

Adhesive Capsulitis of the Shoulder: Comparison Between Conservative Treatment Methods

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ABSTRACT

Objective: To evaluate the functional outcomes of three different conservative treatment protocols in patients with adhesive capsulitis of the shoulder. **Materials and Methods:** Reviews of medical records were carried out on patients treated at the institution for adhesive capsulitis in the period between January 2016 and January 2019. 3 different treatment protocols were compared. Group 1; Suprascapular nerve block (SSNB) with local anesthetic and corticosteroid, analgesics, and physiotherapy after pain reduction. Group 2: SSNB with local anesthetic without corticosteroids, analgesics, and physiotherapy, and group 3: analgesics and physiotherapy, without SSNB. The functional outcomes were determined with the ASES scale and the subjective results were assessed with the SSV. **Results:** A total of 46 patients treated for adhesive capsulitis were divided into 3 groups. Group 3 presented a higher mean number of physiotherapy sessions (30.31). Group 2 had the highest mean number of SSN blocks (3.27). The results of the functional scores were: group 1 (15 patients): mean ASES 84 and mean SSV 84; group 2 (15 patients): mean ASES 93.40 and mean SSV 91.67; group 3 (16 patients): mean ASES 79.4 and mean SSV 80.63. **Conclusion:** The various forms of conservative treatment for adhesive capsulitis achieve excellent outcomes. Analgesia through serial blocks of the suprascapular nerve with an anesthetic and corticosteroid achieved better functional and subjective outcomes and decreased the need to administer analgesics and physiotherapy sessions (group 1).

Keywords: Adhesive capsulitis; conservative treatment.

Level of Evidence: IV

Capsulitis adhesiva del hombro. Comparación entre métodos de tratamiento conservador

RESUMEN

Objetivo: Evaluar los resultados funcionales de tres protocolos distintos de tratamiento conservador en pacientes con capsulitis adhesiva del hombro. **Materiales y Métodos:** Se revisaron las historias clínicas de los pacientes tratados por capsulitis adhesiva en nuestra institución, entre enero de 2016 y enero de 2019. Se compararon tres protocolos diferentes de tratamiento: grupo 1, bloqueo del nervio supraescapular con un anestésico local y corticoide, analgésicos y fisioterapia después del alivio del dolor; grupo 2: bloqueo del nervio supraescapular con anestésico local sin corticoide, analgésicos y fisioterapia; grupo 3, analgésicos y fisioterapia, sin bloqueo del nervio supraescapular. Se determinaron los resultados funcionales con la escala ASES y el resultado subjetivo con el SSV. **Resultados:** Se dividió en tres grupos a 46 pacientes tratados por capsulitis adhesiva. Los pacientes del grupo 3 tuvieron, en promedio, más sesiones de fisioterapia (30,31±21,07). Los del grupo 2 recibieron la mayor cantidad promedio de bloqueos del nervio supraescapular (3,27 ± 1,22). Los resultados de los puntajes funcionales fueron: grupo 1 (15 pacientes): media 84 ASES y 84 SSV; grupo 2 (15 pacientes): media 93,40 ASES y 91,67 SSV; grupo 3 (16 pacientes): media 79,4 ASES y 80,63 SSV. **Conclusión:** Las distintas formas de tratamiento conservador para la capsulitis adhesiva logran excelentes resultados. La analgesia mediante bloqueos seriados del nervio supraescapular con un anestésico y corticoide logró mejores resultados funcionales y subjetivos, y disminuyó la necesidad de administrar analgésicos y de sesiones de fisioterapia (grupo 1).

Palabras clave: Capsulitis adhesiva; tratamiento conservador.

