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FUNCTIONAL OUTCOMES AFTER SURGICAL TREATMENT OF ANTERIOR SOFT-TISSUE SHOULDER INSTABILITY USING A MINIMALLY INVASIVE ANTERIOR APPROACH

FUNKCIONALNI REZULTATI LEČENJA PREDNJE MEKOTKIVNE NESTABILNOSTI RAMENA MINIMALNO INVAZIVNIM PREDNJIM PRISTUPOM

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Summary

Introduction. The purpose of this paper is to present and analyze the results of treatment of anterior soft-tissue shoulder instability using an open surgical technique with a minimally invasive anterior approach, as well as to emphasize the benefits of using an open surgical procedure in high-risk patients. **Material and Methods.** All patients underwent surgery at the Clinic of Orthopedic Surgery and Traumatology in Novi Sad in the period between January 2013 and September 2017. Out of 138 patients undergoing surgery for anterior shoulder instability, 40 patients came for follow-up examination. The average age of subjects was 27 ± 6 . Medical history was taken from each patient and the range of motion and muscle strength of the operated shoulder was examined. The subjects filled out a questionnaire regarding the functional status of the operated shoulder, their experience in resuming sports activities, and their subjective feeling of pain. The Constant-Murley score was used to assess the postoperative results. **Results.** Postoperatively, the mean Constant-Murley score was 90.3 ± 11.5 , while 87.5% patients had excellent and good results. Compared to the contralateral uninjured shoulder, there was a statistically significant difference ($p < 0.05$) in the Constant-Murley score, in external rotation of the abducted shoulder ($13.2^\circ \pm 10.4^\circ$), as well as in shoulder adduction ($10.25^\circ \pm 9.7^\circ$). Out of 35 patients who were athletes, 27 continued to actively engage in sports following the surgical treatment. Four patients had a re-dislocation (10%). **Conclusion.** Open surgical treatment of the anterior shoulder joint instability using a minimally invasive anterior approach is a reliable, time-tested procedure that provides favorable clinical results in young high-risk contact and overhead athletes with timely diagnosis and surgical care.

Key words: Open, Bankart; Shoulder; Anterior; Instability;

Sažetak

Uvod. Cilj ovog rada je prikaz i analiza rezultata lečenja prednje mekotkivne nestabilnosti ramena otvorenom hirurškom tehnikom minimalno invazivnim prednjim pristupom i ukazivanje na značaj primene otvorene procedure kod visokorizičnih pacijenata. **Materijal i metode.** Svi pacijenti su operisani na Klinici za ortopedsku hirurgiju i traumatologiju u Novom Sadu u periodu od januara 2013. do septembra 2017. godine. Od 138 operisanih pacijenata sa prednjom nestabilnosti ramena, 40 pacijenata se odazvalo na kontrolu. Prosečna starost ispitanika bila je 27 ± 6 godina. Svim pacijentima je uzeta anamneza i izvršen pregled obima pokreta i mišićne snage operisanog ramena. Ispitanici su popunjavali upitnik u vezi sa funkcionalnim stanjem operisanog ramena, povratkom sportu i subjektivnim osećajem bola. Za procenu postoperativnih rezultata korišćena je Konstantova bodovna skala. **Rezultati.** Postoperativno srednja vrednost Konstantove bodovne skale iznosila je $90,3 \pm 11,5$, dok je odličan i dobar rezultat imalo 87,5% pacijenata. U poređenju sa suprotnim nepovređenim ramenom, postojala je statistički značajna razlika ($p < 0,05$) u Konstantovoj bodovnoj skali, u spoljašnjoj rotaciji obdukanog ramena ($13,2^\circ \pm 10,4^\circ$), kao i u adukovanom položaju ramena ($10,25^\circ \pm 9,7^\circ$). Od 35 pacijenata koji su se prethodno izjasnili kao sportisti, 27 je nastavilo da se aktivno bavi sportom nakon operativnog lečenja. Četiri pacijenta je imalo re-dislokaciju (10%). **Zaključak.** Otvoreni hirurški tretman prednje nestabilnosti zgloba ramena minimalno invazivnim prednjim pristupom je pouzdana, vremenski testirana procedura koja daje dobre kliničke rezultate, kod visokorizičnih mladih, kontaktnih i overhead sportista koji su pravovremeno dijagnostikovani i hirurški zbrinuti.

