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A COMPARATIVE EVALUATION OF EFFICACY OF EPIDURAL DEXMEDETOMIDINE AND FENTANYL AS ADJUNCT TO 0.2% ROPIVACAINE FOR POST OPERATIVE ANALGESIA IN ELECTIVE ABDOMINAL SURGERIES

Anaesthesiology

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ABSTRACT

This clinical study is undertaken to compare the efficacy of epidural dexmedetomidine and fentanyl in addition to 0.2% ropivacaine for post-operative analgesia in elective abdominal surgeries in ASA grade I and II patients with regards to comparing the onset, duration , hemodynamics, sedation, rescue analgesic requirement and safety profile. Inclusion criteria was patients between 18-55 years undergoing elective abdominal surgeries. The patients were randomly allocated into three groups of 25 patients each. Group R received Ropivacaine 0.2% 9ml with 1ml Normal Saline. Group RF received Ropivacaine 0.2% 9ml with fentanyl 50µ (1ml) Group RD received Ropivacaine 0.2% 9ml with dexmedetomidine 1µ/kg .The set parameters were studied. The groups were similar in age, sex, weight and ASA grading and haemodynamic parameters after administering the drug. The mean duration of analgesia in group RD was significantly longer than in group RF which was significantly longer than in group R. Duration of sedation correlated with the duration of analgesia in all the groups, being the highest in group RD and did not result in respiratory depression at any time in the study period. Incidence of side effects comparable in all groups.The addition of dexemedetomidine to ropivacaine when compared with addition of fentanyl resulted in earlier onset and prolonged duration of analgesia in intra abdominal surgeries with less requirement of rescue analgesics after administering the drug through epidural route with minimal side effects in the patients.

KEYWORDS

Epidural analgesia; ropivacaine; fentanyl; dexmedetomidine; abdominal surgeries

INTRODUCTION

Epidural anaesthesia is the most commonly used technique for providing not only peri-operative surgical anaesthesia but post-op analgesia in abdominal and lower limb surgeries.[1] Various drugs have been used for the same in addition to local anaesthetics like ropivacaine of which opioids and alpha2 agonist have become increasingly popular. Addition of an adjuvant has a dose sparing effect on local anaesthetics and prolongs the analgesia . Dexmedetomidine is a highly selective alpha 2 agonist which has both analgesic and sedative properties and is devoid of side effects caused by opioids. It also enchances the effects of local anaesthetics. This double blind clinical study was therefore undertaken in our institution to compare the efficacy of epidural dexmedetomidine and fentanyl in addition to 0.2% ropivacaine for post - operative analgesia in elective abdominal surgeries .

METHODS

Following approval from the ethical and research committee, and after obtaining informed consent from the patients, 75 patients ASA I and II between 18-55 years, undergoing major abdominal surgery were included in this study .The patients were randomly allocated into three groups of 25 patients each. Patient not fulfilling inclusion criteria, patient refusal, with infection at the site of injection , with coagulopathy, patients on alpha-2 antagonist treatment & patients with history of allergy to local anaesthetics or Alpha-2 adrenergic agonists were excluded from this study. Under all aseptic precautions an 18 G epidural catheter was threaded through T11-T12 interspace via loss of resistance to air technique & advanced minimum of 3 – 4 cm within the space, 3ml of xylocaine with adrenaline 1:200000 was given as test dose to confirm the proper placement of catheter. Intubating position was given thereafter. Standard induction, maintenance and extubation regimen was followed in each case. A multimodal approach for pain by WHO ladder of pain management was followed intra op by administering iv paracetamol and iv diclofenac. Patient was then shifted to PACU, on the first complaint of pain,(VAS4) was administered the drug via epidural route which was one among the three groups R/RF/RD and the interested parameters were recorded. Group R[ropivacaine alone](n=25) Received ropivacaine 0.2% 9ml + normal saline 1ml Group RF [ropivacaine + fentanyl(RF) group] (*n*=25): Received ropivacaine 0.2% 9 ml plus fentanyl 50mcg Group RD [ropivacaine + dexmedetomidine (RD) group] (*n*=25): Received ropivacaine 0.2% 9 ml plus dexmedetomidine 1 mcg/kg. After administering the drug, the following parameters were noted by the independent observer for 10 hrs in PACU. (1) Pain score by using VAS every 5 min for 15 mins and then at 30, 60, 120, 240, 360, 480 & 600 mins. (2) Onset of analgesia (fall of VAS<4 after epidural drug). (3) Duration of analgesia (starting from epidural drug administration to once the patient asked for additional epidural analgesia with VAS4). (4) Haemodynamic parameters - pulse rate, blood pressure systolic/diastolic, respiratory rate at the interval 5mins for the first 15 mins, then at 30, 60, 120, 240, 360, 480 & 600 mins. (5) Number of rescue analgesics required & side effects. (6) Sedation score assessed using a 5 point scale (deep sedation>3). The monitoring devices used in the observation period were NIBP, pulse oximetry, VAS scale and continuous electrocardiogram. Hypotension (defined as systolic arterial pressure falling more than 20% from the pre-operative level) was treated with injection ephedrine 6-12 mg IV bolus and heart rate<50 beats/min was treated with 0.01 mg/kg of injection atropine. Post-operative maintenance IV fluids were given as per body weight. Nausea and vomiting were treated with 0.1 mg/kg of IV ondansetron. Shivering was treated with injection tramadol 50 mg IV.