Nivel de Evidencia: IV

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INTRODUCTION

Adhesive capsulitis of the shoulder (ACS) is a disease that manifests with pain and stiffness. The shoulder joint capsule is an elastic and flexible structure, made up of collagen, that surrounds the joint, and helps in the stability and function of the shoulder.¹ Inflammation of the capsule alters its morphological characteristics, thickening it and thus losing its elasticity. This condition evolves with pain, muscle contracture and myotendinous retractions that cause joint stiffness. 2-5% of the general population suffer from ACS, mainly between the 4th. and 6th. decades of life.¹⁻³

Zuckerman et al. classified the causes of ACS as: idiopathic, when, by definition, there are no known causes, and secondary, when the cause or associated disease has been identified.¹ In the secondary forms, intrinsic shoulder lesions have been largely responsible for the initiation of the condition.⁴⁻⁶

This disease has four stages, as described by Neviaser. Stage 1, also called pre-adhesive, is characterized by a synovial inflammatory reaction; in stage 2, adhesions of the capsule to the humeral head begin; in stage 3, there is synovial regression with narrowing of the axillary recess; and stage 4 is the chronic phase.⁷ Patients experience an insidious onset of rapidly aggravating pain and a decrease in active and passive ranges of motion that progresses to joint stiffness. In most cases, the clinical history and physical examination allow the diagnosis to be made. When an imaging study is necessary, MRI is the test of choice.⁸⁻¹⁰

Surgery is indicated when conservative treatment fails for at least six months. That time can range from 6 weeks to 12 months, depending on published data.^{5,6,11} Procedures described as invasive are hydraulic distension of the joint capsule (high recurrence rate), joint manipulation under anesthesia, and open or arthroscopic capsular release.^{4-6,11}

The objectives of this study were to evaluate and compare the functional outcomes of three different methods of conservative treatment in patients with ACS.

MATERIALS AND METHODS

A retrospective, comparative study was carried out at our institution between January 2016 and January 2019. 107 patients with ACS were evaluated, and 46 of them were included in the study after applying the inclusion and exclusion criteria.

The inclusion criteria were: patients with unilateral or bilateral idiopathic ACS who were willing to participate in the study. The exclusion criteria were: ACS secondary to other associated diseases, such as rotator cuff injuries, acromioclavicular conditions, sequelae of proximal humerus fractures, and degenerative diseases, such as primary glenohumeral osteoarthritis. Patients with treatment protocols other than those proposed, those who dropped out of outpatient follow-up or refused to participate in the study, those who could not respond due to neurological conditions, who could not be contacted due to a change in telephone number, or who had died were also excluded.

Three conservative treatment protocols for ACS were applied. The protocol for group 1 (15 patients) consisted of weekly serial suprascapular nerve (SSN) blocks with 2% lidocaine without a vasoconstrictor, and corticosteroids (betamethasone dipropionate and betamethasone disodium phosphate) along with analgesics and physical therapy to regain range of motion after pain relief. The protocol for group 2 (15 patients) included weekly serial SSN blocks with 2% lidocaine, without corticosteroids, and analgesics and physical therapy after pain relief. The group protocol for group 3 (16 patients) consisted of two doses of intramuscular corticosteroids (betamethasone dipropionate and betamethasone disodium phosphate) every seven days, analgesics and nonsteroidal anti-inflammatory drugs, rest, and immediate initiation of physical therapy.

In order to compare these three different treatment protocols, the ASES scale (*American Shoulder and Elbow Surgeons*)¹² was used for the functional evaluation of the shoulder and the SSV scale (*Subjective Shoulder Value*) was used for the subjective evaluation of each patient.¹³ The average number of physical therapy sessions in each group, as well as complications and the need for surgical treatment were also recorded.

SSN block technique

The blocks were performed in a special room with the help of a nursing technician. The technique consists of injecting an anesthetic agent (with or without corticosteroid) into the suprascapular fossa of the scapula, with the patient seated and with the upper limbs at the sides of the body. Anatomical landmarks are identified: clavicle, acromioclavicular joint, acromion, spine of the scapula, and coracoid process ([Figure 1](#)).

