Indian Journal of Basic and Applied Medical Research; June 2022: Vol.-11, Issue- 3 , P. 20 - 27
DOI: 10.36855/IJBAMR/2022/90215.55525

Original article:

Study of role of computed tomography in evaluation of shoulder trauma

[1]Dr Nitesh Kumar soni , [2]Dr Anjali Pawar , [3]Dr Saloni Yadav , [4]Dr Varsha Rote Kaginalkar

[1]JR III, [2]Associate Professor, [3]JRIII, [4]Profesor and Head
Corresponding Author- Dr Nitesh Kumar Soni
Dept of Radiodiagnosis , Government Medical college and hospital Aurangabad
Corresponding Author- Dr Nitesh Kumar Soni

Abstract:

Introduction: Axial CT is the method of choice to aid in preoperative planning in difficult highly comminuted fractures of the proximal humerus and scapula . In such patients, the exact numberof fracture fragments is easily underestimated in radiographs.

Methodology: This cross-sectional study was conducted in the Radiology department in Government Medical College and Hospital, during 1st December 2019 to 30th October 2021.

Total 50 eligible study participants were enrolled in the study.Source of Study Population:

All patients (including pediatric age group) of both sexes referred from casualty and orthopedics department to Radiology department in Government Medical College andHospital, Aurangabad.

Results : Most common bone involved in shoulder trauma is proximal humerus comprising of 40.5% cases followed by scapula comprising of 31.6% of cases in this study.Clavicle fracture is the least common in this study comprising of 11.4 % cases . Hill-sachs lesion is more common in recurrent anterior shoulder dislocation (comprising 100 % of total recurrent anterior shoulder dislocation) than Primary anterior shoulder dislocation (comprising 50.0% of total primary anterior shoulder dislocation) in this study.Bony Bankart lesion is more common in recurrent anterior shoulder dislocation (comprising 37.5 % of total recurrent anterior shoulder dislocation) than Primary anterior shoulder dislocation (comprising 25.0% of total primary anterior shoulderdislocation) in this study.

Conclusion: Most common age group involved in shoulder trauma is 21-40 year (40%) followed by 41-60 year (38%) age group. There was male predominance in the study: males-72%, females- 28%. Right sided shoulder trauma (60%) is more common than left sided shoulder trauma (40%).

Introduction:

Axial CT is the method of choice to aid in preoperative planning in difficult highly comminuted fractures of the proximal humerus and scapula . In such patients, the exact numberof fracture fragments is easily underestimated in radiographs. Compared with conventional helical CT, MDCT makes use of high-quality MPRs in the coronal oblique and sagittal oblique planes to reveal the exact degree of fragment displacements. [1]MDCT with MPR therefore increases the accuracy of fracture classification in comminuted proximal humerus fractures and scapula . Fracture of the glenoid with a large fragment is known to cause anterior instability of the shoulder. [2]The size of the bony Bankart lesion affects the degree of shoulder instability and if the osseous defect is large enough, Bankart repair with bone grafting is needed. CT images are superior to plain radiographs in assessing the size of a bony defect in the glenoid. [3]MDCT also reveals occult fractures such as lesser and greater tubercle, coracoid process, and

scapular spine fractures.[53] Possible complications of shoulder trauma include neurovascular damage (most commonly axillary nerve palsy), continued instability, restricted range of motion, and rotator cuff injury, and lung related complications (Pneumothorax, hemothorax, hemopneumothorax). Computed tomography is helpful in some of them and also usefull in the follow up.[3,45]

Methodology:

This cross-sectional study was conducted in the Radiology department in Government Medical College and Hospital, during 1st December 2019 to 30th October 2021.

Total 50 eligible study participants were enrolled in the study.Source of Study Population:

All patients (including pediatric age group) of both sexes referred from casualty and orthopedics department to Radiology department in Government Medical College andHospital, Aurangabad.

