EXTENDED REPORT

Suprascapular nerve block (using bupivacaine and methylprednisolone acetate) in chronic shoulder pain

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Background: Shoulder pain from inflammatory arthritis and/or degenerative disease is a common cause of morbidity in the community. It is difficult to treat and there are limited data on the efficacy of most interventions. Suprascapular nerve block has shown promise in limited trials in reducing shoulder pain. There have been no large randomised placebo controlled trials examining the efficacy of suprascapular nerve block for shoulder pain in arthritis and/or degenerative disease using pain and disability end points.

Objective: To perform a randomised, double blind, placebo controlled trial of the efficacy of suprascapular nerve block for shoulder pain in rheumatoid arthritis (RA) and/or degenerative disease of the shoulder.

Methods: 83 people with chronic shoulder pain from degenerative disease or RA took part in the trial. If a person had two painful shoulders, these were randomised separately. A total of 108 shoulders were randomised. Patients in the group receiving active treatment had a single suprascapular nerve block following the protocol described by Dangoisse *et al*, while those in the other group received a placebo injection of normal saline administered subcutaneously. The patients were followed up for 12 weeks by an observer who was unaware of the randomisation and reviewed at weeks 1, 4, and 12 after the injection. Pain, disability, and range of movement data were gathered.

Results: Clinically and statistically significant improvements in all pain scores, all disability scores, and some range of movement scores in the shoulders receiving suprascapular nerve block compared with those receiving placebo were seen at weeks 1, 4, and 12. There were no significant adverse effects in either group.

Conclusion: Suprascapular nerve block is a safe and efficacious treatment for the treatment of shoulder pain in degenerative disease and/or arthritis. It improves pain, disability, and range of movement at the shoulder compared with placebo. It is a useful adjunct treatment for the practising clinician to assist in the management of a difficult and common clinical problem.

Shoulder pain is common in the community, affecting 15–30% of adults at any one time.[1] Causes include degenerative disease affecting the glenohumeral and acromioclavicular joints and supporting soft tissue structures, and inflammatory diseases such as rheumatoid arthritis (RA), seronegative spondyloarthropathies, and crystal arthropathies. In one survey of patients with RA, shoulder pain affected 40% of patients early in the disease and the majority eventually had shoulder pain.[2] The resultant pain and loss of function is also a major cause of disability in people with these conditions, particularly in the elderly.[3]

Evidence for the efficacy of various treatments of shoulder pain is limited.[4–6] Most studies of interventions are of questionable quality and frequently lack outcome data relating to disability. There is little evidence to support or refute the efficacy of common interventions for shoulder pain. From a clinician's perspective, therapeutic options for the management of this problem are limited. Simple analgesia, non-steroidal anti-inflammatory drugs (NSAIDs), intra-articular steroid injection, and surgery all have their limitations, particularly in older populations with comorbidities.

The suprascapular nerve supplies sensory fibres to about 70% of the shoulder joint, including the superior and postero-superior regions of the shoulder joint and capsule,[7] and the acromioclavicular joint.[8] In addition it supplies motor branches to the supraspinatus and infraspinatus muscles. Suprascapular nerve block has shown some promise as an alternative treatment for patients with shoulder pain due to arthritis.[9 10] A suprascapular nerve block in most studies consists of 10 ml of 0.5% bupivacaine hydrochloride and 40 mg of methylprednisolone acetate (Depo-medrone). We therefore elected to use this combination in our study. As far as we know, to date there are no placebo controlled, randomised double blind trials of this treatment for shoulder pain in arthritis with outcome data of pain and disability. We report such a trial in this paper.

METHODS

A randomised, double blind, placebo controlled study of suprascapular nerve block was designed and received ethics committee approval.

The major entry criterion for this study was chronic shoulder pain, the intention being that the patients in the study represented those seen in general rheumatology practice.

Unselected patients with shoulder pain of at least three months' duration were invited to participate in the study. Patients were recruited from the rheumatology outpatient clinics and from inpatient populations of the Repatriation Hospital, Daw Park, South Australia and St Vincent's University Hospital, Dublin, Ireland. Patients with a diagnosis of rheumatoid arthritis fulfilled the 1987 American Rheumatism Association criteria.[11] They were randomly allocated to receive active or placebo treatment; a sealed envelope randomisation

Abbreviations: NSAIDs, non-steroidal anti-inflammatory drugs; RA, rheumatoid arthritis; SF-36, Short Form-36; SPADI, shoulder pain and disability index