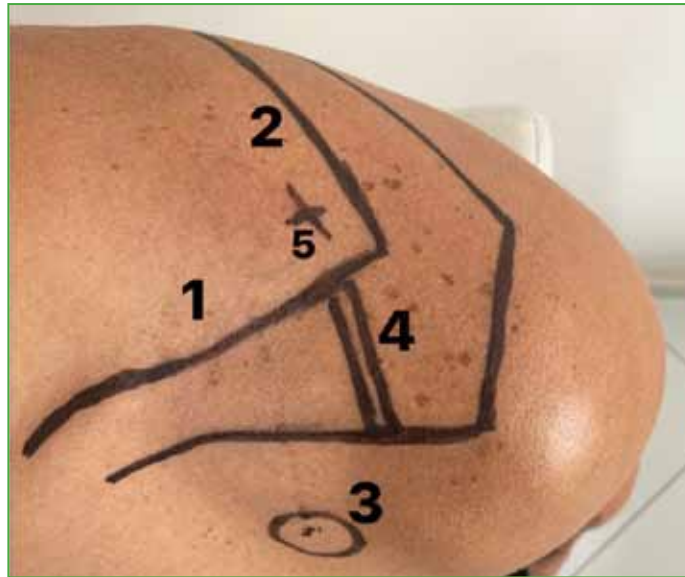


Figure 1. Identification of anatomical landmarks for suprascapular nerve block.
 1. Posterior border of the clavicle. 2. Spine of the scapula. 3. Coracoid.
 4. Acromioclavicular joint. 5. Suprascapular fossa.

After asepsis and antiseptis with alcoholic chlorhexidine, the needle is inserted medially to the apex of the lines obtained between the posterior border of the clavicle and the anterior border of the spine of the scapula, lateral to the base of the coracoid tubercle. (Figure 2).



Figure 2. Needle medial to the apex of the lines drawn on the posterior border of the clavicle and the posterior border of the spine of the scapula, lateral to the coracoid tubercle.

The needle is advanced in a craniocaudal direction, perpendicular to the skin, passing through the trapezius and supraspinatus muscles, until reaching the suprascapular fossa (3-4 cm), next to the base of the coracoid.¹⁴ Aspiration is performed before injecting the anesthetic agent to avoid the risk of encountering the suprascapular artery and injecting directly into the bloodstream.

Statistical Analysis

A descriptive analysis of the results was carried out to obtain graphs and frequency tables, with the aim of characterizing the participants. Results are described as absolute frequency and percentage for categorical variables. Numerical variables are presented as mean, standard deviation, minimum, median, and maximum.

The distributions of the scores between the groups were analyzed with box plots. The box plot gives an idea of the position, dispersion, skewness and discrepant data, and is built by quartiles of data distribution.¹⁵

To compare the scores of the instruments between the treatment groups, and given that the distribution of the scores was asymmetric, the Kruskal-Wallis parametric test was chosen, which is indicated when the assumptions made in the parametric tests are not verified. In the Kruskal-Wallis test, the data of the samples of each group is put in order, where n_1, \dots, n_k is the sample size of groups 1, ... k, respectively. The study compared three types of treatment. There are two possible approaches to discover which of them had the best performance: the first is the parametric approach that requires, among other conditions, the assumption of normality of the data that does not comply with the nature of this study; the second approach is the non-parametric one that, when working with other types of variables such as rankings, does not require as many conditions on the variables and, therefore, turned out to be ideal for the study. The non-parametric technique adopted was the Kruskal-Wallis test. This technique considers each of the three groups of interest and analyzes the size of each group, that is, n_1 is the number of individuals in group 1, n_2 is the number of individuals in group 2, and n_3 is the number of individuals in group 3. Then, for each of the three sample groups, the values collected for each individual in that sample are looked at and ranked in order of importance (lowest to highest values). If there are ties, the score is given by the mean of the orders of the repeated observations. Then the sum of the positions $R_1 \dots R_k$ of each group is made. According to Sheskin (2003), the H-statistic is given by the following formula:

$$H = \frac{12}{n(n+1)} \sum_{j=1}^k \left| \frac{(\sum R_j)^2}{n_j} \right| - 3(n+1).$$

The X^2 distribution is used to approximate the H-statistic, with $k-1$ degrees of freedom. If the result of the Kruskal-Wallis test is significant, it indicates that there are significant differences between at least 2 medians in the groups.¹⁶ All analyses were performed with the help of the R statistical environment (R Development Core Team), version 3.5.

