

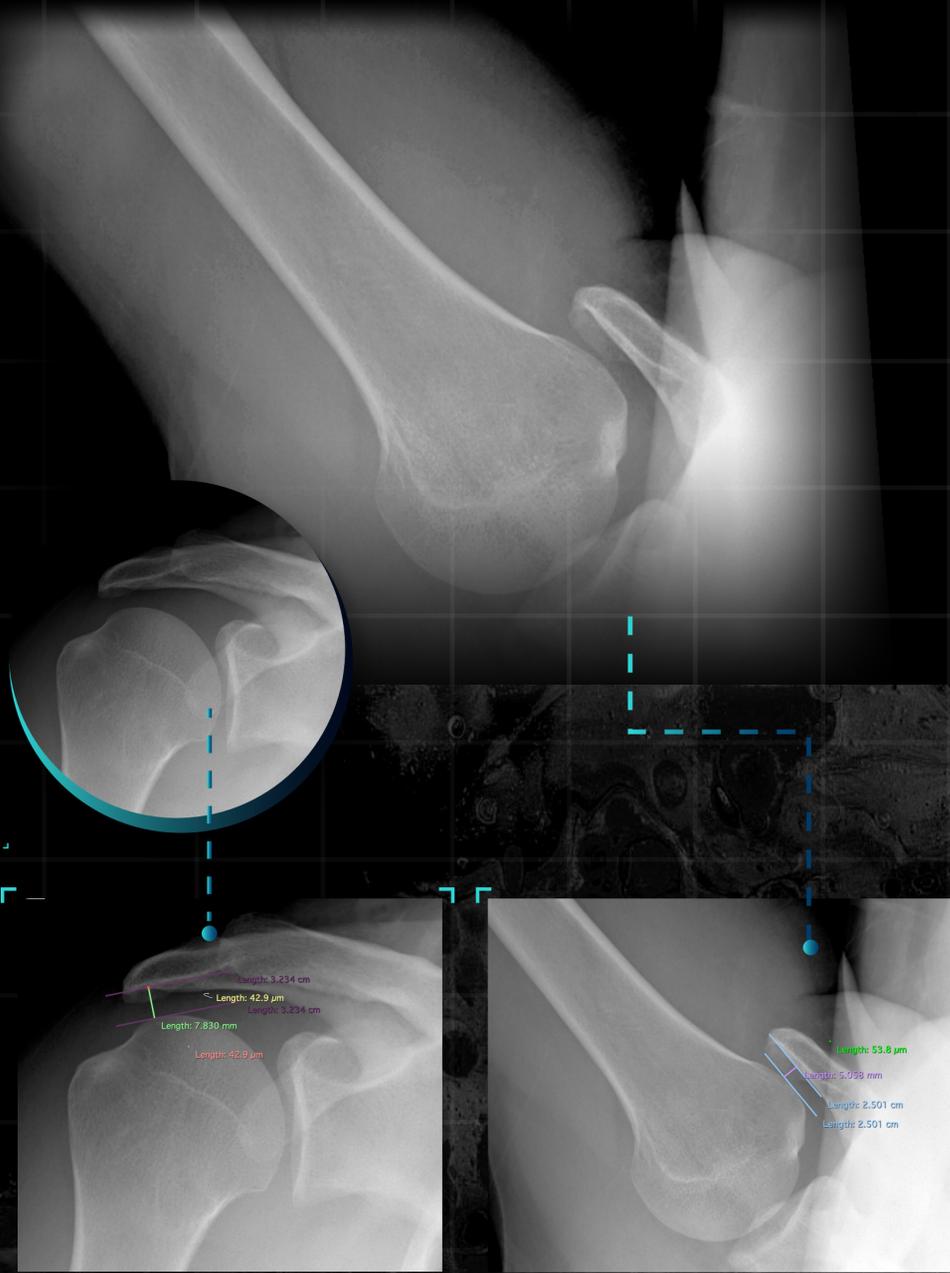
# OMALGIAS OF MIDDLE AGE:

Subclinical vertical translation of the shoulder, a new radiological method to identify it.



## Background:

We propose that subclinical humeral vertical translation plays a predominant role in the genesis of shoulder pain. It is expected that patients with shoulder pain will exhibit a greater translation and, therefore, a greater decrease in the humero-acromial space upon raising the arm compared to patients who have never experienced shoulder pain (the control group).



