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Use of Butorphanol As An Adjuvant To Local Anaesthetics in Brachial Plexus Block for Upper Limb Surgery

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ABSTRACT

AIM: To study the effectiveness of Butorphanol as an adjuvant to local anaesthetics in brachial plexus block for upperlimb surgery.
50 patients of ASA physical status I or II between 18 -50 years were divided into two groups and given supraclavicular brachial plexus block for upper limb surgeries.
Group A: Patients received 30ml 1.5%Lidocaine with Adrenaline(1:200000),10mlBupivacaine 0.5%.
Group B: Patients received 30ml 1.5%Lidocaine with Adrenaline(1:200000),10mlBupivacaine 0.5% with Butorphanol 2mg.
Butorphanol is a good adjuvant to local anaesthetics for supraclavicular brachial plexus block for upper limb surgeries, as it provides rapid onset, good hemodynamic stability with longer profound analgesia without any adverse effects.

KEYWORDS Supraclavicular brachial plexus block, Butorphanol, Analgesia.

INTRODUCTION:
The pain is an unpleasant sensation. It is associated with arterial hypoxaemia, myocardial ischaemia, venous thrombosis and a more florid response to surgery. Postoperative analgesia is nowadays getting importance in elective, emergency as well as day care surgical procedures.

Over the past few years, post operative analgesia has evolved from intravenous injection of pain killers to complex and skilful techniques requiring advanced knowledge, equipments and drugs. The technique should give prolonged anaesthesia, be economically acceptable and have the least number of complications.

Local anaesthetics administered as regional nerve blocks are utilized in providing postoperative pain relief in many surgical procedures by blocking signal traffic to the dorsal horn. Brachial plexus block provides a useful alternative to general anaesthesia for upper limb surgery. Local anaesthetics administered as regional nerve blocks, achieve ideal operating conditions by producing complete muscular relaxation maintaining stable intraoperative hemodynamics and associated sympathetic block. The sympathetic block also decreases postoperative pain.

Brachial plexus block can be given by following approaches:

Supraclavicular

Axillary

Infraclavicular

Interscalene

Certain drugs like opioids, alpha2 adrenergic agonist, sodium bicarbonate, neostigmine, adrenaline, ketamine etc are used as adjuvant to local anaesthetics to lower doses of each agent and enhance analgesic efficacy while reducing the incidence of adverse reactions.

The present study is performed to see the effect of Butorphanol as an adjuvant to local anaesthetic for brachial plexus block, by supraclavicular approach, for different upper limb surgeries.

AIMS:
To evaluate efficacy of Injection Butorphanol (2mg) as an adjuvant to local anaesthetics (30 ml Lignocaine Adrenaline 1.5%, 10ml Bupivacaine 0.5%) in supraclavicular brachial plexus block in adult patients(ASA Grade I & II).

Patients were assessed in terms of:
Time of onset of motor and sensory blockade

Perioperative hemodynamic status

Duration of motor and sensory block

Time of 1st rescue analgesic

Adverse effects of drugs if any

MATERIALS AND METHODS:
The present study was conducted in 50 patients of ASA Grade1 or 2, in age group of 18-50 years under brachial plexus block by supraclavicular approach fo various upper limb surgeries, emergency or planned, after receiving institutional ethical committee approval.

PATIENT EXCLUSION CRITERIA:
Patient with history of known allergy to the study drug.

Patient with history of significant neurological, psychiatric, cardiac, pulmonary, renal or hepatic disease.

Patient with bleeding disorder.

Patient with local site infection.

PREOPERATIVE EVALUATION:
Detailed preanaesthetic check up was done with evaluation of all routine investigations like Hemoglobin,RFT,LFT,Serum electrolytes,Random blood sugar and Chest X-ray.

Patients were explained about the procedure in detail and written consent was obtained.

All patients were instructed to fast for minimum 6 hours prior to scheduled time of surgery.

STUDY GROUPS:
Patients were randomly divided into two groups and each group consisted of 25 patients.

Group-A : Patients received 30ml 1.5% Lidocaine with Adrenaline (1:200000),10ml Bupivacaine 0.5%

Group-B : Patients received 30ml 1.5% Lidocaine with Adrenaline (1:200000),10ml Bupivacaine 0.5% with Butorphanol 2mg added to it.

ANAESTHESIA TECHNIQUE:
No patients received any sedative and narcotic premedication before arrival in operation theatre. Brachial plexus block was performed using a supraclavicular approach by classical technique. The patient was placed in supine position, with head turned away from the side to be blocked and the ipsilateral arm adducted. The interscalene groove and midpoint of clavicle were identified and a mark 1.5 to 2.0 cm above and posterior to the midpoint of clavicle was made. Palpation of the subclavian artery at this site confirmed the landmark.

