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Pain relief in early rehabilitation of rotator cuff tendinitis: any role for indirect suprascapular nerve block?

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Aim. **The purpose of the trial was to evaluate the efficacy of suprascapular nerve block (SSNB) to relieve the shoulder pain, ameliorate recovery after physiotherapy and reduce disability due to a rotator cuff tendinitis (RCT). A prospective, randomized, comparison cross over investigation was performed in the setting of a large inpatient rehabilitation unit with more than 200 admissions annually.**

Methods. **A total of 40 potential study subjects, who complained of shoulder pain from a RCT, were enrolled and randomly assigned to standard rehabilitation treatment plus SSNB (Group A) or to standard rehabilitation treatment alone (Group B). The UCLA shoulder rating scale was used to assess the shoulder mobility on admission and discharge, and to calculate the percentage of potential improvement achieved during rehabilitation (effectiveness). A pain visual analogic scale was used to serially assess pain. At the end of the trial, a self-report questionnaire evaluated whether patients could sleep and achieve activity of day life carry out everday activities better than they could before treatment.**

Results. **Forty patients suffering from RCT entered the study. Those receiving nerve block from the beginning of the treatment in addition to standard rehabilitation theraphy reported significantly less pain during physiotherapy and better final outcomes. During treatment with SSNBs, patients reported a more significant reduction in the intensity of pain and a better reduction of pain during sleep and rehabilitation exercises in comparison to with the standard therapy alone. A statistically significant inverse correlation was found between shoulder pain and mobility.**

Conclusions. **The results indicate that combining nerve block with standard rehabilitative therapy may improve the final outcome of painful RCT. It decreased the severity and frequency of the perceived pain, improved the compliance with physiotherapy, restored more normal sleep patterns, and increased compliance with the rehabilitation program. This result proves to be an effective, safe and inexpensive therapeutic option for patients suffering from painful disabling shoulder tendinitis.**

Key words: **Rotator cuff - Tendinitis - Shoulder - Nerve block - Suprascapular nerve - Pain.**

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Painful shoulder, which can significantly limit the patient's quality of life, is a frequent complaint in primary health care with an estimated yearly incidence of 11.2/1 000 patients.[1-4] The most frequent cause of this syndrome is rotator cuff tendinitis (RCT), although it can also arise from other disorders such as muscular injury, bursitis, or, less often, from joint problems.

The primary care physician usually provides treatment of this disorder, and the choice of treatment depends on the practitioner's preference, based mainly on acquired knowledge and personal experience. No clearly established criteria for choosing the most suitable treatment are available; despite the many published studies on this topic, there is little scientific evidence to support one option over another.

The most potential pharmacological treatments for shoulder pain consist of infiltration with corticosteroids and local anesthesia, and NAIDs per os, with the infiltration of corticosteroids with local anesthesia having often been found more effective than oral nonsteroid anti-inflammatory drugs.[5-8]

Suprascapular nerve block (SSNB) has been shown to be effective as an analgesic for different indications such as shoulder capsulitis.[9, 10] Advocates of this approach explain these effects on the basis of the fact that anesthetic nerve blocks, performed in conjunction with a rehabilitation program, can provide the window of opportunity to proceed with effective rehabilitation.[11-13]

The purpose of the study was to evaluate the clinical effectiveness of a rehabilitation program with or without the analgesic effect due to nerve block in patients with RCT.

Materials and methods

Study design

The study was designed as a crossover investigation where each patient was his own control subject of his own. In other words, this design foresaw that each patient was treated first with the standard physiotherapy regimen and then with physiotherapy plus nerve block or viceversa. Nerve blocks were performed as weekly injections (in number of 2 in all) in conjunction with a rehabilitation program, with the aim to provide a window of opportunity to proceed with effective rehabilitation. The study was conducted according to ethical principles and was responsive to all applicable guidelines for good clinical practice.

Subjects

The participants were selected during a visit to the health center at which they were seen by 1 of 6 different authors as members of the rehabilitation care team. Sequential male and female, RCT subjects of all ages were recruited to participate in this study if they met the inclusion and exclusion criteria for the study and were willing to participate. Recruited subjects were assigned to 1 of 2 groups (A or B) according to a random number table, if they gave their consent to take part after the objectives and procedures of the study had been explained and their questions had been answered.

Inclusion criteria

The diagnosis of RCT was based on clinical examination and eventual further instrumental examinations (*e.g.* shoulder tomography [CT scan]) within the 4th week after the onset of symptoms. Subjects were eligible if they were within the 4th week since the beginning of the painful period and reported 5 or higher score on the baseline self-administered 10 cm pain visual analogic scale (PainVAS) to evaluate shoulder pain on the affected side. The clinical inclusion criteria were: a) clinical diagnosis of RCT, defined as pain on moving the arm through a 60-120° arc, positive impingement test and positive Jobe (*supraspinatus*), Gerber (*subscapularis*) or Pate (*infraspinatus* and *teres minor*) test; b) symptoms present for less than 2 out of 4 weeks at the time of diagnosis; and c) no previous treatment with oral nonsteroid anti-inflammatories.

