

Research Article

Comparison of Restricted Movement Pattern among Patients of Idiopathic, Diabetic and Traumatic Adhesive Capsulitis

Syed Mohsin Ajmal¹, Muhammad Salman Bashir^{2*}, Syed Ijaz Ahmad Burq³, Ashfaq Ahmad⁴, Syed Amir Gilani⁵

¹DPT student, University Institute of Physical Therapy, Faculty of Allied Health Sciences, University of Lahore, Pakistan; ^{2*}Associate Professor, University Institute of Physical Therapy, Faculty of Allied Health Sciences, University of Lahore, Pakistan; ³Physiotherapist, Physiotherapy Department, Lahore General Hospital, Lahore; ⁴Head of Department, University Institute of Physical Therapy, Faculty of Allied Health Sciences, University of Lahore, Pakistan; ⁵Dean & Professor, Faculty of Allied Health Sciences, University of Lahore.

Abstract |

Background Objectives: Restriction in Adhesive capsulitis is known, however pattern of restriction in different groups of adhesive capsulitis is unknown and unclear.

Methods: Self-administered questionnaire was undertaken to measure the available range of motion (ROM) among 60 patients of adhesive capsulitis divided in 3 groups idiopathic, diabetic and traumatic. Age ranged from 40 to 75 years. Standardized Goniometer was used to measure the ranges of shoulder. The data was collected and analyzed statistically by Statistical Package for the Social Sciences (SPSS) software.

Results: Study included 60 patients of adhesive capsulitis consisting of three groups of idiopathic, diabetic and traumatic adhesive capsulitis (20 each). The results regarding patterns of ranges in all groups showed that for flexion range of motion there was non-significant difference between idiopathic and diabetic Group (p value 0.69), while between idiopathic versus traumatic and diabetic versus traumatic group it was significant (p value 0.04 and 0.017 respectively). For extension range of motion, between idiopathic and diabetic group, there was non-significant difference (p value 0.227), while it was significant for idiopathic versus traumatic and diabetic versus traumatic groups (p value 0.022 and 0.001 respectively). Results for abduction range of motion, there was non-significant difference for all groups i.e. idiopathic versus diabetic, idiopathic versus traumatic and traumatic versus diabetic groups (p value 0.085, 0.503 and 0.286 respectively), while for internal and external rotation groups of idiopathic versus diabetic and idiopathic versus traumatic all showed significant difference (p value 0.000) and non-significant for traumatic versus diabetic group (p value 0.151 and 0.326 respectively) for internal and external rotation.

Conclusion: The study concluded that diabetic and traumatic group of adhesive capsulitis followed cyriax 'capsular pattern' but in idiopathic group of adhesive capsulitis this pattern did not emerged.

Received | 15-09-2017| **Accepted** | May 02, 2018 **Published** | June 20, 2018

***Corresponding Author** | Dr. Muhammad Salman Bashir, Associate Professor, University Institute of Physical Therapy, Faculty of Allied Health Sciences, University of Lahore, Pakistan. **Email:** chistisalman@yahoo.com

Citation | Ajmal, S.M., M.S. Bashir, S.I.A. Burq, A. Ahmed, S.A. Gilani. 2018. Comparison of Restricted Movement Pattern among Patients of Idiopathic, Diabetic and Traumatic Adhesive Capsulitis. *Annals of King Edward Medical University*, 24(2): 22-28

DOI | <http://dx.doi.org/10.21649/journal.akemu/2018/24.2.22-28>

Keywords | Adhesive capsulitis, Range of motion, Diabetic, Traumatic, Idiopathic.