RESULTS

The majority of the sample was female (Table 1). The mean number of physical therapy sessions (14.67 ± 13.29) and SSN blocks (2.4 ± 1.06) was lower in group 1 patients. On the other hand, the highest number of physical therapy sessions (30.31 ± 21.07) was recorded in group 3, reaching a maximum of 100 sessions. Group 2 patients received the greatest number of blocks (3.27 ± 1.22) (Table 2).

Table 1. Absolute and relative frequencies of the sex variable, by treatment group

Group	Sex		Total
	Female	Male	
1	12 (80%)	3 (20%)	15 (100%)
2	12 (80%)	3 (20%)	15 (100%)
3	12 (75%)	4 (25%)	16 (100%)
Total	36 (78%)	10 (22%)	46 (100%)

Table 2. Descriptive measures of the physiotherapy and blocks variables, by treatment group

Variable	Group	Mean	Standard deviation	Minimum	Median	Maximum
Physiotherapy	1	14.67	13.29	0.00	15.00	50.00
	2	18.13	5.55	10.00	20.00	30.00
	3	30.31	21.07	2.00	29.00	100.00
Blocks	1	2.40	1.06	1.00	3.00	4.00
	2	3.27	1.22	1.00	3.00	6.00
	3	-	-	-	-	-

The results of the ASES and SSV scales were compared between the patients of the three groups (Figure 3). Most of the patients in the three treatment groups had high scores. In group 2, the results had less variability, while the lowest values were recorded in group 3 (Table 3).

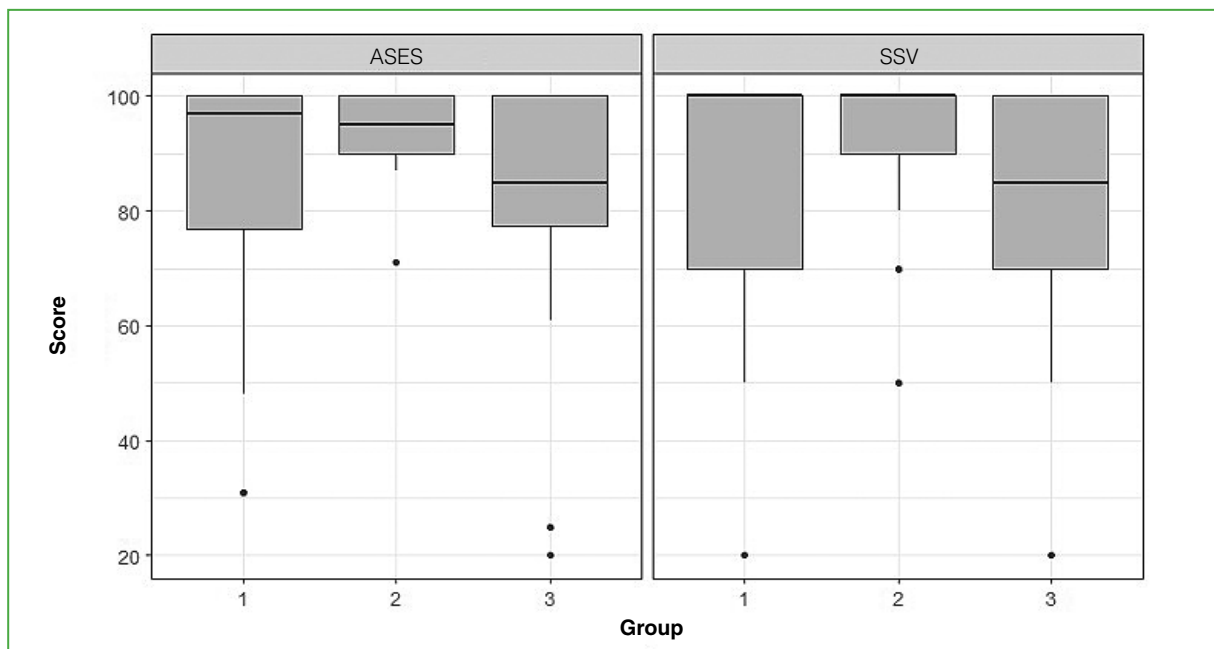
**Figure 3.** Box plot of the ASES (*American Shoulder and Elbow Surgeons*) and SSV (*Subjective Shoulder Value*) scores, by treatment group.

