Print ISSN: 2321-6379
Online ISSN: 2321-595X
DOI: 10.17354/ijss/2017/102

Original Article

Comparative Study of Buprenorphine 150 µg with 0.3% Bupivacaine and 0.3% Bupivacaine Alone in Brachial Plexus Block by Low Interscalene Approach in Upper Limb Surgeries

R Rajasekar[1], R K Sivakumar[1], S Ashwini[2], A L Dharmalingam[1], B K Jayalakshmi[1], Heber Anandan[3]

[1]Senior Assistant Professor, Department of Anaesthesiology, Kilpauk Medical College, Chennai, Tamil Nadu, India, [2]Junior Resident, Department of Anaesthesiology, Kilpauk Medical College, Chennai, Tamil Nadu, India, [3]Senior Clinical Scientist, Dr. Agarwal's Healthcare Limited, Thirunelveli, Tamil Nadu, India

Abstract

Background: In this modern era, using adjuvants with local anesthetics has immensely improved the efficiency of upper limb blocks. The outcomes of adding buprenorphine with bupivacaine are studied and compared.

Aim: A comparative evaluation of the effectiveness of 150 µg of buprenorphine added to 0.3% bupivacaine in upper limb surgeries performed by low interscalene brachial plexus block with 0.3% bupivacaine alone.

Materials and Methods: A prospective randomized control study with 40 patients of ASA-PS 1 and 2 of both sexes between 18 and 58 years posted for upper limb surgeries formed the study group. First group received 30 ml of 0.3% bupivacaine plus 1 ml of isotonic sodium chloride and Group 2 patients were administered 18 ml of 0.5% bupivacaine plus 1 ml of 150 µg buprenorphine. Low interscalene brachial plexus block was performed.

Results: Admixture of buprenorphine produced statistically significant results in terms of onset, duration and intensity of sensory and motor blockade with no complications.

Conclusion: It could be concluded that low interscalene brachial plexus block combining 150 µg of buprenorphine with 0.3% bupivacaine improved the quality of block with no adverse events in comparison to plain 0.3% bupivacaine alone.

Key words: 150 µg buprenorphine, 0.3% bupivacaine, Low interscalene brachial plexus block, Upper limb surgeries

INTRODUCTION

Regional anesthesia finds a unique place in the anesthesiologist's armamentarium by avoiding the complications of general anesthesia in elective and emergency surgeries. It is the safest technique with full stomach patients, also a cost effective and avoids theater pollution.[1,2]

Access this article online

www.ijss-sn.com

Month of Submission : 01-2017
Month of Peer Review : 02-2017
Month of Acceptance : 02-2017
Month of Publishing : 03-2017

It involves a blockade of peripheral nerve conduction using local anesthetic agents. Along with complete pain relief and total muscle relaxation, it produces vasodilatation which improves blood circulation and prevents tissue hypoxia. Furthermore prolonging of surgical analgesia by adding some adjuvants or by fixing catheters is possible. It also avoids polypharmacy.[3,4]

Various approaches for successful performance of brachial plexus blockade have been described with permutation and combination of several adjuvants. The present study is on low interscalene approach for brachial plexus blockade comparing the efficacy of adding 150 µg of buprenorphine to 0.3% bupivacaine with plain local anesthetic solution. Halsted WS first performed brachial plexus block in 1885.[5] Winnie first demonstrated the

Corresponding Author: Dr. R K Sivakumar, No. 1, Rajendra Nagar Ext. Keelkatalai, Chennai - 600 017, Chennai, Tamil Nadu, India. Phone: +91-9841036042. E-mail: siva67_dr@yahoo.com

interscalene approach of the brachial approach of the brachial block in 1970.[6] Among the three approaches, that is, supraclavicular, interscalene, and axillary block, the safest method of the block is axillary block. However, this axillary block is inadequate for the operation on arm and shoulder, difficult to block musculocutaneous nerve and it may cause sparing of radial aspect of forearm and dorsum of the hand. The tourniquet pain is also not tolerable. Hence, we choose low interscalene approach to compare the studies.

Aim

A comparative evaluation of the effectiveness of 150 μg of buprenorphine added to 0.3% bupivacaine in upper limb surgeries performed by low interscalene brachial plexus block with 0.3% bupivacaine alone.

