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Anatomical and Radiological assessment of Acromion morphology and morphometry and its clinical significance in in shoulder impingement syndrome.

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Abstract--- *Objectives-*

To record the Radiological parameters, Anatomical assesment of morphology & morphometric parameters of the acromion process of scapula.

Co-relating the values of present study with various parameters obtained from other studies.

To study the bony abnormalities associated with impingement syndrome and to measure the length of subacromian space using magnetic resonance imaging.

BACKGROUND-

Subacromial space is a gap between the non elastic coracoacromial arch and the head of the humerus.The space is filled by subacromial bursa , supraspinatus tendon and biceps tendon. Raising the arm in activities like combing of the hair, narrows the subacromial space. The space is further narrowed by anatomical abnormalities of acromion process of scapula resulting in impingement which is a disorder of shoulder joint . Radiological parameters, and anatomical parameters of the acromion process are essential in diagnosing the pathogenesis of rotator cuff disease and shoulder impingement syndrome.

Materials & Methods- The study was done at Department of Anatomy & Department of Radiology , MGMC & RI on 80 dry unpaired scapula without any external deformities and age and sex of these scapulas were unknown. Study also included 30 Magnetic resonance Imaging scans (MRI) of patients with history of shoulder pain suggestive of rotator cuff pathology.The thickness of the acromion process, acromial breadth, acromial length, acromio-glenoid distance and acromio-coracoid distance were measured with measuring tape and also by using sliding vernier caliper .Various shapes acromion process were also noted.The bony abnormalities were noted and the length of subacromial space were also measured by MRI.

Results- Out of the 80 dry scapulas of unknown age and sex , various shapes of the scapula that were observed were as follows Curved type (type 11) was seen in 58% of scapula. Hooked type (type 111) was seen in 37% of cases followed by Flat type (type1) acromion process in 5% of cases.

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The mean breadth and length of the acromion process were 24.03mm and 43.6mm , respectively. The mean anterior acromial thickness is 6.94mm, the mean coracoacromial distance is 28.9mm, the mean acromioglenoid distance is 27.35 mm.

Keywords--- *Impingement syndrome , acromion process, scapula , rotator cuff,MRI*

INTRODUCTION

Acromion process is an anterolateral projection of the spinous process of the scapula and appears as a flattetened plate and arches over the glenohumeral joint .The medial smooth border gives attachment to trapezius muscle and lateral border to deltoid muscle. Coracoacromial ligament extends between the tips of coracoid process and acromion process of the scapula Coracoacromial arch protects the shoulder joint by forming a hood like structure. 1.The space underneath the coracoacromial arch is known as subacromial space which transmits supraspinatus tendon, subacromial bursa, biceps tendon. Under normal conditions the height of this space measures about 1.5cms. Scapula plays a significant role in impingement syndrome of the shoulder joint.2 Joint stability is mainly provided by four muscles of the scapula which surround the shoulder joint as cuff , they are supraspinatus, infraspinatus, subscapularis, teres minor. These muscles are responsible for various actions such as medial rotation by subscapularis, lateral rotation by teres minor and infraspinatus and abduction by supraspinatus. Injury to these muscles may alter the direction of the humerus to move superiorly causing narrowing of subacromial space resulting in impingement syndrome 3. Factors which lead to narrowing of the space include different shapes and varying inclination of acromion process , degenerative changes of the supraspinatus tendon with calcium deposits. The other factors which cause narrowing of the space are thickening or calcification of coracoacromial ligament, inflammation of subacromial bursa 4.The present study analyses the various morphometric parameters and radiological parameters which may help clinicians like orthpaedic surgeons .

MRI is considered as one of the important Investigating tool in assessing shoulder joint impingement syndrome.

MATERIALS AND METHODS

Study population

80 dry human scapula available in the department of Anatomy MGMC&RI.

30 old MRI scans of patients with ailments of shoulder impingement syndrome available in the department of Radiology MGMC&RI.

Exclusion and Inclusion criteria

Scapula with degenerative changes and broken acromion process will be excluded.

MRI scans of patients with history of trauma and previous surgeries , fractures, dislocations, tumours were not included in the study.

