Section: Anaesthesiology

Original Research Article

A COMPARATIVE STUDY OF THE EFFECT OF ENDOTRACHEAL TUBE INTRACUFF AIR, PLAIN LIGNOCAINE, AND ALKALINIZED LIGNOCAINE ON THE INCIDENCE OF POST-INTUBATION SORE THROAT

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ABSTRACT

Background: Infraclavicular approach for brachial plexus block is under used but effective technique. The introduction of ultrasonography had rekindled the interest in infraclavicular brachial plexus block. Dexamethasone or Ketamine when added as adjuvant to local anaesthetic like ropivacaine will increase the duration of analgesia. The objectives is to compare postoperative analgesic effect, between Dexamethasone and Ketamine added as adjuvant to 0.2% Ropivacaine in ultrasound guided Infraclavicular Brachial Plexus Block. The primary objective of the study was the duration of post op analgesia or time taken for first rescue analgesia in hours. The secondary objectives were to find postoperative pain score and total rescue analgesic consumption in 24 hours.
Materials and Methods: This was a prospective comparative observational study after institutional and ethics committee approval and patient consent. 100 patients aged 18-60 years with BMI <30 kg/m2 belonging to American Society of Anaesthesiologist (ASA) physical status 1&2 undergoing elective forearm surgery were divided into two groups of 50 each. Group D received USG guided infraclavicular brachial plexus block with 0.2% Ropivacaine 28ml + inj Dexamethasone 8 mg and Group K received 0.2% Ropivacaine 28 ml + inj Ketamine 25µg/kg after giving general anaesthesia. Each patient received Inj Paracetamol 1 gm IV intraoperatively and Q8th hourly in post-operative period. Duration of analgesia, post-operative pain score and analgesic requirements were studied in both groups. Also patient satisfaction score at 24 hour and occurrence of any complications were noted. Statistical analysis was done with SPSS software version 16. Qualitative data were compared using Chi square test and Quantitative data compared using independent t test. A P value of less than 0.05 was taken as significant. **Results:** The mean time required for first rescue analgesic was significantly more in Group D compared to Group K, 19.94+/-2.92 vs 10.76+/-1.69 respectively (P <0.05). The mean total rescue analgesic required in 24 hours significantly low in GroupD compared to Group K, 1.02+/-0.552 vs 1.96+/-0.532 (P <0.05). There was a low NRS score in Group D compared to Group K. **Conclusion:** Addition of Dexamethasone is superior to Ketamine as adjuvant to 0.2% ropivacaine for post-operative analgesia in patient receiving infraclavicular brachial plexus block.
Keywords: Oral health literacy, socioeconomic status, rural population, Jaipur, Health Literacy in Dentistry (HeLD), Oral Health Impact Profile (OHIP-14), quality of life.

INTRODUCTION

Pain after orthopaedic surgeries can be intense and associated with neuroendocrine response, catecholamine release and increased morbidity. Central sensitization is believed to be among the mechanisms implicated in the persistence of post-operative pain. Regional techniques have been suggested to produce better analgesia compared to systemic opioids, which may improve outcome and decrease the adverse side effects of narcotics and increase the degree of patient satisfaction.[1]

Brachial plexus blocks are common regional anaesthesia techniques for surgical anaesthesia and postoperative pain management for elbow, wrist and hand surgeries. USG guided brachial plexus blocks for distal arm surgery are typically administrated at the supraclavicular, infraclavicular or axillary level.[2]

The supraclavicular brachial plexus is a popular technique for surgeries below the shoulder because of its quick onset and high success rate. However, the major disadvantages are higher incidence of complications such as inadvertent vascular injections, pneumothorax, phrenic nerve palsy and Horner's syndrome.[3] Infraclavicular approach for brachial plexus block is under used but effective technique. The introduction of ultrasonography had rekindled the interest in infraclavicular block. The main advantage is the fewer incidence of complication with ultrasound and it is ideally suited for catheter technique.[3]

Investigators have tried various adjuvants with local anesthetics in an attempt to prolong the analgesia from nerve block. Different adjuvants that can be used include opioids, dexmedetomidine, dexamethasone, clonidine, neostigmine, ketamine among others.[1]

Bupivacaine and ropivacaine are long acting amide local anaesthetic agents and when used in 0.5% concentration the effect may persist for about 4 – 5 hours if administered alone.[1] Ropivacaine is a propyl analog of bupivacaine that has the same anesthetic potency with longer duration of action and lesser cardiac and central nervous system toxicity of bupivacaine.[4,5] The addition of adjuvant will prolong the analgesic effect.[1] Some of these adjuvants like opioids have their own adverse effects and some drugs like dexmedetomidine may not be favoured because of their prohibitive costs. In the present study we have selected two adjuvants, which are time tested drugs for their analgesic efficacy when used along with long acting amide local anaesthetic ropivacaine and relatively inexpensive.

