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Comparison of two interventional techniques for the treatment of chronic shoulder pain

Comparación de dos técnicas intervencionistas para el tratamiento del dolor crónico de hombro

Mario Andrés Arcila Lotero[a], María Adelaida Mejía Aguilar[b], Roberto Carlo Rivera Díaz[a,b], Liliana Patricia Montoya[a,c]

[a] Universidad CES, Medellín, Colombia
[b] Instituto Colombiano del Dolor, Medellín, Colombia
[c] Public Health Observatory, Universidad CES, Medellín, Colombia

Keywords: Chronic Pain, Shoulder Pain, Nerve Block, Ultrasonography, Osteoarthritis

Palabras clave: Dolor Crónico, Dolor de Hombro, Bloqueo Nervioso, Ultrasonografía, Osteoartritis

Abstract

Introduction: The prevalence of chronic shoulder pain is 20%, and treatment involves pharmacological and non-pharmacological means, as well as analgesic interventional procedures. The use of intra-articular injections and ultrasound-guided blocks has increased with favorable results, but there are few comparisons to determine their effective use in patients with chronic pain due to shoulder arthrosis refractory to pharmacological treatment.

Objective: To compare the clinical efficacy and safety of 2 interventional techniques in patients with chronic shoulder pain secondary to arthrosis.

Methods: Retrospective cohort analytical study to compare the clinical efficacy and safety of 2 interventional techniques in terms of pain relief, improvement time, and adverse effects in patients coming to Instituto Colombiano del Dolor (Colombian Pain Institute) between June 2011 and April 2012, followed during a period of at least 16 weeks.

Results: The analysis included 62 patients with chronic shoulder pain secondary to osteoarthritis. Suprascapular nerve blocks were performed in 29 patients, and tricompartmental blockade was used in 33 patients, and both procedures were performed under ultrasound guidance. A statistically significant reduction in pain intensity was found during the 16-week period in both groups ($P < 0.0001$), and there were no complications.

Conclusion: Both analgesic techniques provided significant pain reduction over the 16-week period, with a superior clinical trend in favor of the suprascapular nerve block, and they were found to be safe therapeutic options because of the low rate of complications.

Resumen

Introducción: La prevalencia del dolor crónico de hombro es del 20%; su tratamiento incluye medidas farmacológicas, no farmacológicas e intervencionismo analgésico. Recientemente se ha aumentado la práctica de inyecciones intrarticulares y bloqueos periféricos guiados por ultrasonido con resultados favorables pero con pocas comparaciones que permitan determinar su utilidad en pacientes con dolor crónico por artrosis de hombro que no mejoran con tratamiento farmacológico.

Objetivo: Comparar la eficacia clínica y la seguridad de dos técnicas intervencionistas en pacientes con dolor crónico de hombro secundario a artrosis.

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Correspondence: Calle 33 # 74E–156. Medellín, Colombia. E-mail: arcilita1@yahoo.com

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Métodos: Estudio analítico de cohorte retrospectiva para comparar la eficacia clínica y seguridad de dos técnicas intervencionistas, en términos de disminución del dolor, tiempo de mejoría y efectos adversos, en pacientes que consultaron al Instituto Colombiano del Dolor entre junio de 2011 y abril de 2012 y que fueron seguidos por al menos 16 semanas.

Resultados: Se analizaron 62 pacientes con dolor crónico de hombro secundario a osteoartritis. A 29 pacientes se les realizó un bloqueo de nervio supraescapular y a 33 un bloqueo tricompartimental de hombro, ambos guiados por ultrasonografía. Se encontró una disminución estadísticamente significativa de la intensidad del dolor a lo largo de las 16 semanas en ambos grupos ($p < 0{,}0001$), con ausencia de complicaciones.

Conclusión: Ambas técnicas analgésicas proveen una disminución significativa del dolor en las 16 semanas, con una tendencia clínica superior en favor del bloqueo supraescapular, y representan una opción terapéutica segura por la baja presentación de complicaciones.

Introduction

Painful shoulder syndrome is a frequent cause of functional disability among adults, creating significant impact on patient quality of life, because of its association with other conditions such as depression, sleep disorders, anxiety, social impairment, and work disabilities, increasing management complexity. Prevalence in the general population is approximately 20%.[1]

Multiple interventional therapeutic techniques have been described for the treatment of shoulder pain, including tricompartmental blockade of the shoulder[2] and suprascapular nerve blocks (SSNB),[3] both of them performed under ultrasound guidance.