Ključne reči: Otvoreni, Bankart; Rame; Prednja; Nestabilnost;

Introduction

Shoulder joint injuries are common and there has been a noticeable increase in the number of such injuries in the last three decades [1–3]. Anterior dislocations are most common and they account for 90% of

all shoulder dislocations [4]. They are the result of a considerable force, landing on an outstretched arm or a sudden and violent abduction and external rotation of the shoulder joint [5] leading to severe disability and limitations in daily and sports activities. Conservative treatment of anterior shoulder dislocation is

Abbreviations

ISIS – instability severity index score

not a recommended treatment option in young athletes due to a risk of developing shoulder instability following the initial dislocation which occurs in over half of patients between the ages of 20 and 30 years, and up to 80% of patients under the age of 20 [6, 7]. High risk of dislocation recurrence, up to 80%, affects athletes who play overhead sports (the arms are lifted over the head), contact sports, and those with avulsion of the glenoid labrum verified by nuclear magnetic resonance imaging [8].

Anterior shoulder stabilization is the most common and most successful method of surgical treatment of unidirectional soft-tissue shoulder instability [9]. There are two types of surgical procedures: soft-tissue procedures with the objective of repositioning the glenoid labrum and the glenohumeral ligaments into the anatomical position with minimal damage to other shoulder joint structures [9, 10], and additional bone grafting procedures which are used to rebuild the damaged anterior border of the glenoid [11, 12]. The glenoid labrum is placed into the anatomical position around the edge of the glenoid fossa by means of open surgical or arthroscopic techniques. The open surgical procedure has been the gold standard for treating anterior shoulder instability up to the year 2000 [13] when the development of arthroscopic procedures and the improvement of arthroscopic instruments and materials started leading to excellent postoperative results [14]. However, over the years, the percentage of re-dislocations following arthroscopic procedures approached the percentage of re-dislocations occurring after the open surgical procedure [15, 16].

The purpose of this paper is to present and analyze the results of treatment of anterior soft-tissue shoulder instability using an open surgical technique with a minimally invasive anterior approach, as well as to emphasize the benefits of using open surgical procedures in high-risk patients.

Material and Methods

This retrospective study was performed with the approval of the Ethics Committee of the Clinical Center of Vojvodina. During the period between January 2013 and September 2017, 138 patients were treated for anterior shoulder joint instability using open, minimally invasive anterior approach surgery at the Clinic of Orthopedic Surgery and Traumatology of the Clinical Center of Vojvodina in Novi Sad. This study included 40 patients who came for follow-up examination (**Table 1**). The sample included 34 men (85%) and 6 women (15%). The average age of the subjects was 27 ± 6 , whereas 52.5% were between 20 and 29 years old. The most common mechanism of injury was a forced abduction and flexion of the arm in 80% of the cases. Initial dislocation occurred as a result of sports activities in 32 patients (80%). As much as 55% of athletes in this study were in overhead and contact sports. Half of the patients had more than 10

shoulder joint dislocations before the surgery, and nine of them experienced more than twenty dislocations. All patients had unidirectional instability determined by clinical examination of the affected shoulder.

All the patients underwent shoulder stabilization by means of open surgical technique with a minimally invasive anterior approach. Indications for soft-tissue shoulder stabilization include recurrent dislocations following non-operative treatment, avulsion of the glenoid labrum with bone defect of the glenoid surface $< 13.5\%$, avulsion with an accompanying on-track Hill Sachs lesion (HSL) and/or humeral avulsion of glenohumeral ligament (HAGL) lesion [17–19], instability severity index score (ISIS) < 7 [20].

Open surgical procedure was performed instead of arthroscopic treatment, due to the fact that all of the subjects had a high risk of re-dislocation and that more than a half of them had more than ten luxations prior to surgical treatment. The anterolateral approach was used with an incision of up to 5 cm in the middle between the coracoid process of the scapula and the greater tubercle of the humerus instead of the more extensile deltopectoral approach. A part of the detached glenoid labrum and the anterior capsule of the shoulder joint were reattached to the anterior border of the glenoid using three or more anchors (Zimmer Biomet JuggerKnot Soft Anchor 1.5 mm). In the process of surgical wound closure, a repetition of the subscapularis was made using a modified Neer technique [21]. Rehabilitation was provided in accordance with the recommendations outlined by Hayes [5].