Introduction

Painful shoulder syndromes comprises a significant part of the new patient load at specialist clinics.⁽¹⁾ In many cases these patients referred due to

amalgamation of restricted movement and pain leading to the sizable work absenteeism and use of medical services. Furthermore episodic shoulder pain is incessant reason of primary care attendance.⁽¹⁾ Idiopathic adhesive capsulitis a painful and sti

shoulder of an unnamed etiology. In idiopathic adhesive capsulitis the joint capsule become thick and shortened and the collagen is packed more densely.⁽²⁾ Joint restriction is due to the growth of abnormal tissue in between the articular surfaces. Furthermore deplete amount of synovial fluid which play a role of lubrication to shoulder joint during movements also contribute to the restricted intra-articular movements.⁽³⁾ There is reduction in intra-articular volume and capsular compliance due to which glenohumeral motion become restricted in all planes.⁽⁴⁾ Shoulder adhesive capsulitis goes by many names and among them scapulohumeral peri-arthritis, peri-arthritis of duplex, peri-arthritis of shoulder and check-rein shoulder are more sought after. This condition came into scene by the works of Putnam in 1982 than later by Codman.⁽⁵⁾ Adhesive capsulitis rated as the third common reason of musculo skeletal dysfunction with the prevalence rate of 2% in the general population; however, this rate increases dramatically in the reported cases of diabetics with the prevalence rate up to 11%. Type 1 diabetics have a 40% chance of developing adhesive capsulitis in their life. Cases of bilateral adhesive capsulitis have a prevalence of 16% among all the patients with adhesive capsulitis. However, backsliding is uncommon in this condition. This particular condition is more often seen in patients of fifth to sixth decades and women are more affected than men.⁽⁶⁾ As far as pain is concerned, exercises play a huge role in symptom relief in case of Adhesive capsulitis, these exercises improve both flexibility and extensibility of shoulder capsule. Which result in pain reduction. Antero inferior part of joint capsule and point of attachment of joint capsule to neck of humerus is the most thickened part in adhesive capsulitis⁽⁷⁾. Adhesive capsulitis occurs not in high quantity but it has a high psychological impact due to pain and functional disability. Frozen shoulder is divided into three phases: The freezing stage (severe movement restriction and in some cases pain also present), The frozen stage (maximum stiffness phase) and The thawing phase (returns to normal phase, pain and restriction come back to normal).⁽⁸⁾ Despite the recovery of functional abilities some researches depict that up to 50% of patients kept on feeling mild pain and stiffness seven years after the foundational symptoms as well as restriction in shoulder range of motion compared with the healthy shoulder.⁽⁹⁾ Some

studies claim that there are 20 to 50% patients with adhesive capsulitis that suffer restriction issues and other problems that may remain for as long as 10 years. Females of age between 50 to 70 are most likely to produce this condition.⁽²⁾ Furthermore, adhesive capsulitis is largely a unilateral and majorly a self-limiting condition, which recovers within 2 to 3 years on its own. But some researches claim that about 40% of the individuals have issues with symptoms and restricted range of motion even after 3 to 4 years. Adhesive capsulitis is mostly perceived as a self-limiting condition however complete recovery from symptoms does not always occur. 59% of the cases had a near normal shoulder after 4 years.⁽¹⁰⁾ There are many risk factors that can determine the degree of joint restriction between capsule and glenoid cavity. Diabetes mellitus, stroke, cerebrovascular accident, lung disease, arthritis, rheumatic disease, spinal disc conditions and cardiac issues are all risk factors of Adhesive capsulitis. Frozen shoulder by far have connections with other conditions. Diabetes mellitus is the most frequent participant in adhesive capsulitis among systemic conditions, Even some surgical treatment can contribute to adhesive capsulitis like cardiac surgery, cardiac catheterization and radial neck surgery.⁽²⁾ Age is the major decider usually it occurs in individuals more than 40 years.^(8,11) As stated by Cyriax, restriction in shoulder movements under-take according to capsular pattern. External rotation restricted more than abduction then internal rotation and finally then flexion⁽¹²⁾. Surgical and radiological analysis have showed that anterior structures of the glenohumeral joint are mostly affected,^(13,14) which gives us clear indication why the external rotation is the most noted pattern of movement restriction in adhesive capsulitis.⁽¹⁵⁾

Shoulder pain and restricted range of shoulder motion have severe effect on patient's daily living and is a major cause of hospital turnouts. The aim of this study is to investigate the frequency with which the shoulder pain in the society in people with idiopathic, traumatic and adhesive capsulitis, is linked up with restriction of movement and is there any particular movement that is more likely to be restricted than others.