The advent of ultrasound in the field of regional anesthesia has optimized the efficacy and safety of analgesic blocks, allowing for improved accuracy and direct visualization of the needle and of the anatomical site where the analgesic is injected. It has also helped reduce the probability of complications and personal exposure to ionizing radiation, compared to other technologies used for blockades.[4]

The use of intra-articular injections and peripheral blocks has been increasing, although there are few comparisons to determine their application in patients with chronic pain due to shoulder arthrosis unresponsive to pharmacological treatment.

Therefore, the purpose of this study was to compare the clinical efficacy and the safety of two interventional techniques in patients with chronic shoulder pain secondary to arthrosis.

Materials and methods

Having obtained the approval of the Ethics Committee of CES University, an observational analytical retrospective cohort study was conducted using the clinical records of patients with chronic shoulder pain due to arthrosis who had been subjected to either of the 2 blockades for pain management and who had been followed at least for 16 weeks. The review was performed every 4 weeks by the treating physician.

All patients were diagnosed with chronic shoulder pain secondary to arthrosis, the exposed cohort being those patients managed with ultrasound-guided SNNB and the non-exposed cohort were those patients managed with ultrasound-guided tricompartmental blockade.

The sample included adult patients of both sexes with a diagnosis of chronic shoulder pain secondary to arthrosis seen at the Colombian Pain Institute in Medellín between June 2011 and April 2012. A risk of 50% was used in the exposed patients (pain relief) and a 10% risk was used in non-exposed patients (pain relief), with a confidence level of 95%. A sample size of 25 patients was obtained in each group according to the Yates correction. The end-point considered was pain relief at 16 weeks.

The following were the inclusion criteria: patients over 18 years of age; chronic shoulder pain secondary to arthrosis diagnosed by physical examination and shoulder x-ray; pain intensity equal to, or greater than, 6 over 10 in the visual analog scale before the blockade with the use of at least acetaminophen and/or a non-steroidal anti-inflammatory agent plus a weak opioid through any route of administration; ultrasound guidance for the procedure; and follow-up at 16 weeks documented in the clinical record. The exclusion criteria were labor lawsuit associated with disability leave; chronic shoulder pain not due to osteoarthritis; simultaneous SNNB and tricompartmental blockade; simultaneous blockade in a different anatomical site; perineural continuous infusion catheter insertion.

At each visit, pain intensity was measured using the visual analog scale (VAS), and patients were asked about pain intensity on the VAS 2 days after the procedure when they came in for the 1-month follow-up visit. Relief was defined as pain reduction of at least 50% on the VAS.

Data were stored in an Excel database and processed using the PASW Statistics 18 software package (SPSS 18, owned by CES University). A normality test was performed for the statistical analysis, followed by a descriptive analysis for quantitative variables, and association between qualitative variables was determined using the χ^2 and Student *t* tests or the Mann-Whitney *U* test for non-normal distribution. Groups were considered to be homogenous with a $P \geq 0.05$. The Wilcoxon test was used to estimate intra-group changes in pain intensity, and inter-group pain intensity was determined using the Mann-Whitney *U* test. The χ^2 test was used to determine the association between the treatment received by each group of patients and pain improvement during each follow-up period. A statistical significance level of less than 5% was considered. The strength of the association

Table 1. General characteristics of the patients included in the study

Variable	Suprascapular nerve block n (%) (n=29)	Tricompartmental blockade n (%) (n=33)	*P*
Age in years (Mean±SD)	66.4 (14.1)	64.3 (10.7)	0.5
Female sex	75%	70%	0.8
Male sex	25%	30%	0.8
Severe pain (VAS ≥7)	100%	100%	0.9

SD=standard deviation; VAS=visual analog scale.
Source: Authors.