The evaluation of outcomes was performed using the Constant-Murley score [22] which involves a combination of objective physical examination regarding the range of motion of the operated shoulder (40 points) and muscle strength (25 points), and the subjective measurements of patients in terms of the activities of daily living (20 points) and the level of pain measured using the visual analogue scale (15 points). The external rotation range of motion was measured in two positions. In the first position, the arm was in the adducted position (the shoulder joint was at 0° of abduction with 90° of elbow flexion), while in the second position the arm was in the abducted position (the shoulder joint was at 90° of abduction with 90° of elbow flexion). The values of the operated and the healthy shoulder were compared in each subject. Student T-test was used to analyze the results.

Exclusion criteria in this study were previous surgical interventions on either the operated or non-operated shoulder, multidirectional instability, presence of instability in both shoulders, glenoid bone defect $> 13.5\%$, ISIS > 7 .

Results

The average duration of postoperative follow-up was 34 ± 2 months. The Constant-Murley scores of the operated and non-operated shoulder were compared, as well as the external rotation range of motion of the operated and non-operated shoulder measured in two

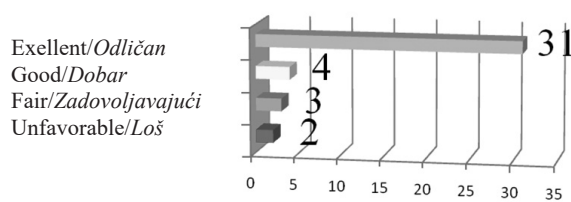
Table 1. Study group characteristics**Tabela 1.** Karakteristike ispitivane grupe

		No Br.	%
Gender Pol	Male/Muško	34	85
	Female/Žensko	6	15
Age Starost	< 20	6	15
	20–29	21	52.5
	30–39	9	22.5
	> 40	4	10
Shoulder instability Nestabilnost ramena	Left/Levo	23	57.5
	Right/Desno	17	42.5
	Dominant/Dominantno	19	47.5
	Non-dominant/Nedominantno	21	52.5
Mechanism of injury Mehanizam povrede	Forceful abduction and external rotation/Forsirana abdukcija i spoljašnja rotacija	32	80
	Fall on outstretched arm/Pad na opruženu ruku	6	15
	High energy trauma/Povreda usled jakog intenziteta	2	5
Etiology Etiologija	Sports/Sportska aktivnost	32	80
	Daily activities/Svakodnevna aktivnost	6	15
	Motor vehicle trauma/Saobraćajni traumatizam	2	5
	Combat/Borilački	7	17.5
Sports Sport	Handball/Rukomet	5	12.5
	Skiing/Skijanje	4	10
	Football/Fudbal	3	7.5
	Volleyball/Odbojka	3	7.5
	Basketball/Košarka	2	5
	Water polo/Vaterpolo	2	5
	Other sports/Ostali sportovi	9	22.5
	Non-athletes/Nesportisti	5	12.5
Level of sports Nivo sporta	Professional/Profesionalan	8	20
	Recreational/Rekreativni	27	67.5
	Non-athletes/Nesportisti	5	12.5

positions. A statistically significant difference ($p < 0.05$) was observed in all compared parameters.

The average Constant-Murley score was 90.3 ± 11.5 for the operated shoulder, and 98.2 ± 1.2 for non-operated shoulder. According to the Constant-Murley score, excellent outcome was achieved in 31 patients, good in 4 patients, fair in 3 patients, and unfavorable in 2 patients (**Graph 1**).

The difference in the external rotation range of motion between the operated and the non-operated shoulder in the adducted position was $10.25^\circ \pm 9.7^\circ$, while in the abducted position it was $13.2^\circ \pm 10.4^\circ$.



Graph 1. Results of the Constant-Murley shoulder score
Grafikon 1. Rezultati Konstant-Marli skora

After surgery, 77.1% (27) of subjects continued to actively engage in sports at the same or lower level; 21 subjects continued participating in recreational sports activities; and 6 professional athletes continued their respective sports at the same or higher level.

Following the surgical treatment, four subjects (10%) had a re-dislocation. All four subjects reported a subsequent injury as the cause of instability of the operated shoulder. One patient experienced luxation and was subjected to revision Latarjet [12] procedure, while the other three patients had subluxations and presented without further issues after physical therapy. None of the patients experienced postoperative infections or neurological complications.

