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Original Research Article

Diagnostic overview of nature and pathogenesis of shoulder dislocation

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ABSTRACT

Background: Shoulder dislocation, soft tissue and bony injuries around shoulder has close relation and hence, detail investigation and diagnosis plays a crucial role in prognosis and further treatment.
Methods: The study of diagnostic arthroscopy aimed to determine the incidence of secondary intra-articular shoulder lesions in acute and chronic anterior shoulder instability patients. Study investigated the occurrence of intra-articular shoulder lesions in a series of 30 patients with acute and chronic traumatic anterior instability.
Results: Prospective observational study was done on patients with acute shoulder dislocation. After ab arthroscopic evaluation, majority 77% of patients had capsulo-labral detachments. 61% of first dislocations showed capsulo-labral detachment/Bankart lesions and all the recurrent dislocations had partial or complete capsule-labral detachment or Bankart lesions. Glenohumeral ligament integrity was disturbed in 58% of recurrent and that of 11% of first time shoulder dislocation cases. Hillsach lesions are in total of 57% of all soft tissue injuries. Bony Bankart lesions were found in 50% of recurrent dislocations. Rotator tears are mainly in recurrent dislocation cases mainly >40 years of age.
Conclusions: Patients with chronic shoulder instability are more likely to have secondary intra-articular lesions, compared to those with acute, likely due to the repeated episodes of dislocation or subluxation. These associated lesions are a consequence of the ongoing instability, which leads to additional damage within the joint. Early intervention plays an important role, as the conditions for surgical intervention are optimal after initial shoulder dislocation.

Keywords: Diagnostic arthroscopy, Hill-Sachs lesion, Bankart lesion, Instability, Shoulder

INTRODUCTION

The glenohumeral joint is prone to instability due to the large humeral head sphere articulating with the comparative small glenoid fossa, making it the most frequently dislocated joint with an annual incidence rate of approximately 17 per 100,000 people.[1] Active young people are at higher risk for experiencing traumatic anterior dislocation of the shoulder. Unfortunately, recurrent instability after shoulder dislocation is a frustrating issue for both patients and treating physicians, especially in young athletes.[2,3] Researchers have investigated various factors, including age, athletic participation, immobilization duration, soft tissue injury severity, and rehabilitation length, to understand their impact on the recurrence of instability.[2]

During dislocations the associated injuries are Hermodsson-Hill-Sachs, rotator cuff lesion, labral flap tear, osteoarthrosis, partial rupture of biceps longus tendon, loose bodies and partial subscapular tears. In this study will be studying the arthroscopic evaluation and incidence of above mentioned injuries.[4]

Shoulder instability recurred within 14 months in all instances. Arthroscopic surgery, however, has shown promising results, achieving a 78% success rate in cadets monitored for a minimum of 14 months.[2] The patient's age at the time of initial dislocation is the most important prognostic factor in predicting recurrent instability. According to Rowe's study, the recurrence rate varies greatly with age: 94% in patients under 20 years, 79% in

those between 21-30 years, 50% in those between 31-40 years, and 14% in patients over 40 years.[5]

Hantes and Raoulis emphasize that surgeons must be well-versed in glenohumeral joint anatomy to effectively diagnose and treat anterior shoulder instability via arthroscopy. Advances in patient selection, surgical techniques, and implants have established arthroscopic treatment as the standard of care, yielding improved clinical and functional outcomes.[6]

The objective of this study is to confirm the need of early intervention and diagnosis of associated soft tissue injuries in acute shoulder dislocation. Study also deals with incidence soft tissue lesions and its nature and pathogenesis.

METHODS

Study design and setting

This prospective observational study was conducted on patients with acute shoulder dislocation who presented to tertiary care centre in Dr. Shankarrao Chavan Government Medical College, Nanded for shoulder reduction between June 2022 and August 2024. The study took place at a single tertiary care orthopaedic centre in Dr. Shankarrao Chavan Government Medical College, Nanded after prior institutional ethical committee (IEC) clearance.