Table 3. Descriptive measures and result of the Kruskal-Wallis test for the comparison of two scores, * by treatment group

Variable	Group	Mean	Standard Deviation	Minimum	Median	Maximum	p
ASES	1	84.00	23.48	31.00	97.00	100.00	0.192
	2	93.40	7.97	71.00	95.00	100.00	
	3	79.44	24.92	20.00	85.00	100.00	
SSV	1	84.00	24.73	20.00	100.00	100.00	0.450
	2	91.67	14.60	50.00	100.00	100.00	
	3	80.63	23.80	20.00	85.00	100.00	

*American Shoulder and Elbow Surgeons (ASES) and Subjective Shoulder Value (SSV), by treatment group.

Complementing the results shown in Figure 3, Table 3 shows that all the groups obtained the maximum score of 100 on the two scales, while the minimum score was 20.

The lowest scores were recorded in group 3, both in the mean (79.44 and 80.63 for the ASES and SSV scales, respectively) and in the median (885 for both).

Group 2 averages on the ASES and SSV scales were 93.40 and 91.67, respectively, the highest among the three groups. According to the results of the Kruskal-Wallis test at a significance level of 5%, there is insufficient evidence of a significant difference between the three groups evaluated (p 0.192 for the ASES scale and p 0.450 for the SSV scale).

DISCUSSION

The objective of this study was to compare the functional and subjective outcomes of three different protocols for the conservative treatment of ACS. Reeves and Gray referred to the natural course of ACS and stressed its self-limiting condition, whereby symptoms and movement restrictions gradually and spontaneously normalize in patients with primary idiopathic ACS.^{8,9} Based on these movement limitations, we decided to compare the functional outcomes of patients treated conservatively with three different therapeutic protocols.

In our study, the prevalence of ACS was 78% in females, a percentage similar to that reported in the literature.^{3,11,17}

The realization that ACS is a self-limiting condition led Godinho et al. to propose a treatment that could follow the natural evolution of the disease, making it less disabling, with a shorter recovery, intensifying pain relief in phase 1 and providing good support for the following phases.^{6,18}

In a randomized study, Ranalletta et al. compared the administration of oral nonsteroidal anti-inflammatory drugs with the application of a single intramuscular injection of corticosteroids. The injection relieved pain more quickly and improved function and movement of the shoulder sooner.¹⁹ In our study, the group treated with SSN block with corticosteroids and anesthetic required fewer blocks to relieve pain and improve range of motion.

The SSN block is a method adopted in many shoulder surgery departments. In a meta-analysis, Chang et al. compared SSN block with physical therapy, placebo and intra-articular injection for chronic shoulder pain. In that study, the outcomes were superior with the SSN block compared with placebo and physical therapy, results similar to the block with intra-articular injection.²⁰ In our study, SSN block yielded better outcomes and the patients required fewer physical therapy sessions.

Checchia et al. performed a retrospective study in 133 patients treated with serial SSN blocks and physical therapy to recover range of motion. They observed that the blocks promoted a rapid and lasting improvement in pain, and this made it easier to start range of motion exercises.² In our study, comparing the two SSN block methods (with and without corticosteroids), the final functional and subjective outcomes were better.