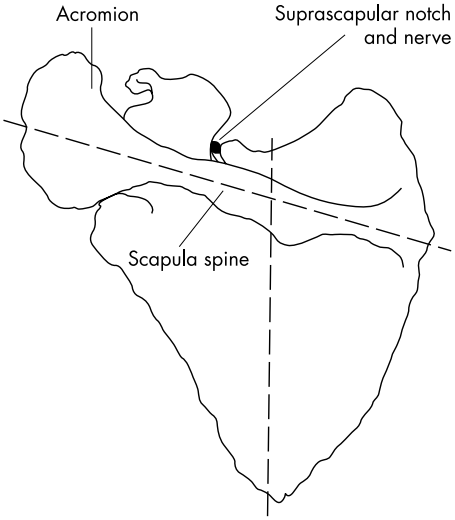

Figure 1 Method of suprascapular nerve injection by identification of surface anatomy. With the patient seated, the spine of the scapula is identified. A perpendicular line is drawn from the angle of the scapula upward to bisect the spine of the scapula. About 2 cm lateral to the intersecting point, in the upper outer quadrant of the scapula, the needle is inserted to the hub of the needle or until the floor of the fossa is reached.

technique was used, with the selection of the envelope made by a person not otherwise involved in the study. The randomisation was concealed throughout the study.

Patients were excluded from the study if they had a known allergy to the injecting agents, severe chronic airways disease, or cardiac failure. We excluded patients with adhesive capsulitis as defined by a global restriction of all shoulder movements, as this has been studied previously.[12] If a patient had two painful shoulders they were invited to have both shoulders entered in the trial with the shoulders being separately randomised. Patients were not asked to stop their usual treatment for shoulder pain, but information was collected on any variation to their treatment throughout the study.

The active treatment required an 11 ml injection into the suprascapular fossa with 10 ml of 0.5% bupivacaine and 40 mg of methylprednisolone after a subcutaneous injection of 1% lidocaine (lignocaine) for local analgesia. The method of the injection has been described by Dangoisse *et al*.[13] Although a previous study has demonstrated the efficacy of suprascapular nerve block using bupivacaine only,[14] we used a mixture of steroid and anaesthetic as this is the more commonly used combination. Anatomical landmarks were used to identify the injection site (fig 1). Patients were seated and a line drawn along the length of the spine of the scapula. This was bisected with a vertical line drawn from the angle of the scapula, dividing the scapula into quadrants. After skin preparation and local anaesthesia, a 21 G × 38 mm needle was introduced through the skin 2.5 cm along the line of the spine in the upper outer quadrant. The needle was directed over the spine in the plane of the scapula and advanced to the hub of the needle or until contact was made with the floor of the suprascapular fossa. After attempted aspiration, the agent was slowly injected to fill the fascial contents of this fossa to produce an indirect suprascapular nerve block. At this point the suprascapular nerve gives off branches to supply the glenohumeral joint, the acromioclavicular joint, and the supraspinatus muscle. In two patients, after identifying the injection site, the location of the needle and the subsequent injection were located by fluoroscopic techniques and the

