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Efficacy of addition of fentanyl to bupivacaine versus bupivacaine alone on postoperative analgesia in cases undergoing abdominal surgeries

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Abstract

Background: Successful selection of a drug for epidural anaesthesia needs an understanding of the anaesthetic potency and estimation of postoperative analgesia requirement. Bupivacaine is a widely used long acting analgesia. The present study was designed to assess the efficacy of bupivacaine alone and bupivacaine with fentanyl in adults cases undergoing abdominal surgeries.

Materials and methods: A total 100 cases undergoing abdominal surgeries under general anesthesia between 18-60 years belongs to ASA grade I and II were recruited. Participants were randomly divided into two study groups i.e. group 1 administered with 0.125% Bupivacaine alone and group 2 administered with 0.125% Bupivacaine with 1mcg/kg fentanyl. Post-operative hemodynamics, respiratory rate, oxygen saturation, postoperative pain assessed by visual analogue pain scale, time for first rescue analgesia and duration of analgesia, Ramsay sedation score and GI complication like nausea/vomiting and pruritus were assessed.

Results: The postoperative difference of hemodynamics, respiratory rate and oxygen saturation was comparable between two study groups. The time for first rescue analgesia in group 1 was 103.56 ± 3.38 and in group 2 was 285.55 ± 3.14 . The mean difference was statistically significant. The incidence of nausea/vomiting and pruritus was more in group 2 than group 1. VAS score and Ramsay sedation score are comparable in both the study groups.

Conclusion: Postoperative epidural analgesia was higher in group 2 than group 1. Epidural infusion of 0.125% Bupivacaine alone is more effective than 0.125% Bupivacaine with 1mcg/kg fentanyl in cases undergoing abdominal surgeries.

Keywords: Bupivacaine, fentanyl, post-operative analgesia, abdominal surgeries

Introduction

In general anesthesia practice, postoperative pain management is a challenge for anesthetist. Postoperative pain after major surgical procedures was commonly managed by local anesthetics, epidural local anaesthetic and opioid combinations [1]. Poorly managed postoperative pain leads to prolonged rehabilitation, adverse psychological and physiological complications [2]. There is a high chance for postoperative pain in abdominal surgeries, which reduces the diaphragmatic movements. This leads to respiratory tract infections due to decreased effort in coughing out the secretions.

Bupivacaine is an effective local anesthetic agent of aminoacyl group commonly used local anaesthetic agent for spinal anesthesia with 60 to 240 minutes duration of action [3, 4]. Adjuvants have been used to increase the efficacy and duration of the neuraxial blockade; opioids are the first among them. Use of opioids resulted in increased duration of analgesia but was associated with adverse events like respiratory depression, sedation and GI complication like nausea/vomiting [5, 6]. Fentanyl is a short acting lipophilic opioid, which binds to a family of G-protein-linked pre and postsynaptic opioid receptors in laminae I and II of the dorsal horn of spinal cord. It has rapid onset and short duration of action of 4 to 6 hours with minimal cephalad spread when administered in single dose (10-30 mcg) [7]. The present study was designed to assess the efficacy of bupivacaine alone and bupivacaine with fentanyl in adults cases undergoing abdominal surgeries.

Materials and Methods

The present prospective non randomized study was conducted in the department of Anesthesiology at MNR Medical College and Hospital, Sangareddy during April 2019 to

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March 2020. A total 100 cases undergoing abdominal surgeries under general anesthesia between 18-60 years belongs to ASA grade I and II were recruited. Cases undergoing elective abdominal surgeries and willing to participate in the study were included. Cases allergic to opioid drugs, contraindication to epidural anesthesia, with neurological diseases, with pregnancy, with coagulation disorders and not willing to participate were excluded from the study. Informed consent was obtained from all the study participants and study protocol was approved by institutional ethics committee.