DICOM images were reviewed using the Horos program at two different times by the same radiologist. A line was drawn along the lower edge of the acromion, and then another line was drawn parallel to the previous one, touching the highest point of the proximal epiphysis of the humerus. The distance between the two lines was measured.

The Mann-Whitney-Wilcoxon test was used for statistical analysis using Epi Info™ Version 7.2.5 and Epidat 4.1 software.

## Results:

The results showed a **statistically significant difference** between both groups ( $p=0.0045$ ) with greater excursion in patients with shoulder pain. The mean vertical translation in patients with shoulder pain was 4.13 millimeters, with no significant difference between the symptomatic and asymptomatic shoulder. In asymptomatic patients, the average was 2.95 millimeters. The standard deviation was 1.88 millimeters for the group with shoulder pain and 1.40 millimeters for the control group (Table 1). No similar papers were found on this topic, which encourages further investigation.

## Conclusions:

In patients with shoulder pain, the vertical excursion of the shoulder with 140-degree elevation is greater, in both shoulders, than in the control group.

## Method:



**40** patients (80 shoulders).



Ages between **30-60** years old.



**20** who never had shoulder pain.



**20** with unilateral or bilateral shoulder pain.



**2** different health centers in Uruguay.

Patients with rotator cuff tears, capsulitis, or glenohumeral arthropathy were excluded.

## SIMPLE X RAY TECHNIQUE:

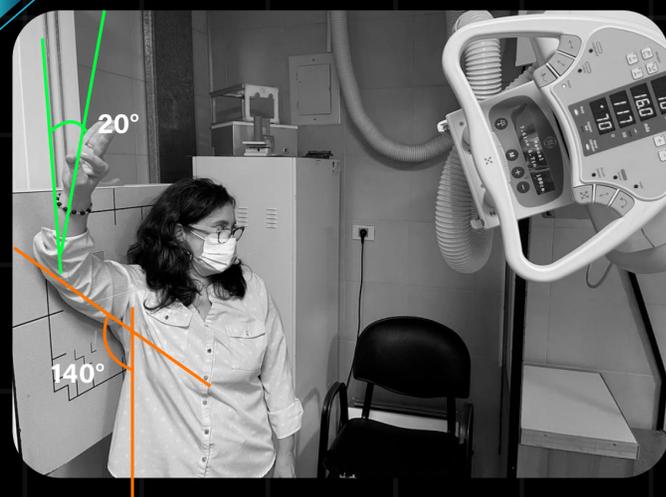
Performed by the same radiologist.

**Constant tube distance:** 1,20mts.

**Constant tube angulation:** 20 degrees caudal inclination.

**AP projection:** Shoulder in resting position of the limb and **20 degrees of internal rotation.**

**Impact position projection:** Shoulder with **140 degrees of elevation and 20 degrees of internal rotation.**



## Team:

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# Correlation between observations

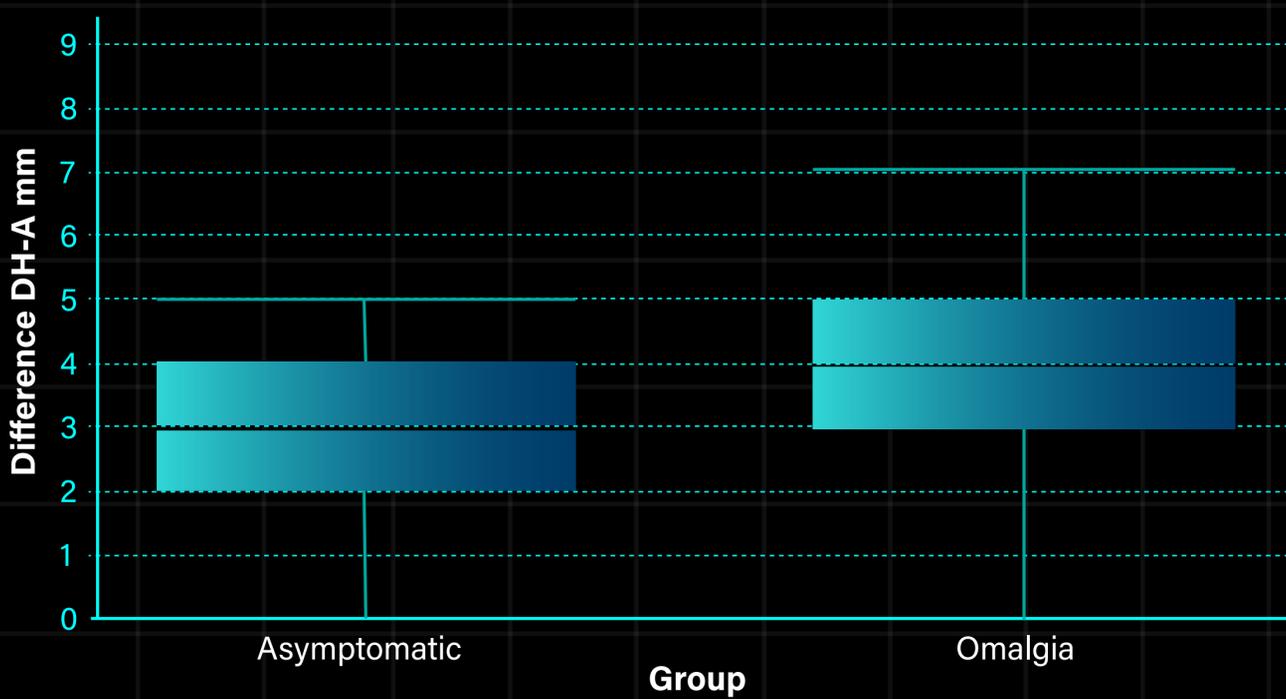
The intraclass correlation coefficient was determined to estimate the concordance of the measurements with respect to the review. The mean of the differences between the pairs of observations was **0.225** with a standard deviation of 0.811; the coefficient value was 0.878 with a 95% CI of (0.816 - 0.920), which shows a high correlation between the original measurement and the subsequent revision.