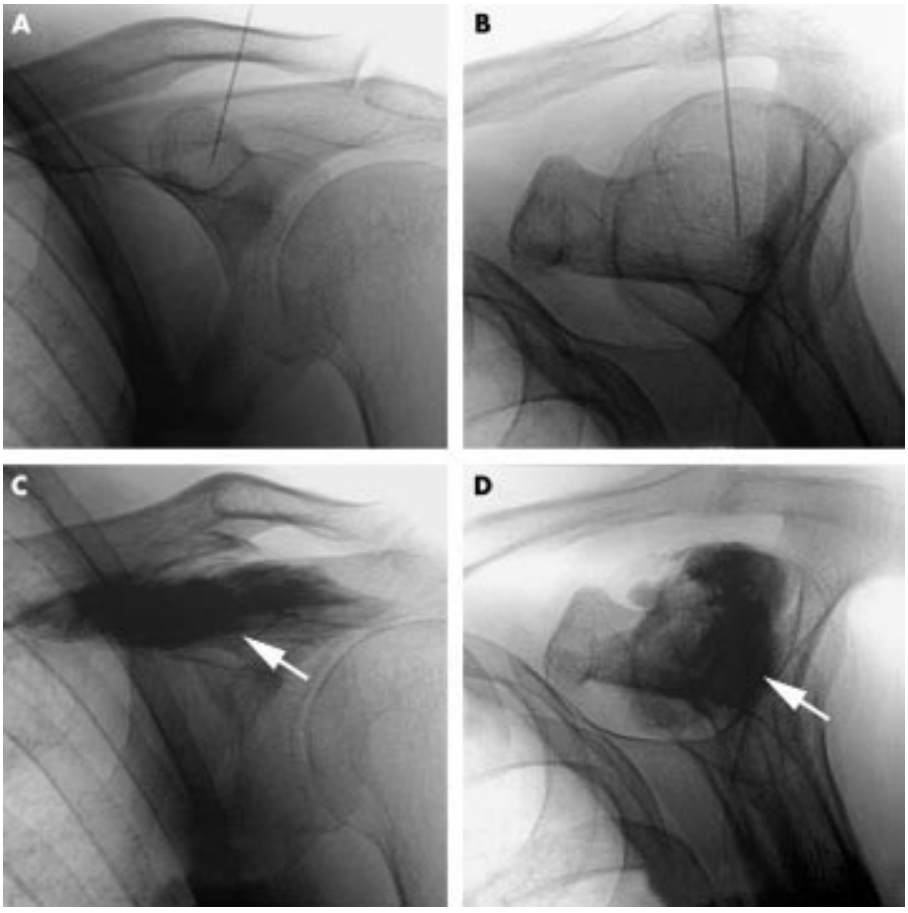

Figure 2 Fluoroscopic image of the suprascapular nerve block injection. The needle is directed over the spine of the scapular and downward into the suprascapular fossa. (A) Anteroposterior view; (B) Neers view. Bupivacaine 10 ml and 1 ml (40 mg) of methylprednisolone is injected into the suprascapular fossa. For the purpose of illustration the injection material is mixed with contrast media. Arrows indicate the injected material. This material suffuses through the suprascapular fossa—(C) anteroposterior view; (D) Neers view.

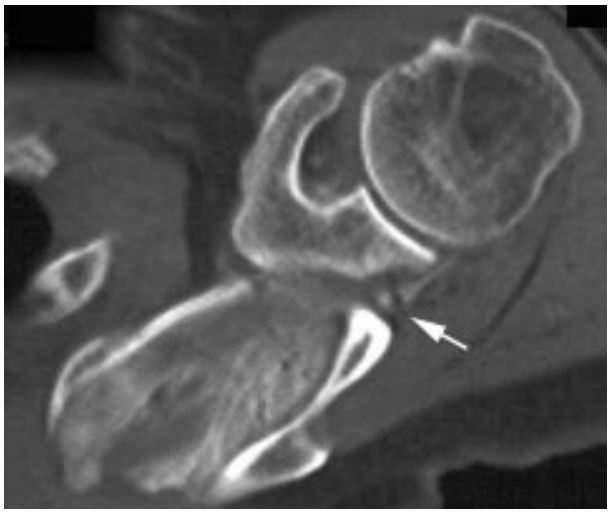

Figure 3 Computed tomographic scan of suprascapular fossa at the level of the suprascapular notch after a suprascapular nerve block mixed with contrast medium. The arrow illustrates the notch, through which runs the suprascapular nerve, bathed in contrast material.

injection of a contrast agent followed by a computed tomographic scan (fig 2 and 3). In this way we were able to establish that the injection indeed bathes the location of the suprascapular nerve as it exits the suprascapular fossa.

The placebo injection consisted of 5 ml normal saline infiltrated subcutaneously after the 2 ml subcutaneous 1% lidocaine infiltration. The use of a subcutaneous injection as placebo, well away from the suprascapular nerve, was thought to be important because of the theoretical possibility of saline itself being potentially active in providing some degree of nerve blockade. The injections were performed out of the line of vision of the patients. They were all performed by a single operator who did not see the patients during the follow up period. The patient assessor was unaware of the nature of the injection. To check whether the blinding was effective, immediately after the injection patients and assessors were separately asked to guess which injection the patient had received. The results of this assessment confirmed the adequacy of the blinding for the patient and the assessor (data not presented.)

Baseline data, including radiological, biochemical, disability, range of movement, and pain scores, were gathered before the injection. Follow up data were gathered at weeks 1, 4, and 12 after the injection. The following data were gathered: (*a*) baseline demographic and disease information; (*b*) baseline plain *x* rays and ultrasound; (*c*) baseline serum biochemistry, full blood count, erythrocyte sedimentation rate, and rheumatoid factor; (*d*) range of movement data at baseline, weeks 1, 4, and 12 (according to the protocol developed by Green *et al*)[15]; (*e*) 100 mm pain visual analogue scale at rest, at night, and with movement at baseline and weeks 1, 4, and 12[16]; (*f*) the shoulder pain and disability index (SPADI) at baseline and weeks 1, 4, and 12; (*g*) Short Form-36 (SF-36) at baseline and weeks 4 and 12. Information was also recorded about the use of extra analgesia or other treatments required during the study period.