Exclusion criteria

Patients were excluded if they had adhesive capsulitis (limited or painful passive mobility of the shoulder), biceps tears (positive palm up test or Yergason test), allergy or intolerance of any of the drugs used in the study, or if they were receiving long lasting steroids treatment.

Procedures

The standard clinical examination for both intervention groups consisted of a routine shoulder examination and shoulder X-rays including oblique views for subacromial space, while ultrasonography and additional CT scan or magnetic resonance imaging were performed only when needed and indicated.

Rehabilitation approach and exercises

The goal of rehabilitation in tendinitis is to create healing scar tissue along the normal lines of stress, rather than an excessive fibrotic cross-linkage that

will result in abnormal function. We also want to establish normal joint mobility and normal balance between the shoulder force couples.

Initially, we are interested in reducing the inflammation with ice (no longer than 20 min at a time) or other modalities. In the acute phase an almost passive pendulum type or assistive passive exercise can be used. The pendulum exercise consists of a patient leaning over a table with the normal arm allowing the injured arm to hang straight down and move in a counter clockwise and clockwise position and then in a flexion and extension motion. A patient should do 5 sets of 20 repetitions. If the patient is unable to contract their own muscle, electrical stimulation may be necessary. A gradual increase in exercises from isometric to isotonic in different ranges of motion are used within the painless or slightly painful range. Isometric exercises are needed only in the early stages since they lose their benefit when the full range of dynamic motion is possible. No strengthening to increase bulk should be used until a full painless range of motion and full accessory joint play motion is established. These bulk muscles are the pectoral, deltoid, and scapulothoracic rotators. Shoulder shrugs with weights are for the upper trapezius, push-ups for the *serratus anterior*, and chin-ups for the *latissimus dorsi*.

Since the cuff muscles are considered endurance muscles, exercises of low weights (no more than 4 kg) and high repetition are recommended or the larger muscles will take over and diminish the specific effect on the rotator muscles. Each muscle of the rotator cuff should be strengthened individually. Surgical tubing exercises in all the planes including diagonal planes should be used. The use of surgical tubing allows the input of eccentric type exercise. If exercises that reach 90° elevation aggravates, then do not force the patient to work through that range since the subacromial space may still be congested or impinged. Along with strengthening, stretching of the shoulder should take place in all of the cardinal planes, but again, not if pain is produced. It has been found that people with an impingement syndrome often have posterior capsular tightness and relative weak external rotators which may require rehabilitation. Isokinetic exercise (fixed speed and accommodating resistance) using Cybex should be an excellent way to increase strength.

It is recommended that since dynamic caudal glide (use of internal and external rotators) of the humerus is necessary for abduction to take place, that exercises be carried out in a specific sequence. For example, if the supraspinatus tendon is the principle principal lesion, then internal and external rotation strengthening should be done first, then flexion and extension, and finally abduction and adduction. Total evaluation of the spine and whole upper and lower extremity, of course, is necessary for complete rehabilitation.

Suprascapular nerve block

Anatomy

Arm blocks require meticulous technique and can be challenging to those unfamiliar with the regional anatomy. The suprascapular nerve originates from the superior trunk of the brachial plexus and contains fibers from the 5th and 6th cervical roots. It enters the supraspinous *fossa* below the transverse scapular ligament after passing obliquely deep to the trapezius and omohyoid muscles. The nerve innervates the *supraspinatus* muscle and gives branches to the glenohumeral and acromioclavicular joints as well as the conoid, trapezoid, and coracoacromial ligaments. The nerve passes around the spinoglenoid notch to terminate in the *infraspinatus* muscle. It also carries sympathetic innervation to the joint capsule. Finally, we must be also familiar with the common anatomic variations of the upper extremity in order to understand the otherwise unexpected result that may be seen with these blocks.[14]

Nerve block methods

The SSNB had been well described since several decades ago,[15, 16] and Granirer firstly described a posterior approach.[17] He used to identify a point on the scapular spine about 5 cm (2 inch) from the lateral border of the acromion, then suggesting to insert the needle about 1 cm (1/2 inch) superior to above this point into the *supraspinatus* notch, and to advance it until bone is contacted before withdrawing several millimeters and angling approximately 15° cephalad (Figure 1). An alternative posterior approach involves dividing the scapular spine into thirds and dropping a perpendicular line at the junction of the middle and outer third. The scapular notch lies 1-2 cm superior to above this point of intersection. The needle is advanced about 2 inches until bone is contacted

