) reported that operative treatment was better and was associated with higher mean constant score; the higher the better (90.4±12.9 vs. 80.7±17.4; p<0.05) as compared to conservative treatment in patients of Grade III AC dislocation. In the light of results of the study by Gstettner et al.<sup>6</sup> operative treatment appears to give better functional shoulder outcome as compared to conservative treatment and it can be advised that in future practice, patients with Grade-III AC dislocation should be offered surgical treatment. However, before adopting this practice in routine, it is worth mentioning that there are studies which report

better functional outcome with conservative treatment instead. Canadian Orthopedic Trauma Society trial<sup>7</sup> (2016) reported that surgical treatment was associated with poor outcome in terms of lower mean constant score (51 vs. 75; p<0.001; SD not given) as compared to conservative treatment. Joukainen et al.<sup>8</sup> (2016) also observed poor outcome with surgical treatment in terms of significantly lower mean constant score (78±21 vs. 87±6.5; p<0.05) as compared to conservative treatment. Owing to this controversy in the existing literature and absence of local such research, the objective of the present study was to reprise this trial and further establish the outcome of conservative versus surgical management of such patients.

**Study Procedure:** The present study was a randomized controlled trial carried out at Orthopedic Department of Sir Ganga Ram Hospital Lahore over 1 year from July 2020 to June 2021. Sample size of 94 cases (47 cases in each group) was calculated with 80% power of test and 95% confidence interval (2-sided) while taking expected mean constant score to be 78±21 with operative versus 87±6.5 with conservative treatment of Grade-III AC dislocation.<sup>8</sup> Non-probability, consecutive sampling was done and patients of both genders with ages in the range of 18-60 years presenting with grade-III AC dislocation (patients presenting with pain over the top of shoulder after a history of fall or road side accident with an unstressed X-ray of shoulder AP view revealing ≥5 mm elevation of AC joint) were included after taking an informed written consent. Patients were considered if they presented with in first 72 of injury. Those with concomitant injury of the shoulder or rotator cuff were excluded. We also excluded obese (BMI≥30Kg/m<sup>2</sup>) and diabetic (fasting blood sugar≥110mg/dl) patients. All the patients had comprehensive clinical assessment comprising of detailed history and clinical examination. These patients were treated either conservatively (the arm was rested in a collar & cuff sling for 3 weeks followed by physiotherapy consisting of graduated exercises) or by surgery (open reduction and hook-plate fixation). Collar and cuff sling was applied post-operatively which was removed after 2 weeks and physiotherapy was started consisting

of graduated exercises) depending upon study group after random allocations using lottery method. Outcome was recorded in terms of mean constant score measured after 6 weeks of treatment. All the surgeries were performed by a single surgical team and all the pre and post-operative care as well as patient evaluation of constant score was done by a single researcher to eliminate bias. Confounding factors were addressed by exclusion. The sampled data was analyzed using Statistical Package for the Social Sciences (SPSS) version 23.0. Mean and standard deviation was determined for numerical variables like age, BMI and constant score while categorical variables such as gender and side (right and left) were described in frequency and percentage. Mean of constant score was compared between the study groups using t-test considering  $p \leq 0.05$  as significant. Data was stratified for age, gender, BMI and side (right and left) to defy effect modifiers. Following stratification t-test was re-applied taking  $p \leq 0.05$  as significant.

### RESULTS

The age of the patients with grade-III AC dislocation ranged from 18 years to 50 years (mean age:  $29.9 \pm 9.5$  years). Majority ( $n=44$ , 46.8%) of the patients were young and were aged between 18-30 years followed by 31-40 years (36.2%) and 41-50 years (17.0%). There were 89 (94.7%) male and 5 (5.3%) female patients in the study group with a male:female ratio of 17.8:1. The BMI of these individuals ranged from  $20.6 \text{ Kg/m}^2$  to  $29.9 \text{ Kg/m}^2$ . The mean BMI was  $25.2 \pm 2.2 \text{ Kg/m}^2$ . Right side was more frequently involved (54.3%) as compared to the left side (45.7%) as presented in Table 1. Both the study groups were comparable in terms of mean age ( $p$ -value=0.855), mean BMI ( $p$ -value=0.604) and age ( $p$ -value=0.901), gender ( $p$ -value=0.646), side ( $p$ -value=0.836) and BMI ( $p$ -value=0.833) groups distribution as presented in Table 2.