Inclusion criteria:

- All trauma patients referred from orthopedics department, GMCH, Aurangabad to Radiology department.
- All trauma patients referred from casualty to radiology department
- Patients of all age groups (including pediatric age group)

Exclusion criteria:

- Unconscious patients.
- Vitally unstable patients.
- Highly irritable patients
- Neoplastic lesions.

Results

In the present study we studied 50 patients with shoulder trauma attending to the tertiary care center and medical college where the study was conducted. The study population consists of 36 males and 14 females. In this study shoulder trauma is more common in males (72%) than females (28%)

Right sided shoulder trauma (60%) is more common than left sided shoulder trauma (40%)

Table 1: Distribution of types of shoulder trauma in study subjects

Types of shoulder trauma	Number (n=79)	Percentage among total shoulder trauma
Shoulder dislocation	13	16.5
Proximal humerus fracture	32	40.5
Scapular fracture	25	31.6
Clavicle fracture	09	11.4
Total	79	100.0

*In some patients multiple fractures/shoulder trauma are present involving more than one bone and multiple fractures are present in single bone.

- Most common bone involved in shoulder trauma is proximal humerus comprising of 40.5% cases followed by scapula comprising of 31.6% of cases in this study.
- Clavicle fracture is the least common in this study comprising of 11.4 % cases.

Table 2) Distribution of Humeral head lesions and glenoid rim fractures according to types of shoulder dislocation.

Anterior shoulder dislocation(Number)	Hill-sachs lesion (%)	Bony Bankart lesion/fracture (%)
Primary anterior dislocation(n=12)	6(50.0)	3(25.0)
*Recurrent anterior dislocation(n=8)	8(100)	3(37.5)

n= total number

8 patients presented with history of recurrent anterior shoulder dislocation. Shoulder dislocation was reduced before the CT scan done.

- Hill-sachs lesions are present in 50.0% and Bony Bankart lesions are present in25.0%

of total Primary anterior dislocations.

- Hill-sachs lesions are present in 100 % and Bony Bankart lesions are present in37.5% of total recurrent anterior dislocations.
- Hill-sachs lesion is more common in recurrent anterior shoulder dislocation (comprising 100 % of total recurrent anterior shoulder dislocation) than Primary anterior shoulder dislocation (comprising 50.0% of total primary anterior shoulderdislocation) in this study.
- Bony Bankart lesion is more common in recurrent anterior shoulder dislocation (comprising 37.5 % of total recurrent anterior shoulder dislocation) than Primary anterior shoulder dislocation (comprising 25.0% of total primary anterior shoulder dislocation) in this study.

Table 3: Distribution of fractures in proximal humerus

Proximal humerus fracture	**Total number of fractures(n=53)**	**% Among total proximal humerus fractures**
Hill-sachs lesion	14	26.4
Head split fracture	05	9.4
Greater tuberosity fracture	17	32.1
Lesser tuberosity fractures	07	13.2
Anatomic neck fracture	02	3.8
Surgical neck fracture	08	15.1
Total	53	100.0

In this study greater tuberosity fractures are most common among the proximal humerus fractures comprising of 32.1% followed by Hill-sachs lesion comprisingof 26.4%.

Table 4: Distribution of proximal humerus fractures (PHF) according to NEER classification

PHF (NEER Classification)	Number (%)	Percentage
1 Part	4	19.1
2 Part	10	47.6
3 Part	2	9.5
4 Part	5	23.8
Total	21	100.0

- NEER 2 part fracture is most common in proximal humerus fracture comprising47.6% followed by NEER part 4 fractures comprising of 23.8%
- NEER 3 part fracture is least common in proximal humerus fracture comprising9.5%.