Methods

Comparative Cross-sectional study was conducted on

comparison of restricted movement pattern among patients with idiopathic, diabetic and traumatic adhesive capsulitis. using convenient sampling procedure to collect data. Total 60 patients calculated through Tasto JP,2005 were included in this study and divided into three groups, idiopathic, diabetic and traumatic. Each group will be comprised on 20 patients. The sample size is calculated at 95% level of confidence. Data was collected from Physiotherapy Department, Lahore General Hospital, Lahore and analyzed in University Institute of Physical Therapy, University of Lahore. The time duration of data collection was three months. Both male and female subjects were included in this study, age between 40 to 75 years. Only unilateral frozen shoulder patients were included in this study. Only those patients were taken who were free from cancer, any systemic disease and any infection. Data was collected through a self-administered questionnaire and the range of movement is measured by a standardized valid reliable Goniometer. The subjects had developed restriction in Range of Motion (ROM) due to adhesions and on the basis of the cause of restriction we divided the subjects into three groups named as idiopathic, diabetic and traumatic adhesive capsulitis. Range of motion measured twice for each movement and average of these were taken into account. In this study five different shoulder movements were measured with Goniometer and those movements were shoulder flexion, shoulder extension, shoulder abduction, shoulder internal rotation and shoulder external rotation. Collected data was entered and analyzed on Statistical Package for the Social Sciences (SPSS) version 20.

Results

Total 60 patients were asked to fill the questionnaire and included in study, among them 33.33% (20) were belonged to idiopathic adhesive capsulitis, 33.33% (20) were belonged to diabetic adhesive capsulitis and 33.33% (20) from traumatic adhesive capsulitis.

Results regarding pattern of shoulder range of flexion movement showed that there was Mean \pm Standard Deviation (SD) for idiopathic frozen shoulder group of patients (111.75+29.50), while that of Mean \pm SD (114.30+12.29) for diabetic frozen shoulder group and Mean \pm SD (98.30+15.46) for traumatic frozen shoulder group. Comparisons of means with Analysis

of Variance (ANOVA) extension of least significant difference of shoulder range of flexion movement showed that there was non-significant difference of 2.55 (p value 0.696) between patients of idiopathic frozen shoulder group to diabetic frozen shoulder group, while a significant difference idiopathic to traumatic frozen shoulder group with mean difference 13.45 (p value 0.043). There was mean difference of 16.00 (p value 0.017) between traumatic and diabetic group of frozen shoulder patients.

Table 1: Group Based Results among Three Groups of Adhesive Capsulitis in terms of Restricted ROM.

Group	Pattern of restriction (From ascending to descending order)
Idiopathic Adhesive Capsulitis	Abduction > Internal Rotation > External Rotation > Flexion > Extension
Diabetic Adhesive Capsulitis	External Rotation > Abduction > extension > Flexion > Internal Rotation
Traumatic Adhesive Capsulitis	External Rotation > Abduction > Flexion > Extension > Internal Rotation

Results regarding pattern of shoulder range of extension movement showed that there was Mean \pm SD (37.92.75+5.21) for idiopathic frozen shoulder group of patients, while that of Mean \pm SD (36.6+2.97) for diabetic frozen shoulder group and Mean \pm SD (41.63+6.20) for traumatic frozen shoulder group. Comparisons of means with ANOVA extension of least significant difference of shoulder range of extension movement showed that there was non-significant difference of 1.92 (p value 0.227) between patients of idiopathic frozen shoulder group to diabetic frozen shoulder group, while a significant difference idiopathic to traumatic frozen shoulder group with mean difference 3.71 (p value 0.022). There was mean difference of 5.63 (p value 0.001) between traumatic and diabetic group of frozen shoulder patients.

