Suprascapular Nerve Block or Interscalene Brachial Plexus Block for Pain Relief after Arthroscopic Acromioplasty

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Abstract

Background: Comparisons between the interscalenic plexus block (ISB) and the su-prascapular nerve block (SSB) have indicated a modestly better effect of ISB for postop-erative pain relief following arthroscopic acromioplasty. The discomfort related to the two blocks has not been evaluated. We conducted a repeated study, considering both the pain relieving effect and the discomfort related to the two blocks.

Methods: The two different interventions were compared in a prospective study using a two-period design performing ISB during the first and SSB during the second period. Out-come parameters were: discomfort in relation to the blocks, consumption of analgesics and pain score during rest / passive movement.

Results: No difference was indicated between the groups as to demographic data and du-ration of operation. The efficacy of blocks was documented by hand grip strength and two-point discrimination. Increased discomfort was related to ISB compared to SSB ($P<0.001$). Pain scores at rest and passive flexion of the shoulder were modestly better with SSB than ISB. The consumption of analgesics did not deviate significantly.

Conclusion: The results of the present study combined with the former reports describing serious lesions in relation to ISB make us recommend SSB as the first choice of blockade for arthroscopic acromioplasty.

Keywords: Pain relief arthroscopic acromioplasty; Suprascapular nerve block; Interscalene brachial plexus block.

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Arthroscopic acromioplasty is often associated with severe post-operative pain that is difficult to manage with orally or IV administered opioids without encountering side effects. A single-dose interscalene brachial plexus block (ISB) has appeared to provide significant analgesia and to be superior to local subacromial bursa infiltration [1]. A random-ised controlled trial by Singelyn et al. compared four groups including interscalene brachial plexus block (ISB), suprascapular nerve block (SSB), intra-articular injection and placebo [2]. From this study it was concluded that ISB is the most efficient analgesic technique after arthroscopic acromioplasty but the SSB block is a clinically appropriate alternative.

However, when evaluating alternative treatments several aspects have to be considered before deciding which one should be preferred. The benefit of ISB for post-operative pain relief should be counterbalanced against the discomfort of the patient re-lated to the performance of ISB compared to SSB. Serious complications such as perma-nent loss of cervical spinal cord function have been reported following ISB so the clinician must be cautious and careful during the performance of this block [3]. Further, two compet-ing techniques have been used for ISB: the traditional approach perpendicular to the in-terscalene groove (Winnie) [2] and the lateral modified approach (Meir) [4]. Both are used rou-tinely but may have different outcomes. Taking these aspects into consideration we de-cided to repeat a direct comparison between ISB and SSB recording the same parameters as Singelyn et al and also we evaluated the discomfort of the patients in relation to the two alternative blocks.

Methods

Subjects eligible for inclusion were patients scheduled for arthroscopic acromioplasty as an out-patient procedure, where further intra- or extra-articular surgery was not expected based on clinical examination, ultrasonography and magnetic resonance imaging (MRI). They were required to be ASA 1-2 and able to understand pain scales. After giving in-formed consent subjects were allocated to either an interscalene brachial plexus block (ISB) or a suprascapular nerve block (SSB) performed by anaesthetists skilled in both types of nerve blocks.

The ISB was performed before the induction of general anaesthesia. A 5 cm, 22 gauge short-bevelled insulated needle (Stimuplex, B. Braun Medical, Melsungen, Germany) was placed in the interscalene groove using the lateral modified approach [3] (Meier approach). The needle connected to a peripheral nerve stimulator (Stimuplex HNS 11, B. Braun Medi-cal, Melsungen, Germany) sent a current (strength: 1mA, duration: 0.1 ms and frequency 2 Hz) into the groove. When a muscle group of the upper extremity was stimulated and the threshold was assessed between 0.2 and 0.5 mA the position was considered adequate. After negative aspiration for blood, 20 ml of 0.25% Bupivacaine was instilled.

The SSB was also performed before general anaesthesia using the same needle and pe-ripheral nerve stimulator as mentioned above. The Stimuplex needle was introduced per-pendicular to the skin 1cm proximal to the middle of the spine of the scapula. The su-prascapular nerve was located if the current caused a contraction of the supra- or infraspi-natus muscles. Ten ml of 0.25% Bupivacaine was injected at that location.