STATISTICALANALYSIS

With reference to previous study, the mean duration of analgesia prolonged in dexmedetomidine group was 407 with SD 47.06 while in fentanyl group was 345.01 with SD 35.02. Assuming the same, using a two tailed alpha value (0.05) and a beta value (0.1), 15 patients per group would be sufficient to detect a significant difference. To make up for any data loss due to drop outs we studied 25 patients in each group. Statistical analysis was performed by the SPSS program for Windows, version 17.0. Data were checked for normality before statistical analysis using Shaipro Wilk test. Normally distributed continuous variables were compared using ANOVA. If the F value was significant and variance was homogeneous, Tukey multiple comparison test was used to assess the differences between the individual groups; otherwise, Tamhane's T2 test was used. Categorical variables were analyzed using the Chi-square test. Spearman's Correlation was also used among various variables. For all statistical tests, a p value less than 0.05 was taken to indicate a significant difference.

RESULTS

The demographic profile of the patients in all three groups was comparable with regards to age, weight and height. The distribution as per ASA class was similar and comparable in the 3 groups.

Addition of dexmedetomidine to ropivacaine resulted in earlier onset (9. 6 ± 1. 7min) of analgesia as compared to fentanyl (10.00 ± 0.0min) and the ropivacaine(R) group (15.00±0.0 min). **Table 1**

Group R	15 min
Group RD	9.6 min
Group RF	10 min

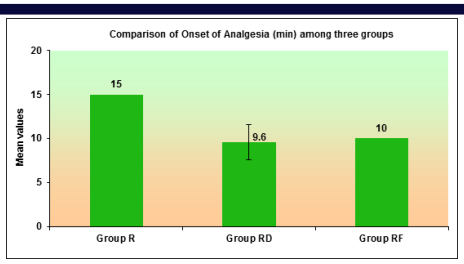

Figure 1
The duration of analgesia in dexmedetomidine group was also longer (561.6 ± 66.81 min) when compared to fentanyl group (379.2 ±82.56 min) and ropivacaine group (230 ± 91.1 min).The difference was statistically significant (p<0.05).

Duration of Analgesia	Group R (N=25)	Group RD (N=25)	Group RF (N=25)	P value	Group R Vs Group RD	Group R Vs Group RF	Group RD Vs Group RF
	Mean ± SD	Mean ± SD	Mean ± SD				
Mean ± SD	230.40±91.13	561.60±66.81	379.20 ±82.56	< 0.001	< 0.001	< 0.001	< 0.001
Min – Max	120-480	360-600	240-480				

Table 2

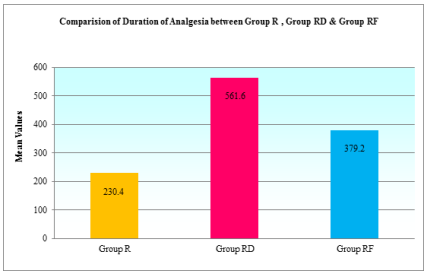

Figure 2
The requirement for rescue analgesics during the study period was significantly more in group ropivacaine and fentanyl in comparison to dexmedetomidine group.

Rescue Analgesia	Group R	Group RD	Group RF	P Value			
	No.	%	No.	%	No.	%	
1	4	16	7	88	19	76	0.620
2	11	44	1	13	5	20	
3	9	36	0	0	1	4	
4	1	4	0	0	0	0	
Total	25	100	8	100	25	100	

Table 3
The VAS score never reached ≥ 4 during the first three hours in any of the groups. However at the end of third hour the number of patients with VAS score ≥ 4 were significantly more in Ropivacaine group compared to the fentanyl and dexmedetomidine group being least in the dexmedetomidine group