Table 5: Distribution of fractures in different scapular regions

Scapular fracture	Total number of fractures (n=35)	% Among total scapular fractures
Bony Bankart lesion	06	17.1
Reverse bony Bankart lesion	01	2.9
Glenoid cavity	04	11.4
Glenoid neck	01	2.9
Scapular wing	14	40.0
Scapular spine	02	5.7

Acromion process	04	11.4
Coracoids process	03	8.6
Total	35	100.0

- In this study scapular wing fractures are most common among the scapular fractures comprising of 40 % followed by bony Bankart lesion comprising of17.1%.

Table 6: Distribution of fractures in clavicle

Clavicle fracture	**Number (n=9)**	**% Among total clavicle fractures**
Medial 1/3rd part	02	22.2
Mid 1/3rd part	04	44.5
Distal 1/3rd part	03	33.3
Total	09	100

- In this study mid 1/3rd part of clavicle fractures are most common among the clavicle fractures comprising of 44.5% followed by distal 1/3rd part fracture comprising of 33.3%.

Discussion:

This cross sectional study conducted during December 2019 to October 2021at the Department of Radiology, in a tertiary care center and teaching hospital in a city of Maharashtra in which 50 eligible shoulder trauma patients which were referred to the radiology department for NCCT shoulder. All the necessary ethical permissions were taken and investigations were done only after informed written consent of the study patient. The consent was obtained from parent in case where the patient is <18 years of age. The synopsis was presented before Institutional Ethical Committee (IEC) and the same was sent to the MUHS for the approval after making corrections as per the suggestions of the committee. The data collected by case record form were entered in the Microsoft Excel 2013 and the analysis was done with the help of SPSS software 20.0 version. Charts, tables, graphs were drawn at the appropriate places.

Table 1 shows most common bone involved in shoulder trauma is proximal humerus comprising of 40.5% cases followed by scapula comprising of 31.6% of cases in this study. Clavicle

fracture is the least common in this study comprising of 11.4% cases.

Anders Nordqvist et al (1995) In their prospective population-based study of all shoulder injuries seen at Malmo General Hospital during 1987, the incidence and causes of major injuries involving fractures of the clavicle, scapula, or proximal humerus and glenohumeral or acromioclavicular dislocations were investigated in children, adults, and the elderly. Four hundred ninety-eight patients had sustained 504 shoulder injuries. The most frequent injuries were fractures of the proximal humerus (53%), fractures of the clavicle (29%), and primary dislocations of the glenohumeral joint (11%). Fractures of the scapula and dislocations of the acromioclavicular joint were infrequent injuries- 3% & 4% respectively.[107] In our study also the most common bone involved in shoulder trauma is proximal humerus comprising of 56%. The discrepancies in other findings may have been due to population differences between the two studies.[6]

We found anterior dislocation is most common comprising of 92.3% followed by posterior dislocation comprising of 7.7% of total shoulder dislocation. (*All shoulder dislocations are primary event in this table) Hiromoto Ito et al (2000)- In a similar study, radiographic examination was performed on a total of 30 shoulders in 27 patients with anterior shoulder instability.[7]Hill-sachs lesions are present in 50.0% and Bony Bankart lesions are present in 25.0% of total Primary anterior dislocations. Hill-sachs lesions are present in 100 % and Bony Bankart lesions are present in 37.5% of total recurrent anterior dislocations. Hill-sachs lesion is more common in recurrent anterior shoulder dislocation (comprising 100 % of total recurrent anterior shoulder dislocation) than Primary anterior shoulder dislocation (comprising 50% of total primary anterior shoulder dislocation) in this study. Bony Bankart lesion is more common in recurrent anterior shoulder dislocation (comprising 37.5% of total recurrent anterior shoulder dislocation) than Primary anterior shoulder dislocation (comprising 25.0% of total primary anterior shoulder dislocation) in this study. There is only 1 posterior dislocation is present in this study which have reverse bony bankart lesion (100%) and no any reverse Hill-sachs lesion.