Participants

Eligible participants were patients aged 18 years or older with acute shoulder dislocation, including both first-time and recurrent cases.

Inclusion criteria

Cases with clinical diagnosis of shoulder dislocation, radiological confirmation of dislocation, and age ≥18 years were included.

Exclusion criteria

Cases with associated proximal humerus fracture, infective conditions in and around the joint, and medical contraindications for operative procedures were excluded.

A total of 30 patients were included in the study, selected through consecutive sampling of eligible patients presenting during the study period.

Variables

The primary outcome measures were: presence and type of soft tissue injuries (e.g., Bankart lesions, SLAP lesions), presence and extent of bony injuries (e.g., Hill-Sachs lesions, glenoid bone loss), and associated complications (e.g., rotator cuff tears, nerve injuries).

Secondary outcomes included: patient demographics (age, sex), mechanism of injury, number of previous dislocations (if any), and time from injury to presentation.

Data sources and measurement

Data were collected through the following methods: clinical examination by an experienced orthopedic surgeon, radiographic assessment including standard shoulder radiographs and MRI, and diagnostic arthroscopy performed within 1-10 days post-dislocation.

All arthroscopic procedures were performed by a single experienced surgeon using a standardized technique. The glenohumeral joint and subacromial space were systematically examined and findings were recorded using a standardized form.

Bias

To minimize bias, we implemented the following measures: all clinical examinations were performed by experienced orthopedic surgeons, a standardized arthroscopic examination protocol was used for all patients, and the arthroscopic surgeon was blinded to the MRI findings until after the procedure.

Study size

We included sample size of 30 patients based on patient reporting to our institution within the given time frame. This sample size was deemed sufficient to provide meaningful data on the prevalence of associated injuries.

Quantitative variables

Age was reported as mean±standard deviation. Other variables such as the presence of specific lesions were reported as percentages.

Statistical methods

Descriptive statistics were used to summarize patient characteristics and the prevalence of various lesions. Chi-square or Fisher's exact tests were used to compare the prevalence of lesions between first-time and recurrent dislocations. A p value <0.05 was considered statistically significant.

We performed subgroup analyses comparing findings in patients <30 years old versus those ≥30 years old, and in first-time versus recurrent dislocations. Missing data were handled using multiple imputation techniques. All statistical analyses were performed using PSPP (GNU pspp 2.0.1).

RESULTS

In present study, mean age in years was 31.47±9.202 ranging from 18 years to 51 years. Out of that 40% in age

of 20-30 years. Majority 90% were males and rest 10% were females. Out of 30 cases, 18 are first time shoulder dislocation cases rest 12 are recurrent dislocation cases. All patients were followed up post-operatively and further significant events and complications noted (Table 1).

Table 1: Demographic variables.

Characteristics	Value
Mean age (years)	31.47±9.202
Age range (year)	18-51
Patients aged 20-30 years	40%
Gender distribution	90% male, 10% female
First-time dislocations	18 cases (60%)
Recurrent dislocations	12 cases (40%)
Right shoulder affected	56%
Left shoulder affected	44%
Dominant side affected	57%
Anterior dislocations	2%
Posterior dislocations	2%
Main cause of dislocation	Accidental fall (70%)
Direct or indirect accidental trauma	23%

Out of all recurrent cases 50% had their first index dislocation at the age less than 20 years and only 8% patients with greater than 40 years age had recurrent dislocations. 70% of cases are due to accidental fall contributing to the major mode of injury for shoulder dislocation. Direct or Indirect accidental trauma constitutes 23% of mode of trauma for shoulder dislocation. Majority of radiologically and clinically diagnosed cases were of anterior dislocation i.e. 98% and only 2% cases of posterior dislocation. In 56% of patients' right shoulder joint was affected and left shoulder in 44% of cases. Out of that 57% of the patients had their dominant side affected.