Table 1: Demographic Features of Studied Patients

| Characteristic            | Study Cohort<br>n=94 |
|---------------------------|----------------------|
| Age (years)               | 29.9±9.5             |
| • 18-30 years             | 44 (46.8%)           |
| • 31-40 years             | 34 (36.2%)           |
| • 41-50 years             | 16 (17.0%)           |
| Gender                    |                      |
| • Male                    | 89 (94.7%)           |
| • Female                  | 5 (5.3%)             |
| BMI (Kg/m <sup>2</sup> )  | 25.2±2.2             |
| • 20-25 Kg/m <sup>2</sup> | 37 (39.4%)           |
| • 25-30 Kg/m <sup>2</sup> | 57 (60.6%)           |
| Side                      |                      |
| • Right                   | 51 (54.3%)           |
| • Left                    | 43 (45.7%)           |

Table 2: Demographic Features of Studied Groups n=94

| Characteristic            | Conservative Treatment<br>n=47 | Surgical Treatment<br>n=47 | P value |
|---------------------------|--------------------------------|----------------------------|---------|
| Age (years)               | 30.1±9.6                       | 29.7±9.6                   | 0.855   |
| • 18-30 years             | 23 (48.9%)                     | 21 (44.7%)                 | 0.901   |
| • 31-40 years             | 16 (34.1%)                     | 18 (38.3%)                 |         |
| • 41-50 years             | 8 (17.0%)                      | 8 (17.0%)                  |         |
| Gender                    |                                |                            | 0.646   |
| • Male                    | 44 (93.6%)                     | 45 (95.7%)                 |         |
| • Female                  | 3 (6.4%)                       | 2 (4.3%)                   |         |
| BMI (Kg/m <sup>2</sup> )  | 25.4±2.1                       | 25.1±2.3                   | 0.604   |
| • 20-25 Kg/m <sup>2</sup> | 18 (38.3%)                     | 19 (40.4%)                 | 0.833   |
| • 25-30 Kg/m <sup>2</sup> | 29 (61.7%)                     | 28 (59.6%)                 |         |
| Side                      |                                |                            | 0.836   |
| • Right                   | 26 (55.3%)                     | 25 (53.2%)                 |         |
| • Left                    | 21 (44.7%)                     | 22 (46.8%)                 |         |

Insignificant difference on Independent sample t-test and Chi-square test

Upon follow-up, the mean constant score was considerably higher in patients treated surgically as compared to conservative

treatment ( $86.72 \pm 6.75$  vs.  $67.43 \pm 8.93$ ;  $p$ -value<0.001) as presented in Table 3. Comparable substantial difference was observed through different subgroups based on patient's age, gender, BMI and side involved as presented in Table 4.

Table 3: Comparison of Mean Constant Score between the Study Groups n=94

|                          | Conservative Treatment<br>n=47 | Surgical Treatment<br>n=47 | P value |
|--------------------------|--------------------------------|----------------------------|---------|
| Constant Score (mean±sd) | 67.43±8.93                     | 86.72±6.75                 | <0.001* |

Significant difference on Independent sample t-test

Table 4: Comparison of Mean Constant Score between the Study Groups across Various Subgroups n=94

| Sub-Groups                | n     | Constant Score (mean±sd)       |                            | P value |
|---------------------------|-------|--------------------------------|----------------------------|---------|
|                           |       | Conservative Treatment<br>n=47 | Surgical Treatment<br>n=47 |         |
| Age                       |       |                                |                            |         |
| • 18-30 years             | 23/21 | 67.78±8.47                     | 87.67±7.45                 | <0.001* |
| • 31-40 years             | 16/18 | 67.31±10.12                    | 87.17±6.64                 | <0.001* |
| • 41-50 years             | 8/8   | 66.63±8.81                     | 83.25±4.06                 | <0.001* |
| Gender                    |       |                                |                            |         |
| • Male                    | 44/45 | 67.59±9.18                     | 86.69±6.89                 | <0.001* |
| • Female                  | 3/2   | 65.00±3.61                     | 87.50±2.12                 | 0.005*  |
| BMI                       |       |                                |                            |         |
| • 20-25 Kg/m <sup>2</sup> | 18/19 | 69.89±10.19                    | 89.47±6.46                 | <0.001* |
| • 25-30 Kg/m <sup>2</sup> | 29/28 | 65.90±7.84                     | 84.86±6.39                 | <0.001* |
| Side                      |       |                                |                            |         |
| • Right                   | 26/25 | 67.08±8.81                     | 86.68±7.26                 | <0.001* |
| • Left                    | 21/22 | 67.86±9.28                     | 86.77±6.28                 | <0.001* |

\* Significant difference on Independent sample t-test

### DISCUSSION

Blunt trauma to shoulder may disrupt the complex ligamentous structure of acromioclavicular joint leading to injury varying from subluxation to frank dislocation.<sup>9</sup> AC joints injuries comprise 40-50% of shoulder injuries among professional involved in contact sports.<sup>10</sup> The indirect involvement of AC joint in the stability and function of shoulder demands appropriate treatment of its injuries which could otherwise result in chronic pain and limitation of shoulder movements particularly overhead abduction.<sup>10</sup> Although, there is a uniform consensus over conservative treatment of Grade-I and Grade-II injuries and surgical treatment of Grade-IV, V and VI injuries, the treatment of Grade-III AC joint dislocation remains controversial as far as surgery is concerned due to variability in the techniques and hardware used in existing research.<sup>11,12</sup> As these injuries usually involve young and physically active males (male to female ratio of 5:1 – 17.6:1 has been stated), their appropriate treatment is far more demanding due to increased concern about proper shoulder function in this age group.<sup>12</sup>

The objective of this study was to compare the mean of constant score between conservative and surgical treatment in patients with Grade-III acromio-clavicular dislocation.