Of course, subjects were aware of where they had been injected. They were told that both types of block supplied effective anaesthesia.

Surgery was performed under general anaesthesia (GA). GA was induced with Thiome-bumal/ Fentanyl and maintained with Propofol/ Remifentanile. A laryngeal tube was in-serted. In both groups 5 ml of Bupivacaine 0.5 % with epinephrine was infiltrated in the anterior portal used for intra-articular probing.

If further surgery apart from acromioplasty was indicated, subjects were excluded from the study. No other exclusion criteria were used.

The post-operative bandage covered both injection areas. A loose sling was applied.

After surgery subjects were moved to the recovery room. Subjects were discharged with Paracetamol 500 mg, Ibumetin 400 mg, and Tramadol 50 mg, and a written instruction allowing them to take up to 8, 3, and 4 tablets respectively during the next 24 hours.

Demograhic data, the type of block and the duration of the operation were recorded. The effects of the blockades were tested and documented by recording hand grip strength and two-point discrimination. For hand grip strength we used a grip sphygmomanomometer and for two-point discrimination we used a slide ruler measuring mm for touch on the index finger's pulp. Discomfort with the application of ISB or SSB was recorded just after the blockades using a 100 mm long visual analogue scale (VAS score). The pain score at rest was recorded on the same scale before operation, 2 and 4 hours after the end of operation by the same observer and by self evaluation by the patient 24 hours after the operation. To assure that the self evaluation was carried out a phone call was made to the patients. The score during passive flexion of the shoulder was recorded before and 2 and 4 hours after the operation according to the following scale: 1: passive flexion not possible due to pain. 2: passive flexion to a lesser degree than 45 degrees. 3: passive flexion to 45 degrees possible but very painful. 4: passive flexion to 45 degrees elicits pain but is not bother-some. 5: passive flexion to 45 degrees is painless.

Outcome parameters thus included:

- Discomfort with the application of the blockade on a 100 mm long visual analogue scale.
- Pain score with the arm at rest.
- Score (according to the scale above) during passive flexion of the shoulder.
- Accumulated consumption of Morphine, Paracetamol, Tramadol or Ibumetin till 24 hours after the operation.

Pain at rest was considered as the most important outcome measure. We did not want to overlook a difference between blocks of more than 20 mm on the VAS scale with a power of 90%. The type one error was set at 5% and the variation was judged based on pain levels from a sample of ISB blocked acromioplasty operated patients. Based on these assumptions, 20 patients were needed in each group. The two sided t-test with different vari-ances was used for comparison of parameters within the present study. To be able to compare with other studies we also calculated mean and standard error of mean.

The protocol was confirmed with the ethical committee of Copenhagen County. The committee recommended the study be conducted as quality control. We conducted the study as a quasi randomised experiment with a two period design using ISB during the first and SSB during the second period

Results

The flow chart of patients in and out of the study is shown in Figure 1. During the study period 3 patients were not included based on a wish of not having any blockades at all. Three patients in the ISB and 4 patients in the SSB group were excluded because further surgery was performed. All patients reported 24 hours post-operative results. This left 21 subjects in the ISB group and 20 in the SSB group.

The pre-operative recordings are listed in Table 1. Demographic data, duration of blockade and operation and two-point discrimination did not deviate significantly between the groups. Pre-operative VAS score and grip strength were significantly higher in the SSB group. Discomfort in relation to the blockade was significantly higher in the ISB group.

Table 1 Pre-operative recordings of the two groups (ISB: Interscalene plexus blockade and SSB: Suprascapular nerve blockade). The visual analogue score for pain at rest and the grip strength were significantly higher in the SSB group. The score for discomfort related to blockade was signifi-cantly higher in the ISB than the SSB group.

