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Effect of Dexmedetomidine and Clonidine as Adjuvant to Intrathecal 0.75% Isobaric Ropivacaine in Gynaecological Surgery

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Abstract
Aim of this trial was to compare the analgesic efficacy of intrathecal dexmedetomidine or clonidine as adjuvant with isobaric ropivacaine in gynaecological surgery. 90 patients of ASA grade I or II, ages between 20-60 years, were randomly allocated to three equal groups, Group R received 3ml of isobaric ropivacaine (0.75%) with normal saline as a placebo, group D received 3ml of isobaric ropivacaine (0.75%) with 5 µg of dexmedetomidine and Group C received 3ml of isobaric ropivacaine (0.75%) with 30 µg of clonidine. All solutions were made up to 3.5 ml with addition of normal saline. The onset and duration of sensory and motor blockade, time to reach peak sensory and motor level and the sensory and motor regression times were recorded. Time to use first rescue analgesia, hemodynamic changes and side effects were recorded. Time to onset of sensory block and motor block was earlier in Group D and Group C as compared to Group R. Duration of sensory and motor blockade was prolonged in Groups C and D compared with Group R. The mean regression time to S1 segment was prolonged in Group D, and in Group C compared to Group B. The time to 1st rescue analgesia was significantly prolonged in Group D compared with Group C and group R. Dexmedetomidine when added to intrathecal ropivacaine prolongs the sensory block and provides prolonged postoperative analgesia compared to clonidine.

INTRODUCTION

Subarachnoid block is widely used in gynaecological surgeries due to its safety and simplic-ity. Bupivacaine is the most widely used long acting spinal anaesthetic but it has been associated with cardio and neuro toxicity[1]. Ropivacaine has a high pKa and low lipid solubility which is a s-enantiomer and has been used extensively for epidural and peripheral nerve blocks. It is less cardiotoxic and has a significantly higher threshold for central nervous system toxicity. The efficacy and tolerability of isobaric Ropivacaine for spinal anaesthesia in have been demonstrated in several studies[2]. It has shown to produce sufficient surgical anaesthesia and analgesia with reduced side effect. However, Ropivacaine is less potent than Bupivacaine. Its action is slower in onset and short lived[3]. To overcome this, many adjuvants have been added to Ropivacaine intrathecally to potentiate the anesthetic effect. The efficacy and safety of Clonidine, which is a partial α2 adrenorecptor agonist, when used intrathecally is well established. Its addition to local anaesthetics prolongs the duration of both motor and sensory spinal blockade. Dexmedetomidine, a highly selective α-2 adrenergic agonist has evolved as a panacea for various applications and procedures in the perioperative and critical care settings[4]. It is also emerging as a valuable adjunct to regional anesthesia and analgesia in central neuraxial blocks. The present study is being undertaken to evaluate and compare the effects of Dexmedetomidine and Clonidine as intrathecal adjuvants to Ropivacaine.

MATERIALS AND METHODS

A prospective randomized comparative study was conducted in a tertiary care hospital after obtaining permission from hospital ethical committee. The study was done on 90 patients after taking informed consent who were to be scheduled for gynaecological surgeries of age ranging from 20-60 years between September 2021-October 2022. 90 patients of physical status ASA I and II were selected on basis of inclusion and exclusion criteria and were randomly allocated into three groups. Each group consists of 30 patients.

- **Group R:** Received 3 ml of 0.75% isobaric Ropivacaine (diluted with normal saline to 3.5ml)
- **Group D:** Received 3 ml of 0.75% isobaric Ropivacaine with 5 mcg of inj. Dexmedetomidine. (diluted with normal saline to 3.5ml)
- **Group C:** Received 3 ml of 0.75% isobaric Ropivacaine with 30 mcg of inj. Clonidine. (diluted with normal saline to 3.5ml)

Exclusion Criteria:

- Patients with cardiac disease and coagulopathy.
- Infection at the site of injection.
- Patients with preexisting neurological or spinal deformities.
- Patients allergic to local anaesthetics.