In all acute shoulder dislocation moderate haematoma found. Majority 77% of patients had capsulo-labral detachments out of that 40% has complete detachment and remaining 60% had partial capsulo-labral detachment. 61% of first time shoulder dislocations showed capsulo-labral detachment/Bankart lesions and all the recurrent shoulder dislocations had partial or complete capsule-labral detachment or Bankart lesions. Glenohumeral ligament integrity was disturbed in 58% of recurrent shoulder dislocation cases and that of 11% of first time shoulder dislocation cases. Hillsach lesions are more common in recurrent shoulder dislocation cases i.e. 83% and that of 38% in first time shoulder dislocation patients, contributing in total of 57% of all soft tissue injuries. Bony Bankart lesions were not found in first time shoulder dislocation cases instead 50% of recurrent dislocations reported bony Bankart lesions during diagnostic arthroscopy (Table 2).

Rotator cuff tears are found mainly in recurrent dislocation cases. Out of all acute shoulder dislocations almost all patients with rotator cuff injury were >40 years of age.

Loose bodies were reported only in 7% of cases and all the patients were recurrent shoulder dislocation cases. Out of 30 cases, 23% showed recurrent instability as the major complication. In this 57% patients were of recurrent shoulder dislocation.

Neuropraxia was found in 6% of total cases and all the cases were from first time shoulder dislocations. Reduced range of motion at shoulder joint was found in 10 % of total cases after sequential follow–up.

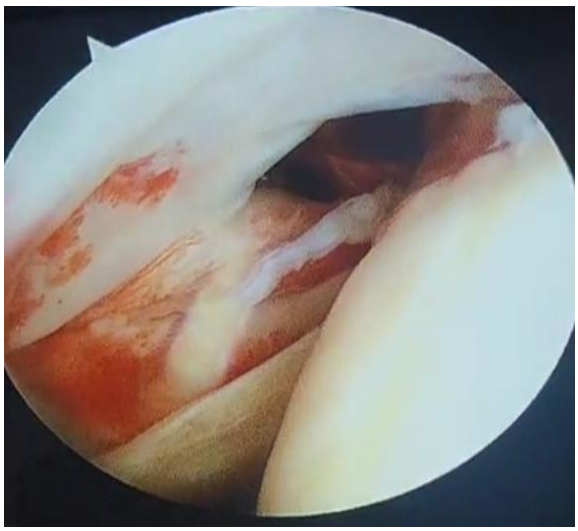

Figure 1: Rotator cuff tear (supraspinatus).

Table 2: Distribution of soft tissue injury in shoulder dislocation.

S. no.	Type of dislocation	Hematoma (%)	Capsulo-labral tear/bankart lesion (%)	Glenohume-ral ligament integrity (%)	Hillsach lesion (%)	Bony bankat lesion (%)	Rotator cuff tear (%)	Loose body (%)
1	**First time shoulder dislocation cases**	100	11 (61)	2 (11)	7 (39)	0 (0)	1 (5)	0 (0)
2	**Recurrent shoulder dislocation cases**	100	12 (100)	7 (58)	10 (83)	6 (50)	3 (25)	2 (20)
	Total	100	23 (77)	9 (30)	17 (57)	6 (20)	4 (13)	2 (14)

Figure 2: Hillsach lesion.

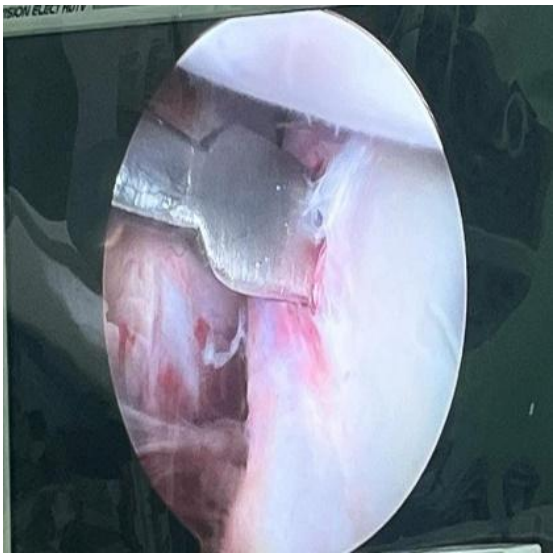

Figure 3: Bankart lesion.