Discussion

In the last decades, there has been an intensive development of methods and procedures for the treatment of anterior shoulder instability. The most affected population are physically active working age young men and it is the case in this study as well. The sample included 34 men (85%) and 6 women (15%).

The average age of patients was 27 (from 18 to 43 years of age), and more than half of them were between 20 and 29 years old. The injuries mostly occurred in the course of sports activities, and the most common mechanism was violent abduction and external rotation of the arm. Epidemiologic data in our test group do not differ from the test groups in Harris et al. [23], Naviaser et al. [24], Zacchilli & Owens [4], and Longo et al. [25].

The Constant-Murley score is an internationally accepted score used to follow the outcomes of surgical treatment of the anterior shoulder instability, and it involves comparison of the level of pain, range of motion, muscle strength, and the level of functionality in the activities of daily living of the operated and non-operated shoulder. The average Constant-Murley score in this study for the operated shoulder was 90.3 ± 11.5 . Harris et al. [23] analyzed 26 studies including 731 subjects who underwent open surgical technique and determined an average Constant-Murley score of 82.2. According to the Constant-Murley score, excellent and good results were achieved in 87.5% of subjects, fair results in 7.5%, and unfavorable results in 5% of patients. This is in line with the study performed by Pavlik et al. [26] who also used the Constant-Murley score: excellent and good results were achieved in 88% and a fair result in 12% of patients. Stone & Pearsall [27] found that excellent and good results were achieved in 92.1%. It may be concluded that the functional results of patients in this study are comparable to the results gathered by the aforementioned authors.

Our study compared the average external rotation deficit with the arm in adduction of the operated and non-operated shoulder and it was $10.25^\circ \pm 9.7^\circ$, while the average value of the external rotation deficit with the arm in abduction was $13.2^\circ \pm 10.4^\circ$. The external rotation deficit of the operated shoulder in our sample was in line with the studies conducted by Lai et al. [28], Boileau et al. [21], Yamamoto et al. [29], Autor et al. [30] who reported average values of the external rotation deficit between 6° and 17° . Naviaser et al. [24] reported an average external rotation deficit over 4° , in both in adduction and abduction. They attribute lower deficit to the capsular release technique described in their study. The deficit in the maximum external rotation following the minimally invasive open surgical stabilization of the shoulder is an acceptable deficiency of the open surgical technique which in our opinion causes no limitations in daily and sports activities of the patients.

In our research, 35 patients were athletes. The subjects mostly played contact and overhead sports (55%). Following the surgery, 27 (77.1%) resumed their sports activities. Yamamoto et al. [29] reported that 38 (75%) out of 51 athletes who played contact sports and who were treated using an open surgical technique continued their sports activities, while 13 (25%) quit sports. Naviaser et al. [24] included 107 athletes in their study; 98 (91%) of them resumed sports activities, and 2 out of the 9 remaining subjects quit sports as a result of functional limitations of the operated shoulder. The percentage of patients who resumed sports activities after the surgical treatment indicates that the open

minimally invasive surgical technique for the anterior shoulder stabilization is a reliable procedure in the treatment of high-risk athletes.

In our study, instability of the operated shoulder occurred in four subjects (10%). All four subjects claim that it was caused by a subsequent injury. Berendes et al. [31] reported a re-dislocation rate of 9.7%. Boileau et al. [21] reported 11%. In their 2012 meta-analysis, Murray et al. [32] recorded a re-dislocation rate of 7.5% in a sample of 775 athletes following an open surgical procedure. Harris et al. [23] analyzed 26 papers in their study and determined a mean re-dislocation of 8%. The study included 731 patients who underwent an open surgical technique. Yamamoto et al. [29] compared the percentages of re-dislocations in athletes in contact (10%) and non-contact (5%) sports and reached a conclusion that contact sports is a risk factor for re-dislocation, given the double dislocation recurrence rate. Virk et al. [33] reported a slightly greater re-dislocation rate of 16%, however, they explained that all patients experienced additional trauma. The percentage of complications in our study was in line with the aforementioned studies by different authors; correct determination of indications for operative treatment of patients suffering from anterior shoulder instability is highly important to achieve satisfactory clinical results.

The limitations of this study include a small sample size, inability to reach patients to perform a follow-up examination, short follow-up period, as well as the subjectivity of patients when filling the questionnaire.