Classification of acromion process according to their shape

Flat -Type one

Curved- Type two

Hooked-Type three

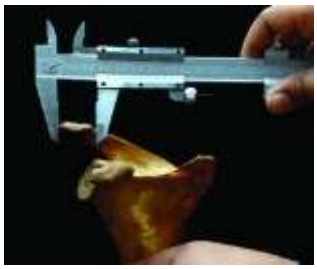
The various shapes were described by Bigliani et al.5

Digital vernier caliper with an accuracy up to 0.01mm was used to measure the morphometeric parameters of acromion process.

The length was measured as distance between the tip and midpoint of posterior border.(Fig1)

(FIG-1)

The breadth was measured as distance between the medial and lateral borders at the midpoint of acromion process.



(FIG- 2)

The measurement of coracoacromial distance was taken as a distance between the tip of the acromion process and tip of the coracoid process(

Fig3a)

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The measurement of the acromio-glenoid distance was taken as distance between the tip of the supraglenoid tubercle and tip of the acromion process

(Fig3b)

The measurement of thickness was taken at a point 1cms posterior to anterior border and 1cms medial to lateral border.

(Fig 3c)

Shape of Acromion process

RESULTS

Data obtained was statistically analysed using SPSS 16 software . Pearson correlation test was used for calculation of data such as mean , percentage, and standard deviation. Using P test the relationship between various variables were analysed.

Type of acromion process-Out of the 80 dry scapula of unknown age and sex , the curved or type two (fig-b)was observed in 58% of scapula, hooked or type three (fig-c) was observed in 37% of cases followed by flat or type one acromion process (fig-a) in 5% cases.

Coracoacromial distance-

In the present study the coracoacromial distance was ranging from 24.9mm to 31.4mm.

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The mean coracoacromial distance was observed to be 28.9mm The standard deviation was observed to be- 4.38

P value- 0.04

Acromio-glenoid distance-

In the present study the acromioglenoid distance was ranging from 24.2mm to

30.5 mm.

The mean of acromio-glenoid distance was observed as -27.35mm.

The standard deviation was observed to be- 4.02mm

P value- 0.02.

Comparison of parameters of acromion process in regional and International populations.

Table - 1

Authors	length (mm)	breadth (mm)	thickness (mm)	coraco-acromial distance (mm)	acromio- glenoid distance (mm)
Present study (South Indian)	43.60	24.03	6.94	28.9	27.35
Ritu Singhora et al (North Indian)	45.05	25.79	7.12	37.96	29.86
Mansur et al (Nepalese)14	46.01	26.93	-	39.21	31.9
Coskun et al (Turkish)	44.7	-	-	17.8	-
Gosavi et al (Maharashtra	43.7	22.78	6.9	26.9	22.68
Singh et al (Rajasthan)	46.1	23.2	6.6	37.5	27

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El-Din et al (Egyptian)	52.81	32.05	9.06	31.34	27.39
Paraskevas et al (Greek) 15	46.1	22.3	6.8	28.1	17.7

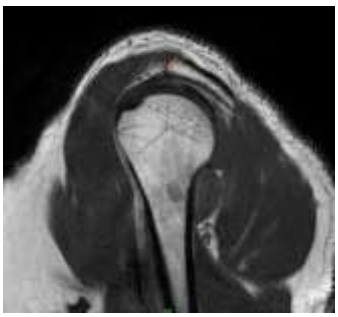
Table -2

	Minimum	**Maximum**	**Mean**	**Standard Deviation**	**P value**
Length	40.4mm	47.6mm	43.60mm	4.74mm	0.00mm
Breadth	22.1mm	25.1mm	24.03mm	2.04mm	0.00mm
Acromial Thickness	5.8mm	8.1mm	6.94mm	1.62mm	0.02mm
Coracoacromial distance	24.9mm	31.4mm	28.9mm	4.38mm	0.04mm
Acromio- glenoid distance	24.2mm	30.5mm	27.35mm	4.02mm	0.02mm

Radiological findings –

we have taken 30 retrospective MRI scans of the shoulder impingement syndrome. The radiological findings of the shoulder impingement syndrome are as given below.