We selected the shoulder pain and disability index or SPADI as our outcome measure of disability.[17] The SPADI is a self administered index consisting of 13 items divided into two subscales, pain and disability. It has functioned well on testing in older populations, particularly in older men. It shows good internal consistency, test-retest reliability, and criterion and construct validity. It can detect change over time and accurately discriminates between patients who have improved or worsened.[18]

Table 1 Demographic data—numbers of shoulders

	Active (n=56)	Placebo (n=52)
Mean age, range (years)	73 (31–87)	74 (46–89)
Sex		
Male	30	26
Female	26	26
Shoulder		
Left	24	23
Right	32	29
Clinical diagnosis		
Degenerative disease*	29	27
RA	27	25
Mean duration of symptoms, range (months)	146 (6–480)	119 (4–600)

RA, rheumatoid arthritis.
*Degenerative disease refers to degenerative changes in the glenohumeral joint, acromioclavicular joint, and/or rotator cuff.

Table 2 Clinical and imaging findings of shoulders

	Active injection group (n=56)	Placebo injection group (n=52)
x Ray findings		
Normal	6	4
GH changes only	20	14
AC changes only	7	12
GH and AC changes	13	18
Greater tuberosity changes only	7	3
Subacromial changes only	3	1
Ultrasound findings		
Normal	4	2
Partial tear supraspinatus tendon	4	9
Full tear supraspinatus tendon	34	25
Biceps rupture only	1	1
Impingment only	2	4
Not performed	11	11
Clinical findings		
Global painful movement	19	27
Painful arc	14	10
Joint crepitus	4	1
Painful, restricted movement	19	14

GH, glenohumeral joint; AC, acromioclavicular joint.

Statistical analysis

Pain and disability relating to the shoulder, as measured by the SPADI, was considered as the major end point of the study. Pain measured on the visual analogue scale was considered a second major end point of the study. Total disability (as measured by the SF-36) and range of movement were considered to be secondary end points. These outcomes were examined in the total group.

Power calculations were performed to determine the sample size at the study design stage assuming a power of 80% (β=0.2) and a type 1 error of 0.05. A sample size of 38 per group had the power to detect a difference in a mean of 10 on the SPADI, assuming a common standard deviation of 15.3 using a two group *t* test with a 0.05 two sided significance level. The analysis performed was an intention to treat analysis.

A patient missed a follow up appointment on 19 occasions. These data points were handled statistically by omitting the data point from the analysis. Data were entered into the SPPS statistical package (version 10.0). χ^2 Analyses were used for the difference between groups in the numbers of patients improving by more than 10 points on the SPADI.

To reduce the possibility of a type 1 error and because multiple *t* tests were performed in the analysis, a modified Bonferroni adjustment was performed to account for the number of time points.[19]

Table 3 The mean SPADI and pain scores with their 95% confidence intervals

Outcome measurement (max score)	Week 0 Active (n=56) Placebo (n=52)		Week 1 Active (n=55) Placebo (n=51)		Week 4 Active (n=52) Placebo (n=46)		Week 12 Active (n=53) Placebo (n=48)	
	Mean	CI	Mean	CI	Mean	CI	Mean	CI
SPADI – total (100)								
Active	68.1	(63.7 to 72.6)	51.6	(46.9 to 56.2)	55.0	(49.9 to 60.2)	55.5	(49.3 to 61.7)
Placebo	66.5	(61.4 to 71.6)	63.7	(57.9 to 69.5)	64.3	(59.1 to 69.5)	63.9	(57.8 to 69.8)
SPADI – pain (100)								
Active	68.1	(63.8 to 72.4)	45.2	(40.5 to 49.9)	51.4	(45.9 to 56.9)	52.2	(45.4 to 59.1)
Placebo	66.4	(61.2 to 71.6)	63.4	(57.9 to 68.9)	61.5	(55.7 to 67.4)	60.5	(54.0 to 67.1)
SPADI – disability (100)								
Active	68.2	(62.8 to 73.6)	57.9	(52.2 to 63.7)	58.7	(52.9 to 64.5)	58.8	(52.5 to 65.1)
Placebo	66.5	(60.4 to 72.7)	63.9	(56.9 to 71.0)	67.2	(61.2 to 73.1)	67.1	(60.4 to 73.8)
Pain at rest (100)								
Active	44.7	(38.8 to 50.6)	29.3	(23.4 to 35.1)	30.4	(24.6 to 36.2)	32.0	(25.9 to 38.1)
Placebo	46.2	(39.5 to 52.9)	42.9	(35.2 to 50.5)	40.1	(32.0 to 48.1)	48.2	(40.5 to 55.8)
Pain at night (100)								
Active	60.2	(53.6 to 66.8)	39.1	(32.2 to 45.9)	39.2	(31.8 to 46.5)	44.7	(37.3 to 52.1)
Placebo	58.2	(50.5 to 65.8)	51.7	(43.4 to 59.9)	47.8	(39.4 to 56.3)	55.9	(47.7 to 64.0)
Pain on movement (100)								
Active	71.1	(65.0 to 77.2)	50.0	(44.2 to 55.9)	54.4	(47.5 to 61.3)	52.8	(45.5 to 60.2)
Placebo	67.5	(61.4 to 73.6)	59.0	(51.7 to 66.3)	60.2	(52.5 to 67.9)	64.5	(57.2 to 71.7)

