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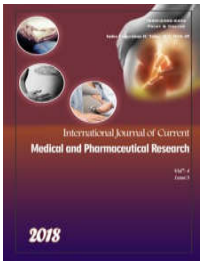

Research Article

SUPRA CLAVICULAR BLOCK WITH BUPRENORPHINE FOR POST OPERATIVE PAIN RELIEF; COMPARISON BETWEEN 0.375% BUPIVACAINE AND 0.375% BUPIVACAINE WITH BUPRENORPHINE

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ABSTRACT

Background: The use of peripheral nerve blocks for anaesthesia and postoperative analgesia has increased significantly in recent years. Adjuants added to local anaesthetics enhances the quality and duration of anaesthesia and analgesia. With the discovery of peripheral opioid receptors, various opioids have been used as adjuncts. Of all these, the long acting buprenorphine can be used with local anaesthetics to produce post operative analgesia.

Aims: To compare the onset and extent of sensory and motor block. To compare the duration of post operative analgesia between 2 groups.

Methods: A double blinded randomized study was conducted in 60 patients of age 16 to 60 years posted for upperlimb orthopaedic surgeries. Group 'B' patients (30) received 30 ml of 0.375% bupivacaine alone whereas group BB patients (30) received 30 ml of 0.375% bupivacaine with 5μg/kg of buprenorphine. Onsent and extent of sensory and motor block were studied. Duration of postoperative analgesia was compared between 2 groups.

Result: Onset of sensory and motor block was quite earlier in Group BB than Group B. Duration of motor block and post operative analgesia was also prolonged in group BB.

Conclusion: Addition of bupreorphine to local anaesthetics quickens the onset of anaesthesia and markedly prolongs the duration of postoperative analgesia.

INTRODUCTION

Brachial plexus block is a simple safe regional anaesthetic technique, which provides anaesthesia for upper extremity surgery. Brachial plexus can be approached at different levels, of these supraclavicular block is anaesthetically efficient, as a small volume of solution can be delivered at a point in which three trunks are compactly arranged[1]. The use of adjuants in combination with local anaesthetics for peripheral nerve blocks enhances the quality and duration of anaesthesia and analgesia. Demonstration of peripheral opioid receptors enables us to use opioids as adjuncts to local anaestheics. A variety of opioids have been studied for brachial plexus block including buprenorphine. Buprenorphine, a thebaine derivative is a synthetic opioid of high potency and longer duration of action[2]. In this study, the efficacy of buprenorphine added to 0.375% bupivacaine was evaluated.

METHODS

After getting approval from ethical committee, ASA I & II grade patients of age 16-60 years posted for upper limb orthopaedic surgeries were included in this double blinded randomized controlled study. After obtaining written informed consent sixty patients were randomly allocated into two groups. Group 'B' patients received 30 ml of 0.375% bupivacaine alone for supraclavicular block. Group BB patients received 30 ml of 0.375% bupivacaine with 5 □g/kg of buprenorphine. Patients allergic with local anaesthetics and coagulation abnormalities were excluded from the study. Block was performed by one anaesthetist and evaluation was done by another anaesthetist.

After securing 18G venous cannula in opposite hand, routine monitors were connected (oxygen saturation, blood presure, electrocardiograph). With the patient in supine, head turned to the opposite side, (with ipsilateral arm adducted) supraclavicular block was performed with nerve stimulator.

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After obtaining muscle twitch with the output current of 0.5 mA, the drug was injected with intermittent aspiration.

Onset of sensory and motor block was assessed every five minutes until thirty minutes. Onset of sensory block was established after the loss of response to pin prick in all three nerves distribution and onset of motor block was assessed by

0 - Full motor power;
1 - Reduced motor power but still able to more arm.
2 - Unable to move arm but able to move fingers
3 - Complete motor block

Duration of motor block was assessed at hourly interval (Duration of motor block was the time from onset to complete recovery of motor power). Duration of analgesia was the time between the onset of sensory block and first request of analgesics. Duration of analgesia was assessed by visual analogue scale (VAS 0-10). Analgesia was considered satisfactory if the score was 3. If the score was >3, Inj. Diclofenac 75mg IV was given and the patient was excluded from the study. Duration of analgesia was evaluated every hour for six hours. Then at every two hours for next six hours till 24 hours. Signs of systemic opioid side effects (nausea, vomiting, drowsiness, pruritus and respiratory depression) were noted. Statistical analysis was performed with student's 't' test, chi square test. A p value of less than 0.05 was considered statiscally significant.