There is no consensus in the literature on which treatment method—surgical, conservative, or combined—is the most effective for the management of ACS. Treatment methods (surgical and conservative) do not alter the natural

course of the disease; however, they do promote short-term pain relief and improvement in shoulder range of motion.²¹ It has been shown that patients who do not undergo SSN blocks require more physical therapy sessions and more analgesics.

According to the classification of the causes of ACS, analgesia is an important factor in the treatment; the functional use of the shoulder is the only non-invasive method to restore its non-elastic capsule. Motivation and the ability to perform capsule stretching with active exercises, withstanding some degree of physical discomfort, are also required.^{2,18,22} Taking into account this important function, SSN block with corticosteroids achieves the best outcomes in order to start physical therapy sessions more quickly.

Drugs, anesthetic blocks and physical therapy are the basis of conservative treatment, whether alone, in the early stages, or in combination with other therapeutic modalities in the later stages. For Ramírez et al., the most effective treatment for ACS is uncertain.¹⁰

Conservative treatment includes the use of nonsteroidal anti-inflammatory agents, short-term oral corticosteroids, SSN blocks with or without corticosteroids, physical therapy, acupuncture, and capsule hydrodilatation.^{4,6,11,22}

Complications of conservative treatment are chronic pain and limited movement. When symptoms do not improve with conservative treatment, some patients require surgery that can cause complications, including fractures, labral injuries, dislocations, and rotator cuff injuries.^{4,23}

CONCLUSIONS

ACS is a prevalent disease in females. Excellent outcomes can be achieved with various forms of conservative treatment. Analgesia through serial SSN blocks with corticosteroids achieved the best functional and subjective outcomes, and decreased the need for analgesics and physical therapy sessions.

Conflict of interest: The authors declare no conflicts of interest.

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REFERENCES

1. Zuckerman JD, Rokito A. Frozen shoulder: A consensus definition. *J Shoulder Elbow Surg* 2011;20(2):322-5. <https://doi.org/10.1016/j.jse.2010.07.008>
2. Checchia SL, Fregoneze M, Miyazaki AN, Doneux Santos P, Andrade da Silva L, Ossada A, et al. Tratamento da capsulite adesiva com bloqueios seriados do nervo supra-escapular. *Rev Bras Ortop* 2006;41(7):245-52. Available at: https://cdn.publisher.gn1.link/rbo.org.br/pdf/41-6/2006_jul_08.pdf
3. Malavolta EA, Gracitelli ME, Assunção JH, Pinto GM, Silveira AZ, Ferreira Neto A. Shoulder disorders in an outpatient clinic: An epidemiological study. *Acta Ortop Bras* 2017;25(3):78-80. <https://doi.org/10.1590/1413-785220172503170849>
4. Miyazaki AN, Santos PD, Silva LA, Sella GdV, Carrenho L, Checchia SL. Clinical evaluation of arthroscopic treatment of shoulder adhesive capsulitis. *Rev Bras Ortop (English ed.)* 2017;52(1):61-8. <https://doi.org/10.1016/j.rboe.2016.12.004>
5. Endres NK, ElHassan B, Higgins LD, Warner JJP. The stiff shoulder. En: *Rockwood and Matsen's The shoulder*. 4th ed. Philadelphia: Saunders; 2009:1405-1435. <https://doi.org/10.1016/B978-1-4160-3427-8.50035-0>
6. Georgiannos D, Markopoulos G, Devetzi E, Bisbinas I. Adhesive capsulitis of the shoulder. Is there consensus regarding the treatment? A comprehensive review. *Open Orthop J* 2017;11:65-76. <https://doi.org/10.2174/1874325001711010065>
7. Neviaser JS. Adhesive capsulitis and the stiff and painful shoulder. *Orthop Clin North Am* 1980;11(2):327-31. [https://doi.org/10.1016/S0030-5898\(20\)31482-6](https://doi.org/10.1016/S0030-5898(20)31482-6)