MATERIALS AND METHODS

A prospective comparative study of 40 patients of ASA-PS I and II category of both sexes in the age group of 18-58 years posted for upper limb surgeries in the department of plastic and hand reconstructive surgery at Kilpauk Medical College Hospital formed the material for the study. The Institutional Ethical Committee approval and informed consent were obtained. Patients were randomly divided into two groups. Group I (n = 20) received 18 ml of 0.5% bupivacaine + 12 ml of isotonic sodium chloride solution making the solution 0.3% and Group II (n = 20) received 18 ml of 0.5% bupivacaine + 12 ml of isotonic sodium chloride solution + 1 ml of 150 μg of buprenorphine. The brachial block was performed by interscalene approach. Inclusion criteria are all consented patients of both the sexes weighing between 40 and 70 kg and aged between 18 and 58 years belonging to ASA I and II category undergoing both elective and emergency upper limb surgeries. Exclusion criteria are patient refusal, clinically significant coagulopathy, bacterial and fungal infection of the injection site, pneumothorax, known epileptic, allergy to any of the drugs used in the study and ASA PS III and IV. Patients were evaluated preoperatively both clinically and with routine baseline investigations and assessed for fitness. Patients selected were counseled about the risks and benefits in performing the block. After getting informed and written consent, patients willing to be included in the study were enrolled. Intravenous (IV) access was secured with 18G IV cannula and all the baseline monitors such as pulse oximeter, noninvasive blood pressure (BP), electrocardiogram (ECG) (lead II continuous) were connected. Local anesthesia test dose was done. For continuous neurological evaluation, no sedative drugs were administered preoperatively. Boyle's machine, suction equipment, emergency intubation cart, and manual resuscitation bag with mask were kept ready. The procedure was carried out in Operation theatre (OT) or preparation room where all the facilities for resuscitation are available. The patient is positioned on the table and proper illumination was done at the site of block. Drugs used were 0.5% bupivacaine 1 vial, and bupergesic 1 amp (buprenorphine 0.3 mg) and distilled water 2 vials. Initially, the pre-procedure parameters were recorded such as pulse rate (PR), oxygen saturation (SpO_2), ECG, and monitored intra- and post-operatively. Block was then administered and patients were observed vigilantly for the development of any complications.

Surface Landmarks

The anesthesiologist stands at the head end of the table. The interscalene groove is located by asking the patient to lift the head slightly to bring the clavicular head of the sternocleidomastoid into prominence and the index finger is rolled laterally across the belly until the groove is palpated. The finger is then moved inferiorly down the groove until the pulse of subclavian artery is palpated between scalene muscles. Once the groove is found, skin wheal is increased about 2.3 cm above the midpoint of the clavicle with 2 ml of lignocaine with 23G needle. After sterile preparation of the region, a 22G 4 cm needle was inserted through the skin wheal above the palpating fingers immediately lateral to the subclavian artery. It was directed 45 dorsolaterally parallel to the scalene muscles toward the elbow of the patient. There was a click once the sheath is pierced and entered. The patient felt paraesthesia of the hand and fingers once the tip of the needle crossed the perineural sheath. In this technique, paraesthesia was obtained before the 1st rib was contacted. If paraesthesia was not elicited, then the needle was withdrawn and redirected. Distal paresthesia was sought as a confirmatory index of being close to the nerves. Then, the needle was carefully held at the same position and the drugs were injected after aspiration for blood in the syringe. If there was any shooting pain, then the needle was slightly withdrawn. Repeated aspirations were performed after every 3-5 ml of drug injected. After injecting the local anesthetic, the block is tested for both sensory (using pin prick) and motor (using muscle power) and is compared with the same stimulation or power in the contralateral arm using the Hollmen's scale. The onset of blockade means minimum Grade 3 of Hollmen's scale. Motor block is evaluated by thumb abduction (radial nerve), thumb adduction (ulnar nerve), thumb opposition (median nerve), and flexion of the elbow in supination and pronation of the forearm (musculocutaneous nerve). Patients with failed blocks were excluded from the study. Postoperatively, patients were monitored for 12 h. Baseline vital signs such as PR, BP, and SpO_2 were recorded and monitored. The time required for onset and completion of the blockade, duration of blockade, the intensity of sensory and motor blockade, complications of the blockade, and rescue analgesia were assessed.

RESULTS

A total of 20 patients in each group results were analyzed. Distribution of gender is given in Table 1. Male patients are more in each group.

Table 2 shows time taken for complete sensory and motor blockade. Time taken for sensory blockade in Group I and II is 20.5 min and 22.4 min, which is statistically insignificant ($P = 0.187$). Time taken for motor blockade in Group I and II is 17.25 min and 19.2 min, which is statistically insignificant ($P = 0.104$). Group II took more time for sensory and motor total blockade.

Table 3 shows total duration of sensory and motor blockade. Total duration for sensory blockade in Group I and II is 331.2 min and 680.6 min, which is statistically significant ($P < 0.0001$). Total duration for motor blockade in Group I and II is 300.9 min and 632.2 min, which is statistically significant ($P < 0.0001$).

As per the Hollmen's scale, the intensity of sensory blockade between two groups had statistically significant difference ($P < 0.0001$). The intensity of motor blockade between two groups had statistically significant difference ($P = 0.016$) (Table 4).

