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Original Research Paper

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A PROSPECTIVE RANDOMISED COMPARITIVE DOUBLE BLIND STUDY TO DETERMINE THE DURATION OF ANALGESIA OF BUPRENORPHINE AND DEXAMETHASONE AS ADJUNCTS TO BUPIVACAINE IN SCIATICO-POPLITEAL AND SAPHENOUS NERVE BLOCK FOR BELOW KNEE SURGERIES.

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ABSTRACT

BACKGROUND: Adjuvants to local anaesthetics improve the block properties and reduce opioid consumption. This study compared combination of local anaesthetic bupivacaine with buprenorphine and dexamethasone in ultrasound guided sciatico-popliteal and saphenous nerve block for below knee surgeries.

STUDY DESIGN: A prospective, double-blind, randomized, comparative study.

MATERIAL AND METHODS: 82 patients posted for elective or emergency below knee surgeries were randomly divided into 2 groups. Group X received 25ml block solution made up of 2mg/kg of 0.5% bupivacaine with 2mcg/kg buprenorphine and normal saline and group Y received 25ml block solution made of 2mg/kg of 0.5% bupivacaine with 0.1mg/kg dexamethasone and normal saline. Onset of sensory block, onset of motor block, duration of analgesia, hemodynamic parameters, and side effects were noted in each group.

RESULTS: The mean time of onset of sensory block was earlier in group X (6.730±1.871 min) as compared to group Y (11.340±3.038min). The mean time of onset of motor block was also rapid in group X (9.000±2.121 min) than in group Y (13.020±2.286min). The mean total duration of analgesia was longer in group Y (1098.000±169.216) as compared to group X (794.070±145.084). There was no significant difference in the mean duration of motor block between the groups. Both the groups were hemodynamically stable, and no significant side effects were noted.

CONCLUSIONS: Onset of sensory and motor blockade was faster in the buprenorphine group, however duration of analgesia was much longer in the dexamethasone group without any significant side effects.

KEYWORDS : Adjuvants, Bupivacaine, Buprenorphine, Dexamethasone. Sciatico-popliteal and Saphenous Nerve block.

INTRODUCTION

Regional anaesthesia effectively produces mitigation of nociception as it diminishes the intensity of afferent impulses reaching the spinal cord & brain. Sciatico-popliteal and Saphenous nerve block given together provide complete anaesthesia below the knee for all types of surgical procedures. This block has certain advantages over general and spinal anaesthesia for surgery of the leg, ankle and foot. Prolonging surgical anaesthesia and analgesia is of significant benefit in regional anaesthesia. In order to increase the duration of local anaesthetic action and improve the quality of peripheral nerve blocks, different adjuvant medications have been added. Addition of multiple adjuvants to local anaesthetic ("multimodal perineural analgesia") may prolong analgesia after single injection peripheral nerve blockade.[1] A meta-analysis found that addition of dexamethasone as an adjuvant to local anaesthetics prolonged brachial plexus blockade.[2] Buprenorphine also prolongs the duration of analgesia after axillary nerve blockade[3], and intraoral nerve blockade.[4]

MATERIAL AND METHODS

After obtaining the clearance from the institutional scientific and ethical committee study was undertaken AT Dr.Jeyasekharan Hospital and Nursing Home Nagercoil, Kanyakumari district, Tamilnadu. The study period was 18 months from September 2017 to February 2019.

After obtaining clearance from the ethical and scientific committee, the study was undertaken. Written and informed consent was obtained from every patient and standard protocols were followed for anesthesia in both the group patients. Pre-anesthetic checkup of the patients was done, the night before surgery and the patients were reviewed preoperatively in OT. No premedication was given. 82 patients aged above 18years were selected and they were randomly allocated by means of computer generated random table into two groups.

Group X: patients were given 0.5% Bupivacaine 2 mg/kg with Buprenorphine 2μg/kg diluted with normal saline to make 25ml block solution.

Group Y: patients were given 0.5% Bupivacaine 2 mg/kg with Dexamethasone 0.1mg/kg diluted with normal saline to make 25ml block solution.