## DH-A difference comparison

	Patients with Omalgia	Control group (without Omalgia)
Mean	4,13	2,95
Median	4,0	3,0
Standard deviation	1,88	1,40
Sample size	40	40

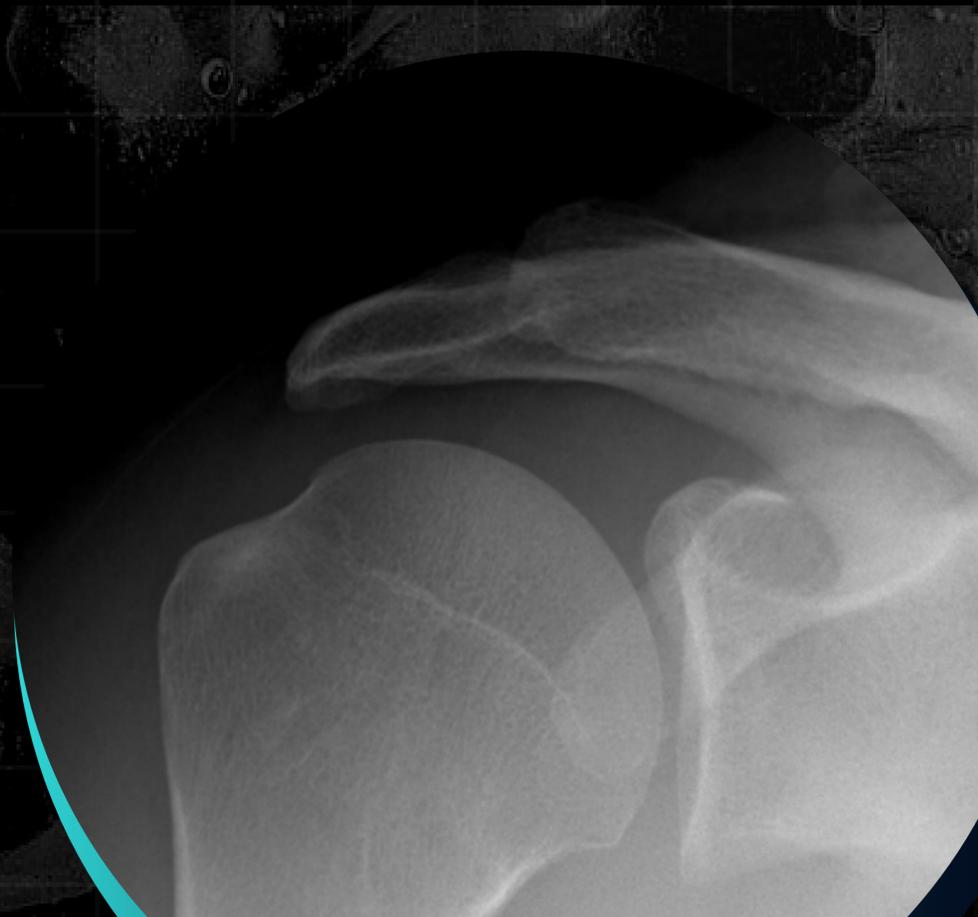
## T- test

Variances	Degrees of freedom	T - statistic	P - value
Unequal	68,444	2,486	<b>0,015</b>