Ketamine is a well-known anaesthetic agent with potent local effect on peripheral nerves. The local effect of ketamine is most probably by blocking the voltage operated sodium channels. The effect of ketamine on N -methyl D-aspartate (NMDA) antagonism abolishes peripheral afferent noxious stimulation.[1] Dexamethasone produce antinociception by decreasing the release of inflammatory mediators, inhibiting potassium channel regulated discharge of c-fibers and also by reducing ectopic neuronal discharge. Steroids also induce a degree of vasoconstriction and act by reducing local anaesthetic absorption.[3]

There is paucity of literature comparing ketamine and dexamethasone as adjuvant in brachial plexus block. However, there are no studies comparing the 2 drugs used as adjuvant with 0.2% rppivacaine in infraclavicular brachial plexus block, to the best of our knowledge.

MATERIALS AND METHODS

Study Design: A prospective comparative observational study.

Study Setting: Major operation theater, NMCH, Government medical college hospital, Kozhikode

Inclusion Criteria

Patient aged between 18 and 60 years of age, ASA 1 and 2 undergoing elective below elbow/fore arm surgery.

Exclusion Criteria

- Patient with cardio vascular disease.
- Patient with neuromuscular disease or neurological deficits.
- Patient with thyroid disease.
- Patient with hepatic or renal disease.
- Pregnant women.
- BMI >30 kg/ cm ^2
- Patient with coagulopathy.
- Patient having allergy to local anesthetics
- Patient with local infection.
- Chronic pain syndrome patient requiring opioid intake at home.

Sample Size: 100

Methodology

After obtaining institutional research and ethics committee approval, 100 adult patients were selected based on inclusion and exclusion criteria. All patient was assessed preoperatively by detailed history, physical examination and laboratory evaluation. On the day before surgery, procedure was explained to each patient and informed written consent were taken for participation to study. The patient was grouped into two of 50 each.

Group K (ketamine group): received USG guided Infraclavicular brachial plexus block with 28 ml 0.2% ropivacaine + 2ml of fluid containing ketamine 25μ/kg (total 30ml).

Group D (Dexamethasone group): received USG guided Infraclavicular brachial plexus block with 28ml 0.2% ropivacaine + 2ml of fluid containing Dexamethasone 8mg (total 30 ml).

All patients were kept nil per oral as per guidelines and pre medicated with Tab Alprazolam 0.25mg and Tab pantoprazole 10 mg. On arrival to the operation theater, an 18 G intravenous cannula was secured in non-operating hand. Ringer lactate solution were started at rate of 15ml/kg/h and patient were

monitored with standard monitoring including electrocardiography, pulse oximetry, and noninvasive blood pressure. All baseline parameters were recorded. Pre medication was given with Inj emeset 0.01mg/kg iv + Inj glyco 0.005 mg/kg iv + inj Fentanyl 1 µ /kg iv. Anesthesia was induced with intravenous propofol 1-2.5 mg/kg till the loss of verbal contact with the patient. Neuromuscular blockade was achieved with succinylcholine 1.5mg/kg.Manual face mask ventilation was performed for 1 minute after which supraglotic airway of suitable size were inserted (I gel/ LMA) according to the weight of the patient. Relaxation was maintained with atracurium 0.5mg/kg and O2+N2O+isoflurane.

Then the infraclavicular BPB was done while the patient in supine position and his head slightly turned to other side with the upper extremity abducted 90°.The entry site were identified at 2 cm medially and 2cm caudal to the coracoid process. After skin preparation the probe of ultrasound were placed medial to the coracoids process in the parasagittal plane to identify the axillary artery and the three cords of the brachial plexus, a 100 mm 20 gauge insulated needle was advanced in plane to anesthetize each cord. LA solution were injected around each cord. Injection of LA solution were given slowly with frequent aspiration with every 3ml to avoid unintentional intravascular injection. At the beginning of surgery Inj paracetamol 1gm IV given as infusion and repeated Q8th hourly post operatively.