After aseptic preparation of area a skin wheal was raised at the marked point with 1ml of 2% Lidocaine subcutaneously, a 23G-3.75cm needle was directed in a caudal slightly medial and posterior direction.A nerve locator was used to locate the brachial plexus.The location end point was a distal motor response with an output lower than 0.7mAmp.On localization of brachial plexus and negative aspiration of blood, the study medication was injected.

The assessment for onset of sensory and motor block was done every minute from the time of injection of test drug until the block was established.

Sensory block was evaluated by pinprick test in hand and forearm whereas motor block was assessed by asking the patient to abduct the shoulder and flex the forearm and hand against gravity.

Onset of sensory block was defined as the time elapsed between injection of drug and complete loss of pinprick sensation.While onset of motor block was defined as the time elapsed from injection of drug to complete motor block.Only patients with complete motor block were included in study.

After establishment of block, surgery was started and time of beginning of surgery was noted.Intravenous fluids were continued intraoperatively at a rate of 2ml/kg/hr. Intraoperatively pulse, BP, SPO_2 and ECG were monitored every half hourly.Any complications like tachycardia, bradycardia, hypotension, nausea, vomiting, breathlessness, cough, discomfort and sedation were noted.

During the procedure, anaesthesia was considered satisfactory if patient didn't complain of any pain or discomfort. Any patient requiring supplemental anaesthesia was excluded from the study. All 50 patients were monitored for anaesthesia and analgesia up to 15 hours in the postoperative period.

Duration of satisfactory analgesia was recorded.

Duration of sensory block and duration of motor block were recorded.

MONITORING:
Intensity of postoperative pain was evaluated using visual analogue scale, Grade 0(no pain) to 100(worst pain).

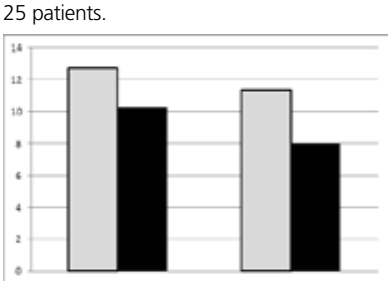
Analgesia was considered satisfactory if the score was ≤30. If the score was >30, analgesia was considered unsatisfactory and rescue analgesic Inj. Diclofenac sodium 75mg i.v. was administered. Time for first analgesic was noted.

Postoperatively heartrate ,BP , respiratory rate, SPO_2 were recorded at 0 min, 30 min, 1 hr, 2 hr, 3 hr, 4 hr, 6 hr,9 hr, 12 hr and 15 hr.

COMPLICATIONS:
Patients were observed carefully for any complication of supraclavicular block like pneumothorax, local anaesthetic toxicity and other complications like sedation , bradycardia , nausea , vomiting etc.In each patient a chest x-ray was done 6 hr postoperatively to rule out pneumothorax.Any neurological complication was noted.

STATISTICAL ANALYSIS:
Comparison for the duration of satisfactory analgesia was done. Data was presented as mean values and mean±SD and analysed using unpaired 't' test with P value<0.05 considered statistically significant and P value<0.001 considered statistically highly significant.

OBSERVATION AND RESULTS:
After studying 50 cases, observation and results are summarized in tabulated form and described below, both group comprised of 25 patients.

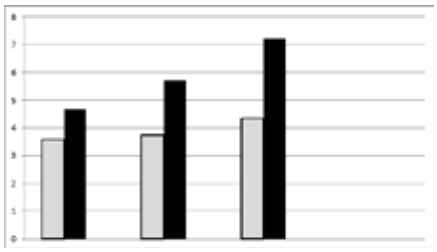


ONSET OF ANAESTHESIA

Onset of Anaesthesia	Group A	Group B	P value	Inference
Mean Sensory Block (mins)	12.76±1.33	11.36±0.81	<0.05	S
Mean Motor Block Motor	10.24±1.33	8±1.15	<0.05	S

The mean time of onset of sensory and motor block was significantly lower in group B compared to group A.

DURATION OF ANAESTHESIA



	Motor Block (hrs)	Sensory Block (hrs)	Rescue Analgesia (hrs)
Group A	3.59 ± 0.38	3.75 ± 0.24	4.34 ± 0.20
Group B	4.68 ± 0.40	5.71 ± 0.36	7.22 ± 0.47
P value	<0.05	<0.05	<0.05
Inference	S	S	S

Mean duration of motor block and sensory block are significantly longer in group B than in group A. Mean time for first rescue analgesia requirement is significantly longer in group B than in group A.