### Statistical Research:

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# Table 1

## Patients with Omalgia

#	Patient	Age	Sex	Dominant Hand	Omalgia 2022/ Previous omalgia	Humeral-Acromial Distance (HAD)				HAD measurement review			DIF 1st and 2nd
						Repose	High	Dif	Side	Repose	High	Dif	
1	CR	32	Male	Right	Left omalgia	14	5	9	Right	14	5	9	0
						10	8	2	Left	11	8	3	-1
2	AA	32	Male	Right	Left omalgia	8	5	3	Right	8	5	3	0
						8	5	3	Left	8	5	3	0
3	MD	35	Male	Right	Right omalgia	8	4	4	Right	8	6	2	2
						9	5	4	Left	9	5	4	0
4	RC	38	Male	Right	Right omalgia	7	3	4	Right	8	3	5	-1
						8	3	5	Left	8	3	5	0
5	CA	44	Female	Left	Bilateral omalgia	10	6	4	Right	10	5	5	-1
						13	6	7	Left	13	6	7	0
6	EK	46	Male	Right	Left omalgia	11	6	5	Right	11	5	6	-1
						10	6	4	Left	10	6	4	0
7	AM	49	Female	Left	Bilateral omalgia	9	4	5	Right	9	4	5	0
						9	4	5	Left	10	4	6	-1
8	UN	50	Female	Right	Right omalgia	6	6	0	Right	9	7	2	-2
						8	5	3	Left	9	7	2	1
9	BT	51	Female	Right	Bilateral omalgia	7	3	4	Right	7	3	4	0
						9	3	6	Left	9	3	6	0
10	LS	52	Female	Right	Right omalgia	9	5	4	Right	10	7	3	1
						8	6	2	Left	10	7	3	-1
11	PR	54	Male	Right	Right/bilateral	12	6	6	Right	13	4	9	-3
						11	5	6	Left	11	6	5	1
12	MB	55	Female	Right	Left/bilateral	10	3	7	Right	10	4	6	1
						10	4	6	Left	10	4	6	0
13	LG	46	Female	Right	Left omalgia	7	5	2	Right	11	7	4	-2
						8	5	3	Left	10	6	4	-1
14	GS	56	Female	Right	Right omalgia	7	4	3	Right	7	5	2	1
						8	6	2	Left	8	6	2	0
15	BM	58	Female	Right	Left omalgia	8	4	4	Right	7	3	4	0
						7	4	3	Left	7	4	3	0
16	LS	59	Female	Right	Bilateral omalgia	6	6	0	Right	6	6	0	0
						8	6	2	Left	9	7	2	0
17	CI	38	Female	Right	Left omalgia	6	4	2	Right	6	4	2	0
						8	5	3	Left	8	5	3	0
18	MV	55	Female	Right	Bilateral omalgia	7	4	3	Right	7	4	3	0
						7	4	3	Left	7	4	3	0
19	NC	41	Female	Right	Bilateral omalgia	7	6	1	Right	7	6	1	0
						7	4	3	Left	7	4	3	0
#	DM	58	Female	Right	Right omalgia	8	3	5	Right	8	3	5	0
						7	0	7	Left	7	0	7	0
<b>Averages</b>		47				8,5	4,65	3,85		8,925	4,9	4,025	-0,175

