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DEXMEDETOMIDINE AS ADJUVANT TO EPIDURAL BUPIVACAINE FOR LAPAROTOMIES- A DOUBLE BLIND PILOT STUDY.

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ABSTRACT

Background and Aim: Epidural anaesthesia is widely practiced for laparotomy. Adjuvant to local anaesthetics improves the quality and duration of this route and dexmedetomidine can be a useful adjuvant. We undertook a double blind study comparing 12 ml of 0.5% bupivacaine with a combination of same dose bupivacaine and 1 mcg per kilogram of dexmedetomidine as adjuvant, administered epiduraly, in laparotomy. **Material and Methods:** The participants of the study were randomly allocated in to two groups of 30 each; group B with epidural bupivacaine (0.5%) and group D,with 0.5% bupivacaine and 1mcg per Kg of dexmedetomidine. We compared between the magnitude of variations in heart rate and mean arterial pressure, onset and duration of analgesia and surgical condition provided. **Result:** Variation in the heart rate of group B and group D (22.25±13.46bpm,18.64±9.91bpm: p 0.248) and MAP are (25.56±10.15 mm of Hg,26.46±10.48mm of Hg: p 0.737). The Chi Square value comparing surgical condition provided by the groups is 1.741. Onset of blockade of gp B and gp D are 10.56±2.61mins and 5.11±1.25,p value < 0.05. Duration of analgesia in gp B and gp D are 172.81±83.99mins and 367.14±251.08mins, p< 0.05. **Conclusion**; Addition of dexmedetomidine to bupivacaine in epidural anaesthesia has comparable hemodynamics with earlier onset and prolonged postoperative analgesia.

KEYWORDS: Epidural dexmedetomidine, adjuvant, laparotomy.

INTRODUCTION

Pain of surgery is associated with the ongoing and impending tissue damage. Epidural placement has long been found to be a safe and effective means of providing surgical anaesthesia and postoperative analgesia. It is one of the more commonly used techniques in surgeries of the lower abdomen and limbs.[1] Many techniques and regimens, with partial or greater success have been tried in making the quality of anaesthesia better.[2] Various adjuvants have been tried with a view to mitigate the use of larger volumes of local anaesthetics or the overzealous and impulsive use of sedatives which can prove deleterious and renege the purpose of regional anaesthesia.[3] Although technically more demanding, recent evidences point to the fact that thoracic epidural may improve splanchnic perfusion and intestinal mucosal functions.[4,5]

Alpha 2 agonists are an area active research as an adjuvant to epidural local anaesthetics. They have been the focus of much interest for their sedative, analgesic, perioperative sympatholytic, hemodynamic stabilizing and anaesthetic sparing effects.[6] Dexmedetomidine is a highly selective alpha 2 agonist with an affinity 8 times that of clonidine.[7] The anaesthetic and the analgesic requirements are significantly reduced because of its analgesic properties and augmentation of local anaesthetic effects as it causes hyperpolarisation of nerve tissues by altering trans-membrane potential and ion conductance at locus coeruleus in the brainstem. In addition, the stable haemodynamics and the decreased oxygen demand owing to the sympathetic stability make their use more appealing.[8-13]

The optimal dose of epidural dexmedetomidine is not clearly defined and the doses cited in literature ranges from 0.5 to 2 mcg/kg.[14] Higher doses of dexmedetomidine is associated with side effects, most common being bradycardia[14] and lower doses do not seem to provide significant advantages. We conceptualized this study to use a modest dose of dexmedetomidine, aiming to make use of its superior qualities at the cost of minimal side effects.

MATERIALS AND METHODS

This double blind study was undertaken in a tertiary care teaching hospital, for a period of one year. After obtaining institutional ethical committee clearance 60 patients of both gender, between the age group of 40 to 65 belonging to ASA 1 & 2, posted for laparotomy in whom epidural anaesthesia is judged appropriate by the attending anaesthesiologists, were enrolled in the study. Those with coagulation and spine abnormalities were excluded.

Basal values of heart rate [HR] and mean arterial pressure [MAP] were recorded. Intravenous lines using 18G IV cannula was accessed and preloaded with balanced salt solution of 750 ml before instituting regional blockade. They were premeditated with inj.midazolam 1 mg, inj Butorphanol 0.5 mg and inj Ondensetron 4 mg.Epidural space was identified by the primary investigator with loss of resistance to air technique under full aseptic precautions at T6 to T8 vertebral space. After confirming the epidural position of the catheter by a test dose of 3 ml of 2% lignocaine with adrenaline, the primary investigator, who was blinded about the epidural drug, administered either of the study solution based on the randomization, grouping them in to either group B or group D.

Group B patients received 10 mls of 0.5% bupivacaine and 2 ml normal saline making to 12mls. Group D patients received 10 mls of 0.5% bupivacaine and 1mcg/kg dexmedetomidine with normal saline making it up to 2 ml(total of 12 ml) solution, prepared by a fellow anaesthesiologist who is unaware about the study. NIBP, ECG,HR, RR and SPO2) were monitored. The primary investigator performed subsequent data collection. The following parameters were looked for and compared for statistical significance.

a. maximum variation in heart rate[HR]
b. maximum variation in mean arterial pressure[MAP]
c. onset of analgesia
d. duration of analgesia
e. operating conditions

HR(Heart rate) and MAP(mean arterial pressure) before instituting epidural anaesthesia and their largest fluctuation from the base line values from onset of surgery to 6 hours post operative period was noted. Operating condition in term of ease to handle internal organs and muscle relaxation was assessed by the operating surgeon as

- Good- as in case of general anaesthesia [grade 4],
- Optimal- [grade 3],
- Suboptimal [grade 2]
- Poor [grade 1].