After detailed preanaesthetic examination, all patients were kept fasting for six hours before the procedure and received tablet alprazolam 0.25 mg and tablet ranitidine 150 mg the night before surgery. In the preoperating room peripheral vein was secured and preloading was done with 500 ml ringer lactate solution. After shifting the patient to the operating room monitoring devices were attached which included heart rate, electrocardiograph (ECG), pulse oximetry (SpO2), non-invasive blood pressure (NIBP), respiratory rate and the baseline parameters were recorded. Lumbar puncture was performed in sitting position using 25-gauge Quincke type spinal needle. The intrathecal drug was prepared by a separate anaesthesiologist under strict aseptic conditions. The anaesthesiologist who administered anaesthesia was blinded to the group allocation. Vitals were recorded every 2 minutes up to the 10^{th} minute and every 10 minutes thereafter up-60 minutes. Beyond 60 minutes the vitals were recorded every 15 minutes till the time of discharge from PACU (Post Anaesthesia Care Unit). All the parameters recorded after spinal injection and during surgery were compared with baseline. Changes in these parameters were recorded and mean changes in each group at different periods of observation was calculated. Onset of sensory block, onset of motor block, duration of sensory block and duration of motor block were noted for inter group comparison. The sensory dermatome level was assessed by pin prick method. The motor blockade was assessed according to the modified Bromage Scale[5]. Bromage 0-Patient able to move hip, knee and ankle. Bromage 1-Patient unable to move hip, but able to move knee and ankle. Bromage 2-Patient unable to move hip and knee but able to move the ankle. Bromage 3-Patient unable to move hip, knee and ankle. Onset of sensory and motor block-Time to reach the T-10 Dermatome and to reach the Bromage 3 level. Duration of sensory and motor block-Time to regression to dermatome S2 and time to reach Bromage 0 was noted in post operative care unit. All durations were calculated taking the spinal injection time as time zero. Postoperatively, the pain score was recorded by using visual analog pain scale (VAS) between 0 and 10 (0=no pain, 10=severe pain), with the vital recordings of the study until the patient was discharged[6]. IV paracetamol was given as rescue analgesia when VAS was greater than 4. Time of administering the first dose of rescue analgesia was noted. Sedation was assessed by using Modified Ramsay sedation scale. Side effects including nausea, vomiting, bradycardia, hypotension, respiratory depression, sedation, shivering etc. were assessed both intra-operatively as well as post-operatively. Hypotension is defined as a decrease in systolic blood pressure >20% of the baseline value, which was treated by Ephedrine 6 mg i.v or when the SBP was <90mmHg and bradycardia is defined as heart rate <60/min but atropine 0.6mg i.v was given when heart

rate falls below 50/min. Post operatively vital signs, VAS scores and sedation scores was monitored in the recovery room every 15 minutes until the time of regression of sensory block to S2 dermatome and then patient was shifted to the ward. All the statistical analysis were performed by using SPSS version 21. The various statistical tests that were used in this study were analysis of variance (ANOVA) test, Post hoc test (Bonferroni test) and nonparametric tests like kruskalwallis test. For all statistical analysis p<0.05 was considered statistically significant.

RESULTS AND DISCUSSIONS

The demographic parameters of patients in the three groups were comparable and the difference was statistically insignificant. The mean time taken for onset of sensory block was 3.5±0.872 mins in R group, 2.96±0.779 mins in C group and 2.34±0.697 mins in D group. So onset of sensory blockade in group C and in group D was faster compared to the R group and highly significant. (p-value <0.05) (Fig. 1)

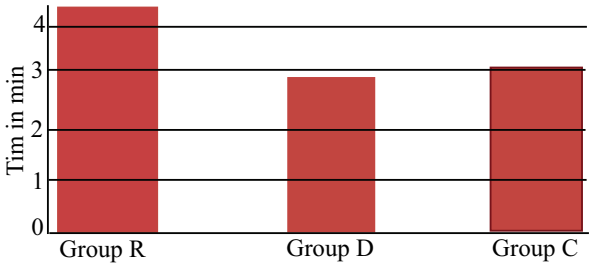

Fig 1: Time to Achieve T 10 Level of Sensory Block

Two out of 30 patients in group R, 8 out of 30 patients in group C and 12 out of 30 patients in group D had T5 level of sensory blockade. Four out of 30 patients in group R, 5 out of 30 patients in group C and2 out of 30 patients in group D had T6 level of sensory blockade. Twenty-four out of 30 patients in group R, 17 out of 30 patients in group C and 16 out of 30 patients in group D had T7 level of sensory blockade. (Fig. 2)

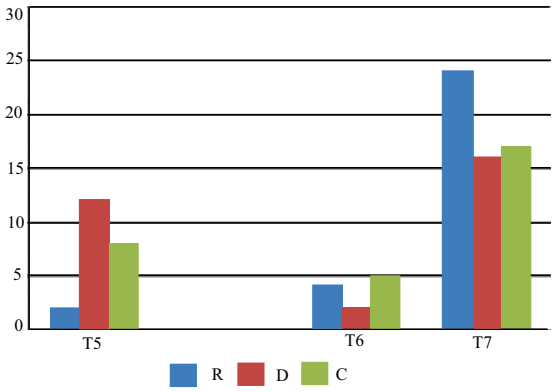

Fig. 2: Maximum Level of Sensory Blockade Achieved

The time taken for sensory blockade regression to S2 level were 172±33.5 minutes in group R, 286.6±50.21 minutes in group D and 258.83±20.93 minutes in group C. Intergroup analysis revealed a statistically significant difference amongst group R and D and group R and C. These values also significantly differ between group D and group C (P<0.05). Duration of sensory blockade was longer in group D than group C. (Fig. 3)