In the presents study, the mean age of the individuals with AC joint dislocation was  $29.9 \pm 9.5$  years. Sarrafan et al.<sup>13</sup> (2012) reported similar mean age of  $28.9 \pm 8.6$  years in Iranian such patients. A comparable mean age of  $28.7 \pm 2.6$  years has been described by De Carli et al.<sup>14</sup> (2015) in such patients in Italy. Sugathan et al.<sup>15</sup> (2012) reported it to be  $31.0 \pm 6.9$  years in British such patients. A relatively higher mean age of  $36.0 \pm 8.2$  years has been reported by Virtanen et al.<sup>16</sup> (2013) among such patients in Finland. Joukainen et al.<sup>8</sup> also described higher mean age of  $53 \pm 7.8$  years in Finnish patients. A younger mean age of  $23.6 \pm 4.6$

years has been described by Lin et al.<sup>17</sup> (2006) among patients with AC joint injury in Taiwan.

We observed that majority (n=44, 46.8%) of the patients were young and were aged between 18-30 years followed by 31-40 years (36.2%) and 41-50 years (17.0%). A similar distribution of 20-30 years (45.0%), 31-40 years (35.0%) and 41-50 years (20.0%) age groups has been described by Sureshkumar et al.<sup>18</sup> (2016) among Indian patients with AC joint injuries.

In the current study, we observed that there was a male predominance among patients with AC joint injuries with male:female ratio of 17.8:1. A comparable male predominance with male:female ratio of 17.6:1 has been described by Rhee et al.<sup>19</sup> (2014) in Korean such patients. Sarrafan et al.<sup>13</sup> described similar male predominance with male:female ratio of 9:1 among such individuals in Iran. A similar male predominance among Finnish such patients has been reported by Joukainen et al.<sup>9</sup> and Virtanen et al.<sup>16</sup> who observed it to be 15:1 and 5.3:1 respectively. Fauci et al.<sup>20</sup> also observed similar male predominance among Italians such patients with a male:female ratio of 3:1 while Sugathan et al.<sup>15</sup> reported it to be 2.3:1 in UK. A predominant male involvement can be explained by the mechanism of injury like road side accidents and sports injury which frequently involve males.

We observed that right side was more frequently involved (54.3%) as compared to the left side (45.7%). Virtanen et al.<sup>16</sup> (2013) also reported similar more frequent involvement of right side (54.0%) among such patients in Finland. A similar higher proportion of right sided injuries have been reported by Fauci et al.<sup>20</sup> who observed it in 55.0% cases. Joukainen et al.<sup>9</sup> observed the involvement of right side in 68.0% cases.

We observed that after 6 weeks of treatment, the mean constant score was significantly higher in patients treated surgically as compared to conservative treatment (86.72±6.75 vs. 67.43±8.93; p-value<0.001). Similar substantial difference was witnessed through different subgroups based on patient's age, gender, BMI and side involved. Our observation matches with that of Gstettner et al.<sup>6</sup> (2008) who also described that operative treatment was better and was associated with higher mean constant score (90.4±12.9 vs. 80.7±17.4; p-value<0.05) as compared to conservative treatment in patients of Grade III AC dislocation. A similar significant difference in the mean constant score has also been reported by McKee et al.<sup>21</sup> in 2012 (75 vs. 52; p-value<0.001).

The present study is first of its kind (currently there was no such published material in local population) and has found that surgical treatment of patients with Grade-III acromioclavicular dislocation was associated with better functional shoulder outcome as compared to conservative treatment. It can be thus advocated that surgical treatment in the form of hook plate should be preferred in future practice if there is no contraindication to surgery.

A very important limitation to the current study was that we only considered functional shoulder outcome as the outcome variable and overlooked other important aspects of orthopedic management like cost, time to return to work, complications of anesthesia and surgery, infection, hardware failure rate and need for revision etc. which should be addressed before adopting it in routine. Such a study is imperative and is highly recommended in future clinical research.

## CONCLUSION

Surgical treatment of patients with Grade-III acromioclavicular dislocation was associated with better functional shoulder outcome as compared to conservative treatment and should be preferred in future practice if there is no contraindication to surgery.

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