RESULTS

Table 1 lists the demographic characteristics of the patients. Sixteen patients were recruited from St Vincent's University Hospital in Dublin, Ireland and the remainder (67 patients) from the Repatriation Hospital in Adelaide, South Australia. The same injector and the same protocols for enrolment and follow up were used at both sites. The randomisation was performed centrally. The patients had tried multiple treatments for shoulder pain before the study, with most having had pharmacological treatments (for example, NSAIDS or simple analgesia) or intra-articular injection, or both. The minimum interval between any intra-articular shoulder injection and enrolment in the study was three months. Eighteen patients refused to participate in the study. They were not demographically different from the study group in any way. The principal reasons for refusal to participate were: did not want to take part in a placebo controlled trial (five patients), transport difficulties for follow up (six), too old/frail (three), concerned about the side effects (two), and no reason given (two). In all, 108 shoulders were included in the study. Forty patients (52 shoulders) had proven RA (American Rheumatism Association criteria)[11] and 43 patients (56 shoulders) had shoulder pain relating to degenerative disease. Patients within these two groups were randomised separately to active injection or placebo (table 1). Table 2 summarises the radiological, clinical, and ultrasound findings of the participants.

Tables 3 and 4 summarise the data from the SPADI. Pain and disability subscales and the total scores are presented. These outcomes are also represented graphically in fig 4. Table 3 summarises the mean scores with 95% confidence intervals for the four time points. Table 4 shows the differences between the scores in the active versus placebo groups over the three time periods. These data were analysed using the independent Student's *t* test for the difference of the means. Table 5 summarises the range of movement data for abduction, flexion, external rotation, and hand behind back movements.

Table 4 Placebo *v* active for SPADI, (total scores, pain, and disability subscales) and pain (rest, night, and on movement) scores

Outcome measure (max score)	Week 1 Active (n=55), placebo (n=50)		Week 4 Active (n=55), placebo (n=51)		Week 12 Active (n=53), placebo (n=48)	
	Mean change (SD)	Difference in mean change between groups (95% CI)	Mean change (SD)	Difference in mean change between groups (95% CI)	Mean change (SD)	Difference in mean change between groups (95% CI)
SPADI (100)						
Active	16.5 (15.3)	15.8 (9.9 to 21.8)	13.6 (18.5)	12.9 (6.6 to 19.1)	13.5 (19.3)	10.9 (3.6 to 18.2)
Placebo	0.66 (15.1)		0.8 (13.2)		2.6 (17.4)	
SPADI – pain subscale (100)						
Active	22.5 (18.1)	22.2 (14.9 to 29.4)	17.0 (20.9)	14.2 (21.9 to 6.5)	16.6 (21.7)	11.0 (2.7 to 19.3)
Placebo	0.3 (19.3)		2.8 (19.0)		5.6 (20.3)	
SPADI – disability subscale (100)						
Active	10.6 (16.6)	9.5 (3.4 to 15.7)	10.25 (20.1)	11.5 (4.9 to 18.2)	10.5 (20.2)	10.9 (3.2 to 18.4)
Placebo	1.04 (15.1)		–1.27 (13.3)		–0.4 (18.2)	
Pain at rest (100)						
Active	14.8 (19.4)	10.8 (3.3 to 18.4)	14.5 (22.6)	7.9 (–1.5 to 17.4)	12. 9 (23.9)	14.6 (23.5 to 5.7)
Placebo	4 (19.7)		6.5 (26.3)		–1.6 (21.4)	
Pain at night (100)						
Active	21.6 (25.3)	14.8 (5.8 to 23.8)	22.4 (28.0)	11.8 (1.0 to 22.6)	16.3 (30.5)	13.9 (2.6 to 25.2)
Placebo	6.8 (20.6)		10.6 (28.0)		2.4 (26.8)	
Pain on movement (100)						
Active	21.3 (22.6)	11.3 (3.3 to 19.3)	16.9 (24.4)	10.2 (0.8 to 19.7)	19.2 (24.5)	15.4 (25.1 to 5.7)
Placebo	9.9 (18.1)		6.7 (24.5)		3.8 (24.9)	

