ORIGINAL RESEARCH PAPER

Anaesthesiology

A COMPARATIVE STUDY OF EFFECTS OF FENTANYL &DEXMEDETOMIDINE AS ADDITIVES TO 0.75% ROPIVACAINE FOR EPIDURAL ANESTHESIA IN LOWER LIMB SURGERIES.

KEY WORDS:
Dexmedetomidine, epidural anesthesia, fentanyl, ropivacaine.

Dr Maheshwar Reddy Kandi Senior Resident, Department of Anaesthesiology, Chalmeda anand rao institute of medical sciences, Karimnagar, Telangana

Dr Sindhuja Arikanti* Junior Resident, Department of Anaesthesiology, Chalmeda anand rao institute of medical sciences, Karimnagar *Corresponding Author

Dr A Srikanth Reddy Professor and HOD, Department of Anaesthesiology, Chalmeda anand rao institute of medical sciences, Karimnagar

ABSTRACT

AIM: To evaluate the clinical effects & adverse events when fentanyl & dexmedetomidine are used as additives to 0.75% Ropivacaine for epidural anesthesia.

METHODS: Institutional ethical committee clearance was obtained.A total of 80 patients of both sex,aged 18-60 years, ASA grade I,II posted for elective lower limb surgeries were divided into two groups(n=40) by open label randomization method.Group RF received 1μg/kg Fentanyl & group RD received 1μg/kg Dexmedetomidine along with 15 ml Ropivacaine 0.75% in both groups. Onset of complete motor & sensory blockade,duration of analgesia, two segmental dermatomal regression & adverse effects were recorded. Data was analysed using Fisher's exact test & Chi-square test. Value of $P<0.05$ is considered significant and $P<0.001$ as highly significant.

RESULTS: The demographic profile was comparable in both the groups. Onset of sensory analgesia at T10 (10.04±0.86 vs 13.76±1.42) & onset of complete motor blockade (16.5±1.24 vs 20.4±1.32) was significantly earlier in RD group as compared to RF group. Duration of motor and sensory block was significantly longer in group RD (194.2. ± 20.73 and 150.42 ± 5.18 min) as compared to group RF (162.32 ± 22.38 and 122.4 ± 3.46 min).Incidence of bradycardia,hypotension & dry mouth was significantly higher in the RD group whereas incidence of nausea & vomiting was significantly higher in RF group with $P < 0.05$.

CONCLUSION : Epidural anesthesia with dexmedetomidine as an additive to 0.75% ropivacaine is more effective with respect to earlier onset & prolonged duration of sensory & motor blockade when compared to fentanyl.

INTRODUCTION

Epidural anesthesia may be used for providing analgesia alone,adjunct to general anesthesia,as a sole technique for surgical anesthesia & post operative analgesia in lower abdominal and lower limb surgeries.[1] Epidural anesthesia using bupivacaine was using since ages & it is highly cardiotoxic. The new amide local anaesthetic(LA) Ropivacaine was found to have minimal cardiovascular and central nervous system toxicity and longer duration of action.[2]

Addition of adjuvants decreases the requirement of LA dose, hence side effects of LA wil be minimised.Addition of fentanyl to ropivacaine in epidural helps in providing better analgesia and lesser systemic toxicity.[3] But opioids has disadvantages of pruritus,nausea,vomiting and respiratory depression.[4]

Dexmedetomidine, an alpha-2 adrenoreceptor agonist,which has got numerous beneficial effects when used through epidural route.[5] It has been used as an effective adjuvant to ropivacaine for regional and central neuraxial blocks.[6]

METHODOLOGY:

This prospective randomized study was conducted after obtaining approval from the institutional ethics committee. Patients of ASA physical status I-II,aged 18-60 years of either sex undergoing lower limb surgeries were included in this study. Patients refusing consent, coagulopathy, spinal deformity, infection at the puncture site, allergy to local anesthetics were excluded from the study.

A total of 80 patients were divided into 2 Groups comprising of 40 patients each by allocating them a random number by a computer generated table.

- Group RF(Ropivacaine+Fentanyl) received fentanyl 1μg/kg along with 15ml ropivacaine 0.75%.
- Group RD (Ropivacaine+Dexmedetomidine) received dexmedetomidine 1μg/kg along with 15ml ropivacaine 0.75%.

Preanesthetic evaluation and written informed consent was obtained and adviced for nil per oral for 6hours prior to surgery.All patients were premedicated with inj.pantaprazole 40mg iv and inj.ondensatron 1mg/kg iv 1hour prior to surgery.

In the operation theatre, venous access was secured with 18G/20G cannula and preloaded with 10 ml/kg of lactated Ringer's solution. All the baseline parameters were recorded which consisted of heart rate (HR),electrocardiography (ECG), non-invasive blood pressure (NIBP), and pulse oximetry (SpO2).

Patients in sitting position, under aseptic precautions lumbar epidural anesthesia was performed using 18G Touhy needle at L3-L4 interspace and epidural space was confirmed by loss of resistance technique. A test dose of 3 ml of 2% lignocaine with adrenaline was administered into epidural space and later epidural catheter was secured 5 cm into the epidural space and patients were placed in supine.The following solutions were randomly administered: 15 ml of 0.75% ropivacaine associated to 1 μg/kg of dexmedetomidine in group RD (n=40) and 1 μg/kg of fentanyl in group RF (n=40). The following parameters were observed after the administration of epidural anesthesia.