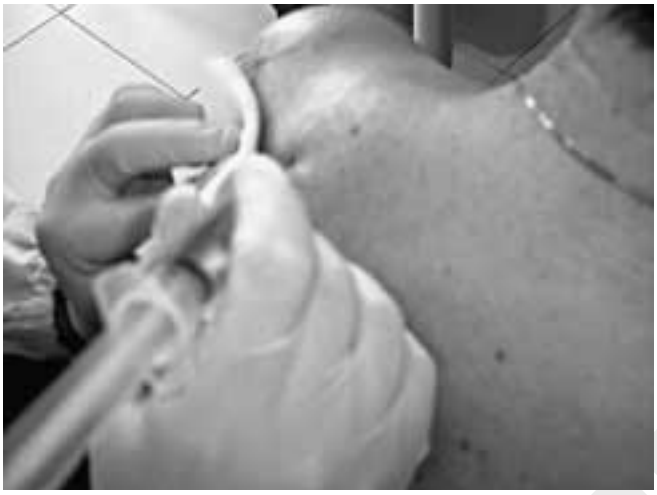

Figure 1.—Posterior approach for suprascapularis nerve block: insert the needle about 1 cm (1/2 inch) superiorly to a point on the scapular spine about 5 cm (2 inch) from the lateral border of the acromion, penetrating the supraspinatus notch; advance needle until bone is contacted and withdraw it several millimetres then angle it approximately 15° cephalad before injection.

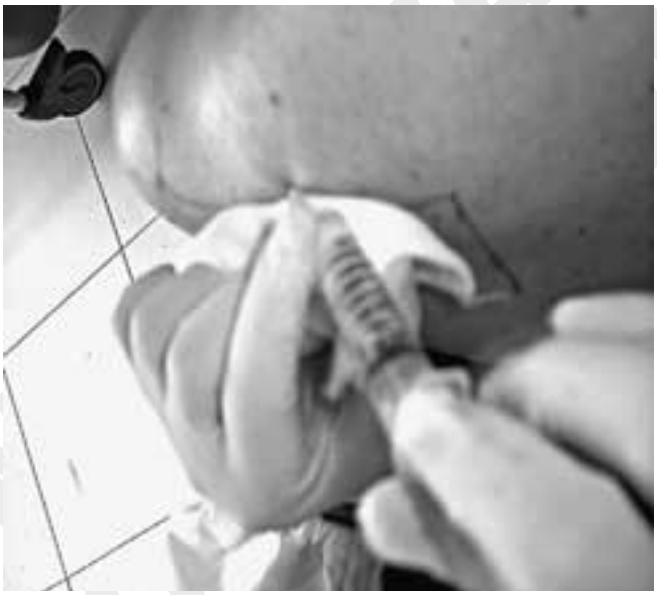

Figure 2.—SSNB Alternative approach dividing scapular spine into thirds: the needle is inserted 1-2 cm superior to the intersection between the middle and outer third.

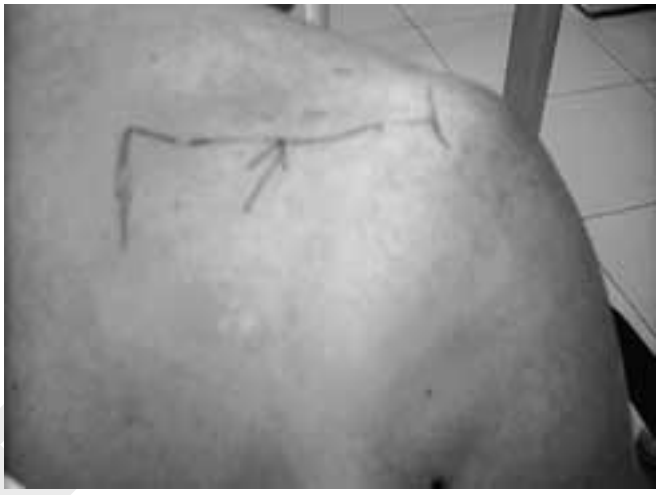

Figure 3.—Indirect suprascapular nerve blocks: to insert the needle 2 cm above the bisection point of the upper border of spine of the scapula.