Hiromoto Ito et al (2000)- In their study, radiographic examination was performed on a total of 30 shoulders in 27 patients with anterior shoulder instability. Hill-Sachs lesions were found in all 11 shoulders in the dislocation group and in 17 (89%) of the 19 shoulders in the subluxation group. Findings are similar to our study.[7]

We found greater tuberosity fractures are most common among the proximal humerus fractures comprising of 32.1% followed by Hill-sachs lesion comprising of 26.4%.

Ville V. Haapamaki et al (2004)- In the similar study to establish the role of Multi detector CT in shoulder fractures. Two hundred and ten patients underwent shoulder MDCT due to acute trauma. Based on MDCT, a total of 311 fractures—159 in the proximal humerus [Hill–Sachs 43(27.0%), Reverse Hill–Sachs 10(6.3%), Head splitting 3(1.9%), Greater tubercle 52(32.7%), Lesser tubercle 15(9.4%), Anatomical neck 2(1.3%), Surgical neck 34(21.4%)]—occurred in 191 (91%) of the 210 patients.[8]

We found NEER 2 part fracture is most common in proximal humerus fracture comprising 47.6% followed by NEER part 4 fractures comprising of 23.8%. NEER 3 part fracture is least common in proximal humerus fracture comprising 9.5%.T. Lind et al (1989)- In their study which was based on a total of 730 proximal humerus fractures. According to Neer gave the following: types 1 and 3 amounted to 53.3% of the fractures. Three- and four-part fractures, accounted for 16% and 3.6% respectively.[8]

Conclusion:

Most common age group involved in shoulder trauma is 21-40 year (40%) followed by 41-60 year (38%) age group. There was male predominance in the study: males-72%, females- 28%. Right sided shoulder trauma (60%) is more common than left sided shoulder trauma (40%). RTA is found to be the most common cause for shoulder trauma in our study comprising of 44% followed by fall from ground level comprising 24%. Physical assault and Jerk are the least common cause of shoulder trauma in this study comprising of 10% each. Fall from height comprises of 12% of cases. Most common bone involved in shoulder trauma is proximal humerus comprising of 40.5% cases followed by scapula comprising of 31.6% of cases in this study. Clavicle fracture is the least common in our study comprising of 11.4% cases. Shoulder dislocation is present in 16.5% cases.

References:

1. Hoffmeyer, P., 2002. The operative management of displaced fractures of the proximal humerus. The journal of bone and joint surgery. British volume, 84- B(4), pp.469-480.
2. Jeong J, Bryan J, Iannotti J. Effect of a Variable Prosthetic Neck-Shaft Angle and the Surgical Technique on Replication of Normal Humeral Anatomy. The Journal of Bone and Joint Surgery-American Volume. 2009;91(8):1932-1941.
3. Hill HA, Sachs MD. The grooved defect of the humeral head: a frequently unrecognized complication of dislocations of the shoulder joint. Radiology 1940;35(6):690–700.
4. Bishop J, Flatow E. Pediatric Shoulder Trauma. Clinical Orthopaedics & Related Research. 2005;432:41-48.
5. Sheehan S, Gaviola G, Gordon R, Sacks A, Shi L, Smith S. Traumatic Shoulder Injuries: A Force Mechanism Analysis—Glenohumeral Dislocation and Instability. 2022.
6. Watling J, Brabston E, Padaki A, Ahmad C. Anterior instability. Shoulder and Elbow Trauma and its Complications. 2015;3-22.
7. Ito H, Takayama A, Shirai Y. Radiographic evaluation of the Hill-Sachs lesion in patients with recurrent anterior shoulder instability. Journal of Shoulder and Elbow Surgery. 2000;9(6):495-497.
8. Haapamaki V, Kiuru M, Koskinen S. Multidetector CT in shoulder fractures. Emergency Radiology. 2004;11(2):89-94.
9. Lind T, Kroner K, Jensen J. The epidemiology of fractures of the proximal humerus. Archives of Orthopaedic and Trauma Surgery. 1989;108(5):285-287.