1. Onset of sensory analgesia at T10
2. Time to acheive complete motor blockade.
3. Time to regression to bromage scale 1.
4. Time to two segmental dermatomal regression
5. First feeling of pain/rescue analgesia.

Onset of sensory blockade at T10 level was noted by loss of painful stimuli by pinprick. Degree of motor blockade was

noted using modified Bromage scale from 0 to 3[Bromage scale 0= No motor block, 1 = inability to raise extended leg (able to flex knee); 2 = inability to flex knee (able to flex foot only); 3 = inability to flex ankle joint.] For quantification of pain, visual analog scale (VAS) score from 0 to 10 was used.Complications such as bradycardia, hypotension, pruritus,nausea,vomiting were documented & treated accordingly.

STATISTICAL ANALYSIS:

Data was compiled using statistical package for the social sciences (SPSS) version 15. Data are expressed in terms of mean ± standard deviation (SD) &percentage. Data were analyzed by student t test and chi square test. Based on Bajwa S, et al. [5] study by considering a probability level of 0.05 (α-error) and power of 80%(1-β) yeilded a sample size of 40 patients in each group. P-value <0.05 was considered significant and p-value <0.0001 was considered highly significant.

RESULTS:

Demographic data was statistically comparable among the two groups(Table 1).

Table 1: Demographic Data

Variables	Group RD (Mean± SD)	Group RF (Mean± SD)	P value
Age(years)	45.4±11.06	46.56±11.25	0.64
Height(cms)	158.1±7.54	159.4±7.70	0.43
Weight(kg)	55.42±9.32	56.64±8.64	0.54

Data expressed in terms of mean ± standard deviation.

Onset of sensory analgesia at T10 and onset of complete motor blockade was significantly earlier in RD group as compared to RF group. Duration of motor and sensory block was significantly longer in group RD (194.2. ± 20.73 and 150.42 ± 5.18 min) as compared to group RF (162.32 ± 22.38 and 122.4 ± 3.46 min).Time to first rescue analgesia was significantly longer in RD group as compared to RF group (Table-2).

Table-2 Sensory and motor block variables.

Variables	Group RD	Group RF	P value
Onset of complete motor blockade (mins)	16.5±1.24	20.4±1.32	P<0.0001
Onset of sensory blockade at T10 level (mins)	10.04±0.9	13.76±1.42	P<0.0001
Time to regression to bromage 1(mins)	194.2±20.7	162.3±22.4	P<0.0001
Time to first rescue top up(mins)	330±21.08	234±21.84	P<0.0001
Mean time for two segmental regression (mins)	150.4±5.18	122.4±3.46	P<0.0001

Data expressed in terms of mean ± standard deviation.

Table-3 Side effects and complications

Side effects	Group RD	Group RF
Bradycardia	08(20%)	03(7.5%)
Hypotension	15(37.5%)	08(20%)
Dry mouth	06(15%)	01(2.5%)
Nausea	05(12.5%)	14(35%)
Vomiting	01(2.5%)	06(15%)
Pruritis	00(0%)	03(7.5%)
Shivering	00(0%)	02(5%)
Respiratory depression	00(0%)	00(0%)

In terms of proportion there was higher incidence of bradycardia,hypotension,dry mouth in RD group as compared to RF group whereas the incidence of nausea,vomiting,shivering,pruritis was higher in RF group as compared to RD group(Table-3).

DISCUSSION:

Epidural analgesia offers superior pain relief and early mobilization especially when local anesthetic dose is combined with an adjuvant as compared to LA used alone.[7]

The synergism between epidural administered LA and opioids was well established but there is a scarcity of literature regarding usage of combination of LA with dexmedetomidine through epidural route.[8] In this study we have compared the effects of epiduraly administered dexmedetomidine and fentanyl as additives to 0.75% ropivacaine.

Demographic profile in our study was comparable among both groups. In our study onset of sensory analgesia at T10 and onset of complete motor blockade was significantly earlier in RD group as compared to RF group which was correlated with findings of Vasupalli R et al.[9]study.

Duration of motor block was significantly longer in RD group as compared to group RF which was correlated with findings of Singh R et al.[10]study. Duration of sensory block and time to first rescue top up was significantly longer in group RD compared to group RF.Similar results was found in the study of Bajwa SJ et al. [11]

In our study incidence of side effects and complications like bradycardia, hypotension, dry mouth was 20%, 37.5%, 15 % in RD group as compared to 7.5%,20%,2.5% in RF group respectively whereas the incidence of nausea, vomiting, shivering, pruritis was higher in RF group as compared to RD group. Respiratory depression is not observed in both groups.

CONCLUSION:

Dexmedetomidine is a better alternative to fentanyl as additive to 0.75% ropivacaine for epidural anesthesia as it provides earlier onset, prolonged duration of sensory and motor blockade and time to first rescue analgesia was longer.

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