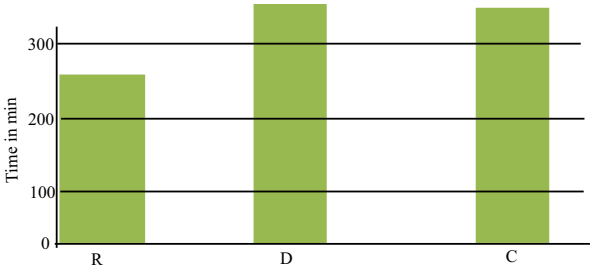

Fig 3: Time Taken for Sensory Blockade Regression to S2 Level

The mean time taken for motor block regression to Bromage 0 was 156.66±102 mins in R group, 232.76±23.10 mins in D group and 214.43±21.82 mins in C group. So duration of motor blockade in group D and C was longer compared to the group R and highly significant. (p-value <0.001) (Fig-4) shows incidence of side effects among the three groups and their statistical comparison.

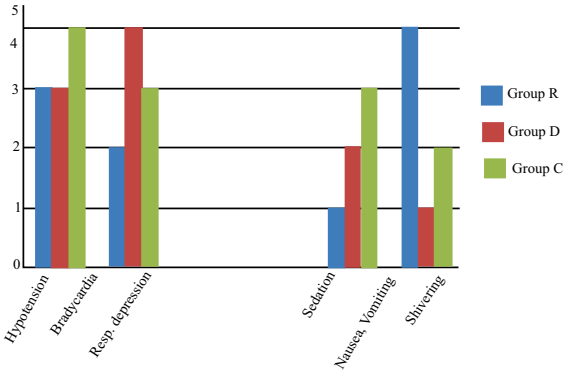

Fig. 4: The Mean Time Taken for Motor Block Regression

Ropivacaine is a new long-acting, enantiomerically pure (S-enantiomer), amide local anaesthetic with a high pKa and low lipid solubility[7]. It is considered to block sensory nerves to a greater degree than motor nerves. Because of sensory motor dissociation Ropivacaine may be a favourable local anaesthetic for day-case surgery and may result in earlier postoperative mobilization than bupivacaine.While Clonidine has been used as an adjuvant to local anaesthetic agents for intrathecal purposes with successful results, there are only a few studies available for Dexmedetomidine for such studies and hence there is a need to compare its effectiveness as a spinal adjuvant to ropivacaine[8,9]. In our study, all patients receiving either drugs achieved adequate level of anaesthesia. Mean time needed for sensory

blockade at T10 was 156.4667±33.78 s in Group RD and 185.2000±35.17 s in Group RF. The results are clinically and statistically significant. Our results are consistent with El-Attar[12] study where he compared intrathecal dexmedetomidine and fentanyl as additives to bupivacaine and concluded that dexmedetomidine has faster sensory onset compared with fentanyl and local anesthetic when injected intrathecally. Our results were similar to the studies done by Mahendru[10] Gupta[11] El-Attar[12] and Safari[13] who concluded that intrathecal dexmedetomidine is associated with prolonged sensory block when compared to other adjuvant. Mahendru *et al.* studied intrathecal dexmedetomidine, clonidine and fentanyl as adjuvants to hyperbaric bupivacaine for lower limb surgery. They found that when dexmedetomidine and fentanyl were added as adjuvants, duration of analgesia was prolonged and maximum height of sensory block achieved was T6 in both groups. Gupta[11] studied intrathecal dexmedetomidine and fentanyl as adjuvants to bupivacaine. They concluded that duration of analgesia was prolonged and the maximum height of sensory block achieved was T5 with dexmedetomidine and T6 with fentanyl as adjuvant to local anesthetic. Al-Mustafa[14] observed dose dependent prolongation of motor and sensory blockade with decreased analgesic requirement with increasing dose of intrathecal dexmedetomidine. In a study conducted by Hala E A Eid[15] significant prolongation of the duration of spinal blockade was seen by intrathecal dexmedetomidine as an adjunct to hyperbaric bupivacaine. Dexmedetomidine reduced postoperative pain scores and provided longer analgesic duration. Kanazi[16] and Al Ghanem[17] concluded that dexmedetomidine and clonidine added to bupivacaine produced a similar prolongation in the duration of the motor and sensory block, with preservation of hemodynamic stability. All the above studies are in agreement with our study.

CONCLUSION

Dexmedetomidine when added to Ropivacaine provided an early onset of sensory and motor blockade and prolonged the duration of analgesia compared to clonidine in gynaecological surgeries.

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