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Radiographic metric analysis of Acromion Process in Shoulder Impingement

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ABSTRACT

After spine and knee, 16% of the musculoskeletal diseases appear in patients with shoulder joint pain. Most important extrinsic factor that influences the injury of rotator cuff characteristically changes of acromial morphology.

The purpose of this work is to study the Degenerative changes, Length of acromion process and Acromion Index (AI) on Radiographs of the patients with shoulder joint pain and control.

For, the present study, we studied 200 radiographs of shoulder joint (100 AP view and 100 supraspinatus outlet view) of patients with shoulder pain who are above age 18yr and attended orthopedic OPD for shoulder pain and 60 radiographs (30 AP view and 30 supraspinatus outlet view) of normal individuals

We had seen degenerative changes and length of acromion in both AP and Supraspinatus Outlet view (260).Acromion Index was measured in A-P view of radiographs (130).

Anterior spur was seen on the anterior third of acromion process in 73% of shoulder pain patients and 60% of normal individuals

Mean length of acromin process in shoulder pain patients was 52.63mm and mean length ofcontrol group was37.95mm.which is statistically significant

In the present study, mean AI of control group (0.73) is smaller than shoulder pain patients (0.76)

Our study concludes that measurement of length of acromion process is predictable parameter to differentiate between normal and shoulder pain patients as compared to degenerative changes in acromion process and Acromial Index.

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INTRODUCTION

After spine and knee, 16% of the musculoskeletal diseases appear in patients with shoulder joint pain. Most important extrinsic factor that influences the injury of rotator cuff characteristically changes of acromial morphology. The principle of extrinsic factor leads to mechanic compression of rotator cuff and its surrounding soft tissue causing external impingement syndrome.

The fact that acromioplasty relieves the impingement pain suggests the importance of the acromion in the aetiology of this disease. The shape and certain morphological angles of the acromion have been presented to be associated with the pathogenesis of impingement syndrome (Neer 1983[1], Aoki M et al. 1986[2], Bigliani et al. 1986[3], Toivonen et al. 1995[4,]Tuite et al. 1995[5]). On the other hand, the mechanical aetiology of impingement might be related to several other factors (Gruber 1863[6], Neer 1972[7], Kessel& Watson 1977[8], Gerber et al. 1985[9], Uhthoff et al. 1988[10,] Jobe et al. 1989[11], Walch et al. 1992[12]). These numerous aspects are attributed to the extrinsic theory of impingement aetiology, according to which the lesion appears purely mechanically. In 1972[7], Neter described pathological interaction of anterior third of the acromial , coracoacromial ligament abutted against tendinous portion of rotator's cuff leading to rotator cuff tearing over time so called "impingement syndrome".Predictive Rotator Cuff Tear parameters like acromion morphology, acromion index, critical shoulder angle and lateral acromion angle are strongly supporting extrinsic factors. Especially acromion involvement is the most likely factor suggested for rotator cuff degeneration.

Aim – To do metrical analysis of acromion process in patients of shoulder pain.

METHODOLOGY –

Inclusive criteria-

Patients above age 18yr who attended orthopedic OPD for shoulder pain.

Exclusive criteria-

1. Patient with surgery on the shoulder.
2. Patient with inflammatory diseases of the shoulder joint.
3. Patient with a congenital abnormality of the shoulder joint.

Study procedure –

After ethical clearance from Institutional Ethical Committee, informed written consent was taken and radiographs were studied for following parameters.

1. Degenerative Changes-

Degenerative changes mostly seen on the anterior third of acromion process were studied in 260 radiographs.

2. Length of the acromion (L)-

Length of acromion process was measured from the tip of the acromion to end of acromion process. By using Digital Verniercaliper,in 260 radiographs.

3. Acromion index(AI)-

The acromion index (AI) was measured on true Anteroposterior radiographs according to Nyffeler et al. (2006)[13]. The distance from the glenoid plane to the acromion (GA) was divided By the distance from the glenoid plane to the lateral aspect of the humeral head (GH).