8. Grey R. The natural history of 'idiopathic' frozen shoulder. *J Bone Joint Surg Am* 1978;60(4):564. <https://doi.org/10.2106/00004623-197860040-00029>
9. Reeves B. The natural history of the frozen shoulder syndrome. *Scand J Rheumatol* 1975;4(4):193-6. <https://doi.org/10.3109/03009747509165255>
10. Ramirez J. Adhesive capsulitis: Diagnosis and management. *Am Fam Physician* 2019;99(5):297-300. PMID: 30811157
11. Lech O, Sudbrack G, Valenzuela CN. Capsulite adesiva ("ombro congelado"). abordagem multidisciplinar. *Rev Bras Ortop* 1993;24:617-24. Available at: <https://rbo.org.br/detalhes/951/pt-BR>
12. Michener LA, McClure PW, Sennett BJ. American shoulder and elbow surgeons standardized shoulder assessment form, patient self-report section: Reliability, validity, and responsiveness. *J Shoulder Elbow Surg* 2002;11(6):587-94. <https://doi.org/10.1067/mse.2002.127096>
13. Gilbert MK, Gerber C. Comparison of the subjective shoulder value and the constant score. *J Shoulder Elbow Surg* 2007;16(6):717-21. <https://doi.org/10.1016/j.jse.2007.02.123>
14. Dangoisse MJ, Wilson DJ, Glynn CJ. MRI and clinical study of an easy and safe technique of suprascapular nerve blockade. *Acta Anaesthesiol Belg* 1994;45(2):49-54. PMID: 7976163
15. Morettin PA, Bussab WO. *Estatística básica*, 7ª. ed. São Paulo: Editora Saraiva; 2011.
16. David J. *Handbook of parametric and nonparametric statistical procedures*. 3rd ed. New York: Chapman & Hall/CRC; 2004.
17. Cohen C, Tortato S, Bento Souza Silva O, Ferreira Leal M, Ejnisman B, Faloppa F. Association between frozen shoulder and thyroid diseases: Strengthening the evidences. *Rev Bras Ortop* 2020;55(4):483-9. <https://doi.org/10.1055/s-0039-3402476>
18. Pardini A, Godinho G. Capsulite adesiva: Tratamento conservador. In: Pardini A. *Clínica ortopédica*. Rio de Janeiro: Medsi; 2000:197-202.
19. Ranalletta M, Rossi LA, Bongiovanni SL, Tanoira I, Elizondo CM, Maignon GD. Corticosteroid injections accelerate pain relief and recovery of function compared with oral NSAIDs in patients with adhesive capsulitis: A randomized controlled trial. *Am J Sports Med* 2016;44(2):474-81. <https://doi.org/10.1177/0363546515616238>
20. Chang KV, Hung CY, Wu WT, Han DS, Yang RS, Lin CP. Comparison of the effectiveness of suprascapular nerve block with physical therapy, placebo, and intra-articular injection in management of chronic shoulder pain: A meta-analysis of randomized controlled trials. *Arch Phys Med Rehabil* 2016;97(8):1366-80. <https://doi.org/10.1016/j.apmr.2015.11.009>
21. Yip M, Francis A, Roberts T, Rokito A, Zuckerman JD, Virk MS. Treatment of adhesive capsulitis of the shoulder: A critical analysis review. *JBJS Rev* 2018;6(6):e5. <https://doi.org/10.2106/JBJS.RVW.17.00165>
22. Lafosse L, Boyle S, Kordasiewicz B, Guttierrez-Arramberi M, Fritsch B, Meller R. Arthroscopic arthrolysis for recalcitrant frozen shoulder: A lateral approach. *Arthroscopy* 2012;28(7):916-23. <https://doi.org/10.1016/j.arthro.2011.12.014>
23. Redler LH, Dennis ER. Treatment of adhesive capsulitis of the shoulder. *J Am Acad Orthop Surg* 2019;27(12):e544-e554. <https://doi.org/10.5435/JAAOS-D-17-00606>