Results regarding pattern of shoulder range of abduction movement showed that there was Mean \pm SD (53.45 \pm 15.69) for idiopathic frozen shoulder group of patients, while that of Mean \pm SD (60.70 \pm 12.34) for diabetic frozen shoulder group and

Mean \pm SD (56.23+10.75) for traumatic frozen shoulder group. Comparisons of means with ANOVA extension of least significant difference of shoulder range of abduction movement showed that there was non-significant difference of 7.25 (p value 0.085) between patients of idiopathic frozen shoulder group to diabetic frozen shoulder group, and idiopathic to traumatic frozen shoulder group with mean difference 2.78 (p value 0.503). There was mean difference of 4.46 (p value 0.286) between traumatic and diabetic group of frozen shoulder patients.

Results regarding pattern of shoulder range of internal rotation movement showed that there was Mean \pm SD (29.125 \pm 14.85) for idiopathic frozen shoulder group of patients, while that of Mean \pm SD (47.20+9.96) for diabetic frozen shoulder group and Mean \pm SD (52.41 \pm 8.08) for traumatic frozen shoulder group. Comparisons of means with ANOVA extension of least significant difference of shoulder range of internal rotation movement showed that there was significant difference of 18.08 (p value 0.000) between patients of idiopathic frozen shoulder group to diabetic frozen shoulder group, and idiopathic to traumatic frozen shoulder group with mean difference 23.30 (p value 0.000). There was mean difference of 5.21 (p value 0.151) between traumatic and diabetic group of frozen shoulder patients. Results regarding pattern of shoulder range of external rotation movement showed that there was Mean \pm SD (40.92 \pm 5.53) for idiopathic frozen shoulder group of patients, while that of Mean \pm SD (30.41 \pm 9.17) for diabetic frozen shoulder group and Mean \pm SD (28.05 \pm 7.47) for traumatic frozen shoulder group. Comparisons of means with ANOVA extension of least significant difference of shoulder range of external rotation movement showed that there was significant difference of 10.51 (p value 0.000) between patients of idiopathic frozen shoulder group to diabetic frozen shoulder group, and idiopathic to traumatic frozen shoulder group with mean difference 12.87 (p value 0.000). There was mean difference of 2.36 (p value 0.326) between traumatic and diabetic group of frozen shoulder patients.

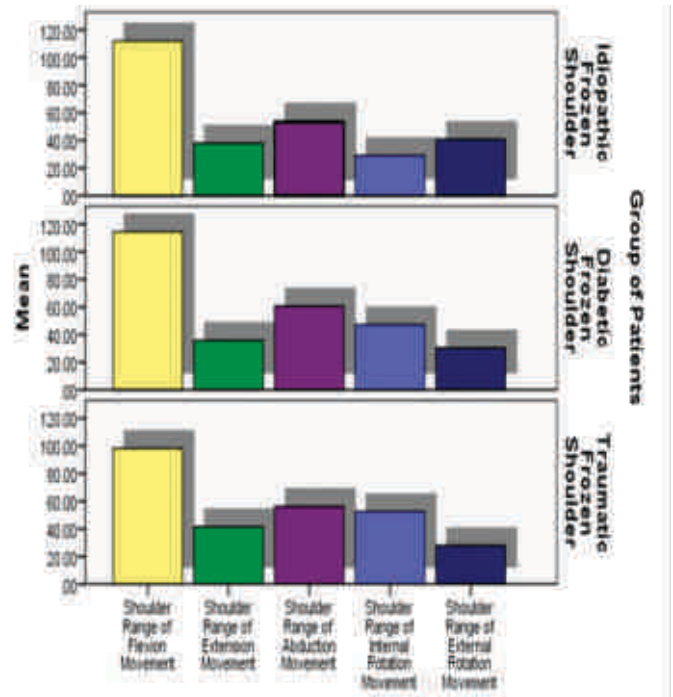


Figure 1: Representing Group Based Restriction in 5 Different Groups (Flexion, Extension, Abduction, Internal Rotation and External Rotation).

