Annals of Medical Research
DOI: 10.5455/annalsmedres.2019.03.163 2019;26(6):1010-3

Original Article

Does superior labrum tear effect joint position sense?

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Abstract

Aim: The purpose of this study is to evaluate the change in shoulder joint position sense (JPS) in patients with superior labrum anterior posterior (SLAP) lesion treated conservatively and to compare with healthy contralateral shoulder and healthy subjects.
Material and Methods: We evaluated JPS at 30°-60°-90°-120° with isokinetic dynamometer (Cybex Norm, Ronkokoma, NC) in 17 patients diagnosed with SLAP tear. The mean age of patients was 36.2 (21-45). Pre and postoperative age, weight and VAS scores were recorded. The data was compared with contralateral shoulder and healthy subjects.
Results: The mean age of patients and healthy subjects were 36.3±9.1 and 31.1±7.8; respectively (p>0.05). Mean VAS score of involved shoulder was 5.5±1.6 and was found to be statistically higher compared to contralateral shoulder and healthy subjects (p<0.05). There was no statistically significant difference in JPS at 30°-60°-90°and 120° (p>0.05).
Conclusions: Isolated SLAP lesion doesn't have a significant impact on JPS. This may rule out the proprioception specific rehabilitation in patients with SLAP lesion.
Level 1: Prospective, Clinically controlled trial

Keywords: Proprioception; joint position sense; superior labrum; SLAP.

INTRODUCTION

Proprioception, defined now as the sense of position and body movement, was first described by Charles Sherrington in the early 20th century. (1). Information regarding joint position and movement is obtained from joints, muscles and other soft tissues and transmitted to central nervous system (CNS) via mechanoreceptors. This information also enables body to react against excess loading in joints and muscles (2). It is well-known that any impairment in mechanoreceptors results with increased susceptibility to injury (3-5). Moreover, repeated injuries cause increased loss of mechanoreceptors and impairment in proprioception (6). This led to emergence of proprioception specific rehabilitation programs and increase the number of investigations. (7-8).

Many studies evaluating the relationship between knee instability and proprioception present in the literature, particularly in the lower extremity (9-12). However, less study evaluating upper extremity proprioception was published. This could be due to difficulty in assessment in upper extremity when compared to knee or ankle.

Shoulder joint has the ability to move in three planes, which could be the main reason causing difficulty in assessment. Shoulder instability is the leading injury, for which proprioception is evaluated. We know that anterior instability caused by anteroinferior glenohumeral ligament (AIGHL) rupture impaired proprioception. We also know that exercises focused on improving the JPS has positive effects after shoulder instability surgery (13-15). There is currently no study evaluating proprioception prospectively following SLAP lesions. We aimed to investigate the presence of any change in JPS in patients with SLAP lesion.

MATERIAL and METHODS

Institutional review board approval was obtained from Istanbul Medipol University with number of 10840098-604.01.0-E.9707. All patients and healthy subjects signed enlightened consent form. In this prospectively planned study, we included 20 patients aged between 20 and 40 and diagnosed with SLAP lesion between May 2017 and December 2017. All patients were examined and MRI was obtained from all patients. All patients had type II and III

Received: 27.03.2019 **Accepted:** 10.04.2019 **Available online:** 21.05.2019
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(12 type II and 8 type III) SLAP lesions according to Snyder classification. Positive O'Brien's active compression test and loss of integrity in the superior labrum on T2 coronal images were selected as diagnostic criteria. Demographic data and VAS scores of all patients were recorded. Exclusion criteria included patients younger than 20 years old; or older than 50 years old, degenerative arthritis in shoulder joint, rotator cuff pathology, subacromial impingement, history of shoulder surgery, and patients non-compliant with the test applied.

We assessed JPS in both involved and contralateral shoulder in patients. Additionally, we also assessed JPS in 20 healthy subjects' dominant shoulder.