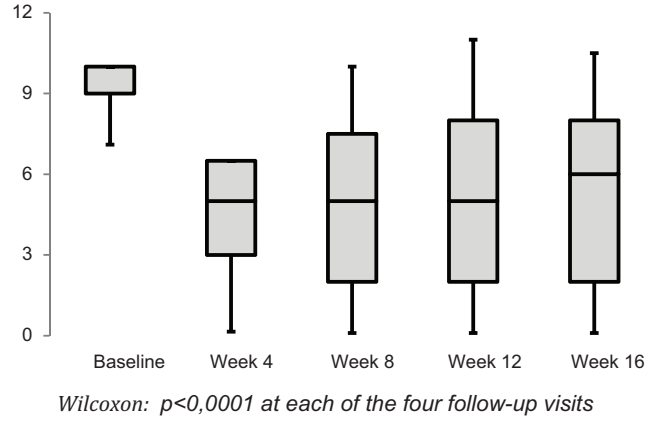


Figure 1. Pain intensity distribution according to the VAS score of patients who received a suprascapular nerve block. VAS=visual analog scale.
Source: Authors.

was estimated using relative risk and the corresponding confidence intervals. A frequency analysis for each complication was conducted by group, statistically significant differences were determined through a χ^2 test, and relative risks and confidence intervals were also calculated.

Results

The analysis included 62 patients with chronic shoulder pain due to osteoarthritis who received an ultrasound-guided analgesic block at the Colombian Pain Institute in Medellin during the time period between June 2011 and April 2012. There were no statistically significant differences in terms of general patient characteristics between the 2 groups (Table 1).

In the group that received the SSNB, there was a statistically significant reduction of pain following the procedure, lasting during the 16 weeks of observation, and changing from an initial median score of 10 to a median of 5 on the VAS on week 4 ($P<0.0001$), week 8 ($P<0.0001$) and week 12 ($P<0.0001$), and to a score of 6 on the VAS on week 16 ($P<0.0001$), with noticeable clinical improvement. In the tricompartmental blockade group there was also a reduction in the median VAS during the 16 weeks. However, relief was clinically relevant only during the first 8 weeks ($P<0.0001$). At presentation, the initial median VAS was 10 and went down to a median of 5 by week 4 ($P<0.0001$), a median VAS of 6 on week 8 ($P<0.0001$) and a median VAS score of 8 on week 12 ($P<0.0001$) and week 16 ($P<0.0001$) (Figs. 1 and 2).

In terms of the proportion of patients with pain relief during the different observation periods, it was consistently higher in the SSNB group, although not statistically significant (week 4: $P=0.36$; week 8: $P=0.19$; week 12: $P=0.21$; week 16; $P=0.34$) (Fig. 3 and Table 2).

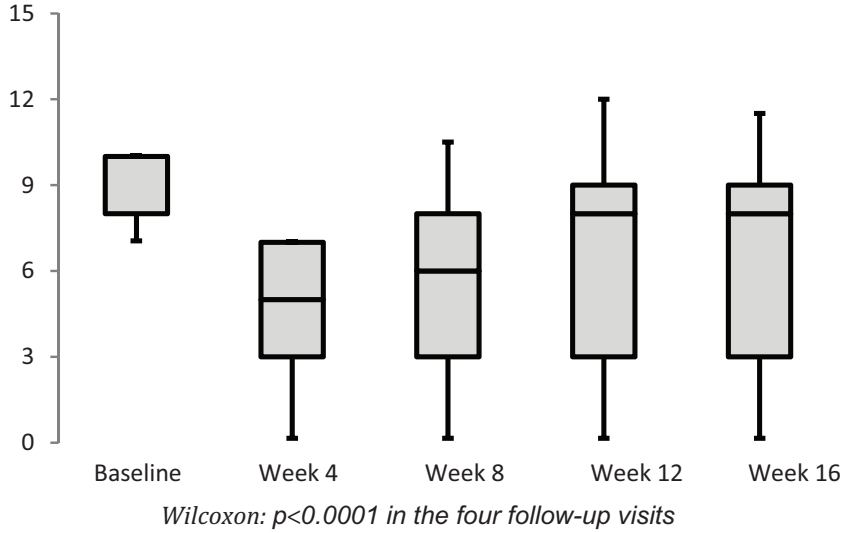
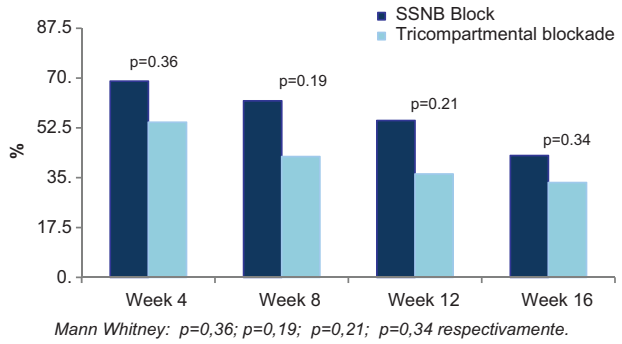
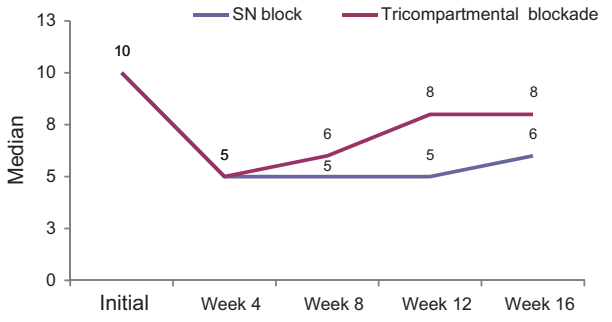