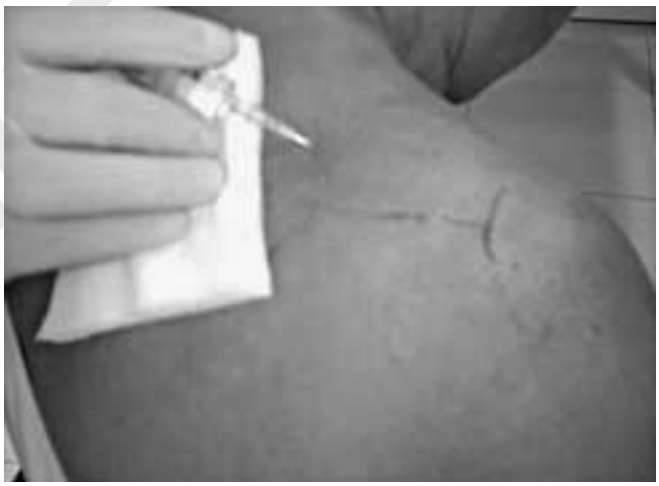

Figure 4.—Indirect suprascapular nerve blocks: It is better to needle approximately 1 to 2 cm above the supero-anterior border of the spine of the scapula at the bisection point.

(Figure 2). The needle can be adjusted until the suprascapular notch is identified and 8-10 mL of solution can be injected.[18, 19]

In particular, to refine our technique and reduce the risk of pneumothorax we followed the indirect SSNB method described by Dahan *et al*.[20]

Namely, these authors describe and perform the indirect SSNBs for the ambulatory setting using a 3.75 cm 22 G inserting it 2 cm above the bisection point of the upper border of spine of the *scapula spine*, approximately 1 to 2 cm above the supero-anterior border of the spine of the *scapula* at the bisection point (Figures 3, 4). These authors suggest to inserting the needle in the direction of the plane of the

scapula, carefully checking not to do not insert the needle in the vertical plane where it may inadvertently penetrate the suprascapular notch and cause a pneumothorax (Figure 5).

The injection of 10 cc of lidocaine into the supraspinous *fossa* results in completely filling the *supraspinatus* muscle *fossa*, which then contains the anaesthetic within its *fascia*. The suprascapular nerve then gets bathed in local anaesthetic as it enters the notch resulting in an effective nerve block.[18-20]

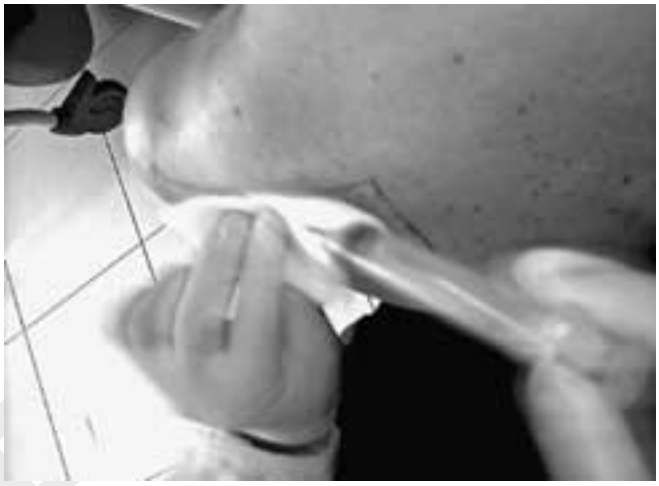

Figure 5.—Avoid penetrating the supra scapular notch causing pneumotorax: to insert the needle in the direction of the plane of the scapula, carefully check not to insert the needle in the vertical plane where it may cause a pneumothorax.

Local anaesthetics

The local anesthetics are widely used and generally safe when administered properly.[21] They exert their effect by reversibly inhibiting neural impulse transmission. The local anesthetic molecules diffuse across neural membranes to block sodium channels and inhibit the influx of sodium ions: therefore, proximity of the local anesthetic to nerve to be blocked is required.[22]

Normally, we use lidocaine that is the most versatile and widely used of the local anesthetics. It has a short onset of action (0.5-15 min) and short duration of action, typically 0.5-3 h. The difference between the effective dose and the toxic dose is wide, resulting in a high therapeutic index compared to other common local anesthetics.

Using the international guidelines, total injection of 1% lidocaine should remain below 30 mL (30 mL×10 mg/mL=300 mg). In this trial we used 10 mL of lidocaine 2% diluted in 5-10 mL of sterile saline water.[21, 22]

Finally, we must consider that as an amide anesthetic, it is hydrolyzed by the liver microsomial enzymes to inactive products. Thus, patients with hepatic failure or reduced hepatic flow are more sensitive to such agents. For this reason, patients taking beta blockers or who have congestive heart failure have a lower maximum dosage because of their reduced hepatic flow and decreased elimination rates of amide local anesthetic.

Primary outcome measures

Measurements of study outcome were obtained at baseline and/or at various times in the course of the study. They included subjective self-assessment of experienced pain, assessment of functional (disability) status, and self-assessment of daytime activities and sleep quality. Pain assessment in both groups was done each every 7 days (once weekly). The disability was assessed on admission and at the end of study (day 28th). Finally, the sleep and activities of daily living (ADL) quality were assessed only at the end of the study period (day 28th).