Table 2: Percentage Restriction in ROM of 5 Different Movements in Idiopathic, Diabetic and Traumatic Adhesive Capsulitis.

Groups	Movement	Mean ROM	Normal ROM	Difference	Percentage Restriction
Idiopathic Adhesive Capsulitis	Flexion	111.75	180	68.25	37.91%
	Extension	37.92	60	22.08	36.8%
	Abduction	53.45	180	126.55	70.30%
	Internal rotation	29.11	70	40.89	62.27%
	External rotation	40.92	90	49.08	54.53%
Diabetic Adhesive Capsulitis	Flexion	114.30	180	65.7	36.5%
	Extension	36.00	60	24	40%
	Abduction	67.70	180	112.3	66.27%
	Internal rotation	47.20	70	22.8	32.57%
	External rotation	30.41	90	59.59	66.21%
Traumatic Adhesive Capsulitis	Flexion	98.30	180	81.7	45.38%
	Extension	41.63	60	18.37	30.61%
	Abduction	56.23	180	122.77	68.76%
	Internal rotation	52.41	70	17.59	25.12%
	External rotation	28.05	90	61.95	68.83%

Discussion

This is the study to compare the pattern of restriction

in shoulder range of motion among three groups of patients. These groups are of idiopathic, traumatic and diabetic adhesive capsulitis. Unlike the other studies, this study compares patients of same pathology based on different cause. In this study five movements were examined flexion, extension, abduction, internal rotation and external rotation.

In a study of examining movement and pain pattern in early stage adhesive capsulitis (Sarah Walmsley et al, 2014) concluded that the most differently behaved movements in patients of early stage idiopathic adhesive capsulitis were external rotation and abduction.⁽¹⁶⁾ Researcher also elaborates the same pattern that the external rotation and the abduction was the most difficult and demanding movements for the patients of adhesive capsulitis. According to Sarah et al mean for abduction movement was 81.4 while in our study mean for idiopathic adhesive capsulitis was 53.45,⁽¹⁶⁾ mean for diabetic adhesive capsulitis was 60.70 and mean for traumatic adhesive capsulitis was 56.23. In same way, according to Sarah et al the mean for external rotation was 36.0,⁽¹⁶⁾ our study showed the mean of 40.92, 30.41 and 28.05 for idiopathic, diabetic and traumatic groups respectively. This study is different from Sarah's in regards that we took patients of adhesive capsulitis in the frozen stage of this particular disease. Furthermore, our patients not only belonged to idiopathic class but also to diabetic and traumatic ones.

A study on shoulder kinematics in subjects with frozen shoulder (Peter j. Rundquist et al, 2003) compared ROM of patients of frozen shoulder with control comparison group. This study concluded that there was significant decrease in shoulder kinematics in the frozen shoulder group.⁽¹⁷⁾ Furthermore, this study also concluded that there was not any particular capsular pattern emerged.⁽¹⁷⁾ In this point researcher's study supports this claim of Peter j. Rundquist as we also did not find any capsular pattern in our study in our study. We compared patients of one group of adhesive capsulitis with the other two groups of same pathology based on different cause. Peter took measurement in two phases i.e. movement relative to the trunk and movement relative to the scapula.⁽¹⁷⁾ There were marked difference in both groups in terms of range of motion. The ranges of our study is not matched with Peter et al except mean external rotation which is quite close with peter's both groups

i.e. relative to the trunk and relative to Scapula.

Eto, 1991 who studied 17 individuals with "periarticular scapulohumeralis", wrote down that the highest elevation was ranging from 21° to 67° averaging 38.3°.⁽¹⁸⁾ In the present study, the abduction values ranging from 38° to 68° in case of idiopathic adhesive capsulitis, 48° to 72° in case of diabetic adhesive capsulitis and 43° to 69° in case of traumatic adhesive capsulitis.