Any hemodynamic fluctuations more than 25% of base line, was treated appropriately with intravenous fluids, inj.dopamine. Those cases, where surgery lasted more than 3 hrs or experienced any discomfort to patient or surgeon during the procedure were converted to general anaesthesia.

RESULTS

The study group consisted of 60 consenting patients whose demographic details are summarised as below and are comparable statistically.

Group		**Mean**	**Intergroup comparison**
Age (years)	Group B	57.75±10.411	P value .318
	Group D	54.86±11.822	
Sex	Group B	F (8), M (22)	Chi square 1.408
	Group D	F (11), M (19)	p value 0.182
Height	Group B	147.34±4.56	P value = o.236
	Group D	145.65±6.53	

The comparison of the change in heart rate and change in MAP between the groups is given in the table below.

Group		**Mean**	**Intergroup comparison**
Change heart rate (bpm)	Group B	22.25±13.469	P value =.248
	Group D	18.64±9.919	
Change in MAP (mm of Hg)	Group B	25.56±10.157	P value =.737
	Group D	26.46±10.483	

Comparison of surgical conditions between the two groups is depicted in the table below.

Group		**Mean**	**Intergroup comparison**
Surgical conditions	Group B	Score 2 (6 nos), Score 3 (23 nos), Score 4 (1 no)	Chi square = 1.741
	Group D	Score 2 (2 nos), Score 3 (27 nos), Score 4 (1 no)	P value = 0.419

The onset of analgesia and the duration of analgesia was compared between the groups using independent "t" test and the results are tabulated as below:

Group		**Mean**	**Intergroup comparison**
Onset of Analgesia (minutes)	Group B	10.56±2.614	P value = .000
	Group D	5.11±1.257	
Duration of Analgesia (minutes)	Group B	172.81±83.992	P value = .000
	Group D	367.14±251.088	

DISCUSSION

The groups were comparable in terms of basal demographic characteristics like age and sex. The heights of the groups were also comparable. The average height of the population in the study shows the rationale for choosing the volume of the epidural drug. The desired sensory blockade was a level of T4 and this could be achieved with the total dose of 15 ml in our study. Shahi et al[14] used a volume of 14 ml in their study and Safiya et al[1] used a volume of 15 ml in their study. We were able to achieve adequate levels of blockade with the volumes used.

The dose of epidural dexmedetomidine reported is in the range of 0.5-2 µg/kg. Fukushima, et al.[15] administered 2 µg/kg epidural dexmedetomidine for postoperative and Maroof, et al.,[16] used epidural dexmedetomidine 1.5 µg/kgwithout any serious side effects.

We did not note any significant decrease in heart rate or MAP with the addition of dexmedetomidine. Shahi et al[14] noteda significant decrease in heart rate but no change in MAP in their study with 0.5 mcg /kg dexmedetomidine.

We noticed similar operating conditions between both the groups. The onset of analgesia was quicker in the dexmedetomidine group. Safiya et al[1] has established the faster onset of sensory levels with dexmeditomidine in their comparative study. The duration of analgesia was longer in the dexmedetomidine group. Safiya et al[1] had established that dexmedetomidine provided a longer duration of analgesia compared to clonidine. A pilot study by Sonawane et al[17] showed that epidural dexmedetomidine provided longer time of analgesia compared to epidural ketamaine. Shahi et al[14] also obtained longer duration of analgesia with bupivacaine in combination with dexmedetomidine compared to either magnesium sulphate as an additive or bupivacaine alone.

The study clearly shows the benefits of addition of dexmedetomidine to the epidural local anaesthetic and opens a promising frontier for further research. Alpha-2 agonists may provide an attractive alternative to anesthetic adjunctive agents now in use because of their anesthetic-sparing and hemodynamic-stabilizing effects. They produce analgesia by depressing release of C-Fiber transmitters and by hyperpolarization of postsynaptic dorsal horn neurons[18–20] They have a complimentary analgesic action when used along with local anaesthetics. They also prolong the motor blockade by combining with motor neurons.[21] Dexmedetomidine is eight times more specific and highly selective α-2 adrenoreceptor agonist compared to clonidine

We do not want to overlook on the obvious limitations of our study. We have not used an objective scale for the assessment of pain. The surgeries were varied making the operating conditions and post operative analgesic requirements different. The quality of surgical conditions were assessed subjectively and inter-surgeon variability has not been taken into account. The postoperative analgesic requirements have not been studied.

We hope our study will spark more research in the field and contribute to making anaesthesia and perioperative medicine ever more efficacious and safe.

CONCLUSIONS

From our observations, we concluded that adding 1mcg/kg of dexmedetomidine to bupivacaine administered via epidural route can significantly hasten the onset and prolong the duration of analgesia. At this dose, the intrinsic sympatholytic side effects were kept to the minimum. This can minimize the stigma of slow action of epidural local anaesthetics and poor relaxation. With an extrapolation of such a technique, epidural analgesia can be a popular choice for patients with higher risk for general anaesthesia. However, a multicentre study with a larger sample size need to be undertaken for a clearer picture.

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