

Efficacy of low dose Interscalene Brachial Plexus Block on post anesthesia recovery parameters after Shoulder Surgery

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ABSTRACT

Objective: Excellent postoperative pain control plays central role in the outcome of open shoulder surgery which provides early rehabilitation and accelerates functional recuperation.

Methodology: Fifty patients who were candidate for elective shoulder surgery were enrolled in this study. Patients were randomized to two 25-patient groups. One group received morphin sulfate and in the other group small volume Interscalene Brachial Plexus Block (ISBPB) was performed. Pain severity, patient satisfaction scores and post anesthesia recovery parameters were assessed.

Results: Patients satisfaction score was significantly improved in ISBPB ($P < 0.001$). Agitation in ISBPB group was significantly reduced compared to the other group ($P = 0.009$). Pain severity score was significantly reduced with ISBPB ($P = 0.001$). ISBPB did not have any side effects on post anesthesia recovery parameters.

Conclusion: Small volume ISBPB may be considered as a suitable technique for reducing intermediate postoperative pain without any effect on post anesthesia care unit parameters and stay in patients undergoing open shoulder surgery.

KEY WORDS: Shoulder Surgery, Interscalene Brachial Plexus Block, Anesthesia, Recovery.

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INTRODUCTION

More than 40% of patients undergoing orthopedic procedures experience moderate to severe postoperative pain.¹ Open shoulder procedures are often associated with severe postoperative pain, especially within the first 48 hours.² Opioid use for control of the postoperative pain has limited value because of the adverse effects of opioids. Nerve blocks have great value among different postoperative analgesic methods, of which interscalene nerve block is the mostly recommended technique.³ A single injection peripheral nerve block provides upto 12-15 hours analgesia after upper extremity procedures.⁴ Interscalene brachial plexus block (ISBPB) has been shown to provide a safe and effective pain relief after open shoulder surgery.⁵ After surgery, quality of pain control is better, degree of patient satisfaction is higher and the incidence of side effects is decreased with ISBPB.^{6,7}

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Klein S.M et.al in 2000 showed that benefits of interscalene perineural catheters last more than 24 hours in hospitalized patients.⁸ Continuous interscalene nerve block is considered the gold standard for postoperative analgesia after shoulder surgery by some authors,⁹ because of better efficacy on pain control.¹⁰ Catheter placement for interscalene brachial plexus block has some challenges include avoiding the external jugular vein, inclusion of catheter site in the sterile surgical field and superficial placement which leads to catheter dislodgment.¹¹ However this technique leads to administration of large volume of local anesthetic which may have potential toxic effect because of accumulation after prolonged period of infusion. However a 100% of Phrenic nerve palsy limits the application of this block in patients with boarderline respiratory reserve.

In this study we evaluated the efficacy of low dose interscalene nerve block on postoperative pain and recovery parameters in patients undergoing open shoulder surgery.

METHODOLOGY

The study was approved by the institutional ethical review board and local ethics committee of Tabriz University of Medical Sciences. After obtaining the informed consent from patients, 50 patients who were candidates for open shoulder surgery in Shohada Hospital (September 2008 to September 2009) were enrolled in this study. Patients with severe bronchopulmonary disease, Coagulopathy, infection in block site, neuropathy, previous history of brachial plexus block and allergy to local anesthetic were excluded.

Using a computer sequence of numbers, 25 patients were randomly assigned to receive general anesthesia for shoulder operation and receive morphine sulfate 5 mg in incremental doses for post operative pain and the other 25 patients received general anesthesia with same drugs (all patients received propofol 2.5 mg/kg, midazolam 0.05mg/kg, fentanyl 2 i/kg and atracurium 0.5 mg/kg for induction of anesthesia and O₂, N₂O and isoflurane for maintenance of anesthesia) and at the end of surgery and after returning of three responses for TOF (Train-Of-Four) with 20 j, interscalene nerve block was performed as following: After local skin infiltration with 10 mg of 2% lidocaine, the interscalene groove was identified using the landmarks described by Winnie¹² and the plexus located with an 21-gauge, 5-cm-long insulated needle connected to a nerve stimulator (stimulation frequency, 2 Hz; duration of the stimulating pulse, 0.1 ms). All nerve blocks were performed by, or under the super-

vision of an experienced anaesthesiologist with the aid of a nerve stimulator (Stimuplex HNS11, B-Braun, Germany) using canulated stimulating insulated needles (Contiplex D, B-Braun, Germany).