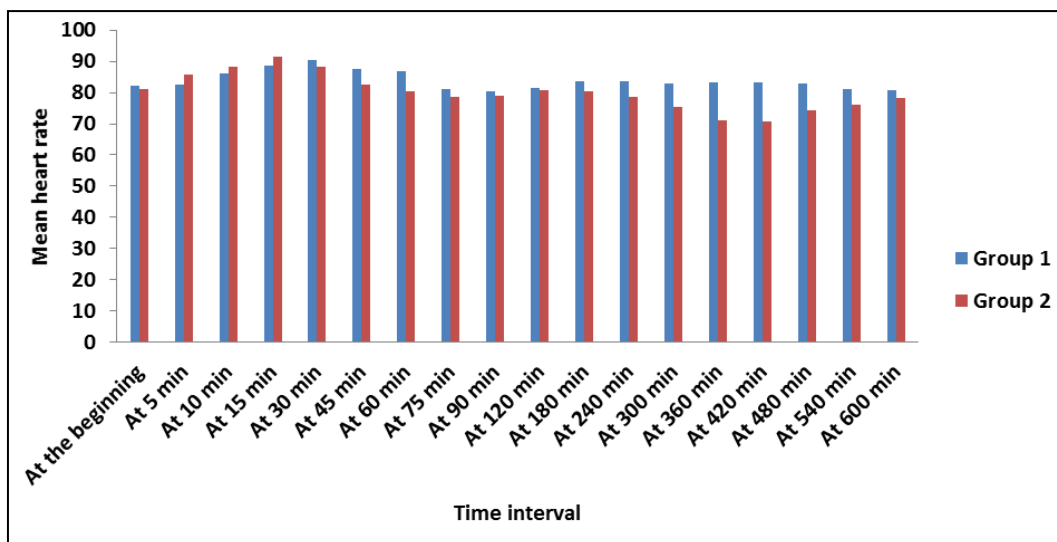
Participants were randomly divided in to two study groups i.e. group 1 administered with 0.125% Bupivacaine alone and group 2 administered with 0.125% Bupivacaine with 1mcg/kg fentanyl. All the study participants were clinically examined, monitored regularly with EEG, pulse oximetry and NIBP. Parameters like heart rate, blood pressure, respiratory rate, oxygen saturation, pruritus were assessed. Post-operative pain was assessed by visual analogue pain

scale, time for first rescue analgesia and duration of analgesia, Ramsay sedation score and postoperative complication like nausea and vomiting were assessed. The SPSS version 23 software was used to carry out statistical analysis relevant to the study. Descriptive statistics were used to represent mean values and percentages. Study variables was analysed by chi-square test. A p-value of < 0.05 was considered statistically significant.

Results

Table 1.

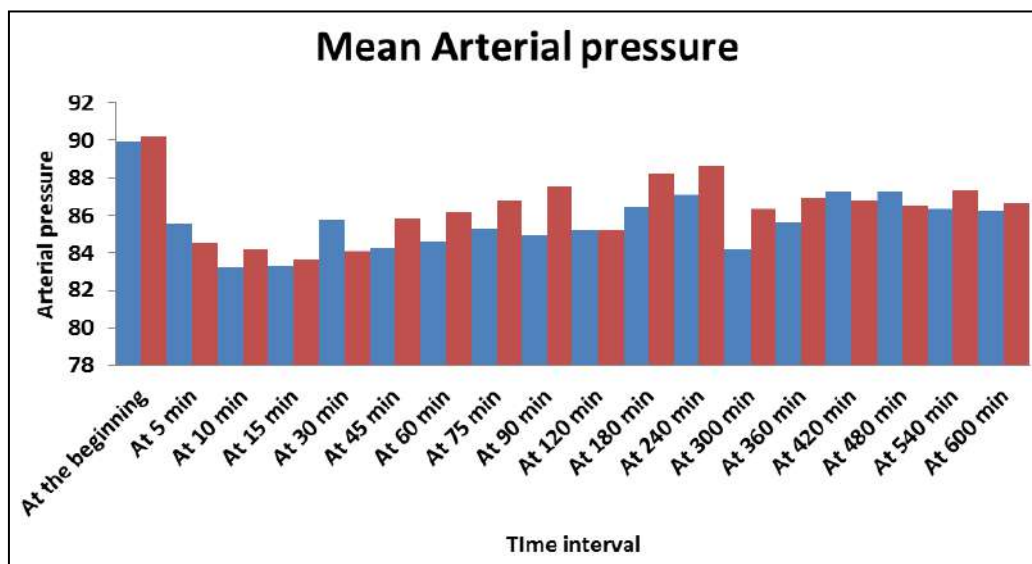
Parameters	Group 1	Group 2	p value
	Mean ± SD	Mean ± SD	
Age	38.29 ± 3.40	36.58 ± 2.82	0.684
Gender (Male/Female)	19/31	16/34	0.562
Weight	65.23 ± 2.12	61.20 ± 1.57	0.339
Time for first rescue analgesia	103.56 ± 3.38	285.55 ± 3.14	0.003



Graph 1: Comparison of mean heart rate in two study groups.