Clarke et al, 2003 took 30 known patients of Adhesive capsulitis and they compare their range of motion with hydrogoniometer.⁽¹⁹⁾ A hydrogonio-meter is a special type of goniometer which is filled with water and uses gravity as reference point. In our study, we used standard goniometer instead of hydrogoniometer and our values were not based on gender as in Clarke's study, they were based on group of patients i.e. (idiopathic, diabetic and traumatic). In our study, the values of external rotation were greater than those measured by Clarke. His values were, men averaged 23° and women averaged 28°,⁽¹⁹⁾ on the contrary researcher's values were averaged 40°, 30° and 28° for idiopathic, diabetic and traumatic groups of adhesive capsulitis respectively and our abduction values were also greater as compare to those presented by Clarke. His values for abduction were, men averaged 42° and women averaged 51°, on the contrary researcher's values were 53°, 60° and 56° for idiopathic, diabetic and traumatic group of adhesive capsulitis respectively.

An interesting evaluation given by (Terry et al, 1991) regarding external and internal rotation Range of motion when the arm is abducted and when the arm is adducted.⁽²⁰⁾ According to him range of motion was greater for external rotation when arm is positioned in abduction, whereas range of motion for internal rotation was smaller when arm is positioned in abduction.⁽²⁰⁾ This pattern according to him is remarkably plausible in non-symptomatic shoulders too.⁽²⁰⁾ Whereas, researcher took measurements of external and internal rotations in adduction. And found that external rotation in adduction is more restricted as compare to the internal rotation. The mean values of ROM of internal rotation were 29.11°, 47.20° and 52.41° for idiopathic, diabetic and traumatic group of adhesive capsulitis respectively, on the other hand the mean values of ROM of external rotation were

40.92°, 30.41° and 28.05° for idiopathic, diabetic and traumatic group of adhesive capsulitis respectively.

Sang yoon lee et al, 2015 conducted a study on relationship of adhesive capsulitis and capsular stiffness, in that study he concluded that abduction and external rotation were the most restricted movements in patients who had capsular stiffness.⁽²¹⁾ He also concluded that capsular stiffness had play no role in the onset of pain in his subjects.⁽²¹⁾ In this study, researcher found the same pattern, external rotation and abduction were the two most hampered movements but we had not considered capsular stiffness in terms of culprit causing ROM restriction. Furthermore, Sang et al stated that the prevalence of adhesive capsulitis is greater in women as compare to the men,⁽²¹⁾ to support his statement he stated further that the cause of this is because women with adhesive capsulitis had considerably stiffer capsule than men.⁽²¹⁾ In this study gender distribution among groups was quite interesting, in idiopathic adhesive capsulitis patients the gender ratio was men 55% and women 45%, in diabetic adhesive capsulitis patients the gender ratio was men 40% and women 60% and in traumatic adhesive capsulitis patients the gender ratio was men 60% and women 40%.

Conclusion

This study concluded that diabetic and traumatic group of adhesive capsulitis showed capsular pattern as proposed by the cyriax (external rotation restricted more than abduction then internal rotation and finally then flexion) but the capsular pattern of cyriax did not appeared in idiopathic group of adhesive capsulitis.