PARAMETER	ISB	SSB	P
Patients			
Gender (m/f)	10/11	10/10	>0,5
Age (years)	51,9 (2,1)	48,9 (2,6)	0,18
Weight (kg)	69,0 (2,4)	72,0 (2,6)	0,21
Height (m)	169,8 (1,6)	173,8 (2,1)	0,07
VAS score	34,0	52,3	0,01
Passive move	3,4 (0,3)	3,7 (0,3)	0,42
Grip Strength	59,8 (3,3)	70,5 (3,5)	0,03
Two-point discrim.	2,5 (0.14)	2,8 (0,13)	0,10
Block			
Duration (min)	11,5	10,5	0,07
Discomfort	68,4 (0,9)	51,3 (2,1)	<0.001
Operation			
Duration (min)	35,8 (1,5)	33,5 (1,5)	0,14

The post-operative recordings are listed in Table 2. The grip strength and two-point discrimination deteriorated significantly more in the ISB than the SSB group. The VAS score decreased more after SSB than ISB and the difference was significant 2 hours after the operation. Concordantly, score for passive flexion remained significantly better with SSB compared to ISB at 2 hours post-operatively. The consumption of analgesics was higher in the SSB group but no significant difference was found.

Discussion

Well designed randomised trials provide the best evidence for the clinician to choose between competing interventions. Originally, we planned to conduct a "head to head" ran-domisation in the present study. However, this showed up to be troublesome and the local ethical board recommended conduction of the study as quality control. When a "head to head" randomisation has not been carried out the risk of bias is increased considerably. In the present study the pre-operative VAS score at rest differed significantly between the two groups. The latter operated group (SSB) probably had a higher pre-operative VAS score because pain and disability were progressing during the waiting time. To eliminate this bias from the post-operative evaluation we recorded the difference between post- and pre-operative VAS scores.

For evaluation of the results it is important to optimise the blockades and validate the measurements. We optimised the placement of

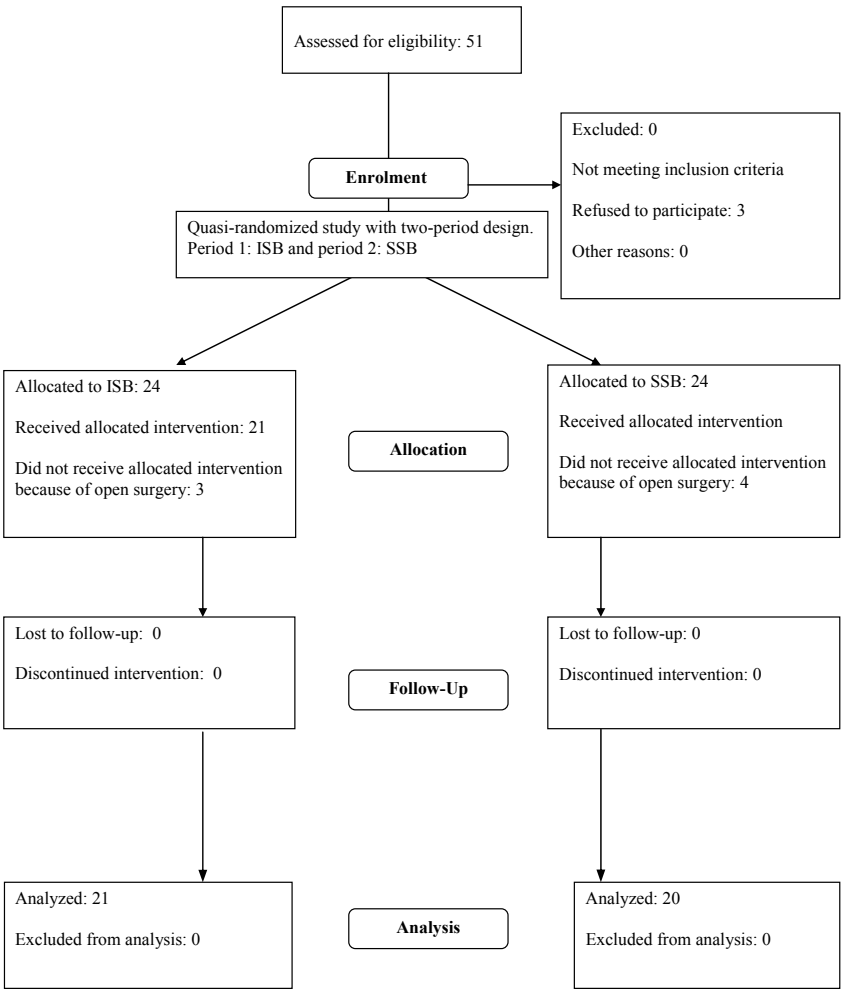

Figure 1 Flow chart of patients scheduled for arthroscopic acromioplasty.