Table 1: Distribution of genders in study groups

Gender	Group I	Group II
Male	16	17
Female	4	3

Table 2: Time taken for total blockade

Time take for blockade	Mean	*P* value
Sensory		
Group I	20.5 min	0.187
Group II	22.4 min	
Motor		
Group I	17.25 min	0.104
Group II	19.2 min	

Table 3: Total duration of blockade

Duration of blockade	Mean	*P* value
Sensory		
Group I	331.2 min	<0.0001
Group II	680.6 min	
Motor		
Group I	300.9 min	<0.0001
Group II	632.2 min	

Table 4: Intensity of blockade using Hollmen's scale

Intensity of blockade	Grading				*P* value
	1	2	3	4	
Sensory					
Group I	0	13	7	0	<0.0001
Group II	0	1	5	14	
Motor					
Group I	0	7	13	0	0.016
Group II	0	4	9	7	

DISCUSSION

In this prospective randomized study, 40 patients satisfying the inclusion criteria underwent brachial plexus block with or without the addition of buprenorphine; onset, completion, duration and intensity of blockade were compared and statistically analyzed. The addition of 150 µg of buprenorphine to 0.3% bupivacaine resulted in significant increase in duration and intensity of sensory and motor blockade, shortens the onset of sensory and motor blockade, and there was no difference in time taken for total blockade. Hirschel described the first percutaneous technique for blocking the brachial plexus by the axillary approach in 1911 and reported on its successful use in this patients.[7] Kulenkampff assistant to Heinrich Braun used the supraclavicular technique in 1913.[8] Viel *et al.* postulated three possible mechanisms of action of prolonged analgesia produced by peripheral administration of opioids. The dorsal nerve root tissues contain mu opioid receptor finding sites.[9] Young *et al.* demonstrated axonal flow or movement of opioid receptors and these moving receptors circulated endorphins and their ligands in addition to exogenous opioids.[10] Daugaard *et al.* found that concentration of opioids to produce analgesia by diffusion from brachial plexus sheath to extramural and subarachnoid spaces to act on opioid receptors in the dorsal horn was inadequate. Evidence of axonal flow of various macromolecules suggests possible centripetal axonal transport of opioids into the substantia gelatinosa after perineural injection.[11] Stein *et al.* postulated that activation of these neuronal receptors causes attenuation of the excitability of the nociceptive input terminals or inhibition of release of excitatory transmitters or both.[12]

CONCLUSION

Brachial plexus blockade by low interscalene approach using 150 µg of buprenorphine as an adjuvant to 0.3% bupivacaine provided a faster onset of sensory and motor blockade with a significant increase in the duration and intensity of sensory and motor blockade with no complications when compared to plain 0.3% bupivacaine local anesthetic solution in upper limb surgeries.

REFERENCES

1. Moore DC. Regional Block. 4th ed. Springfield, IL: Charles C. Thomas; 1965. p. 221-74.
2. Winnie AP. Perivascular techniques. Regional anaesthesia for upper extremity surgery symposium. Reg Anaesth 1980;5:5-6.
3. Patrick J. The technique of brachial plexus block anaesthesia. Br J Surg 1940;27:734-9.
4. Winnie AP. Perivascular Techniques of Brachial Plexus Block, Plexus Anaesthesia. Vol. l. Philadelphia, PA: BW Saunders; 1990.
5. Halsted WS. Practical comments on the use and abuse of cocaine; Suggested by its invariably successful employment in more than a thousand minor surgical operations. N Y Med J 1885;42:294-5.
6. Winnie AP. Interscalene brachial plexus block. Anesth Analg 1970;49:455-66.
7. Hirschel G. Anesthesia of the brachial plexus for operations on the upper. München Med Wochenschr 1911;58:1555-6.
8. Kulenkampff D. Anaesthesia of the brachial plexus. (German). Zentralb C F Chir 1913;40:849.
9. Viel EJ, Eledjam JJ, De La Coussaye JE, D'Athis F. Brachial plexus block with opioids for postoperative pain relief: Comparison between buprenorphine and morphine. Reg Anesth 1989;14:274-8.
10. Young WS 3rd, Wamsley JK, Zarbin MA, Kuhar MJ. Opioid receptors undergo axonal flow. Science 1980;210:76-8.
11. Daugaard JJ, Dahl JB, Christensen CB. Concentrations of morphine in the cerebrospinal fluid after femoral perineural morphine administration. Anesth Analg 1989;68:413.
12. Stein C, Comisel K, Haimerl F, Yassouridis A, Herz A, Peter K. Analgesic effect of intraarticular morphine after arthroscopic knee surgery. N Engl J Med 1991;25:1123-6.

How to cite this article: Rajasekar R, Sivakumar RK, Ashwini S, Dharmalingam AL, Jayalakshmi BK, Anandan H. Comparative Study of Buprenorphine 150 µg with 0.3% Bupivacaine and 0.3% Bupivacaine Alone in Brachial Plexus Block by Low Interscalene Approach in Upper Limb Surgeries. Int J Sci Stud 2017;4(12):81-84.

Source of Support: Nil, **Conflict of Interest:** None declared.