The intensity of stimulating current was initially set to deliver 1 mA and then gradually decreased to 0.5 mA after the proper motor response at the deltoid and/or biceps muscle was observed. Then the study solution (20 ml lidocaine 1.5%) was injected slowly with multiple negative aspirations for blood. The onset of block was detected by the deletion of twitch response to nerve-stimulator and the signs of neck sympathetic ganglion blockade as increasing in skin temperature and skin blood flow and unequal pupil size. After that patients were extubated and transferred to PACU (Post Anesthesia Care Unit) and were assessed by nurse who was blind to the study. Demographic data, pain severity, agitation, patient satisfaction were recorded. Pain intensity was assessed with visual analog scale (0: no pain and 10: worst possible pain), while asking the patients to move the hand and flex the elbow joint and the degree of pain was recorded. Breakthrough pain was treated with morphine sulfate (10 mg). Patient satisfaction was evaluated with a two point score:1=satisfied; if operated in the future, I will ask for the same procedure, 2=unsatisfied; if operated again in the future, I will ask for a different technique.¹³ Patients were discharged from PACU based on modified Aldrete score. Statistical analysis was performed with SPSS 15. Data were expressed as mean (range) or as a number (percentage). A P value less than 0.05 was considered statistically significant. Data distribution was first evaluated using the Kolmogorov-Smirnov test. Variables were compared with the use of Fisher exact test, Chai Square, Kruskal-Wallis, Independent sample T-test and the Mann-Whitney U test, as appropriate.

RESULTS

Demographic characteristic of patients in both groups are shown in Table-I. As seen patients of two groups had no significant difference in age, sex and duration of operation. In the general Anesthesia group (GA), pain severity had no significant relation with age and operation time (P=0.403, P=0.798 in order). Agitation also had no significant relation with age and sex. (P=0.440, P=0.496 in order). Our study showed that time to eye opening and time to respond verbal stimuli in PACU were not prolonged with ISBPB.

In general anesthesia plus interscalene brachial plexus block group (GA+ISBPB) pain severity had no significant relation with age and duration of

Table-I: Demographic data of patients in two groups.

	GA	GA+ISBPB	P value
Age	44.04±16.41	37.87±13.17	0.163
Sex (M/F)	17/8	20/5	0.333
Duration of operation	143.91±65.63	121.91±48.39	0.190

operation. (P=0.240, P= 0.748 in order). Also agitation had no significant relation with age and sex (P=0.274, P=0.606 in order). Between two groups there was no significant difference in order of duration of recovery stay. In GA group seven patients had score one of patients satisfaction, but in GA+ISBPB 23 patients had score one of patient satisfaction which is statistically important (P<0.001 Table-II). Postoperative pain score in group GA is significantly more than group GA=ISBPB. (P=0.001, Table-II)

Agitation in group GA is significantly more than group GA+ISBPB (P=0.009, Table-II).

DISCUSSION

As major shoulder surgeries have moderate to severe pain during 24-48 hours after surgery and intensive postoperative rehabilitation is necessary for ideal functional result, pain control after such operations is crucial. ISBPB is ideal for proximal upper extremity but it is not devoid of side effects. Singelyn F et al showed that single shot interscalene block provides ideal postoperative pain control after shoulder surgery.¹⁴ We performed this block to patients who were candidate for open shoulder surgery for reducing pain and early onset of physiotherapy. This block is usually performed before surgery and some perform it via catheter for continuous infusion of local anesthetic. But because of catheter problems and

possible toxicity of local anesthetics, we performed this block with low dose of local anesthetic via single shot at the end of surgery. Borgeat et al. in some studies failed to show that lower concentration of local anesthetic could suppress the operation pain,^{5,15} but in this study we showed that small volume of medium concentration of local anesthetic might be used for ISBPB. Rosenberg and Hoinenonen showed that in small concentration, Ropivacaine produces more potent block than Bupivacaine.¹⁶ Continuous ISBPB is recommended by some authors for open shoulder surgeries but has the failure rate of 12-25% which seems to be high,¹⁷⁻²¹ so they recommended additional techniques and equipments like ultrasound technique. Previous studies showed that continuous ISBPB, even in small doses, cannot be recommended for patients with respiratory compromise. Our study showed that small dose ISBPB significantly reduced pain and agitation score of patients after shoulder surgeries, so significantly improved patient satisfaction score. In this study, ISBPB didn't have any effect on recovery parameters like time to respond to verbal stimuli and time to eye opening, so didn't have any adverse effect on prolong PACU stay of patients. Riazi S, et al showed that use of low-volume ultrasound-guided SBPB is associated with fewer respiratory and other complications with no change in postoperative analgesia compared to standard volume which similar to our results.²²

Table-II: Characteristics of patients in two groups during PACU stay.

		GA	GA+ISBPB	P value
Patient's satisfaction	Satisfied	7	23	<0.001
	Unsatisfied	18	2	
Pain (VAS)	Mild(0-4)	11	17	0.001
	Moderate(5-7)	4	7	
	Severe(8-10)	10	1	
Agitation		14	5	0.009
Duration of PACU stay		37.88±16.81	48.26±26.43	0.108
Eyes opening		10.75±6.82	17.13±17.01	0.096
Reply to verbal stimulation		17.08±10.14†	27.65±21.17	0.030

GA: general Anesthesia, ISBPB: interscalene brachial plexus block, VAS: visual analog scale, †:mean±standard deviation

In conclusion, this study showed that administration of small dose ISBPB provides good and comparable control of immediate postoperative pain without any side effect on patients' recovery parameters, especially in patients with respiratory compromise. This benefit doesn't translate into lower overall pain for the first 48 hours after operation. However for inducing more pain relief, we recommend future studies with long-acting local anesthetics to facilitate rehabilitation and improvement of patient's well being.

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