During the last two decades, there has been a tendency towards a reduced use of open surgical procedure in treating anterior shoulder instability in favor of arthroscopic and bone grafting procedures. In 2016, Virk et al. [33] found that in case of open surgical procedure, complications tend to occur later (34.2 months) than in case of arthroscopic procedure (12.6 months), which leads to the conclusion that open surgical procedure is more suitable for high-risk patients. In 2020, Reider [34] pointed out that more and more orthopedic surgeons use the open surgical anterior soft-tissue stabilization procedure as an alternative to the arthroscopic procedure when treating high-risk patients.

The treatment of the anterior soft-tissue shoulder instability is a current topic of discussion amongst orthopedic surgeons at various conferences and a subject of numerous studies. Our opinion is that additional research is needed, as well as comparison between open surgical and arthroscopic techniques in order to reach a clear consensus regarding the indications for the type of operative treatment in high-risk patients.

Conclusion

Shoulder instability most commonly occurs in men between 20 and 29 years of age and athletes who play contact and overhead sports are at higher risk. Following surgical treatment, 80% of patients have no limitations in daily activities, while 77.1% of athletes resume sports activities.

Open surgical treatment of the anterior shoulder joint instability using a minimally invasive anterior ap-

proach is a reliable, time-tested procedure which leads to favorable clinical results in high-risk young contact

and overhead athletes with proper, timely diagnosis, and surgical care.