Intraoperative mean arterial blood pressure (MAP) heart rate (HR) was recorded preoperatively and every five minutes after the administration of LA solution till the end of the surgery. Post-operative pain was assessed using a 10 cm numerical rating score (NRS) (0: no pain :10 worst pain imaginable) and recorded at admission to postoperative care unit and 1,2,4,6,8,12,18 and 24 hr postoperative. If the patient complained of pain, Inj Diclofenac sodium 1.5mg/kg iv were given as first rescue analgesia. (When NRS >3). If patient again complaint of pain second rescue analgesia was given with Inj Pethidine 1mg/kg iv. The time for first rescue analgesic or total duration of analgesia measured in Hours. Total amount of rescue analgesic was also noted. Patient satisfaction was assumed by directly asking the patient regarding the degree of their satisfaction about the block using a four-point scale after 24 hours. (1=very dissatisfied, 2: dissatisfied,3=satisfied and 4= very satisfied). Any intraoperative or postoperative complications was recorded such as pneumothorax, vascular puncture, Horner's syndrome, somnolence, local anesthetic toxicity, bradycardia (HR<50 beats/min and managed by atropine 0.5mg) and hypotension (defained as a decrease of bp>25% of the baseline and managed by iv fluids and ephedrine 10mg bolus iv if no response to fluid administration).

Statistical Analysis: Initial data was entered in an excel spread sheet and were analyzed using SPSS version 16 software package. Data were presented as mean±SD or percentage. The qualitative data were analyzed with Chi square test and quantitative data were analyzed using t-test for significance. P<0.05 was considered as a statistically significant.

RESULTS

The patients' demographic information was similar for both groups. With a P value >0.05, the mean SBP and DBP in Groups K and D were comparable across all time periods. With a P value <0.05, Group K's mean heart rate significantly decreased after 10 minutes of block and an hour of operation. The two groups' mean heart rates were similar in every other way. This demonstrates that when administered as an adjuvant to ropivacaine in a USG-guided infraclavicular brachial plexus block, neither dexamethasone (Group D) nor ketamine (Group K) significantly alter hemodynamics. No group's heart rate or MAP decreased, necessitating medical intervention.

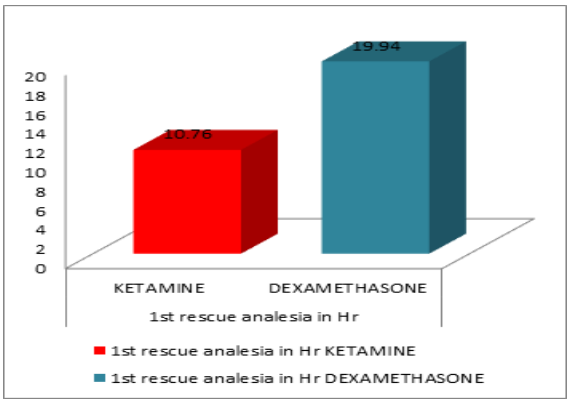

Figure 1: Comparison of mean time required for first rescue analgesic.

The mean time required for first rescue analgesic in Group D were longer compared to Group. The mean in Group K and D were 10.76+/-1.69 and 19.94+/-2.92 hours respectively. This is statistically significant as P value <0.001.

Table 1: Comparison of mean of total rescue analgesics required in 24 hours.

Group	Mean	P value
Group K	1.96+/-0.532	<0.001
Group D	1.02+/-0.552	

The means of total rescue analgesics in Group K and D were 1.96+/-0.532 and 1.02+/-0.552 respectively. This difference was statistically significant with first 2 hours after surgery the mean NRS was 0 in both groups. After that the mean NRS was highest in Group K than D. There was significant difference

between two group in NRS at 4,6,8,12,18,24 hours post operatively.

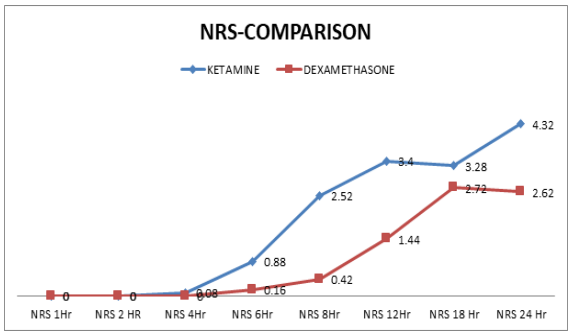

Figure 2: Comparison of mean NRS for 24 hours among each groups

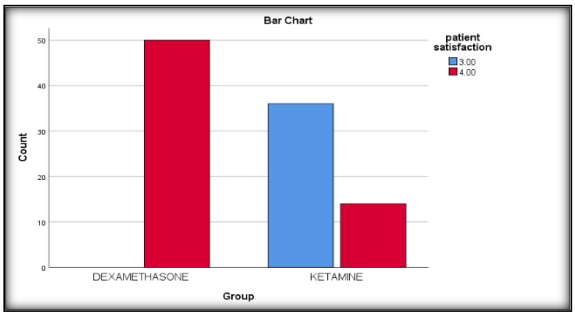

Figure 3: Comparison of satisfaction score at 24 hours.

Among Group K 72% having satisfaction score of 3 and rest 28% having 4 at 24 hours. Group D showed 100% having satisfaction score of 4 at 24 hours. This is statistically significant as P value was <0.001.