## Asymptomatic patients

#	Patient	Age	Sex	Dominant Hand	Omalgia 2022/ Previous omalgia	Humeral-Acromial Distance (DH-A)				DH-A measurement review			DIF 1st and 2nd
						Repose	High	Dif	Side	Repose	High	Dif	
1	MP	30	Male	Right	Asymptomatic	5	3	2	Right	8	5	3	-1
						5	3	2	Left	10	6	4	-2
2	SB	44	Male	Right	Asymptomatic	7	6	1	Right	8	6	2	-1
						8	6	2	Left	8	6	2	0
3	JO	33	Male	Right	Asymptomatic	7	4	3	Right	7	4	3	0
						9	5	4	Left	9	4	5	-1
4	ML	34	Male	Right	Asymptomatic	10	6	4	Right	10	5	5	-1
						10	6	4	Left	10	6	4	0
5	VP	37	Female	Right	Asymptomatic	9	6	3	Right	10	6	4	-1
						10	6	4	Left	9	6	3	1
6	AA	42	Male	Right	Asymptomatic	6	5	1	Right	8	5	3	-2
						7	5	2	Left	8	5	3	-1
7	MS	43	Male	Right	Asymptomatic	8	6	2	Right	9	6	3	-1
						8	5	3	Left	10	7	3	0
8	NM	45	Male	Right	Asymptomatic	6	4	2	Right	6	4	2	0
						5	4	1	Left	7	5	2	-1
9	PS	45	Female	Right	Asymptomatic	7	2	5	Right	7	3	4	1
						8	4	4	Left	8	4	4	0
10	SR	56	Female	Right	Asymptomatic	8	4	4	Right	7	4	3	1
						9	4	5	Left	8	4	4	1
11	NM	56	Female	Right	Asymptomatic	7	3	4	Right	6	2	4	0
						7	2	5	Left	6	1	5	0
12	SB	59	Female	Left	Asymptomatic	9	5	4	Right	9	5	4	0
						8	7	1	Left	8	6	2	-1
13	MC	52	Male	Left	Asymptomatic	7	4	3	Right	7	4	3	0
						9	5	4	Left	9	4	5	-1
14	MG	30	Male	Right	Asymptomatic	8	6	2	Right	8	6	2	0
						9	9	0	Left	9	9	0	0
15	VC	32	Female	Left	Asymptomatic	8	6	2	Right	8	6	2	0
						7	5	2	Left	8	6	2	0
16	MR	40	Male	Right	Asymptomatic	7	3	4	Right	7	3	4	0
						7	3	4	Left	7	3	4	0
17	VD	42	Female	Right	Asymptomatic	9	6	3	Right	9	6	3	0
						9	7	2	Left	9	6	3	-1
18	PM	43	Female	Right	Asymptomatic	8	4	4	Right	8	4	4	0
						9	5	4	Left	9	5	4	0
19	LG	41	Female	Right	Asymptomatic	11	7	4	Right	11	7	4	0
						10	6	4	Left	10	6	4	0
#	LV	35	Female	Right	Asymptomatic	7	5	2	Right	7	5	2	0
						6	5	1	Left	6	5	1	0
<b>Averages</b>		42				7,85	4,925	2,925		8,2	5	3,2	-0,275