The difference of mean heart rate between two study groups was statistically significant at 300 min, 36 min, 480 min, 540 min and 600 min ($p < 0.05$). The difference of mean

arterial pressure was not statistically significant between two study groups ($p > 0.05$).



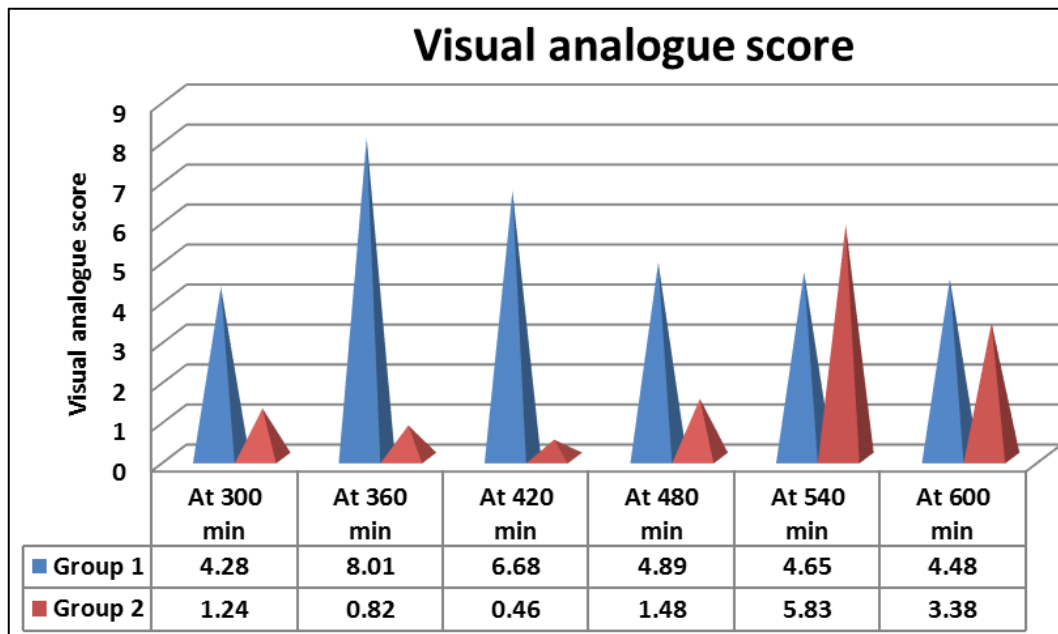
Graph 2: Comparison of mean arterial pressure in two study groups.

Table 2: Comparison of mean respiratory rate and oxygen saturation changes in two study groups.