When corrected using the Bonferroni adjustment all results are statistically significant with the exception of pain at rest in week 4.

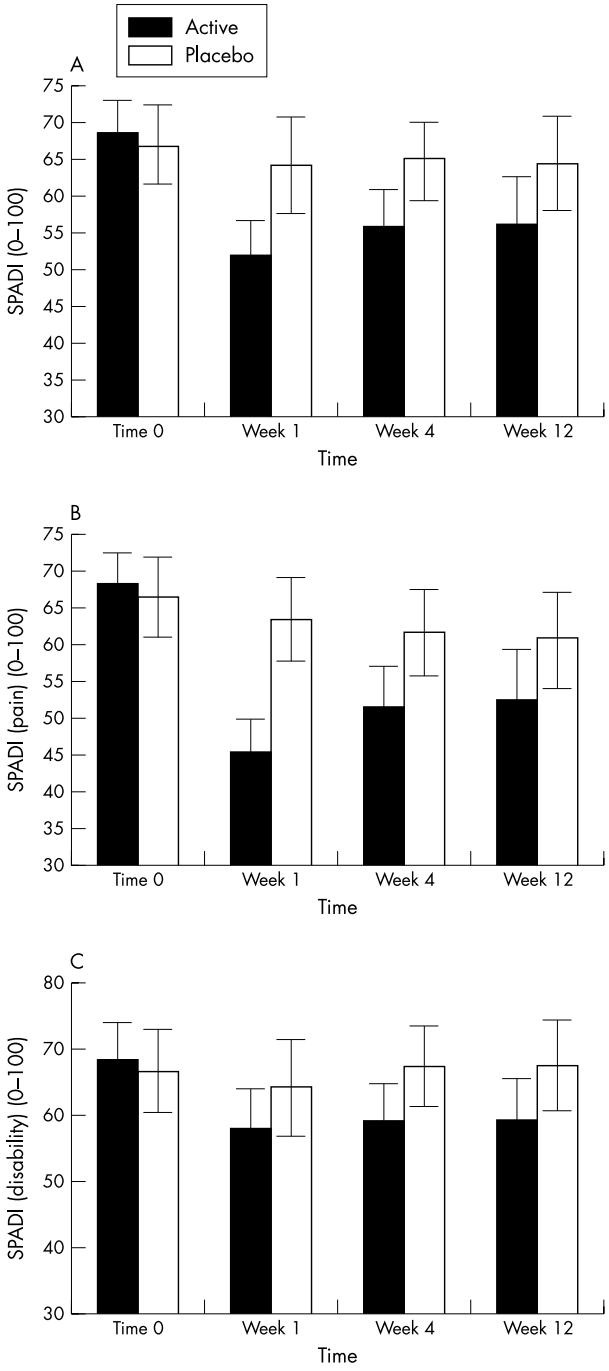

Figure 4 SPADI scores in the group receiving active treatment and placebo group at baseline and weeks 1, 4, and 12. (A) SPADI total scores; (B) SPADI pain subscale; (C) SPADI disability subscale. Values are mean scores and error bars are 95% confidence intervals.

We then examined the percentage of shoulders that improved by more than 10 points on the SPADI scale in both groups at each time point. At week 1, 67% of shoulders in the active group improved by at least 10 points on the overall SPADI score compared with 23% in the placebo group ($p<0.01$). At week 4, the improvement rates were 66% and 11%, respectively ($p<0.01$) and at week 12, 55% and 18% ($p<0.01$).

SF-36 data were analysed. No significant differences were found using the SF-36 between the two groups at any of the time points. An analysis was also performed including those patients with only one shoulder was affected. There were no significant changes to the results with this analysis. In addition, the two broad classes of disease (RA and degenerative) were analysed separately. These analyses showed consistent trends of improvement in the group receiving active treatment compared with placebo in both disease categories and at all time points. However, because of the smaller numbers in each of these groups, not all the improvements reached statistical significance. The results from the two centres were also examined separately. No significant differences were found between the results from either site. Finally, we analysed only those cases that were known to have a tear in the supraspinatus tendon proven on ultrasound (either partial or complete). The improvements in the patients in the active treatment group compared with those in the placebo group were also highly statistically and clinically significant.