Table 2 Post-operative recordings of the two groups. The grip strength is given as per cent of the pre-operative measurement, whereas two-point discrimination, pain score at rest and pain during move are given as the difference post-operative minus preoperative score. ISB: interscalene plexus block and SSB: suprascapular nerve block.

PARAMETER	ISB	SSB	P
Grip strength			
2 hours	25,6 (6) %	95,8 (2) %	<0,01
4 hours	26,6 (6) %	95,5 (2) %	<0,01
Two points discrimination			
2 hours	21,9 (3,3) mm	0,6 (0,1) mm	<0,01
4 hours	18,5 (3,0) mm	-0,6 (0,1) mm	<0,01
Pain score at rest			
2 hours	-22 (5,7)	-41 (4,8)	0,02
4 hours	-25 (4,4)	-35 (5,1)	0,17
24 hours	-16 (5,8)	-23 (5,5)	0,44
Pain during move		-0,15 (0,3)	
4 hours	-1,9 (0,3)		P<0,01
Consumption of Analgesics after 24 hours		0	
Morphine	0	5,9	1,0
Paracetamol	5,0	2,8	0,31
Ibumetin	1,9	1,3	0,25
Tramadol	0,8		1,3

the local anaesthetics by using nerve stimulator and validated the efficacy of the blocks by recording hand grip strength and two-point-discrimination. After ISB an extensive motor and sensory blockade was validated by hand grip strength and two-point discrimination, respectively. The slight influence on the tests following SSB is in accordance with the limited motor (m. infra- and m. supraspina-tus) and no cutaneous innervation of the suprascapular nerve.

Inside the shoulder joint the SSB blocks about 70% of the posterior glenohumeral joint, the acromioclavicular joint, the subacromial bursa, and the coracoclavicular ligament [6]. This explains the beneficial effect of this block in relation to shoulder surgery as documented in several studies. Direct comparison between pain scores after ISB and SSB was carried out in the present study and that of Singelyn et al. The results of Singelyn et al indicated modestly better pain relief with ISB than SSB in one among three tests. Contrarily, in our study VAS score and score during passive flexion of the shoulder indicated better effect of SSB. These paradoxical findings between the two studies may be explained by the two different techniques used for ISB. Using the Winnie approach Singelyn et al injected the local anaesthetics near the superior trunk from which the suprascapular nerve is originating. This is probably not the case when we used the Meier approach. The lateral and caudal placement of local anaesthetic associated with this approach is increasing the risk not including the suprascapular nerve.

In our study the blocks were performed while the subjects were awake. A dis-cussion has taken place whether blocks may be performed during general anaesthesia or not [6,7,8,9,10]. Serious complications with spinal cord lesions have been described when the ISB was carried out during general anaesthesia. Several anaesthetists find that ISB is ab-solutely contraindicated during general anaesthesia. The risk of serious complications seems especially to be related to the Winnie approach whereas both serious complications and side effects

are lesser frequent after the modified lateral approach [4]. Ultrasound guided ISB is probably rather safe and may exclude the risk of serious nerve lesions, but further evidence is needed in this field [11]. Probably the SSB performed with modern atraumatic cannulas can be performed without any risk of serious lesions of the relative small su-prascapular nerve.

Although pain relief in our study was significantly better following SSB compared to ISB, the difference was never more than 20 mm on the VAS scale and concomitantly we did not find significant difference comparing the consumption of analgesics. We also demonstrated that the patients felt more uncomfortable with the performance of ISB than with SSB and the massive affection on hand sensibility and upper limb motor function was felt as unpleasant by many. The ISB is the most difficult to deliver, requiring a greater time commitment. These latter facts together with the serious complications such as permanent loss of nerve function speaks for SSB as the blockade in relation to acromioplasty.

In conclusion following arthroscopic acromioplasty we found modestly better effect for post-operative pain relief and lesser discomfort during the performance of SSB compared to ISB. We recommend SSB as the primary choice of regional nerve blockade during ac-romioplasty.

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