

Efficacy of the Local Injection of Methylprednisolone Acetate in the Subacromial Impingement Syndrome. A Randomized, Double-Blind Trial

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Background: Local glucocorticosteroid injections are frequently used in the treatment of subacromial impingement syndrome (SIS), however its efficacy is still controversial.

Objective: To compare the efficacy of the subacromial injection of methylprednisolone acetate plus lidocaine (MPL) versus lidocaine alone (LA) in SIS.

Material and method: Consecutive SIS subjects, defined as a positive Neer's injection test were randomized to a subacromial injection of 2 mL methylprednisolone acetate (40 mg/mL) plus 1 mL of 1% lidocaine (27 patients); or 3 mL of 1% lidocaine (29 patients) were studied. The change from baseline of the score of a Spanish validated version of the Shoulder Disability Questionnaire (S-SDQ), pain intensity, and shoulder range of motion were measured at 15 and 30 days, and afterward every month for five months.

Results: After adjusting for duration of symptoms and pain intensity at baseline by way of a general lineal model, we did not find differences in the change of S-SDQ scores and shoulder range of motion between the study groups. Subjects randomized to LA had greater improvement of pain intensity than MPL subjects during the entire follow-up.

Conclusions: A subacromial injection of methylprednisolone acetate was not more efficacious than the injection of lidocaine alone in patients with SIS.

Key words: Shoulder pain. Rotator cuff. Therapy. Clinical trial. Glucocorticosteroid injection.

Eficacia de la inyección local de acetato de metilprednisolona en el síndrome de pinzamiento subacromial. Un ensayo clínico aleatorizado, doble ciego

Antecedentes: Las inyecciones locales de glucocorticoides son frecuentemente utilizadas en el tratamiento del síndrome de pinzamiento subacromial (SPSA); sin embargo, su eficacia es aún motivo de controversia.

Objetivo: Comparar la eficacia de la inyección subacromial de metilprednisolona más lidocaína contra lidocaína sola en el tratamiento del SPSA.

Material y método: Se incluyó a pacientes con SPSA definido por un resultado positivo en la prueba de la inyección de Neer, quienes fueron aleatorizados para recibir una inyección de 2 ml (40 mg/ml) de acetato de metilprednisolona más 1 ml de lidocaína al 1% (27 sujetos) o 3 ml de lidocaína al 1% (29 sujetos). Se comparó el cambio desde la línea basal en la calificación de una versión validada al español del Shoulder Disability Questionnaire (S-SDQ) de la intensidad del dolor y de los arcos de movilidad a los 15 y 30 días, y luego cada mes por 5 meses más.

Resultados: El análisis mediante un modelo general lineal con ajuste para el tiempo de evolución y la intensidad del dolor en la línea basal no detectó diferencias en el cambio de la calificación S-SDQ y los arcos de movilidad entre los grupos de estudio en ningún momento del seguimiento. El grupo de lidocaína sola presentó mayor disminución en la intensidad del dolor durante todo el seguimiento.

Conclusiones: La inyección subacromial de acetato de metilprednisolona no fue más eficaz que la inyección de lidocaína sola en pacientes con SPSA.

Palabras clave: Hombro doloroso. Manguito rotador. Tratamiento. Ensayo clínico. Inyección de glucocorticoide.

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Introduction

Shoulder pain is a frequent reason for patients to seek medical attention; its prevalence has been established at 20% of the general population.¹ Rotator cuff tendinopathy is the most common cause of shoulder pain and subacromial impingement syndrome (SIS), an angiofibroblastic tendinopathy produced by the entrapment of the rotator cuff in the coracoacromial space is the most common source of rotator cuff tendinopathy.²⁻⁴

A conservative therapeutic focus based on physiotherapy, rehabilitation, and non-steroidal anti-inflammatory drugs (NSAIDs) can be insufficient to a significant proportion of patients with SIS and, when this happens, a local injection of corticosteroids in the subacromial space is a frequently employed therapeutic intervention.^{3,4} However, the efficacy of this treatment modality is still a matter of controversy.⁵⁻⁸ Recently, Koester et al,⁹ after carrying out a systematic review of the topic, concluded that up to the moment there is little reproducible evidence to support the subacromial injection of steroids in the management of patients with SIS.

Because of this, and employing a validated version in Spanish of the Shoulder Disability Questionnaire¹⁰ as a primary outcome variable, we decided to perform a double blind, randomized clinical trial to evaluate the efficacy of the injection of methylprednisolone acetate plus lidocaine in the subacromial space in comparison with the injection of lidocaine by itself, in the treatment of patients with SIS who have not responded to NSAIDs.