Pain

Pain since the SSNB was documented by asking the subject to place a mark on a horizontal 10 cm PainVAS. The left end of the PainVAS was marked "0" and "No pain" while the right end was marked "10" and "Severe pain".[23] On this scale, higher numbers indicate more perceived pain. A baseline PainVAS value of 5 or more was required for study entry.

Disability

The functional ability, or inability, of the study subject was documented by the UCLA shoulder rating scale (USRS), a scale of 3 items that evaluates shoulder pain and mobility with a cut-off of 30 for normal subjects.[24] It was developed by authors from UCLA to evaluate outcome in patients having a total shoulder arthroplasty.[24] The rating before and after the treatment can be compared and the post-treatment course monitored using the scale.

Having already assessed the variable pain by means of VAS, we used the subscales for the variables "function" and "muscle power and motion" only.

TABLE I.—*Demographics of study subjects.*

Variable	All subjects	Group 1	Group 2	Stats
Number	40	20	20	
Age (years)	45.65	46.02±12.69	45.10±12.01	NS
Age range (years)	18-66	19-66	18-63	
Gender (Male:Female)	18:40	07:20	11:20	NS
Percent Male (%)	45	35	55	
Ethnicity (Percent Caucasian)	100%	100%	100%	NS
Symptoms Onset				
— Mean (Weeks)	4.52	4.50	4.55	
— Range (Weeks)	3-6	3-6	3-6	

USRS has a hierarchy of 10 for each item, from least (score 0) to most mobile. It correlates with other measures of disability, being reliable and responsive to change in these impaired patients undergoing treatment.

ADL AND SLEEP QUESTIONNAIRE

This simple questionnaire (digital answers, yes or no) regarding the quality of daytime activities and sleep was developed specifically for this study. It included 2 questions about the quality of usual daily activities and sleep at night. It was administered only at the last visit, after the study subject had completed the last PainVAS assessment. The wording of the questions was as follows.

The following questions are about activities you might do during a typical day:

— Question 1. Does your shoulder pain now limit you in these activities? Yes __ No __

— Question 2. During the past 3 weeks, did pain interfere with your normal sleep (including either afternoon rest or nightly sleep)? Yes __ No __

CALCULATIONS AND STATISTICAL ANALYSIS

The parameter "Treatment effectiveness" was used as a measure of residual disability for both outcome variables (PainVAS and RMI). Effectiveness at discharge reflected the proportion of potential improvement achieved during hospitalization. The proportion was calculated according to the following formula:

$$\text{Effectiveness}=(\text{Discharge scale score} - \text{Initial scale score})/(\text{Maximum scale score} - \text{Initial scale score})\times 100$$

According to the formula, the effectiveness was 100% when a patient achieved the maximum scale score.[25-27]

The PainVAS [22] was given on day 1 (baseline), on day 7 (1st treatment), on day 14 (2nd treatment), on day 21 (3rd treatment), and on day 28 (4th treatment), after completing all of the treatments. The PainVAS assessments were obtained within about 24 h after each SSNB.

The questionnaire results were analyzed using the χ^2 test. The USRS score [24] was calculated on admission and discharge and correlation of effectiveness to pain-relief was evaluated according to PainVAS. With a chosen confidential confidence interval of 95% (for all analyses, the criterion α level for statistical significance was set at 0.05; α=0.05), we used the χ^2 test (χ^2 test for P-equality or independence) and analysis of variance for statistical analysis of the data. Linear regression and correlation in Group A data were made to assess the possible correlation between improvement in mobility and pain, and the correlation between final motility and intensity of pain at the end of the trial.

Finally, we determinate the number of patients we need to treat with SSNB therapy to prevent painful poor sleep by calculating the absolute risk reduction (ARR) and number needed to treat (NNT) as follows: ARR=(CER-EER) and NNT=1/ARR, where CER=control group event rate and EER=experimental group event rate.

Results

Between April 2004 and July 2005, we screened about 200 patients from the clinics in our hospital. Of these, 40 met the selection criteria and were enrolled into our study. They were randomized to each of the 2 groups. All the participants completed

TABLE II.—*Pain visual analog scores (PainVAS) by study group.*

Variable	Group A SSNB first 2 weeks	Group B SSNB 3rd-4th weeks	P value Statistic**	Group 2 Control*
Number	20	20		47
T0 mean±SD	8.10±1.02	7.45±1.14	=0.065	8.02±0.83
(Range)	(6-9)	(6-9)		(6-9)
T1 mean±SD	4.30±1.30	5.85±1.63	=0.002	6.77±1.46
(range)	(3-8)	(3-9)		(4-9)
P value***	Values after SSNB treatment	Value after physio only		
T2 mean±SD	3.95±1.05	5.25±1.99	=0.014	5.94±1.22
(range)	(2-8)	(2-8)		(3-8)
P value***	Values after SSNB treatment	Value after physio only		
T3 mean±SD	2.80±1.36	3.20±0.76	=0.258	4.96±1.12
(range)	(0-5)	(2-5)		(3-7)
P value***	Value after physio only	Values after SSNB treatment		
T4 mean±SD	1.95±1.23	2.50±0.68	=0.088	
(range)	(0-4)	(1-4)		
P value***	Value after physio only	Values after SSNB treatment		