# References

- 1)** Castagna A 1 , E Cesari 2 , A Gigante 3 , B Di Matteo 4 , R Garofalo 5 , G Porcellini 6 "Age-Related Changes of Elastic Fibers in Shoulder Capsule of Patients with Glenohumeral Instability: A Pilot Study." *Biomed Res Int.* 2018 Jul 18;2018:8961805.  
doi: 10.1155/2018/8961805.
- 2)** Deutsch A, Altchek DW, Schwartz E, Otis JC, Warren RF. "Radiologic measurement of superior displacement of the humeral head in the impingement syndrome"  
*J Shoulder Elbow Surg.* 1996 May-Jun;5(3):186-93. doi: 10.1016/s1058-2746(05)80004-7.
- 3)** Desmeules Francaois, MSc, PT, Luc Minville, Barbara Riederer, MD, Claude H. Co<sup>^</sup>te<sup>´</sup>, PhD, and Pierre Fre<sup>´</sup>mont, MD, PhD "Acromio-Humeral Distance Variation Measured by Ultrasonography and Its Association With the Outcome of Rehabilitation for Shoulder Impingement Syndrome". *Clin J Sport Med* - Volume 14, Number 4, July 2004 doi:10.1097.
- 4)** Graichena H,\* , S. Hinterwimmera,b, R. von Eisenhart-Rothea, T. Voglc, K.-H. Englmeierd, F. Eckstein "Effect of abducting and adducting muscle activity on glenohumeral translation, scapular kinematics and subacromial space width in vivo". *Journal of Biomechanics* 38 (2005) 755-760 <https://doi.org/10.1016/j.jbiomech.2004.05.020>
- 5)** Hallström E, MD\*, and J. Kärrholm, MD, PhD† "Shoulder Kinematics in 25 Patients with Impingement and 12 Controls". *CLINICAL ORTHOPAEDICS AND RELATED RESEARCH* Number 448, pp. 22–27 © 2006 Lippincott Williams & Wilkin
- 6)** Keener, Jay D. (2009). "Proximal Humeral Migration in Shoulders with Symptomatic and Asymptomatic Rotator Cuff Tears". *The Journal of Bone and Joint Surgery (American)*, 91(6), 1405–. doi:10.2106/JBJS.H.00854
- 7)** Kibler W Ben 1 , Paula M Ludewig, Phil W McClure, Lori A Michener, Klaus Bak, Aaron D Sciascia. "Implications of scapular dyskinesis in shoulder injury: the 2013 consensus statement from the 'Scapular Summit'". doi: 10.1136/bjsports-2013-092425 *Clinical*.
- 8)** Kibler, W. B.; Sciascia, A. (2010). "Current concepts: scapular dyskinesis". *British Journal of Sports Medicine*, 44(5), 300–305. doi:10.1136/bjism.2009.058834.
- 9)** Leong, H; Fu, S; He, X; Oh, J; Yamamoto, N; Yung, S (2019). "Risk factors for rotator cuff tendinopathy: A systematic review and meta-analysis". *Journal of Rehabilitation Medicine*, (), 0–. doi:10.2340/16501977-2598
- 10)** Luc J Hébert 1 , Hélène Moffet, Marie Dufour, Christian Moisan. "Acromiohumeral distance in a seated position in persons with impingement syndrome". *J Magn Reson Imaging.* 2003 Jul;18(1):72-9. doi: 10.1002/jmri.10327.
- 11)** Luke T. Mattar, BSa,b, Adam J. Popchak, DPT, PhDc, William J. Anderst, PhDd,e, Volker Musahl, MDa,b,e, James J. Irrgang, PT, PhD, FAPTAc,e, Richard E. Debski, PhDa,b,e,\* "Associations between range of motion, strength, tear size, patient-reported outcomes, and glenohumeral kinematics in individuals with symptomatic isolated supraspinatus tears". *J Shoulder Elbow Surg.* 2022 Jun;31(6):1261-1271. doi: 10.1016/j.jse.2021.12.032. Epub 2022 Jan 26.
- 12)** Paletta G A Jr 1 , J J Warner, R F Warren, A Deutsch, D W Altchek. "Shoulder kinematics with two-plane x-ray evaluation in patients with anterior instability or rotator cuff tearing"  
*J Shoulder Elbow Surg.* 1997 Nov-Dec;6(6):516-27. doi: 10.1016/s1058-2746(97)90084-7.
- 13)** Pattappa G. 1,\* , J. Zellner1, B. Johnstone2, D. Docheva1 and P. Angele1,3 et al. "Cells under pressure – the relationship between hydrostatic pressure and mesenchymal stem cell chondrogenesis" *European Cells and Materials* Vol. 37 2019 (pages 360-381) DOI: 10.22203/eCM.v037a22 ISSN 1473-2262
- 14)** Phil. "Shoulder muscle imbalance and subacromial impingement syndrome in overhead athletes". *Int J Sports Phys Ther.* 2011 Mar;6(1):51-8.
- 15)** Poppen NK, Walker PS. "Forces at the glenohumeral joint in abduction". *Clin Orthop Relat Res.* 1978 Sep;(135):165-70.
- 16)** Satoshi Ogata M, .D.,\* and Hans K .Uhthoff M, .D., F.R.C.S.(C.)\*\* "Acromial Enthesopathy and Rotator Cuff Tear. A Radiologic and Histologic Postmortem Investigation of the Coracoacromial Arch".
- 17)** Teyhen Deydre S 1 , Joseph M Miller, Tansy R Middag, Edward J Kane. "Rotator cuff fatigue and glenohumeral kinematics in participants without shoulder dysfunction". *Athl Train.* 2008 Jul-Aug;43(4):352-8. doi: 10.4085/1062-6050-43.4.352.
- 18)** Thompson Melissa D 1 , Dennis Landin, Phillip A Page "Dynamic acromiohumeral interval changes in baseball players during scaption exercises" *J Shoulder Elbow Surg.* 2011 Mar;20(2):251-8. DOI: 10.1016/j.jse.2010.07.012
- 19)** Yamaguchi Ken ; Jerry S. Sher; William K. Andersen; Ralph Garretson; John W. Uribe; Keith Hechtman; Robert J. Neviaser (2000). "Glenohumeral motion in patients with rotator cuff tears: A comparison of asymptomatic and symptomatic shoulders" , 9(1), 0–11. doi:10.1016/s1058-2746(00)90002-8

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