Material and Method

Patients

Between February 2002 and December 2003, every patient with the clinical suspicion of SIS referred to the departments of Orthopedics and Rheumatology of the Hospital de Especialidades del Centro Medico Nacional Ignacio García Téllez of the Instituto Mexicano del Seguro Social in Mérida, Yucatán, Mexico, was invited to participate in the study. The inclusion criteria were: an age of at least 18 years, a painful shoulder for more than 7 days which had not improved with NSAIDs treatment, and the diagnosis of SIS defined by the compliance with the criteria for rotator cuff tendinitis proposed by the Southampton group,¹¹ and a positive result after undergoing the Neer test of subacromial lidocaine injection.^{12,13} The exclusion criteria were: a hooked acromion, an acromioclavicular joint osteophyte or a calcium deposit in the subacromial region present on an anteroposterior x-ray of the shoulder; subjects with a history of allergy to lidocaine, the presence of a systemic inflammatory infectious disease or uncontrolled hypertension or diabetes.

Measurements

The primary outcome measure was the change from baseline in the score of the validated Spanish version of the Shoulder Disability Questionnaire (S-SDQ),^{10,14} in this scale a larger score means more functional limitation. The secondary outcome measures were the change in the intensity of pain evaluated through a visual analog scale of 100 mm and in the goniometric measure of the ranges of shoulder movement.

Methods

Patients were enrolled by one of the researchers (ABP), who performed the Neer injection test and registered the baseline data. Three days after this procedure, the subjects who complied with the enrollment criteria and accepted to participate in the study were assigned through a randomization procedure to receive, through a lateral approach, to an injection of either a mixture of 2 mL of methylprednisolone acetate suspension plus 1 mL of lidocaine 1% or 3 mL of lidocaine 1%, carried out by another researcher (JAN) who was blind to the baseline values. The treatment assignment sequence was generated through the randomization module of the True Epistat software package. Blinding to the patients treatment was insured. After this intervention, all of the patients were submitted to a standard physiotherapy and rehabilitation program provided by another researcher (JRP), and the use of anti-inflammatory drugs was continued according to the requirements of each patient. The use of simple analgesics as a rescue therapy was allowed in the case of intense pain. S-SDQ measures, pain intensity and in the range of movements were performed at 15 and 30 days after the injection of treatment and, afterwards, every month for 5 months more by one of the researchers (ABP), who was blinded to the treatment received.

Ethical Aspects

The Local Research Committee of the unit where the study was carried out approved the protocol. All of the patients signed an informed consent form before entry into the study.

Statistical Analysis

A general lineal model was used to compare the shift in the S-SDQ score, the intensity of pain and the range of shoulder movement between treatment groups. Because the intensity of pain and the duration of symptoms before entry to the study were different at

baseline between the groups, both characteristics were included as covariables in the abovementioned model. The statistical significance was established at 0.05. Data was stored and analyzed in the SPSS software package for Windows (version 11.5).

Results

Clinical and demographic characteristics at baseline. A total of 56 patients were included; 27 were assigned to methylprednisolone plus lidocaine and 29 to lidocaine only. The majority of the clinical and demographic variables were similar between the study groups at the beginning of the trial; however, the duration of symptoms before entry into the study was significantly larger in the group of patients who received methylprednisolone. In addition, the group of patients who received lidocaine only had a marked tendency to a higher intensity of pain at baseline (Table 1).

Permanence in the Study

More than 80% of patients in both groups completed more than 3 months of follow-up. After that, the rate of patient dropout in both groups exceeded 20%. Only 15 (55.6%) patients in the methylprednisolone group and 17 (58.6%) in the lidocaine only group completed 6 months of follow-up. There were no differences in the time of mean follow-up between the study groups: methylprednisolone group, 4.7 (1.7) months; lidocaine only group, 4.7 (1.7) months ($P=.96$). With the exception of the interval of abduction, which was larger in the group of patients who finished at 6 months of follow-up ($132^\circ [46^\circ]$ vs $105^\circ [31^\circ]$; $P=.01$), no significant differences in the rest of the clinical and demographic characteristics were seen at the beginning of the study between the patients who finished treatment and those who didn't.

Adverse Events

One patient in the methylprednisolone group had intense pain after the injection. The pain lasted approximately 12 hours and was controlled with an oral dose of dextropropoxiphene. No other adverse events were detected.

Changes in the S-SDQ Score

There was a noticeable tendency to a greater degree of functional improvement in the lidocaine only group from the first month of follow-up. However, this was not statistically significant in any of the evaluations (Figure 1).