Figure 2. Pain intensity distribution according to the VAS score of patients who received. VAS=visual analog scale.
Source: Authors.



Mann Whitney: p=0,36; p=0,19; p=0,21; p=0,34 respectivamente.

Figure 3. Distribution according to pain relief of the two blockade procedures in patients with chronic shoulder pain secondary to osteoarthritis.
Source: Authors.



Mann Whitney: p=0,57; p=0,18; p=0,1; p=0,11 respectively.

Figure 4. Distribution according to VAS score (median) during the 16 weeks of follow-up for both blocks. VAS = visual analog scale.
Source: Authors.

Taking the SSNB group as the "exposed cohort for relief," during the different observation periods relative risks were higher than 1, with non-significant *P* values but with a clear trend in favor of SSNB.

Observed efficacy between the 2 blocks in terms of the duration of the effect and reduction of the VAS score was similar during the first 8 weeks. After that time, greater analgesic response was observed among the patients who received the SSNB as compared to tricompartmental blockade, although the difference was not statistically significant (week 4: $P=0.57$; week 8: $P=0.18$; week 12: $P=0.1$; week 16; $P=0.11$) (Fig. 4).

Finally, there were no complications in the patients included.

Discussion

The biggest challenge with studies on chronic shoulder pain has to do with the multiple sources of pain affecting this joint, to the point that one could designate the shoulder as the great simulator joint. Many diseases are associated with shoulder pain, and they each have a different pathophysiology and require different treatment. The main causes of chronic shoulder pain include adhesive capsulitis, frozen shoulder, rotator cuff syndrome, subacromial impingement, rheumatologic disorders, arthritis, arthrosis, postoperative pain, trauma, and even painful syndromes following stroke, as a complication of hemiplegia.[5–8] Some risk factors that may be involved in the genesis of long-term pain have been proposed, mainly work-related.[9–12]

When the cause of pain arises from the joint itself, several structures may be the source, including muscles, ligaments, bones or nerves, all of them giving rise to similar symptoms and clinical findings, making etiological diagnosis challenging and misleading.[13] In most cases, imaging studies like x-rays, ultrasound, CT scan, and nuclear magnetic resonance are required.[14–16] This study was conducted only in patients with a diagnosis of shoulder osteoarthritis, but the association with muscle involvement is frequent in this disease.

Approximately 70% of the patients in this study were females, a percentage only slightly higher than the 1 reported in the literature.[17,18] This reflects the higher prevalence of chronic and functional pain in women.[19]

The indication for each block, based on the group of specialists in the institution, did not depend on age, meaning that there was no preference for performing one or the other. However, this study showed a clinical, but not statistical, trend in favor of the SSNB, which requires future studies for confirmation.