RESULTS

There was no statistically significant difference between the groups in age, sex, weight, type and duration of procedure as shown in table -1&2. No demonstrable variation in heart rate, mean arterial pressure and oxygen saturation between the groups.

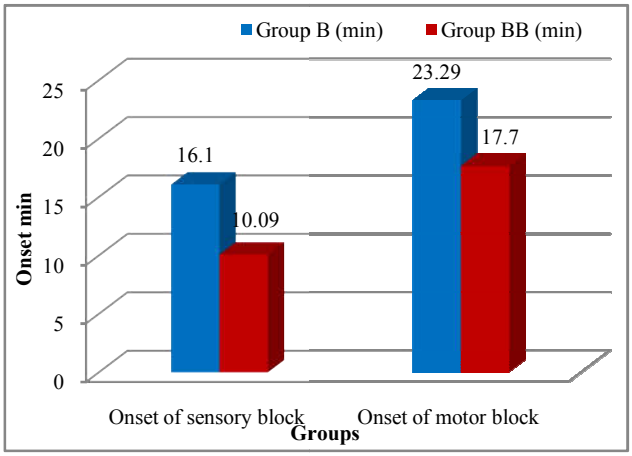
Table 1 Demographic Data

Group B		Group BB	
Age 16-60	35.8 ± 12	Age 18-60	32.86 ± 12
Weight 35-56	49.73 ± 5	Weight 44-56	50.43 ± 3.5
Gender	20/10		21/9

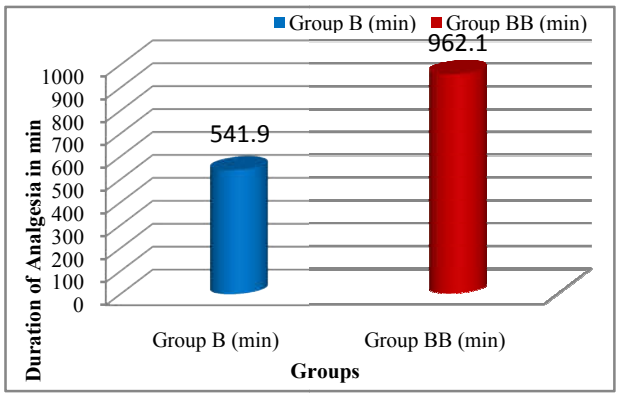
Table 2 Type And Duration Of Surgery

Type of Surgery	Group B	Group BB
# BBFA	15	13
#Lower 1/3 of humerus	9	12
# Olecranon	6	5
Duration of procedure (min)	73.21 ± 16	75.53 ± 13
Tourniquet time (min)	55.8 ± 15	53.95 ± 14

Onset of sensory block and motor block in Group BB was earlier than the group B as shown in Graph -1. Duration of motor block also prolonged in group BB than group B (as shown in Table – 3) which was statistically significant. Duration of analgesia in Group BB was 962.10 ± 43 min compared to 541.90 ± 24 min in group B (as shown in Graph - 2) which was statistically significant.



Graph 1 Onset of Sensory And Motor Block



Graph 2 Duration Of Analgesia

Table 3 onset and duration of block

	Group B (min)	Group BB (min)
Onset of sensory block	16.1 ± 1.6	10.09 ± 1.8
Onset of motor block	23.29 ± 1.5	17.7 ± 1.6
Duration of motor block	364.4 ± 28	450.8 ± 42
Duration of Analgesia	541.9 ± 24	962.1 ± 33

In Group BB, 5 patients had drowsiness and 4 patients had dryness of mouth as shown in table- 4. All these side effects may be due to buprenorphine, which occurred during first 6 hours of post anaesthesia. Hemodynamic and respiratory parameters did not vary in both the groups intraoperatively and post operatively.

Table 4 Complication

Side effects	Group B	Group BB
Drowsiness	-	5
Nausea	-	2
Vomiting	-	1
Dryness of mouth	-	4

Two patients in Group B and Group BB had partial block and were excluded from the study.