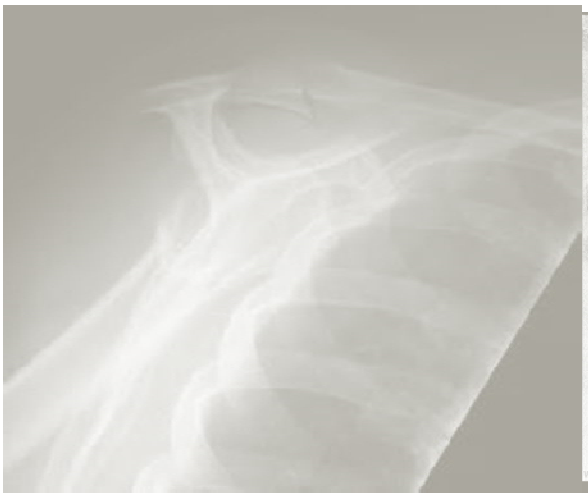
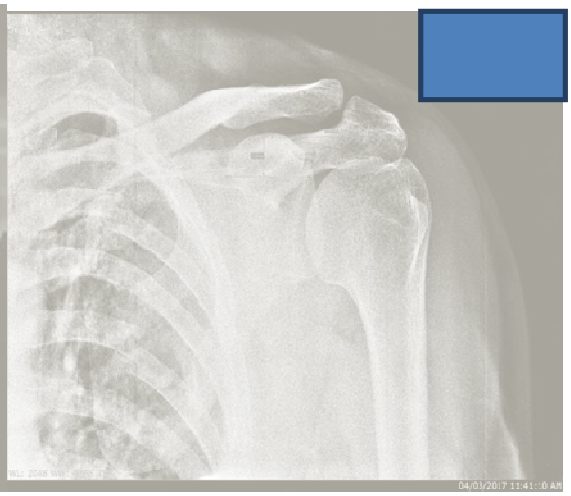


Figure 1:



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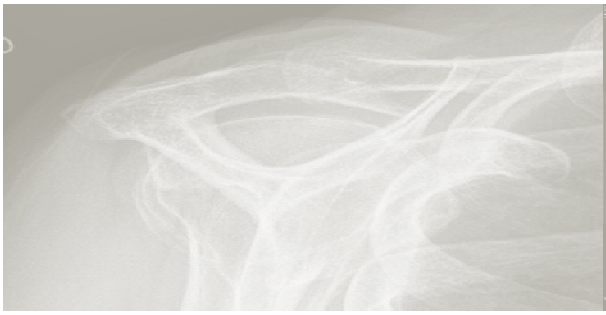

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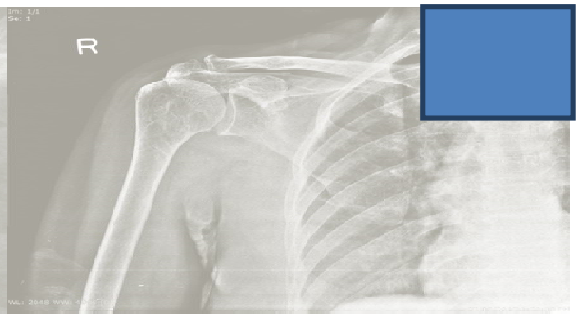

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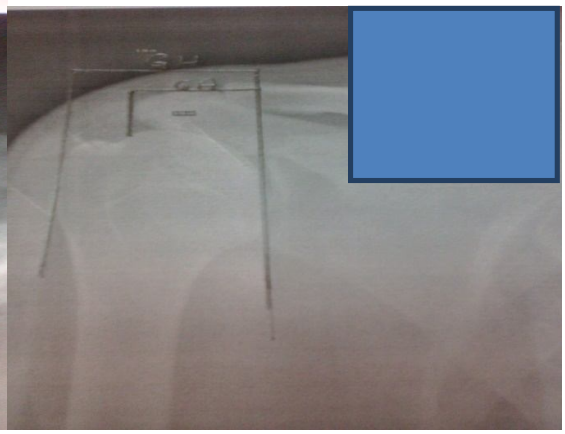


Figure 5: **Figure 6:**

Figure 1: supraspinatus outlet view shows degenerative changes on anterior third of acromion process;

Figure 2: A-P view of radiograph showing degenerative changes at anterior third of acromion process;

Figure 3:supraspinatus outlet view shows degenerative changes on anterior third of acromion process;

Figure 4:A-P view of radiograph showing degenerative changes at anterior third of acromion process;

Figure 5: Length(L)of acromion process;

Figure 6:Acromion Index=GA/GH.

OBSERVATIONS -

Table no. 1: Degenerative changes on anterior thirdof acromion process

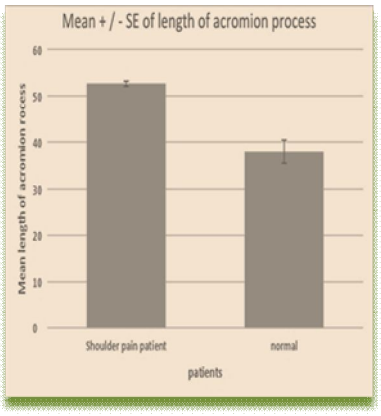
Radiographs	N	Degenerative changes	N	percent
Shoulder pain patient	200	Present	146	73%
		Absent	54	27%
Normal	60	Present	36	60%
		Absent	24	40%