*) Values are expressed as mean pain visual analogic scale (PainVAS) scores ± standard deviation (SD) and (range) of the observed values. **) P value for comparisons within group change with time. ***) P value for comparison across group change with time.

PainVAS 22 was given on day 1 (Baseline= T0), on day 7 (T1), on day 14 (T2), on day 21 (T3), and on day 28 (T4]), after completing all of the treatments. The PainVAS assessments were obtained within about 24 h after each suprascapular nerve block (SSNB).

TABLE III.—*Demographics of study subjects.*

Variables	Group A SSNB first 2 weeks	Group B SSNB 3rd- 4 th weeks	ANOVA P Value
Effectiveness PainVAS T1	Av. 46.20%	Av. 21.95%	P=0
	St. Dev 15.97	St. Dev 16.01	F=23
	Median 46.42	Median 19.64	
	Values after SSNB treatment	Value after physio only	
Effectiveness PainVAS T2	Av. 50.03%	Av. 18.30%	P=0
	St. Dev 16.04	St. Dev 22.12	F=26.97
	Median 55.55	Median 15.47	
	Values after SSNB treatment		
Effectiveness PainVAS T3	Av. 64.48%	Av. 56.20%	P=0.104
	St. Dev 18.47	St. Dev 12.38	
	Median 66.66	Median 57.14	
	Value after physio only	Values after SSNB treatment	
Effectiveness PainVAS end of treatment	Av. 76.04%	Av. 65.2%	P=0.016
	St. Dev 14.95	St. Dev.11.80	F=06.38
	Median 77.77	Median 66.66	
	Value after physio only	Values after SSNB treatment	

Effectiveness at discharge reflects the proportion of potential maximal improvement achieved during hospitalization. The proportion was calculated according to the following formula: PainVAS effectiveness=100× (Discharge scale score - Initial scale score) / (Maximum scale score- Initial scale score).

According to this formula, PainVAS effectiveness was 100% when a patient achieved the maximum scale score.

PainVAS: Pain visual analogic scale; Av.: average; St.Dev.: standard deviation; ANOVA: analysis of variance.

the intervention as allocated and were able to return for treatments and follow-up. Groups did not differ significantly at baseline for personal characteristics or baseline main outcome measure (Table I).

After interventions the SSNB group showed a significantly (P>0.016) greater reduction in pain than the control groups, at week 2 (Control Group VAS average=5.25, effectiveness=18.30%; SSNB Group VAS average=3.95, effectiveness=50.03%, Tables II, III and Figures 6, 7) as than at week 4 (Control Group VAS