Random group assigned slip was enclosed in a sealed opaque envelope to ensure concealment of allocation sequence. After shifting the patient inside operation theatre, sealed envelope was opened by an anesthesiologist not involved in this study to prepare drug solution according to randomization. Patient's age, sex and weight were recorded. Patients were monitored with ECG, pulse oximetry (SPO2), Noninvasive Blood pressure (NIBP), and respiratory rate.

All patients received sciatic nerve blockade high in the popliteal fossa, with the patient in the prone / lateral position at the junction of the tibial and common peroneal component of sciatic nerve. This was done using the linear probe of ultrasound machine and 20 ml of the block solution was administered using 22G 5cm echogenic needle. Saphenous nerve was also blocked under USG guidance in the adductor canal triangle with 5ml of block solution. Time of completion of block performed was noted. The time of complete sensory block was assessed every 3 minutes for 1st 30 minutes with application of cold spirit swabs and by response to atraumatic prick with a blunt needle in the areas innervated by the blocked nerves. The time when complete sensory blockade is achieved as indicated by absence of sensation to cold swabs and needle prick was noted. The onset of motor block was assessed every 3 minutes by asking the patient to move the

ankle and / toes. When the patient could not move the ankle or toes, this was considered as the time of complete motor block and the time was noted. The surgery was allowed to proceed when complete sensory and motor block has been achieved.

Postoperative follow up with atraumatic needle prick was carried out in the recovery and postoperative ward every 2 hours for first 6 hours and then every 3 hours up to total 24 hours after nerve block or at any time when the patient complained of pain. NRS score ≥ 1 or if the patient complains of pain was taken as return of sensations. The duration of analgesia was calculated from the difference between the time of return of sensation and the time of onset of sensory block. Side effects if any namely Nausea, Vomiting, Respiratory depression, Hematoma at the block site; were recorded and treated accordingly.

Following parameters were noted:

Complete sensory blockade – Time at which there is loss of sensation to cold spirit swabs and atraumatic needle prick.

Complete motor blockade – time when patient is unable to dorsiflex and plantar flex the ankle and / or toes.

Return of sensations – NRS score ≥ 1 or if the patient complain of pain.

Motor recovery – when patient regains the ability to dorsiflex and plantar flex the ankle and / or toes.

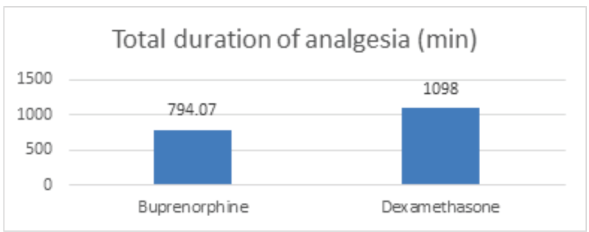
Duration of motor blockade – Difference between the time of complete motor blockade and the time of motor recovery.

Total duration of analgesia – Difference between the time of return of sensations and the time at which complete sensory blockade has been achieved.

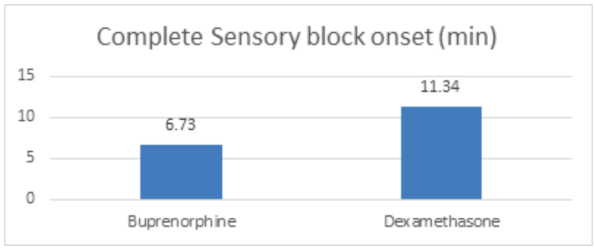
Master chart was prepared using the available individual data from the patient proforma, following which the data was analyzed. The quantitative data is expressed in terms of mean (standard deviation) and comparison done employing "independent sample t-test." P value is considered significant if it is less than 0.05. Statistical calculation done using Statistical Package of Social Science (SPSS) version 10.