The suprascapular nerve is easy to identify in trained hands using ultrasound guidance, and its blockade has been studied in patients with chronic shoulder pain of multiple etiologies with favorable outcomes and a low rate of complications.[20–25]

Tricompartmental blockade has been studied essentially in patients with shoulder osteoarthritis, in rotator cuff muscle pathology and in adhesive capsulitis, and it has been shown to be safe and effective, as was the case in this study.[13,26] Moreover, it may be used for differential diagnoses in shoulder pain.[27]

There are other therapeutic options in analgesic interventional procedures, such as continuous perineural

Table 2. Relative risk for pain improvement according to the VAS score in patients receiving shoulder blockade during the 16 weeks of follow-up

Blockade (%SN vs %TC)	RR	95% CI	P
Week 4 (68 vs 54)	1.26	0.85–1.87	0.3
Week 8 (62 vs 42)	1.46	0.89–2.38	0.19
Week 12 (55 vs 36)	1.51	0.86–2.65	0.2
Week 16 (48 vs 33)	1.44	0.78–2.67	0.3

VAS = visual analog scale; SN = suprascapular nerve; TC = tricompartmental blockade; RR = relative risk; CI = confidence interval.
Source: Authors.

catheter infusion,[28–30] pulsed radiofrequency of the suprascapular nerve,[31–33] and prolotherapy.[34] However, these procedures were not evaluated in this study.

In the past, the 2 blocks were performed blindly, with a higher frequency of adverse events and failed injections.[35,36] Image-guided techniques have been shown to be more accurate, effective and associated with a lower rate of complications.[37–41]

Suprascapular nerve blocks are performed with the patient in the sitting position and the operator behind the patient. A high-frequency linear probe is used to start the scan at the level of the suprascapular fossa, using a short axis view (cross-section) with a slight medial-to-lateral to localize the floor of the fossa and the deep fascia of the supraspinatus muscle, inaccurately called "transverse ligament,"[42] and then localize the suprascapular nerve and artery immediately underneath. The block may be performed with a 23-G hypodermic needle or a Teflon-coated 50- or 100-mm stimulation needle for simultaneous nerve stimulation. The needle is inserted in-plane from posterior to anterior and from medial to lateral down to the floor of the suprascapular fossa to inject 6 to 10 mL of a mix of local long-acting anesthetic (0.5% bupivacaine) plus a non-particulate steroid (dexamethasone).[43,44]

The tricompartmental blockade is performed with the patient in the sitting position, looking first for the acromiclavicular joint. Using an out-of-plane approach a 26- or 23-G needle is introduced to the level of the joint in order to inject 2 to 3 mL of a mix of local anesthetic plus steroid. Then, the subacromial space is localized in-plane at the level of the subacromial bursa and above the supraspinatus tendon to inject 3 to 5 mL of the same mix. The final injection is applied inside the glenohumeral cavity. Two approaches may be used: the posterior approach underneath the teres minor tendon, or the out-of-plane anterior approach through the space between the humeral head and the coracoid process.[43,44]

In this study, the 2 blocks were equally effective for pain reduction during the first 8 weeks. However, over the next 8 weeks there was a greater analgesic response in the group of patients receiving the SSNB, although with no statistically significant difference. This is in contrast with the report by Abejón et al[2] who described tricompartmental blockade as a promising technique in patients with arthrosis followed during 1 month only. Most of the available literature on the 2 techniques reports a maximum follow-up period of 16 weeks, also showing a trend in favor of SSNB.[3,4,23,24,45–49]

With the appropriate training and ultrasound guidance, both procedures are safe and are associated with a low rate of adverse events, similar to what this study found, where there were no complications.[3,4,13,23,24,45,50]

The SSNB requires only 1 injection in the suprascapular region, entering through the trapezius muscle. Tricompartmental blockade requires identification of the 3 target structures[51] and 3 injections, leading to longer procedure time and lower patient satisfaction. This study did not assess these 2 variables, which is a limitation.

Other limitations include the short follow-up period, the size of the sample, and the absence of information in the clinical records regarding other functionality scores for the shoulder, considering the retrospective nature of the study. These results point to the need for clinical trials with a larger sample size comparing the two techniques in the different diagnoses associated with chronic shoulder pain.

Conclusions

Interventional management of shoulder pain using ultrasound-guided SSNB and tricompartmental blockade provides significant pain relief, with a clinically superior trend in favor of the former, during a follow-up period of 16 weeks. Both techniques represent safe therapeutic options. Prospective cohort studies and clinical trials comparing both techniques in a larger population group are required.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors declare that no patient data appear in this article.

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Conflicts of interest

The authors declare having no conflict of interest.

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