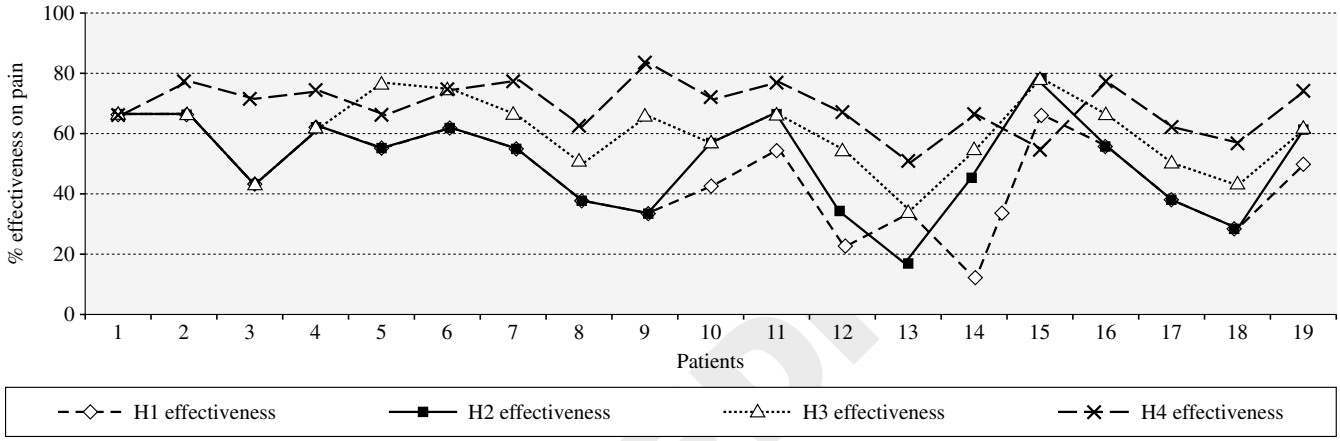

Figure 6.—Change in shoulder pain over the course of the study in suprascapular nerve block (SSNB) group. *) Effectiveness at discharge reflects the proportion of potential maximal improvement achieved during hospitalization. The proportion was calculated according to the following formula: PainVAS effectiveness=100× (Discharge scale score - Initial scale score)/(Maximum scale score- Initial scale score). According to this formula, the PainVAS effectiveness was 100% when a patient achieved the maximum scale score. VAS: visual analogic scale. The PainVAS [22] was given on day 1 (Baseline), on day 7 (H1), on day 14 (H2), on day 21 (H3), and on day 28 (H4), after completing all of the treatments. The PainVAS assessments were obtained within about 24 h after each SSNB.

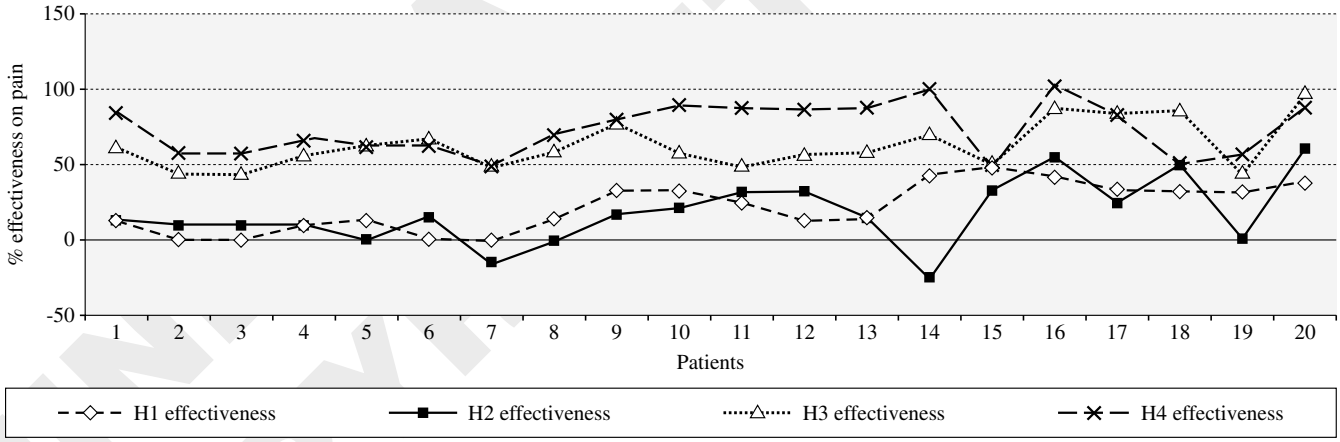

Figure 7.—Change in shoulder pain over the course of the study in the control group. *) Effectiveness at discharge reflects the proportion of potential maximal improvement achieved during hospitalization. The proportion was calculated according to the following formula: PainVAS effectiveness=100× (Discharge scale score - Initial scale score)/(Maximum scale score- Initial scale score). According to this formula, the PainVAS effectiveness was 100% when a patient achieved the maximum scale score. VAS: visual analogic scale. The PainVAS [22] was given on day 1 (Baseline), on day 7 (H1), on day 14 (H2), on day 21 (H3), and on day 28 (H4), after completing all of the treatments. The PainVAS assessments were obtained within about 24 h after each SSNB.

average=2.50, effectiveness=16.7%; SSNB GroupVAS average=1.95, effectiveness=59.68%, Tables II, III and Figures 6, 7).

So although a small, nonsignificant (P>0.05) benefit in the control group was at any rate observed, the SSNB patients appear to be more than 2 times more likely to report pain relief.

These results seem definitely to suggest a weekly or longer effect of SSNB (sensitive pathways desensitization?), even after the end of the anestethic effect due to its complete metabolization.

Furthermore, the SSNB experienced a significantly greater reduction in disability also in most secondary outcomes than the control group. An association was evident in the SSNB Group between perceived improvement in pain and quality of daytime activities

TABLE V.—*UCLA shoulder rating scale (USRS) SSNB.*

	Subscale "Function"	Subscale "Muscle power and motion"
UCLA shoulder rating scale effectiveness*	83±23%	78±26%

*) The UCLA shoulder rating scale (USRS) is a scale of 3 items (each one with 0=worst to 10 as best scores) that evaluates functional shoulder ability, or inability, of the study subject, with a cut-off of 30 for normal subjects. Here we report the subscales "function" and "muscle power and motion" (third subscale is pain).