JPS assessment was performed using isokinetic dynamometer and treatment device (Cybex Norm, Ronkokoma NC). We also evaluated shoulder flexion since biceps tendon pathology could accompany superior labrum lesions. We assessed active assisted JPS at 30-60-90 and 120° shoulder flexion angles as referenced from earlier studies (Figure 1). Initially, all patients were educated 5 times for each flexion angle. Later patients/healthy subjects were asked to flex the shoulder to desired angle. In order to prevent outer stimulus eyes and ears of the patients/healthy subjects were closed. Absolute angle error (AAE) of each flexion angle was recorded for 5 times on involved shoulder of patients and dominant shoulder of healthy subjects. Additionally, same procedure was repeated on contralateral shoulder of patients.

Statistical Analysis

Descriptive statistics included mean, standard deviation, median, lowest and highest value, frequency and ratio. Distribution of the variables was assessed using Kolmogorov-Simirnov test. Quantitative independent data was analyzed using Mann-Whitney u test, while dependent data was analyzed using Mann-Whitney u test. Statistical analysis was performed using SPSS v22.0.

RESULTS

There was no statistically significant difference between groups in terms of age, height, weight and BMI (Table 1). Mean VAS score was higher in the involved shoulder compared to the contralateral shoulder (Table 2) ($p<0.05$), while there was no significant difference in JPS between shoulders of the patients, and involved shoulder of patients and healthy subjects at any angle (Figure 2).

Table 1. General characteristics of patients and control group

	Control		Patients		p
	Mean.±s.s.	Median	Mean.±s.s.	Median	
Age	31.1 ± 7.8	36.5	36.3 ± 9.1	39.0	0.103 [m]
Height	168.7 ± 7.0	168.0	171.4 ± 8.7	172.0	0.373 [m]
Weight	63.2 ± 10.5	64.3	70.8 ± 8.1	71.5	0.055 [m]
BMI	22.1 ± 2.6	22.8	24.0 ± 1.6	23.6	0.064 [m]

[m] Mann-whitney u test

Table 2. VAS and JPS analysis comparing involved side, uninvolved side and healthy subjects

	Slap tears		Healty patients		
	Mean.±s.s.	Median	Mean.±s.s.	Median	p*
VAS	5.5 ± 1.6	5.5	0.2 ± 0.4	0.0	0.000 [w]
JPS40	1.9 ± 6.0	3.3	3.1 ± 3.7	4.0	0.569 [w]
JPS70	1.2 ± 8.1	3.8	2.1 ± 4.6	3.6	0.605 [w]
JPS90	-2.0 ± 6.7	-4.5	3.4 ± 4.5	4.7	0.125 [w]
JPS130	-2.5 ± 10.2	-3.9	2.4 ± 7.3	2.6	0.070 [w]

[w] Wilcoxon test

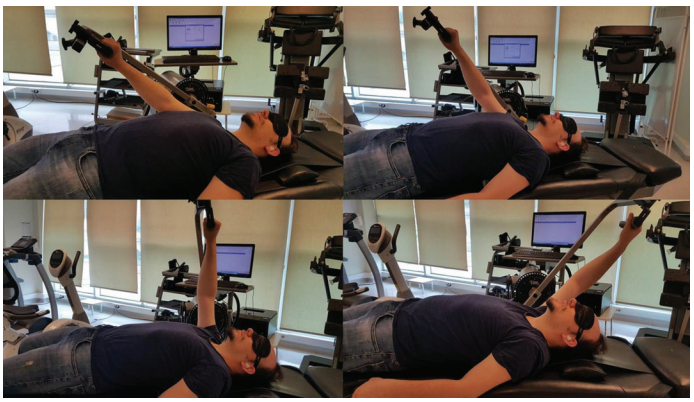

Figure 1. JPS measurement at 30-60-90 and 120 degrees. All assessments were measured with isokinetic dynamometer

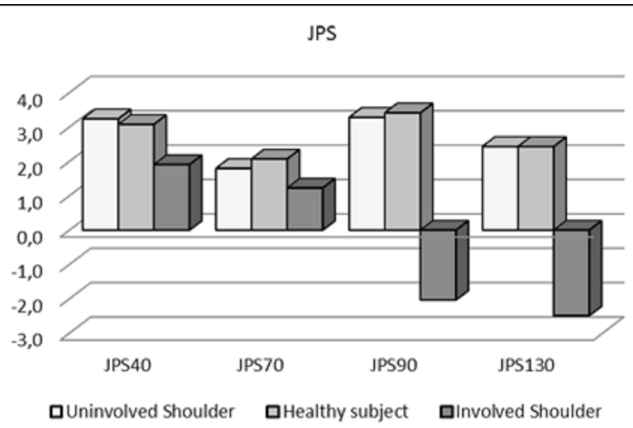

Figure 2. JPS differences between groups

DISCUSSION

In this prospective controlled study we didn't detect a significant difference in JPS in shoulder joint between patients and healthy subjects.