Adverse events

Few adverse events were recorded in either group. One patient in the active treatment group complained of chest pain the evening after the injection. Follow up examination and investigation showed chest wall tenderness but no pneumothorax or cardiac cause for the pain. This settled with simple analgesia within 24 hours. Minor bruising was noted in one other patient in the placebo group.

One patient died before the 12 week follow up from a myocardial infarction unrelated to the study.

DISCUSSION

The results of this study show a clear benefit from the use of suprascapular nerve block using bupivacaine and methylprednisolone in patients with chronic shoulder pain from arthritis. There was a statistically and clinically significant reduction in pain. This benefit was prolonged, with benefit still present at 12 weeks. The improvement in this parameter is at least comparable with published studies examining NSAIDs or intra-articular steroid injection.[20 21] There were no significant side effects from the injection, which was well tolerated by most of the patients.

As suggested by Carette in a recent editorial,[22] we included a valid and reproducible measurement of disability as a primary end point measurement. There was also an overall modest, but clinically significant, improvement in disability as measured by the disability subscale of the SPADI. Although most of the patients had structurally very abnormal shoulders, a reduction in pain seems to have reduced the level of their measurable disability at the shoulder. This effect was not seen in overall disability as measured by the SF-36.

A number of reliable and valid instruments have been developed for the measurement of disability with shoulder problems. The question whether a specific instrument is better than a general instrument is debated. Usually it appears that outcome studies are more powerfully served by specific measures rather than more general tools.[23] The results of our study reinforce this concept and are consistent with the results of other studies comparing specific instruments with a generic instrument.

An improvement of 10 on the SPADI has been shown to represent significant clinical improvement.[15] In this study about two thirds of the patients who received the active injection had at least this level of improvement at weeks 1 and 4. The percentage improvement decreased after this, but more than 50% of the subjects had clinical improvement over baseline at week 12 as compared with less than 20% in the placebo group. Interestingly, while both pain and disability subscales improved significantly, the pain subscale improved more than the disability scale. This may be because many of the patients had structurally abnormal shoulders due to long duration of disease. As a result, the level of disability was not likely to show much improvement. The range of movement improvement was modest, with only abduction and the hand behind back combined movement showing any significant improvement.

Table 5 Range of movement change scores

Outcome measure (max score)	Week 1 Active (n=55), placebo (n=50)		Week 4 Active (n=54), placebo (n=51)		Week 12 Active (n=52), placebo (n=48)	
	Mean change (SD)	Difference in mean change between groups (95% CI)	Mean change (SD)	Difference in mean change between groups (95% CI)	Mean change (SD)	Difference in mean change between groups (95% CI)
Active abduction (180)						
Active	16.0 (19.1)	10.46* (3.7 to 17.2)	17.6 (20.2)	13.7* (5.6 to 21.8)	14.7 (21.9)	9.6* (0.9 to 18.2)
Placebo	5.6 (15.4)		3.9 (21.6)		5.1 (21.6)	
Passive abduction (180)						
Active	20.3 (16.0)	15.1* (8.6 to 21.6)	20.8 (18.0)	18.4* (10.0 to 26.8)	16.0 (18.6)	13.0* (5.0 to 21.0)
Placebo	5.1 (17.5)		2.4 (24.9)		3.0 (21.6)	
Active flexion (180)						
Active	8.6 (24.9)	–0.2 (–9.2 to 8.8)	13.1 (27.6)	6.8 (–3.0 to 16.7)	9.9 (33.4)	3.0 (–8.0 to 14.1)
Placebo	8.8 (21.4)		6.25 (22.8)		6.8 (20.4)	
Passive flexion (180)						
Active	9.9 (23.6)	2.4 (–6.5 to 11.4)	24.8 (70.1)	19.1 (–1.50 to 39.6)	9.8 (33.9)	6.3 (–5.1 to 17.7)
Placebo	7.4 (22.6)		5.7 (25.0)		3.5 (22.1)	
Active external rotation (100)						
Active	5.1 (9.7)	1.9 (–2.3 to 6.1)	4.3 (9.2)	1.4 (–2.4 to 5.3)	3.7 (11.9)	2.5 (–1.7 to 6.7)
Placebo	3.2 (12.0)		2.9 (10.8)		1.2 (8.9)	
Passive external rotation (100)						
Active	4.6 (8.9)	3.5* (0.34 to 6.8)	4.8 (10.5)	2.9 (–0.9 to 6.7)	4.5 (10.5)	1.9 (–2.2 to 5.9)
Placebo	1.0 (7.8)		1.9 (9.3)		2.6 (10.0)	
Hand behind back						
Active	2.5 (3.4)	2.0* (0.8 to 3.2)	3.1 (3.7)	2.7* (1.4 to 4.0)	3.1 (3.7)	2.7* (1.4 to 4.0)
Placebo	0.5 (3.0)		0.4 (2.9)		0.4 (2.9)	