	Mean Respiratory rate			Mean Oxygen saturation change		
	Group 1	Group 2	P value	Group 1	Group 2	P value
	Mean ± SD	Mean ± SD		Mean ± SD	Mean ± SD	
At the beginning	12.12 ± 0.23	12.56 ± 0.61	0.892	98.69 ± 0.25	99.82 ± 0.23	0.378
At 5 min	12.41 ± 0.58	12.30 ± 0.45	0.454	100.01± 0.28	99.96 ± 0.35	0.834
At 10 min	12.34 ± 0.18	12.32 ± 0.25	0.237	98.98 ± 0.12	98.63 ± 0.12	1.00
At 15 min	12.02 ± 0.89	12.02 ± 0.56	0.189	99.64 ± 0.23	100.07±0.42	0.476
At 30 min	12.00 ± 0.30	12.00 ± 0.23	0.476	99.98 ± 0.18	100.65±0.56	0.156
At 45 min	12.47 ± 0.24	12.32 ± 0.21	0.588	99.56 ± 0.22	100.22±0.18	0.583
At 60 min	12.00 ± 0.00	12.00 ± 0.00	0.462	99.98 ± 0.19	99.78 ± 0.21	0.248
At 75 min	12.08 ± 0.22	12.15 ± 0.08	0.327	100.12±0.36	99.88 ± 0.34	0.652
At 90 min	11.98 ± 0.48	12.45 ± 0.87	0.446	100.03±0.22	100.03±0.25	0.652
At 120 min	12.68 ± 0.23	12.57 ± 0.56	0.898	99.54 ± 0.14	99.89 ± 0.12	0.148
At 180 min	13.56 ± 0.89	13.23 ± 0.58	0.912	99.84 ± 0.03	99.96 ± 0.15	0.263
At 240 min	11.78 ± 0.22	11.78 ± 0.45	0.721	100.05±0.00	100.11± 0.30	1.00
At 300 min	10.25 ± 0.54	11.44 ± 0.33	0.779	100.12±0.04	100.16±0.18	0.357
At 360 min	11.98 ± 0.54	11.86 ± 0.57	0.019	98.78 ± 0.69	99.45 ± 0.22	0.002
At 420 min	13.63 ± 0.23	13.62 ± 0.36	0.384	99.52 ± 0.23	99.86 ± 0.18	0.286
At 480 min	12.72 ± 0.45	12.25 ± 0.56	0.033	99.28 ± 0.77	99.95 ± 0.59	0.026
At 540 min	13.87 ± 0.42	12.58 ± 0.28	0.669	99.82 ± 0.21	99.86 ± 0.38	0.126
At 600 min	12.69 ± 0.78	12.68 ± 0.24	0.242	99.89 ± 0.25	99.92 ± 0.56	0.242

The mean respiratory rate was statistically significant at 360 min and 480 minutes. The difference of oxygen saturation changes among study groups was statistically significant at

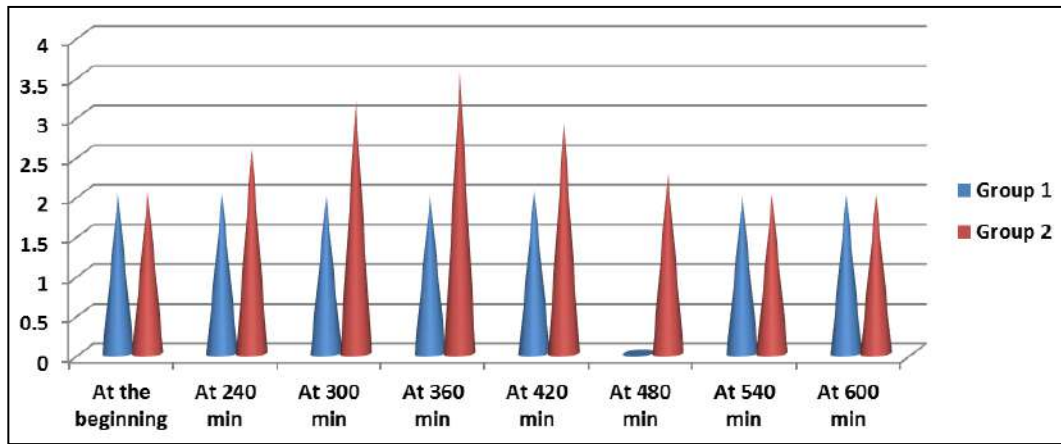
360 min ad 480 min ($p < 0.005$) (Table 2). The visual analogue score in the study groups were statistically significant ($p < 0.05$).



Graph 3: Comparison of visual analogue score in study groups.

The VAS score at 300 min, 360 min, 420 min, 480 min and 540 min was statistically significant ($p < 0.05$). The mean Ramsay sedation score at the beginning, 240 min, 300 min,

360 min, 420 min, 480 min and 540 min was statistically significant ($p < 0.05$).



Graph 4: Comparison of Ramsay sedation score in two study groups.

Table 3: Comparison of the post-operative nausea/vomiting and pruritus in two study groups

Parameters	Group 1		Group 2		p value
	N	%	N	%	
Nausea/vomiting					
Present	-	-	31	62%	0.002
Absent	50	100%	19	38%	
Pruritus					
Present	-	-	36	72%	0.004
Absent	50	100%	14	28%	

In group 2, 62% cases have shown nausea/vomiting postoperatively, whereas in group 1, none of the cases shown nausea/vomiting which is statistically significant. 72% cases had pruritus in group 2, whereas none in group 1.