INTRA OPERATIVE CHANGES IN PULSE RATE, RESPIRATORY RATE, BP

Time (mins)	Pulse rate(/min)		Respiratory Rate(/min) Group A		Blood Pressure (mmHg)			
					Group B			
	Group A	Group B	Group A	Group B	SBP	DBP	SBP	DBP
0	85 ± 6.84	84.8 ± 7.19	15.28 ± 0.93	15.4 ± 1	120.72 ± 7.48	77.61 ± 4.39	121.28 ± 7.04	77.6 ± 5.53
30	85.9 ± 7.33	84.24 ± 6.95	15.48 ± 1	15.36 ± 1.03	123.04 ± 8.68	76.44 ± 5.58	119.12 ± 6.27	76.08 ± 4.74
60	86.08 ± 6.53	80.72 ± 6.40	15.2 ± 1.11	15.44 ± 0.82	123.08 ± 8.77	77.92 ± 5.7	113.40 ± 4.66	73.2 ± 5.39
90	84.42 ± 7.85	81.21 ± 6.86	15.5 ± 0.79	15.21 ± 0.9	118.83 ± 5.74	76.5 ± 2.57	110.42 ± 4.40	70.22 ± 4.69
120	87± 16.97	80.2 ± 7.29	16	14.83 ± 1.09	117± 4.24	74 ± 2.82	109.6 ± 6.69	70 ± 4.32

No significant difference was seen in intraoperative pulse rate, respiratory rate or blood pressure between both groups.

DISCUSSION:

Brachial plexus block provides a useful alternative to general anaesthesia for upper limb surgeries. Nowadays the regional technique of brachial plexus block has gained importance for surgical, diagnostic and therapeutic purposes in interventional pain management.

Blocking the brachial plexus using local anaesthetic agent where it is most compactly arranged, provides ideal condition for surgery, maintains stable hemodynamics, reduce chance of aspiration, reduce postoperative nausea, vomiting and pain.

Brachial plexus block via supraclavicular approach provides postoperative analgesia of short duration even when a long acting local anaesthetic used. It is desirable to increase quality and duration of local anaesthetic action. Various adjuvant drugs like opioids, clonidine, neostigmine, sodium bicarbonate, dexamethasone, tramadol have been evaluated in conjunction with local anaesthetics to prolong the period of analgesia with supraclavicular block. Butorphanol is a mixed agonist-antagonist with low intrinsic activity at μ opioid receptors. It is also an agonist at k opioid receptors. Its interaction with these receptors in the central nervous systemapparently mediates most of its pharmacologic effects including analgesia.

Therefore the present study was performed to evaluate the efficacy of Butorphanol when administered with local anaesthetics mixture of 30ml 1.5% Lidocaine with Adenaline(1:200000) and 10ml 0.5% Bupivacaine in supraclavicular brachial plexus blockade on postoperative analgesia in terms of first analgesic requirement. Onset and duration of sensory and motor blockade as well as perioperative hemodynamic changes and side effects were also studied.

ONSET OF SENSORY AND MOTOR BLOCKADE

In our study significant difference was seen between the onset of motor and sensory blockade between the two groups. The mean time of onset of motor and sensory blockade was 10.24±1.33 min and 12.76±1.33 min respectively for Group A and 8±1.15 min and 11.36±0.81 min respectively for Group B. The onset of motor block was found to be faster than the onset of sensory block in both groups.

Winnie et al observed this also, and attributed this to somatotrophic arrangement of fibres in a nerve bundle at the level of the trunks in which motor fibres are located more peripherally than sensory fibres. Therefore a local anaesthetic injected perineaurally will begin to block motor fibres before it arrives at the centrally located sensory fibres.

In I.H.Mir et al[4] study, no significant difference was seen between the onset of motor and sensory blockade was 25±6 min and 10±5 min respectively for Group A and 23±7 min and 12±3 min respectively for Group B. The onset of sensory block was found to be faster than the onset of motor block in both groups.

In Murphy et al[5] study of novel analgesic adjuncts for brachial plexus block they found no significant difference between onset of motor and sensory block between the groups.

Ravi et al[6] in their study of adding tramadol and Fentanyl to 0.75% Ropivacaine in supraclavicular brachial plexus block found no significant difference between onset of motor and sensory blockade between the groups. The mean time of onset of motor and sensory blockade was 14 min and 5 min.