DISCUSSION

ACL injuries are the most common knee injury, therefore, determining the causes and mechanisms is an important step in establishing.

A study examined the frequency of glenohumeral joint soft tissue injuries in patients with acute and recurrent shoulder instability. The results showed that compared to patients with acute dislocations, those with recurrent instability had a significantly higher prevalence of concurrent lesions. Furthermore, the study found that both acute and chronic shoulder instability often involve multiple coexisting lesions, which need to be addressed surgically to effectively treat the condition.

Hovelius et al in his study with 245 patients over 10 years, he showed that 70% of patients who were less than 22 years at time of first dislocation, suffered at least 1 dislocation.[7]

There is almost equal distribution of right and left shoulders out of that 57% of the patients had their dominant side affected. 27 % of patients belong to sport activities rest are engaged in daily wedges.

Two–third dislocations are due to accidental fall, the reminder were the result of accidental trauma and other reasons like electric shock.

A significant trend emerged in the data, showing that older patients tend to dislocate their shoulders at home, typically due to falling onto an outstretched arm (statistically significant, $p<0.01$). In contrast, younger patients usually dislocate their shoulders outside of home, often on sports fields ($p<0.01$), and frequently without any apparent trauma ($p=0.04$).[8]

Hematomas were a consistent finding in acute shoulder dislocations. Capsulo-labral detachments were very common (77%), with most being partial (60%). First-time dislocations often had capsulo-labral detachment/Bankart lesions (61%). Recurrent dislocations always had some degree of capsulo-labral detachment/Bankart lesions.

Glenohumeral ligament integrity was disturbed in 58% of recurrent shoulder dislocation cases and that of 11% of first time shoulder dislocation cases.

Baker et al reported that, following an initial acute anterior shoulder dislocation, 87% of patients developed Bankart lesions, 64% had Hill-Sachs bony injuries, and 18% experienced both capsular tearing and rotator cuff injuries.[9] Taylor et al and Arciero also documented similar findings in their study, with SLAP pathology in 10% and 90% Bankart and HillSach's incidence.[10]

Hillsach lesions are more common in recurrent shoulder dislocation cases i.e. 83% and that of 38% in first time shoulder dislocation patients. Contributing in total of 57% of all soft tissue injuries.

According to study by Yiannakopouloset et al, the incidence of Bankart lesions was 78.2% in patients with an acute dislocation, in chronic cases the incidence of Bankart or ALPSA lesions was 97.11%; the difference was statistically significant ($p=0.002$). A Hill-Sachs lesion was seen in 15 cases in the group with acute dislocations (65.21%) and in 97 cases in the chronic recurrent instability group (93.26%) ($p=0.001$).[11]

Bony Bankart lesions were not present in initial shoulder dislocations, but they were common in patients who experienced recurrent dislocations, with half of these cases showing evidence of bony Bankart lesions during arthroscopic examination.

To determine if bone grafting is required to stabilize a

shoulder with a deficient glenoid accurate assessment of glenoid bone loss is essential for surgeons. Objective measurements provide valuable insights, enabling surgeons to make informed decisions about the need for grafting and ensuring optimal outcomes for patients with glenoid bone loss.[12]

A study conducted by the two authors assessed 194 arthroscopic Bankart repairs using the technique of suture-anchor and found a significant difference in recurrence rates based on glenoid configuration. Specifically, patients with an inverted-pear shaped glenoid had a 61% recurrence rate, whereas those without significant bone deficiency had a much lower recurrence rate of 4%.[12]

Rotator cuff tears are found mainly in recurrent dislocation cases. Out of all acute shoulder dislocations almost all patients with rotator cuff injury were >40 years of age.

Neviaser et al noted a 100% rate of rotator cuff tears in patients age more than 40 years with a primary traumatic shoulder dislocation.[5] In Neer (1990) studies, he found evidence of a rotator cuff rupture in 30 % of the patients older than 40 who sustained a first-time anterior shoulder dislocation.[6] Examiner's bias causes variation in clinical examination findings and limit its diagnostic scope. However, clinical examination and MRI together almost accurately identify the rotator cuff injury.[7] Loose bodies were reported only in 7% of cases and all the patients were recurrent shoulder dislocation cases.