*Significant at the 0.05 level.

The clinical classification of shoulder problems is confusing. Issues concerning the reliability and validity of clinical diagnoses have been discussed previously.[24] Most clinical tests used to establish different shoulder diagnoses for longstanding shoulder joint pain have poor interobserver agreement and their accuracy is low in comparison with arthrography.[25] Even in comparison with ultrasound (which has its own limitations in diagnosing partial tears of the supraspinatus and the labrum), physical examination shows low accuracy in the diagnosis of periarticular shoulder lesions.[26] As a result of these controversies we did not base our analyses on potentially inaccurate clinical classifications. We have included all relevant clinical and radiological information on the patients in the study in order to describe the group as clearly as possible. Even the presentation of these data was difficult because of the lack of uniform clinical descriptors in shoulder studies, and the lack of valid and reliable scoring systems for radiological imaging of the shoulder. Our aim was to keep the categories of disease broad in order to maximise the applicability of the results. In general, our patients were elderly and had longstanding shoulder pain from degenerative and/or rheumatoid disease. Such patients comprise a large proportion of people presenting to rheumatologists with a problem of shoulder pain. In addition, our results suggest that suprascapular nerve block reduces pain and disability at the shoulder for subjects with a tear in their supraspinatus tendon, irrespective of their clinical diagnosis.

The low incidence of reported side effects is an advantage. Pneumothorax has been reported as a complication of this procedure.[27] However, in our experience (now well in excess of 300 patients) we have had no such events. Our findings in this large trial and subsequent experience confirm that the approach of Dangoisse[13] is safer than previous methods. Our safety record is consistent with that of other recent studies using this method.[12] We believe that the use of the standard needle makes this complication very unlikely, and this is supported by the radiological imaging performed, which shows the end of the needle superior to the suprascapular notch (fig 2). The 11 ml volume allows the mixture to suffuse to the region of the notch and nerve (fig 3). Other studies using smaller volumes have shown less efficacy.[28] In addition, the procedure is easy to learn and has a short "learning curve". For the purpose of this study a single experienced injector performed the procedure, but others have been trained to perform the intervention in a single session.

That pain relief from the block extends beyond the pharmacological effect of the drug is well described. There are a number of possible explanations for this. A decrease in central sensitisation of dorsal horn nociceptive neurones[29] or a "wind down" (because of a reduction of peripheral nociceptive input) have been suggested. A depletion of substance P and nerve growth factor in the synovium and afferent C fibres of the glenohumeral joint after the blockade may also contribute to the longer term relief.[30] It is also interesting to speculate on the potential contribution to pain relief from the direct infiltration of the supraspinatus muscle, and the possible blockade of those fibres of the nerve supplying the supraspinatus muscle and possible "downstream" blockade of the infraspinatus muscle. No reduction in the power of these muscles was reported, although this could not be formally tested because of the severity of the shoulder pathology in most of the subjects studied.

We have demonstrated that suprascapular nerve block is efficacious without the need to image the area by ultrasound or fluoroscopy during the procedure. This study shows that this treatment not only reduces pain but also decreases disability and gives clinicians a proven efficacious treatment for patients with shoulder pain. Whether the efficacy would be further improved with guidance of the needle under direct imaging is unknown. The combination of nerve block with other approaches to pain relief would also be a potentially worthwhile area to study.

In summary, this study provides evidence that suprascapular nerve block is a safe, effective, and well tolerated treatment for patients with chronic shoulder pain from arthritis and/or degenerative shoulder disease. We have not established its efficacy in other settings or with other conditions such as frozen shoulder or shoulder pain from seronegative arthritis. It can be performed in an outpatient department and provides the clinician with an alternative or additional approach to oral drug treatment and intra-articular injection. Further, it may prove to be a useful treatment for patients who are unfit or unwilling to consider surgical intervention.

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