Funding Source: None

Conflict of interest: None

References

- Jain TK, Sharma NK. The effectiveness of physiotherapeutic interventions in treatment of frozen shoulder/adhesive capsulitis: a systematic review. *Journal of back and musculoskeletal rehabilitation*. 2014;27(3):247-73.
- Manske RC, Prohaska D. Diagnosis and management of adhesive capsulitis. *Current reviews in musculoskeletal medicine*. 2008;1(3-4):180-9.
- Walther M, BLAnKE F, Von Wehren L, Majewski M. Frozen shoulder--comparison of different surgical treatment options. *Acta orthopaedica Belgica*. 2014; 80(2):172-7.
- Lundberg BJ. The Frozen shoulder: clinical and radiographical observations the effect of manipulation under general anesthesia structure and glycosaminoglycan content of the joint capsule local bone metabolism. *Acta Orthopaedica Scandinavica*. 1969; 40(sup119):1-59.
- Balci N, Balci MK, Tüzüner S. Shoulder adhesive capsulitis and shoulder range of motion in type II diabetes mellitus: association with diabetic complications. *Journal of Diabetes and its Complications*. 1999;13(3):135-40.
- Tasto JP, Elias DW. Adhesive capsulitis. *Sports medicine and arthroscopy review*. 2007;15(4):216-21.
- Davies GJ, Dicko -Ho man S. Neuromuscular testing and rehabilitation of the shoulder complex. *Journal of Orthopaedic & Sports Physical Therapy*. 1993;18(2):449-58.
- Favejee M, Huisstede B, Koes B. Frozen shoulder: the effectiveness of conservative and surgical interventions—systematic review. *British journal of sports medicine*. 2011;45(1):49-56.
- Sha er B, Tibone J, Kerlan RK. Frozen shoulder. A long-term follow-up. *J Bone Joint Surg Am*. 1992; 74(5):738-46.
- Hand C, Clipsham K, Rees JL, Carr AJ. Long-term outcome of frozen shoulder. *Journal of shoulder and elbow surgery*. 2008;17(2):231-6.
- Oh JH, Oh CH, Choi J-A, Kim SH, Kim JH, Yoon JP. Comparison of glenohumeral and subacromial steroid injection in primary frozen shoulder: a prospective, randomized short-term comparison study. *Journal of shoulder and elbow surgery*. 2011; 20(7): 1034-40.
- Hoeksma HL, Dekker J, Runday HK, Heering A, Van Der Lubbe N, Vel C, et al. Comparison of manual therapy and exercise therapy in osteo-arthritis of the hip: a randomized clinical trial. *Arthritis Care & Research*. 2004;51(5):722-9.
- Ozaki J, Nakagawa Y, Sakurai G, Tamai S. Recalcitrant chronic adhesive capsulitis of the shoulder. Role of contracture of the coracohumeral ligament and rotator interval in pathogenesis and treatment. *J Bone Joint Surg Am*. 1989; 71(10): 1511-5.
- Connell D, Padmanabhan R, Buchbinder R. Adhesive capsulitis: role of MR imaging in differential diagnosis. *European radiology*. 2002;12(8):2100.
- Hanchard NC, Goodchild L, Thompson J, O'Brien T, Davison D, Richardson C. A questionnaire survey of UK physiotherapists on the diagnosis and management of contracted (frozen) shoulder. *Physiotherapy*.

- 2011;97(2):115-25.
16. Walmsley S, Osmotherly PG, Rivett DA. Clinical identifiers for early-stage primary/idiopathic adhesive capsulitis: are we seeing the real picture? *Physical therapy*. 2014;94(7):968-76.
 17. Rundquist PJ, Anderson DD, Guanche CA, Ludewig PM. Shoulder kinematics in subjects with frozen shoulder. *Archives of physical medicine and rehabilitation*. 2003;84(10):1473-9.
 18. Eto M. Analysis of the scapulo-humeral rhythm for periarthritis scapulohumeralis. *Nihon Seikeigeka Gakkai zasshi*. 1991;65(9):693-707.
 19. Clarke G, Willis L, Fish W, Nichols P. Preliminary studies in measuring range of motion in normal and painful sti shoulders. *Rheumatology*. 1975; 14(1): 39-46.
 20. Terry GC, Hammon D, France P, Norwood LA. The stabilizing function of passive shoulder restraints. *The American journal of sports medicine*. 1991; 19(1): 26-34.
 21. Lee SY, Lee KJ, Kim W, Chung SG. Relationships between capsular sti ness and clinical features in adhesive capsulitis of the shoulder. *PM&R*. 2015; 7(12): 1226-34.