DISCUSSION

Like all other brachial plexus block, infra clavicular brachial plexus block is safe and effective for providing anaesthesia and analgesia in forearm surgeries. There are some advantages for ICBPB which include lower incidence of complications such as pneumothorax, phrenic nerve palsy and Horner's syndrome.[3]

Dexamethasone, a synthetic glucocorticoid, is a potent anti-inflammatory agent, and gained interest recently for its role as an adjuvant with perineural blockade. Proposed mechanism of action is by suppression of the C – fiber transmission of pain signals and reduction of neuronal discharge by the nerve cell.[3]

Ketamine will prolong the effect of analgesia when administered with local anaesthetic agent, because of increased concentration of ketamine in the peri neural fat than the systemic circulation. It will act by blocking the Na+ - K+ ion gates at the peripheral nerves to affect the neuronal transmission.[1]

In our study we made comparison between Dexamethasone and Ketamine used as adjuvant to 0.2% Ropivacaine with ultrasound guided infraclavicular brachial plexus block. In this study total 100 subjects were undergone IBPB under usg guidance. out of this 50 received 28 ml 0.2% Ropivacaine + 2 ml of fluid containing 25 µ/kg ketamine (Group K), and in the remaining 50, 28 ml 0.2% Ropivacaine + 2 ml of fluid containing Dexamethasone 8mg (Group D). The groups were comparable with respect to Age, Weight, Height and ASA physical status.[4-6]

The mean time required for first rescue analgesic in group K and Group D were 10.76+/-1.69 and 19.94+/-2.92 hours respectively. This showed Dexamethasone was superior than Ketamine. This is in line with previous study done by Behrooz Zaman and et al.[7] Gudala prasanna kumar and et all studied the effects of dexamethasone as adjuvant to infraclavicular brachial plexus block, and obtained a result of mean time for first rescue analgesic were 17.4 +/- 1.5 hours8. Ismael et all found mean analgesia time of 698+/-139 mint in patient received Ketamine (25 µ /kg) as adjuvant with 0.5% Bupivacaine in infraclavicular brachial plexus block.[1] There was so many studies which showed adding Dexamethasone or Ketamine as adjuvant to local anaesthetic will prolong the duration of analgesia in peripheral nerve block.[8-11] Contrary to this Monard Blough et al reported adding ketamine will be having prolonged analgesic period than dexamethasone in ultrasound guided paravertebral block.[12]

The mean of total rescue analgesic doses required in 24 hours in Group K and Group D were 1.96+/-0.532 & 1.02+/-0.552 respectively. This difference between two groups was statistically significant. These patients were needed only first rescue analgesic (Inj Diclofenac Sodium 1.5 mg/kg iv). None of the patient received second rescue analgesic in the study period (Inj Pethidine 1 mg/kg iv). From the study by Mona Blough et all post-operative consumption of rescue analgesia was significantly lower in Ketamine group and Dexamethasone group as compared to control group. But the dexamethasone group and ketamine group were comparable (P = 0.369).[12]

In the present study, for the first 2 hr after surgery, the mean NRS was 0 in both groups, after that the mean NRS was significantly higher in Ketamine group. [Table 5, Figure 13]. This is contrary to the findings by Mourad et al,[12] who reported a lower VAS score with Ketamine than Dexamethasone.

In our study 100% of subjects in Group D having satisfaction score of 4 at 24 hours. And in Group K 72% subject having satisfaction score of 3 and rest 28% having 4 at 24 hours. Which indicate excellent patient satisfaction score with Dexamethasone group. The mean SBP and DBP in Group K and Group D were comparable in all time frames with a P value >0.05. Mean Heart rate after 10 mint of block and after 1 hour of procedure were showed significant reduction in Group K with a P value <0.05. all other mean heart rate was comparable in both group. This shows that there are no significant differences in hemodynamics between Dexamethasone (Group D) or Ketamine (Group K), when added as adjuvant to ropivacaine in USG guided infra clavicular brachial

plexus block. None of the groups showed a decrease in heart rate or MAP which required treatment.
Respiratory rate and oxygen saturation (Spo2) were comparable in both groups. Respiratory depression or a fall in Spo2 were not reported in any of the patients. We looked complication such as pneumothorax, vascular puncture, Horner's syndrome, somnolence, local anaesthetic toxicity, bradycardia and hypotension. All of these were not recorded in any subjects.
All these showed superior effect of Dexamethasone than Ketamine, which may be due to the effect of difference in dosage of drugs. Comparable doses of ketamine and Dexamethasone as adjuvants has yet to be determined which needs further studies.

CONCLUSION

Addition of Dexamethasone is superior to Ketamine as adjuvant to 0.2% ropivacaine for post operative analgesia in patient receiving infraclavicular brachial plexus block.

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