References

1. Ablove RH, Aul A, Baer G. The incidence and demographics of shoulder repair in Wisconsin, 2002-2010. *WMJ*. 2014;113(6):223-6.
2. Ninković S, Simnjanovski M, Harhaji V, Kovačev N, Janjić N, Obradović M. Surgical treatment of shoulder rotator cuff injuries. *Med Pregl*. 2014;67(7-8):239-45.
3. Ninković S. Treatment of rotator cuff tears. *Med Pregl*. 2020;73(3-4):77-9.
4. Zacchilli MA, Owens BD. Epidemiology of shoulder dislocations presenting to emergency departments in the United States. *J Bone Joint Surg Am*. 2010;92(3):542-9.
5. Hayes K, Callanan M, Walton J, Paxinos A, Murrell GA. Shoulder instability: management and rehabilitation. *J Orthop Sports Phys Ther*. 2002;32(10):497-509.
6. Milankov M. Treatment of the first shoulder dislocation. *Med Pregl*. 2010;63(3-4):155-7.
7. Hovelius L, Thorling J, Fredin H. Recurrent anterior dislocation of the shoulder. Results after the Bankart and Putti-Platt operations. *J Bone Joint Surg Am*. 1979;61(4):566-9.
8. Boileau P, Villalba M, Héry JY, Balg F, Ahrens P, Neyton L. Risk factors for recurrence of shoulder instability after arthroscopic Bankart repair. *J Bone Joint Surg Am*. 2006;88(8):1755-63.
9. Bankart ASB. The pathology and treatment of recurrent dislocation of the shoulder-joint. *British Journal of Surgery*. 1938;26(101):23-9.
10. Rowe CR, Patel D, Southmayd WW. The Bankart procedure: a long-term end-result study. *J Bone Joint Surg Am*. 1978;60(1):1-16.
11. Davidson JF, Collins HR. Long-term followup of the modified Bristow procedure. *Am J Sports Med*. 1994;22(1):151.
12. Latarjet M. Treatment of recurrent dislocation of the shoulder. *Lyon Chir*. 1954;49(8):994-7.
13. Guanche CA, Quick DC, Sodergren KM, Buss DD. Arthroscopic versus open reconstruction of the shoulder in patients with isolated Bankart lesions. *Am J Sports Med*. 1996;24(2):144-8.
14. Bottoni CR, Smith EL, Berkowitz MJ, Towle RB, Moore JH. Arthroscopic versus open shoulder stabilization for recurrent anterior instability: a prospective randomized clinical trial. *Am J Sports Med*. 2006;34(11):1730-7.
15. Chalmers PN, Mascarenhas R, Leroux T, Sayegh ET, Verma NN, Cole BJ, et al. Do arthroscopic and open stabilization techniques restore equivalent stability to the shoulder in the setting of anterior glenohumeral instability? A systematic review of overlapping meta-analyses. *Arthroscopy*. 2015;31(2):355-63.
16. Mohtadi NG, Chan DS, Hollinshead RM, Boorman RS, Hiemstra LA, Lo IK, et al. A randomized clinical trial comparing open and arthroscopic stabilization for recurrent traumatic anterior shoulder instability: two-year follow-up with disease-specific quality-of-life outcomes. *J Bone Joint Surg Am*. 2014;96(5):353-60.
17. Di Giacomo G, Itoi E, Burkhart SS. Evolving concept of bipolar bone loss and the Hill-Sachs lesion: from "engaging/non-engaging" lesion to "on-track/off-track" lesion. *Arthroscopy*. 2014;30(1):90-8.
18. Golijanin P, Peebles L, Arner JW, Douglass B, Peebles A, Rider D, et al. Advanced 3-dimensional characterization of Rad je primljen 31. X 2022.
Recenziran 22. XI 2022.
Prihvaćen za štampu 23. XI 2022.
BIBLID.0025-8105:(2022):LXXV:5-6:177-181.
- Hill-Sachs lesions in 100 anterior shoulder instability patients. *Arthroscopy*. 2021;37(11):3255-61.
19. Petrera M, Patella V, Patella S, Theodoropoulos J. A meta-analysis of open versus arthroscopic Bankart repair using suture anchors. *Knee Surg Sports Traumatol Arthrosc*. 2010;18(12):1742-7.
20. Balg F, Boileau P. The instability severity index score: a simple pre-operative score to select patients for arthroscopic or open shoulder stabilisation. *J Bone Joint Surg Br*. 2007;89(11):1470-7.
21. Boileau P, Fourati E, Bicknell R. Neer modification of open Bankart procedure: what are the rates of recurrent instability, functional outcome, and arthritis? *Clin Orthop Relat Res*. 2012;470(9):2554-60.
22. Constant CR, Murley AH. A clinical method of functional assessment of the shoulder. *Clin Orthop Relat Res*. 1987;(214):160-4.
23. Harris JD, Gupta AK, Mall NA, Abrams GD, McCormick FM, Cole BJ, et al. Long-term outcomes after Bankart shoulder stabilization. *Arthroscopy*. 2013;29(5):920-33.
24. Neviaser RJ, Benke MT, Neviaser AS. Mid-term to long-term outcome of the open Bankart repair for recurrent traumatic anterior dislocation of the shoulder. *J Shoulder Elbow Surg*. 2017;26(11):1943-7.
25. Longo UG, Rizzello G, Loppini M, Locher J, Buchmann S, Maffulli N, et al. Multidirectional instability of the shoulder: a systematic review. *Arthroscopy*. 2015;31(12):2431-43.
26. Pavlik A, Csepai D, Hidas P, Banoczy A. Sports ability after Bankart procedure in professional athletes. *Knee Surg Sports Traumatol Arthrosc*. 1996;4(2):116-20.
27. Stone GP, Pearsall AW. Return to play after open Bankart repair: a systematic review. *Orthop J Sports Med*. 2014;2(2):2325967114522960.
28. Lai D, Ma HL, Hung SC, Chen TH, Wu JJ. Open Bankart repair with suture anchors for traumatic recurrent anterior shoulder instability: comparison of results between small and large Bankart lesions. *Knee Surg Sports Traumatol Arthrosc*. 2006;14(1):82-7.
29. Yamamoto N, Kijima H, Nagamoto H, Kurokawa D, Takahashi H, Sano H, et al. Outcome of Bankart repair in contact versus non-contact athletes. *Orthop Traumatol Surg Res*. 2015;101(4):415-9.
30. Ninković S, Stanković M, Savić D, Matijević R, Milankov M. The surgical treatment of the recurrent dislocation on the shoulder joint with minimum invasion anterior approach. *Med Pregl*. 2008;61(1-2):49-54.
31. Berendes TD, Wolterbeek R, Pilot P, Verburg H, Te Slaa RL. The open modified Bankart procedure: outcome at follow-up of 10 to 15 years. *J Bone Joint Surg Br*. 2007;89(8):1064-8.
32. Murray IR, Ahmed I, White NJ, Robinson CM. Traumatic anterior shoulder instability in the athlete. *Scand J Med Sci Sports*. 2013;23(4):387-405.
33. Virk MS, Manzo RL, Cote M, Ware JK, Mazzocca AD, Nissen CW, et al. Comparison of time to recurrence of instability after open and arthroscopic Bankart repair techniques. *Orthop J Sports Med*. 2016;4(6):2325967116654114.
34. Reider B. Placing the Latarjet in context. *Am J Sports Med*. 2020;48(1):17-20.