Assessment of shoulder proprioception is technically difficult. In earlier studies isokinetic dynamometer was the most used technique (17,19). It enables assessment of both JPS and kinesthesia as well as exercise improving JPS. Other techniques include inclinometer, goniometer and laser pointer (20,21). JPS assessment was performed using isokinetic dynamometer and treatment device

(Cybex Norm, Ronkokoma NC). Before JPS evaluation, all patients should be trained due to minimalize test time. Reference points should be simple for testing according to patients shoulder range of motion limits. Injured patients may have difficulties during maximum range of motion. We limited maximum shoulder flexion at 120° and all patients reached limit without any complication.

Shoulder is a spheroidal joint and can move in three planes. Rotation and abduction is mainly used to evaluate JPS in multiple instability, rotator cuff and subacromial impingement. (22,24,32). JPS is the most commonly used test for shoulder proprioception. It could be assessed either actively or passively. Other tests include threshold to detection of passive motion and kinesthesia (25,27). However, there is no consensus in the literature and no algorithm presents in the assessment of proprioception for SLAP lesions. Thus, we assessed flexion which could be mainly impaired in labral lesions could affect biceps insertion. We also detected 4 reference points in shoulder flexion. In order to assess early flexion we used 30°, for mid-flexion 60° and for excess flexion 90° and 120°.

Studies showed that shoulder injuries impaired proprioception in involved shoulder as well as in contralateral shoulder (28). Idin et al. reported that JPS was impaired in healthy shoulder in patients with shoulder instability (29). Also, they reported that surgical treatment improved JPS in contralateral shoulder. Other studies also showed improvement in JPS in contralateral knee joint following knee surgery (30). We included a group consisting of healthy subjects in order to obtain an optimal evaluation. We compared both injured and non-injured side and we also compared results with healthy controlled group for optimize results.

There are also some studies evaluating proprioception in other lesions of shoulder. A study suggested that rotator cuff lesions impaired JPS and rehabilitation could improve JPS (31). In a study evaluating subacromial impingement (SI), Machner et al reported that kinesthesia significantly improved on involved shoulder compared to contralateral shoulder following surgical decompression (26). In a study comparing 61 SI patients with control group, Sahin et al reported that kinesthesia values were lower on involved and contralateral shoulder compared with control group (16). In our study we compared involved shoulder of patients with contralateral shoulder and healthy subjects and found that SLAP lesion didn't impair JPS. None of our patients had subacromial impingement could be deteriorate joint position sense.

Shoulder instability may be worsen shoulder position sense. In a prospective study, Pötzl and al. evaluated 14 patients with shoulder instability. They noted shoulder position sense improved significantly in 5 year follow up after surgical repair (33). Joint position sense evaluation of all three plans was the strong aspect of this study, Labral lesions may be worsen flexion mostly so we only evaluated sagittal plane joint position sense.

This is the first study evaluating relationship between JPS and SLAP lesions. Other advantages of the study include prospective design, involving a healthy subject group, and comparison between involved shoulder and contralateral shoulder in 4 different flexion angles. However, the major disadvantage of this study is comparison only in a single plan and low number of patients/healthy subjects.

CONCLUSION

We didn't detect a significant difference in JPS between patients and healthy subjects. We believe that SLAP lesion doesn't have an impact on joint proprioception. Therefore, no proprioception specific rehabilitation is indicated for proprioception in either conservative or surgical treatment of SLAP lesions. Future studies with larger numbers of patients and comparing more parameters are necessary to conclude.

Competing interests: The authors declare that they have no competing interest.
Financial Disclosure: There are no financial supports
Ethical approval: This work has been approved by the Institutional Review Board.

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