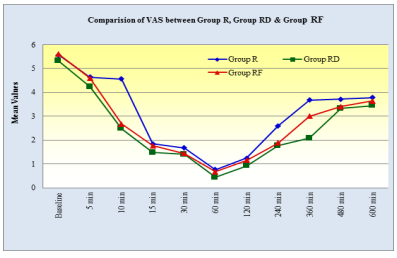

Figure 3
Sedation in fentanyl group lasted for 360 mins with sedation score ranging between 2 and 3. In group dexmedetomidine sedation lasted for almost 480 mins

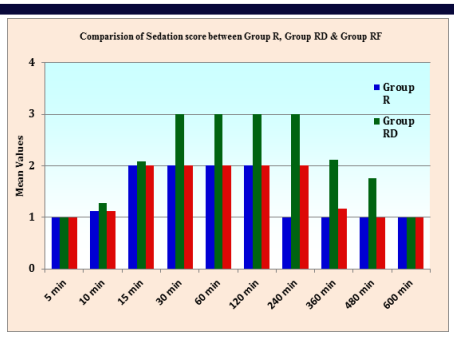

Figure 4
The changes in heart rate, systolic and diastolic blood pressure were comparable amongst all the groups and at all time intervals. No significant difference in the respiratory rate between the three groups was observed. (p>0.05) There were no cases of respiratory depression, bradycardia or hypotension in patients of any group.[2][3]

DISCUSSION

Advantages of epidural analgesia over other modalities of pain relief is that it is able to provide analgesia for prolonged surgeries with better hemodynamic stability and also helps to reduce polypharmacy which is often employed to relieve the post operative pain in patients. It helps the patients to ambulate early , cough and clear secretions more effectively.

Onset of Analgesia: Addition of dexmedetomidine to ropivacaine as an adjuvant resulted in an earlier onset (9. 6 ± 1. 7min) of analgesia as compared to fentanyl (10.00 ± 0.0min). Dexemedetomidine not only provided early onset, but also helped in achieving the peak analgesic level (VAS - 0) in a shorter period compared with group RF. Similar results obtained by various studies like Gupta et al.[4] and others.[5][6][7][8]

Duration of Analgesia: The total duration of post–operative analgesia in fentanyl group was 379.2 ±82.56 minutes and in dexmedetomidine group it was 561.6 ± 66.81 minutes. This difference between the two groups is highly significant (p<0.001). Thus dexmedetomidine had a longer duration of analgesia compared to fentanyl. Previously reported data in different studies show widely varying duration of analgesia for both epidural fentanyl (3 to 6 hours) and epidural dexmedetomidine (6 - 16 hours) when compared to placebo. This could be related to the different doses of drug used and the different types of surgeries. Jaakola ML, Salonen M, Lehtinen R, Scheinin H. explained the analgesic action of dexmedetomidine: A novel alpha2-adrenoceptor agonist in healthy volunteers. Also supported by Bajwa et al.[9] and various other studies.[5][7][8]

Requirement of Rescue analgesics: In fentanyl group 76% required two and only 20% patients required three doses of rescue analgesics. In dexmedetomidine group 28% required one and 4% required two doses of rescue analgesics. Thus the requirement of rescue analgesics was significantly higher in the fentanyl group compared to dexmedetomidine group. Similar observations were also noted by previous studies comparing epidural dexmedetomidine and fentanyl with placebo.[4][9][10][11]

Sedation scores: In group RF sedation lasted for 360 mins with sedation score ranging between 2 and 3. In group RD sedation lasted to almost 480 mins. Also at time of 20 min the number of sedated patients were statistically significantly more in dexmedetomidine group compared to fentanyl group. There was no significant sedation in the post–operative period leading to respiratory depression in either of the groups. The duration of sedation in our study corresponded closely with the duration of analgesia. This is in accordance with various other studies.[4][6][8]12]

Haemodynamic parameters: The changes in heart rate, systolic and diastolic blood pressure were comparable amongst both the groups and at all time intervals. No significant difference in the respiratory rate between the two groups was observed. There were no cases of respiratory depression in patients of either group.[2][3]

Complications: In our study the incidence of Hypotension was observed in 8% patients in RF Group and 4% in Group RD. This was

treated with IV fluid boluses. Shivering occurred in 2% patients in Group RD which was managed by warm iv fluids and blankets. Nausea and vomiting was present in 2 patients in group RF which was treated with iv ondansetron 0.1 mg/kg.

These differences were however not statistically significant. Thus the addition of dexmedetomidine to ropivacaine in our study, did not result in an increase in the incidence of side effects. These observations are supported by most studies.[4][5][7][9][13][14]

CONCLUSION

Dexmedetomidine is a better adjuvant to ropivacaine through epidural route when compared to fentanyl for providing early onset prolonged post-operative analgesia, sedation and stable haemodynamic parameters in intra abdominal surgeries.

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