RESULTS AND DISCUSSION

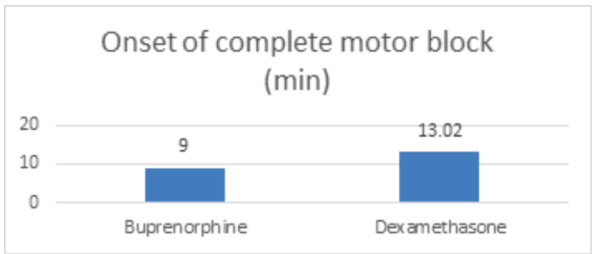
The primary objective of the study was to compare the duration of analgesia of Buprenorphine and Dexamethasone as adjuncts to Bupivacaine in sciatico-popliteal and saphenous nerve block. Dexamethasone and buprenorphine have been compared in sciatic nerve block and showed prolonged block duration, reduced the intensity of worst pain, and decreased analgesic requirements.[5] Persec et al.[6] reported a mean duration of 21 h of postoperative analgesia with 4 mg of dexamethasone with levobupivacaine in supraclavicular blocks. In 1997, Bazin et al.[7] showed that buprenorphine prolonged the median duration of analgesia from combination lidocaine/bupivacaine supraclavicular blocks from 11.5 to 20 hours. In this study the mean total duration of analgesia was more in Dexamethasone group (1098.000 ± 169.216 minutes) compared to Buprenorphine group (794.070 ± 145.084 minutes). This difference was statistically significant and it denotes addition of dexamethasone to bupivacaine significantly prolongs the total duration of analgesia compared to buprenorphine.



The mean time of onset of sensory block was later in Dexamethasone group (11.340 ± 3.038 minutes) compared to Buprenorphine group (6.730 ± 1.871 minutes). This difference was statistically significant between two groups. Mean time of onset of sensory block is slightly more in this study in contrary to the findings of Vadhanan P et al.[8]



The mean time of onset of motor block was also later in Dexamethasone group (13.020 ± 2.286 minutes) than Buprenorphine (9.000 ± 2.121 minutes) group in this study. This difference was also statistically significant between the two groups. The mean time of onset of motor block is more in this study compared to the findings obtained by Vadhanan P et al.[8]



In this study the mean duration of motor block for Buprenorphine group and Dexamethasone group is 389.290 ± 148.572 minutes and 390.630 ± 149.694 minutes respectively. This means that there is no significant difference in the mean duration of motor block among both the groups.

Various adjuvants like opioids, clonidine, dexamethasone and neostigmine are added to local anaesthetic agents to improve the efficacy and safety of blocks. It also helps in prolongation of action of local anesthetics by unclear mechanisms. Opioids when added as adjuvants can produce analgesia and anti-inflammatory effects by activating peripheral opioid receptors thereby reducing unwanted central nervous system side effects like nausea, vomiting and respiratory depression. Comparative studies of use of different opioids as adjuvants have produced conflicting results which resulted in further trials and newer modifications in their usage.

The objective vital parameters like heart rate (HR), mean arterial pressure (MAP) and respiratory rate (RR) were compared among both the groups before and after giving nerve block. There is no significant difference in heart rate or respiratory rate before and after the block in both the groups. In this study there is a significant increase in mean arterial pressure observed in buprenorphine group compared to dexamethasone both before and after the block. This observation is different from the results of all the related studies. So the increase in mean arterial pressure with buprenorphine observed in this study may be incidental and related to the preoperative hypertension status of the patients concerned. Demographic data comparing age, sex, weight, height, BMI shows no statistically significant difference among both the groups.

All patients were monitored for complications like nausea and vomiting, respiratory depression and hematoma at block site during the intra-operative period and up to 24 hours post-operatively. In my study 3 patients (7.3%) of buprenorphine

group developed nausea and vomiting after block within first 24 hours monitoring period. None of the patients in the dexamethasone group had nausea and vomiting. This implies that the buprenorphine group has higher incidence of nausea and vomiting but is statistically not significant. In this study none of the patients in both the groups had respiratory depression. None of the patients had hematoma related to block in both groups.

CONCLUSIONS

The addition of dexamethasone as an adjuvant to bupivacaine significantly prolonged the duration of analgesia compared to buprenorphine. This study also concluded that buprenorphine has faster onset of sensory and motor block when added to bupivacaine compared to dexamethasone. There were no significant adverse effects with both the buprenorphine and dexamethasone as adjuvants to bupivacaine.

Conflicting Interests Author declares no conflict of interest.
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Ethical approval - Obtained
Informed consent- Obtained

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