TABLE 1. Clinical and Demographic Characteristics at the Start of the Study

	Methylprednisolone Plus Lidocaine Group (n=27)	Lidocaine Only Group (n=29)	P
Age, mean (SD), y	53 (9)	52 (9)	.67
Duration of symptoms, wk	8.1 (9.0)	3.1 (2.4)	.005
Men/women	8/19	5/24	.34
Affected site (right/left)	17/10	19/10	
S-SDQ score	74 (13)	71 (15)	.47
Intensity of pain (VAS)	52 (27)	63 (25)	.15
Shoulder flexion, °	125 (35)	122 (43)	.75
Shoulder extension, °	43 (4)	45 (4)	.23
Shoulder abduction, °	122 (45)	119 (39)	.76
Shoulder adduction, °	33 (13)	36 (14)	.47
Shoulder internal rotation, °	103 (8)	105 (7)	.42
Shoulder external rotation, °	41 (10)	43 (9)	.45

^aData is presented as a number or mean (standard deviation). VAS indicates visual analog scale 0-100 mm; S-SDQ, Shoulder Disability Questionnaire.

Changes in the Intensity of Pain

In all of the evaluations, subjects assigned to lidocaine alone had a higher reduction in the intensity of pain compared with the group that received methylprednisolone (Figure 2).

Changes in the Range of Movement

No differences were detected between the study groups in the change in the range of shoulder movement at 3 and 6 months of follow-up (Table 2).

Discussion

Our results, derived from a randomized, double blind clinical trial showed that a local subacromial injection of a mixture of methylprednisolone plus lidocaine was not more effective than lidocaine only in patients with SIS. A therapeutic effect of the cointerventions that were employed (physiotherapy and NSAIDs) cannot be excluded as a reason for these results. However, because these cointerventions are the standard measures recommended by the consensus of experts for the treatment of SIS, our group considered eliminating them from the protocol as unethical. In an unexpected way, subjects who received

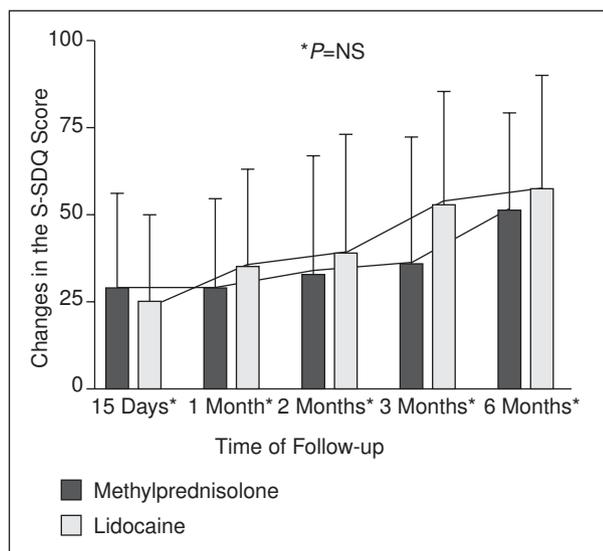


Figure 1. Comparison of the change in the calcification as reflected by the Shoulder Disability Questionnaire during follow-up.

lidocaine only had a higher reduction in the intensity of pain than those assigned to methylprednisolone during the follow-up.

We recognize that our results have to be approached cautiously due to several limitations inherent to it, such as the large rate of patient dropout, the application of injections without guidance by ultrasound and the absence of imaging studies both by ultrasound or magnetic resonance (MR) in the diagnostic evaluation of our patients. With regard to this latter point, we believe it is

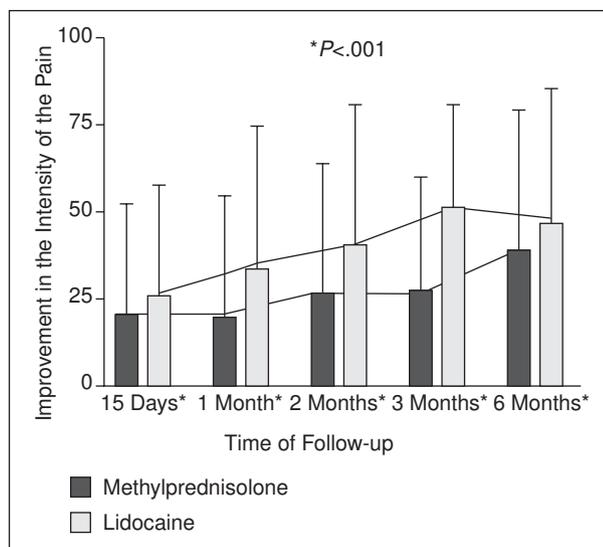


Figure 2. Comparison between the degree of improvement in the intensity of the pain during follow-up.