Effectiveness at discharge reflects the proportion of potential maximal improvement achieved during hospitalization. The proportion was calculated according to the following formula:

UCLA SRS effectiveness=100× (Discharge scale score - Initial scale score)/(Maximum scale score- Initial scale score).

According to this formula, the USRS effectiveness was 100% when a study subject achieved the maximum scale score.

SSNB: suprascapular nerve block.

TABLE VI.—*Correlation between pain and motor recovery in suprascapular nerve block (SSNB) Group.*

PainVAS score End of treatment	UCLA "Function"** End of study	Pearson Test
Mean±SD 2.50±0.68 (range) (1-5)	Av. 8.95±1.35 Median 10 r=-0.050	<0.025 fd=18
PainVAS effectiveness* End of treatment	UCLA "Function" effectiveness* End of study	P value
Av. 76.04% St.Dev. 14.95 Median 77.77	83.30% ±22.53%	P=0.050

*) Effectiveness at discharge reflects the proportion of potential maximal improvement achieved during hospitalization. The proportion was calculated according to the following formula:

UCLA shoulder rating scale (SRS) effectiveness=100× (Discharge scale score - Initial scale score)/(Maximum scale score- Initial scale score).

PainVAS effectiveness=100× (Discharge scale score - Initial scale score)/(Maximum scale score- Initial scale score).

**) The UCLA SRS is a scale of 3 items (each one with 0=worst to 10 as best scores) that evaluates functional shoulder ability, or inability, of the study subject, with a cut-off of 30 for normal subjects. Here we report the subscales "function" scores.

PainVAS: pain visual analogic scale.

and sleep, with the participants in the SSNB Group reporting better quality of ADL (85%, P=0.001, Table IV]) and sleep during the night (95%, P=0.011, Table IV). In particular, these results of the questionnaire into the effect of pain relief on the quality of sleep indicated that no changes occurred in 45% of patients randomized to the control group and 15% of patients randomized to the SSNB. The number of patients we need to treat with SSNB therapy to prevent painful poor sleep can be determined by calculating the absolute risk reduction: ARR=(CER-EER)=(45%-15%) =30% and NNT=1/ARR=1/30%=3.33. We, therefore, need to treat 3.33 patients with SSNB to prevent one from continuing to have a poor quality of sleep during the rehabilitation line-up (Tables V, VI).

Discussion

Given the high prevalence of RCT in our setting and the contraindications, the potential adverse effects of some treatments (*i.e.*, oral anti-inflammatory drugs) and the invasive nature of other treatments (*i.e.*, local infiltration), we believed it has been worthwhile to investigate the efficacy of SSNB for the treatment of pain in RCT. Unfortunately, no single treatment technique is guaranteed to produce complete pain relief and even nerve blocks are very effective in providing temporary pain control, but they must be only part of a total pain management program. Hence, chronic pain and disability related RCT are relatively common outcomes of these conditions. The SSNB protocol was made basing on the basis of the hypothesis that neurological processes may play a vital role in the perpetuation of pain experienced by these subjects. A full review of such mechanisms is beyond the scope of this paper. However, it can be summarily accepted that nerve block, causing temporary cessation of nociceptive information from the shoulder of the central nervous system, can reverse the supersensitivity postulated by several authors,[28] this permitting an improvement in pain experience and facilitate a functional rehabilitation program.

About the study design, while potentially powerful statistically, it should appear to have a major problem: it is not always clearly possible to controll carryover effects. Specifically, we note evidence that the nerve block effects lasted for longer than 1 week, therefore these block effects would appear to confuse results after crossover for the group receiving blocks in the first 2 weeks of treatment. Namely, it should not appear to be any washout period after the initial treatment condition. In effect, readers should keep in mind that lidocaine effects last for not more than few hours whilst the longlasting "block effects" observed are the effective "neurophysiological" effects researched on which we base the therapeutic hypothesis. Other questions should include whether any medications

were used or allowed: during "physiotherapy treatment only" it was not allowed to assume painkillers or other analgesic drugs according to the design study described to the patients enrolled before they signed the consent form.

Conclusions

In conclusion, the present findings indicate that this treatment can be more effective than conventional treatments offering clear advantages (ease of application, low cost, rare side effects) that would make it an attractive choice for sharp pain shoulder considering that the top priority of a pain management program is restoring the function of the affected area.

For patients with chronic pain conditions, a multifaceted approach (treatment that includes rehabilitation and psychological intervention) remain essential. Finally, we can convene that, during early rehabilitation phases, nerve blocks allow a reduction painkiller assumption, a return to more normal sleep patterns, and an increase in the overall rehabilitative process comfort, collaboration and mood.

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