Fig-1



The above MRI findings are- (Fig1)

Rotator cuff tendons are in intact

the infraspinatus , teres minor and subscapularis tendons show intensity pattern

mild effusion in the subdeltoid and sub acromion bursa

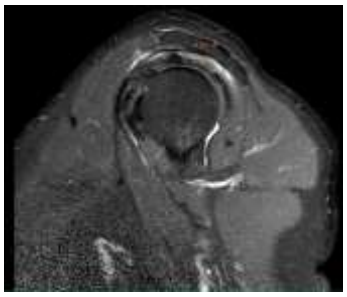


Fig-2

The above MRI findings are –(Fig-2)

Abnormal hyperintensity noted in the subacromial sub deltoid area

Type two acromion is seen

abnormal thickening with hyperintensity noted in the tendon of supraspinatus

Fig-3

The above MRI findings are – (Fig-3)

Type 3 acromion is seen which is hooked anteriorly

Lateral downsloping of acromion seen narrowing the acromiohumeral distance

Glenohumeral joint space is normal.

Fig-4

The above MRI findings are – (Fig-4)

supraspinatus tendon foot print at insertion tear with fluid and distal ibres of tendon for a length of ~9mm from insertion shows interruption of tendon fibres in both articular and bursal surface with some fibres.

Tear is extending upto the conjoint tendon of supraspinatus and infraspinatus.

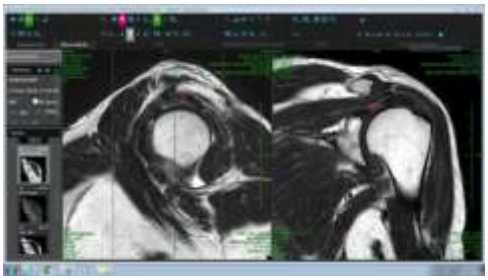


Fig-5

The above MRI findings are – (Fig-5)

Acrmoion morphology the osteophyte in the anteroinferior portion of the acromion hook impinging the supraspinatus tendon.

Reduced acromio humeral distance causing supraapinatus tendon impingement.

DISCUSSION

Type of acromion process-

Out of the 80 dry scapula , curved or type two was observed in 58% of scapula, hooked or type three was observed in 37% of cases followed by flat or type one was observed in 5% of cases. The observation made in our study (curved>hooked>flat) and the findings of Schetino et al in Brazilian population8 and in Turkish population by CosKun et al 3 were similar . Higher incidence of curved followed by flat and less number of hooked type acromion process, curved>flat>hooked was observed by Saha et al(Indian) EL-Din Wan et al (Egyptian) and Gosavi et, al (Maharashtrian) population respectively.

Mean length of acromion process – The mean length was recorded as 43.6mm. Our findings are very close to the findings of Gosavi et al from Maharashtrian population according to which the mean length is 43.7mm.

Mean Breadth of the acromion process- 24.03 mm was found to be the mean breadth of the acromion process in our study .Our findings are very close to the findings of Ritu singroha et al according to which the mean breadth was 25.79 mm in North Indian population.

Anterior thickness of acromion process- The mean anterior thickness of acromion process in our study was found to be 6.94mm. Our findings are similar to the findings of Gosavi et al from Maharashtrian population according to which, mean anterior thickness was 6.9mm.

Coraco-acromial distance- The mean Coraco-acromial distance in our study was found to be 28.9mm. Our findings are very close to the findings of Paraskevas et al 15from greek population according to which the coracoacromial distance was 28.1mm.

Acromio-glenoid distance- The mean of the acromio-glenoid distanc was 27.35mm .Our findings are very close to the findings of singh et al 9 from Rajasthan population according to which, the mean acromio glenoid distance was 27mm.

Radiological findings- some of the MRI scan findings of our study are as follows

1)Abnormal thickening with hypersensitivity in supraspinatus tendon

2) Infraspinatus, teres minor & subscapularis tendon also show intensity pattern.

3) Abnormal hyper intensity noted in the subacromial and subdeltoid area.

4) Mild effusion in the subdeltoid and subacromial area.

5) Shape of the acromion process found - type2 and type 3

6) Lateral down sloping of acromion seen narrowing the acromio humeral distance.

7)Tear in the tendons of supraspinatus and infraspinatus

8) Presence of osteophyte in the antero-inferior portion of the acromion hook impinging the supraspinatus tendon.

CONCLUSION

Knowledge about the types of acromion process and different measurements may help the surgeons while working on the shoulder joint as it is associated with variety of ailments . All the MRI scan findings in our study are the contributing factors which lead to the reduction in acromio humeral distance causing impingement

Obtained approval from human ethics committee and certificate has been issued.

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