TABLE 2. Comparison of the Change (in Degrees) of the Shoulder Range of Movement During the Study^a

	Methylprednisolone Plus Lidocaine Group	Lidocaine Only Group	P
At 3 months			
Adduction	40 (48)	47 (45)	.58
Abduction	130 (24)	134 (27)	.84
Flexion	44 (38)	52 (46)	.83
Extension	0.9 (5)	0.4 (9)	.72
Internal rotation	3.5 (8)	2.2 (6)	.95
External rotation	2.6 (12)	1.4 (7)	.90
At 6 months			
Adduction	43 (49)	40 (46)	.77
Abduction	137 (18)	139 (23)	.81
Flexion	44 (34)	44 (47)	.88
Extension	1.0 (5)	0.6 (6)	.77
Internal rotation	5.3 (9)	2.3 (4)	.41
External rotation	3.3 (8)	0.2 (4)	.27

^aData reflect mean (standard deviation).

necessary to mention that, although in accordance with the expert consensus, the subacromial lidocaine injection test is the standard for the diagnosis of SIS,⁴ especially for research purposes, and that imaging studies such as MR or ultrasound in the context of an individual clinical diagnosis during daily practice have increased the efficacy of the diagnosis of the syndrome, especially in doubtful situations, or for the evaluation of the presence and magnitude of a tendon disruption. In such cases, MR imaging has shown to have an adequate sensitivity and specificity, although its high cost and the reduction in its efficacy in partial disruption or isolated tendinopathy are established limitations.^{15,16} High resolution ultrasound imaging, when carried out by a reliable operator, is a low cost alternative with indications and diagnostic exactitude similar to those of MR.^{17,18} Additionally, recent communications have indicated that the ultrasonographic guidance of injections of glucocorticoids could improve the clinical result in patients with a subacromial region affection.¹⁹

The patients with shoulder pain are frequently offered local injections of steroids; however, in spite of a great number of communications dedicated to the subject, its efficacy is not yet well established because only a small number of these communications have the minimal requirements to be considered as solid scientific evidence,

or their conclusions are contradictory.^{5,7,20} Green et al^{15,6} have performed a series of systematic reviews on the therapeutic interventions for a painful shoulder and have concluded that the subacromial injection of steroids, in comparison with placebo results only in a slight improvement of shoulder abduction while no differences were seen when steroid injections were compared with NSAIDs treatment. Similar conclusions were reached in later systematic reviews.⁷⁻⁹ Some, more recent reports, done in the primary care level, have indicated that steroid injections are more efficacious than physiotherapy or manipulation but only in the short term. After a prolonged follow-up, differences between groups are unappreciable.²¹⁻²⁵

Only a small number of clinical trials have specifically studied the efficacy of steroid injection in SIS. Blair et al²⁶ performed a double blind study with a 26 week follow-up in which they compared the injection of 80 mg triamcinolone acetonide versus lidocaine in 40 patients with a tear in the rotator cuff detected through an MR and evaluated shoulder function through an unvalidated score, pain through a Likert scale and ranges of movement. At the end of follow-up, subjects who received triamcinolone presented significant improvement both in the intensity of pain as in the anterior flexion and external rotation of the shoulder, but no differences were seen in the functionality. Plafki et al²⁷ communicated that 19/40 subjects with SIS, diagnosed through a positive NEER or Hawkins test, who had received a steroid injection, had a "favorable response" in comparison with 0/10 patients who had received the injection of a local anesthetic. On the contrary, Akgun et al,²⁸ in a 3 month study with follow-up of subjects with a solid definition of SIS in which the shoulder functional capacity was evaluated through a validated score, found that the injection of steroid resulted only in short term improvement, in comparison to the local injection of lidocaine. Finally, Álvarez et al,²⁹ who also employed a solid case-definition of SIS, found no statistical differences in 3 functional scales for the shoulder and range of movement after 24 weeks of follow up in patients who received an injection of steroids and those who received lidocaine.

We consider that our results are concordant with those found in the last 2 reports because we employed a methodologic design similar to the one which included the Neer test injection, considered as a standard for the diagnosis of SIS, as a case definition, apart from a validated score (S-SDQ) to evaluate the shoulder function as a measure of primary therapeutic response.

We conclude that in patients with SIS, the subacromial injection of methylprednisolone acetate was not more effective than the injection of lidocaine by itself. We consider that these results could be applicable only to patients who receive NSAIDs and are in a physiotherapy and rehabilitation program as cointerventions

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