Table 2: Length of Acromion Process (L) in mm

Radiographs	N	Mean	Std. Deviation	Std. Error Mean	Minimum	Maximum	unpaired t	p value	Signficance
Shoulder pain patient	200	52.63	8.04	0.57	30.07	80.12	5.866	0.000	Highly significant
Normal	60	37.95	18.88	2.44	5.37	66.26			

Table 3: Radiographs showing acromion Index

	Radiographs	N	Mean	Std. Deviation	Std. Error Mean	p value
Acromion Index	Shoulder pain patient	100	0.76	0.115	0.01154	0.13(NS)
	normal	30	0.73	0.093	0.01713	



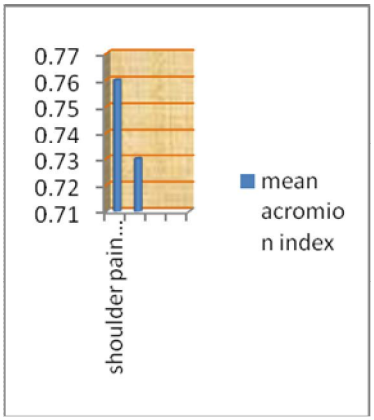


Figure 7: **Figure 8:** **Figure : 9**

Figure 7: Degenerative Changes on anterior third of acromion process;Figure 8: Length of Acromion Process (L) in mm; Figure 9: Acromion Index

DISCUSSION-

1. *Degenerative changes-*

Bigliani, Morrison and April (1986)[3]noted the relationship between the profile Shape of the acromion and degenerative changes in the bone and underlying rotator cuff.

The concept of a 'hooked' acromion, although easily translated into a schematic drawing, is difficult to measure in practice. Secondary degenerative anterior spurs may be mislabelled as such. The influence of the hook on degenerative processes is determined mainly by the slope of the acromion to which it is attached. The development of an anterior spur on the acromion, a process termed enthesopathy, takes place within the substance of the C-A ligament and probably results from the transmission of tensile forces through the ligament (Ogata and Uhthoff 1990)[14]. We believe that this is due to the triangular shape of the C-A ligament which has a wide base attached to the coracoid. The degenerative changes seen on the acromion presumably arise from long-standing impingement by the humeral head.

Degeneration of the acromioclavicular Joint; Neer state that degeneration of the acromioclavicular joint may cause subacromial impingement[7], and many other authors have

supported this statement.[8,15,16] Osteophytes that protrude inferiorly from the undersurface of a degenerative acromioclavicular joint can take part in impingement when the cuff passes beneath the joint[15]. In 1977, Kessel and Watson[8] brought additional attention to the acromioclavicular joint as a cause of Subacromial impingement. Penny and Welsh[17] subsequently found that osteoarthrosis of the acromioclavicular joint can lead to failure after the operative treatment of subacromial impingement. However, resection of the acromioclavicular joint should not be performed routinely for all patients who have subacromial impingement; rather, the joint should be resected only if the patient has symptoms in the region of the joint and if osteophytes contribute to the impingement.

In the present study we had not seen the degeneration of acromioclavicular joint but anterior spur was seen on the anterior third of acromion process in 73% of shoulder pain patients and 60% of normal individuals

2. *Length of Acromion process* –

Edelson and Taitz[21] state that the length of the acromion process and the height of the coracoacromialarch were closely related with degenerative changes. Increased degenerative changes of both types were related with increased length of the acromion process and length was in turn connected to the shape of the acromion process.

In the present study, mean length of acromin process in shoulder pain patients was 52.63mm and mean length of control group was37.95mm. which is statistically significant and it is comparable with the Edelson and Taitz[21] work.

3. *Acromion Index (AI)* –

Acromion Index indicates lateral extension of the acromion. Nyffeler et al[13] introduced the concept of Acromin Index and stated that a large Acromial Index results in a more vertical orientation of the force vector of the middle fibres of the deltoid, which will tend to pull the humeral head upwards, requiring the supraspinatus to exert a greater horizontal force to stabilize the centre of rotation during active abduction.

In the present study, mean AI of control group (0.73) is smaller than shoulder pain patients (0.76). Maurice Balke, Carolin Schmidt, Nicolas Dedy, Marc Banerjee, Bertil Bouillon, and DennisLiem (2013)[20] also found mean AI of controls (0.67) lower than impingement patients (0.73).

CONCLUSION

Our study concludes that measurement of length of acromion process is predictable parameter to differentiate between normal and shoulder pain patients as compared to degenerative changes in acromion process and Acromial Index.

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