DISCUSSION

To extend analgesia after surgery, various modalities have been tried. Catheter based techniques not only provide sustained pain relief but also presents with challenges like need of special equipment, catheter displacement and potential for increased infection risk[3]. Recent concept of multi modal perineuronal analgesia paved the way for the use of various adjuncts like clonidine, dexmedetomidine, opioids along with local anaesthics. Of these agents, the perineuronal buprenorphine has consistently shown the ability to prolong the peripheral

nerve blocks with no reported increase in side effects or clinical toxicity.

In vivo studies in rat have shown that the combination of buprenorphine with local anaesthetic produced reversible block without causing long term motor or sensory deficits[4]. Buprenorphine, a the baine derivative is a synthetic opioid of high potency and longer duration of action. It is the μ,δ and nociceptin opioid receptor agonist and κ-opioid receptor antagonist[5]. It is more potent than morphine with high affinity to μ receptors. It exhibits powerful agonistic balanced with some antagonistic characters with low physical dependence liability. Combination of buprenorphine with local anaesthetic is combatible soluble and stable[4].

Our study has shown that the addition of buprenorphine to local anaesthesia in supraclavicular block produces effective analgesia which lasted twice as long as that produced by local anaesthetic alone. Leffler[6] had shown that buprenorphine has properties of local anaesthetic and blocks voltage gated sodium channels in his experimental study. The onset of sensory and motor block was quite earlier in Group BB than in Group B. This is an accordance with that of Sarihasan[7] who found that the reduction of onset time of brachial plexus blockade with the addition of tramadal to local anaesthetic. Duration of motor block was prolonged in Group BB than Group B. This is in accordance with Kapral[8], who found that the addition of tramadol significantly prolong the motor block in the study.

Total duration of good analgesia was considerably prolonged in Group BB than in Group B. Similar results were observed by Viel[3]. He postulated that the opioid receptors in primary afferent nerve fibres undergo axonal flow with exogenous opioids and produced prolonged analgesia by peripheral action. This was supported by Sanchez[9] who reported a case of total and prolonged analgesia after interscalence injection of morphine in a patient who suggested of an unbearable pain due to a pancoast tumor. Another possible mechanism described by Viel is diffusion of opioids from brachial plexus sheath to extra dural and sub arachnoid spaces and then bind with opioid receptors in the dorsal horn. However Daugarrd[10] measured the concentration of opioid in spinal fluid after perineuronal injection of morphine around the femoral nerve and found that the concentration was inadequate to produce analgesia by acting directly in the spinal cord.

Bazin[11] suggested that physiological properties of opioids may also play an important role in their ability to penetrate axonal myelin and nerve membrane and this is true for buprenorphine, a highly lipophilic and potent analgesic drug as suggested by stein[12]. Bazin also suggested the change in pH can also vary the efficacy of opioids. This was supported by Gormley[13], he found that the alfentanil is largely unioniszed at the physiological pH, which is essential for penetrating the nerve membrane.

Stein also reported that during inflammation, the pH will be low which increases the efficacy of opioid agonists by augmenting the interaction of opioid receptors with G protein in neuronal membrane. Predominantly, peripherally acting opioid agonists unable to cross blood brain barrier and devoid of central side effect such as respiratory depression and dependence could be developed in future.

Stein[14] also postulated that the activation of receptors in the primary afferent neurons by opioid causes attenuation of excitability of nociceptive input terminals and inhibition of action potentials. He also described the peripherally mediated analgesia of opioids in inflamed tissues. Corticotrophine releasing hormone, interleukin-1β and cytokinin have potent antinociceptic effects which stimulate the release of opioid peptides from immune cells. Disrupted perineruium facilitates the trans perinerineural passage of opioids, which readily activate opioid receptors on sensory nerves. It decreases the release of excitatory neurotransmitters such as substance 'p' and calcitonin gene related peptide and inhibit the excitability of primary afferent neurons[15].

The fact that peripheral opioid actions are particularly prominent in inflamed tissue may be clinically advantageous, considering that many painful conditions, sub acute or chronic are associated with inflammation. Side effects reported in this study are usual after opioid administration. However such side effects were relatively rare and their incidence was similar to that reported previously. Hemodynamic and respiratory parameters were similar in both groups.It can be concluded that from the above study that addition of buprenorphine to local anaestehtic quickens the onset of analgesia and markedly prolongs the duration of post operative analgesia.

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