Discussion

Epidural analgesia furnishes preemptive analgesia which prevents polypharmacy, central sensitization and permits early mobilization [8]. Post-operative pain is unavoidable and its relief has been consistently and systematically inadequate [9]. The present study was designed to assess the efficacy of bupivacaine alone and bupivacaine with fentanyl in adults cases undergoing abdominal surgeries. The mean difference of age, gender, weight between two study groups was statistically not significant ($p > 0.005$). The time for first rescue analgesia in group 1 is 103.56 ± 3.38 and in group 2 is 285.55 ± 3.14 . The mean between two study groups was statistically significant ($p < 0.05$).

The difference of mean heart rate between two study groups was statistically significant at 300 min, 36 min, 480 min, 540 min and 600 min ($p < 0.05$). The difference of mean arterial pressure was not statistically significant between two study groups ($p > 0.05$). A study by Krishna and Sharma found mean heart rate and mean arterial blood pressure was not statistically significant between tow study groups [10]. A study by Kulkarni H *et al.* found no significant increase or decrease in heart rate. However, mean arterial blood pressure was significantly decreased in bupivacaine with fentanyl group as compared to ropivacaine with fentanyl [11]. A study by Kumar Lakshmi *et al.* stated that the mean heart rate was low in bupivacaine with fentanyl group at all-time intervals except at 300 min, 360 min and 420 min [1]. A study by Patil SS *et al.* found stable hemodynamic parameter in the both study groups [12].

The mean respiratory rate was statistically significant at 360 min and 480 minutes. The difference of oxygen saturation

changes among study groups was statistically significant at 360 min ad 480 min ($p < 0.005$) (Table 2). The visual analogue score in the study groups were statistically significant ($p < 0.05$). A study by Krishna and Sharma noticed nominal changes in respiratory rate and respiratory changes were constant during entire study. The mean oxygen saturation also remained above 98% in the study group [10]. A study by Nazareth M *et al.* stated that use of low dose fentanyl as an adjuvant to bupivacaine is relatively safe and rarely ends up in respiratory depression [13].

The VAS score at 300 min, 360 min, 420 min, 480 min and 540 min was statistically significant ($p < 0.05$). The mean Ramsay sedation score at the beginning, 240 min, 300 min, 360 min, 420 min, 480 min and 540 min was statistically significant ($p < 0.05$). A study by Kumar Lakshmi *et al.* noticed higher VAS score in bupivacaine with fentanyl group than ropivacaine with fentanyl [1]. Study by Patil SS *et al.* noticed that VAS score was decreased steadily with the progression of infusion [12].

In group 2, 62% cases have shown nausea/vomiting postoperatively, whereas in group 1, none of the cases shown nausea/vomiting which is statistically significant. Opioids use is usually associated with nausea and vomiting [14]. Bupivacaine with low dose fentanyl as an adjuvant in spinal anesthesia is associated with nausea and vomiting [15]. In this study, 72% cases had pruritus in group 2, whereas none in group 1. A study by Krishna and Sharma found pruritus only in fentanyl group [10]. A study Kumar and Singh stated that Intrathecal fentanyl frequently produces pruritus which is inconsolably difficult to control by prophylactic medication [16]. A study by Kamawat *et al.* stated that the incidence of pruritus was high when 50mcg fentanyl was used as adjuvant to 0.125% bupivacaine [17]. A study by Priestley *et al.* stated that high dose of fentanyl was associated with increase in doe dependent complications like pruritus, sedation and respiratory depression. Study also stated that in abdominal surgeries, ropivacaine with fentanyl has higher hemodynamic stability, effective intraoperative and postoperative analgesia than bupivacaine with fentanyl [18].

Conclusion

The time interval between epidural drug bolus and time for first rescue analgesia was higher in group 2 than group 1. The mean heart rate, arterial blood pressure, respiratory rate, oxygen saturation were almost similar and statistically significant at certain time period. The incidence of

nausea/vomiting and pruritus was more in group 2 than group 1. The result of the study concludes that postoperative epidural analgesia was higher in group 2 than group 1.

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