Results from study of Taylor and Arciero suggest that arthroscopic stabilization techniques have a significant role in the treatment of first-time, traumatic shoulder dislocations. The soft tissues are in good condition, and the anatomic disruptions are well defined and easily repaired, which is contrary to the findings we have seen in shoulders after multiple dislocations. For optimal healing after arthroscopic repair, it is essential to have hemarthrosis, excellent tissue quality, and no signs of chronic degeneration or attenuation in the capsule and labrum. This is a critical moment to reassess and potentially improve outcomes for young, athletic patients with high recurrent dislocation rates. Continued research on arthroscopic stabilization procedures will be essential in evaluating the success of this strategy.[4] As per the detailed history taken from all the recurrent acute shoulder dislocation cases, the age at first time of shoulder dislocation and consecutive recurrent shoulder dislocation episodes were studied. As per the data 50% of the recurrent dislocation cases had their first index shoulder dislocation before 20 years of age and only 8% of recurrent dislocations had their index dislocation at >40 years of age. A study of 545 patients with anterior shoulder dislocations treated conservatively found a recurrence rate of 22% over a seven-year mean follow-up period, as reported by Gumina and Postacchini.[13] Wintzell et al study compared the efficacy of arthroscopic lavage versus non-operative treatment for acute anterior glenohumeral dislocation.[14] At the 1-year follow-up, the results showed a significant difference in recurrence rates, in non-operative group 43% recurrence rate found where arthroscopic lavage group showed 13% recurrence rate.

Notably, the study found a striking disparity in the under-25 age group where non-operative group had 65% re-dislocation rate and arthroscopic lavage group had 12% re-dislocation rate. This study demonstrates that arthroscopic lavage is a highly effective treatment for acute anterior glenohumeral dislocation, particularly in younger patients.[14]

Rowe reported a recurrence rate of 94% in 53 patients aged ~20 years, 79% in 64 patients aged 21-30 years, 50% in 16 patients aged 31-40 years, and 14% in 188 patients aged >40 years.[5]

Recurrent instability being the major complications among the all, it is seen in 33% of recurrent dislocation cases and 17% of first shoulder dislocation cases. Only 6% of cases showed nerve injury, in the form of neuropraxia which was found recovered in subsequent follow up visits. And 10% patients showed decreased shoulder range of motion which were non complaint with the physiotherapy protocol.

According to the study by Taylor and Arciero, 90% of patients experienced recurrent instability after a first-time shoulder dislocation. The primary underlying pathology was found to be capsulolabral avulsion, which was closely linked to the high recurrence rate. The strong association between recurrent instability and Bankart lesions suggests that addressing this underlying pathology is crucial in preventing future dislocations.[4]

Limitations

With only 30 participants, the study may lack statistical power to detect significant differences or associations, limiting the reliability of the findings. Limiting factor of the study is generalizability of findings.

CONCLUSION

The likelihood of shoulder lesions increases over time, as patients with chronic instability are more prone to initial dislocation and subsequent secondary lesions. Shoulder arthroscopy is the only procedure that provides a thorough, dynamic examination and detailed visualization of all relevant structures, enabling the identification of pathological findings. The conditions for surgical intervention are standard after initial shoulder dislocation, as the resulting inflammatory response creates an optimal healing environment for soft tissue repair. Additionally, the risk of capsular elongation, a complication commonly associated with recurrent instability, is significantly reduced in the acute phase. Significant prognostic factor in recurrent instability is patient's age at time of first time shoulder dislocation. Arthroscopy plays an important role in identifying and evaluating associated lesions in patients with anterior shoulder instability. The longer the instability

persists, the higher the likelihood of secondary lesions developing, as the initial dislocation often leads to further injuries. In patients with symptomatic shoulders and shoulders with instability, early stabilization is often recommended to prevent additional damage and secondary lesions.

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