PERIOPERATIVE HEMODYNAMIC STABILITY

In our study, the hemodynamic parameters like – Heart rate, Blood pressure, Respiratory rate were stable in both groups perioperatively.

In I.H.Mir et al[4] study, they found no effect on hemodynamics on adding Butorphanol to Lignocaine in axillary brachial plexus block.

Ravi et al[6] in their study observed that addition of Opioids to Ropivacaine in supraclavicular block had no significant effect on hemodynamics.

In Murphy et al[5] study of novel analgesic adjuncts for brachial plexus block they found no significant difference between hemodynamics of two groups.

Wajima et al[8] compared continuous infusion of Mepivacaine, Butorphanol and Mepivacaine-Butorphanol into axillary sheath and found no significant difference in hemodynamics.

Wajima et al[7] also compared brachial plexus infusion with intravenous infusion of Butorphanol and found no difference in hemodynamics.

Wajima et al[9] increased the dose of Butorphanol in Mepivacaine-Butorphanol mixture into axillary sheath and found no difference in hemodynamics.

DURATION OF MOTOR AND SENSORY BLOCKADE

The mean duration of motor blockade was 3.59±0.38 hrs in Group A and 4.68±0.40 hrs in Group B. The duration of motor block was more in Group B (P<0.05). The mean duration of sensory blockade was 3.75±0.24 hrs in Group A and 5.71±0.36 hrs in Group B so it was longer in Group B (P<0.05).

In I.H.Mir et al[4] study, the mean duration of motor blockade was 125±35 min in control group and 313±81 min in Butorphanol group. The duration of motor block was more in Group B (P<0.05).). The mean duration of sensory blockade was 101±35 min in control Group and 240±80 min in Group B so it was longer in Group B (P<0.05).

Ravi Madhusudhana et al[6] found that addition of opiates to Ropivacaine had an additive effect in terms of postoperative analgesia. The duration of sensory (9 hrs) and motor block (8 hrs) was significantly longer with additive groups when compared to control group (sensory 6 hrs, motor 5 hrs)

DURATION OF POSTOPERATIVE ANALGESIA

Intensity of postoperative pain was evaluated using Aitkin's "Visual Analogue Scale". The scale consists of a ruler with markings from 0-100 mm. The patient is asked to describe his pain, assuring 0 as no pain and 100 as worst possible pain. The duration of postoperative analgesia was assessed in terms of first analgesic requirement.

In our study time for first rescue analgesic in Group A was 4.34±0.20 hrs compared to 7.22±0.47 hrs in Group B. It shows that duration of postoperative analgesia was significantly more in Group B (P<0.05).

Ravi Madhusudhana et al[6] found that addition of opiates to Ropivacaine had an additive effect in terms of postoperative analgesia.

Wajima et al[7] found that Butorphanol 2 mg with 0.5% Mepivacaine provide sufficient postoperative analgesia after upper limb surgery.

COMPLICATIONS:

Nausea occurred in only one patient in group B intraoperatively. It didn't require any treatment. There was no incidence of sedation, respiratory depression, vomiting.

I.H.Mir et al[4] found no complication in their study.

Wajima et al[7] observed nausea and vomiting in both groups. There were no significant differences in the incidence of complications between the two groups.

SUMMARY:

After institutional approval and informed consent, a comparative study of 50 patients (ASA Grade I/II) scheduled for various surgeries of upper limb, under supraclavicular brachial plexus block, was carried out.

Patients were randomly divided into two groups of 25 each. Group A patients received 30ml Lignocaine Adrenaline 1.5%, 10 ml Bupivacaine and Group B patients received Butorphanol 2mg along with the local anaesthetic agents in same dose and concentration in brachial plexus block.

The onset and duration of sensory and motor blockade was compared.

Intraoperative and perioperative hemodynamics were observed.

Patients were observed for any complications or adverse effects.

The duration of postoperative analgesia was compared using visal analogue scale and in terms of requirement of first rescue analgesia.

The data were studied using mean values and mean ±SD and then compared using unpaired 't' test.

P value of <0.05 was considered significant.

CONCLUSION:

From the study, we conclude that, when Butorphanol 2mg is added to local anaesthetic solution in supraclavicular brachial plexus block, it provides rapid onset of block, better analgesia, good hemodynamic stability and profound and longer analgesia without any adverse effects. In nutshell Butorphanol is a good adjuvant to local anaesthetic agent for brachial plexus block via supraclavicular approach for various upper limb surgeries.

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