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Comparison of Fentanyl Alone Versus Fentanyl-Bupivacaine in Continuous Epidural Infusion For Postoperative Pain Relief

KEYWORDS: Postoperative analgesia, epidural, bupivacaine, fentanyl.

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ABSTRACT *Background-The highly lipid soluble opoid, fentanyl if given via epidural route has short transient time in cerebrospinal fluid, so less likely to be associated with respiratory depression and other side effects. In this study we tried lowest dose of bupivacaine with fentanyl to minimize side effects and to see synergestic effect existed.*

Aims and Objectives: To determine that addition of bupivacaine0.1 to continuous epidural fentanyl infusion produces superior analgesia while minimize side effects in comparison with continuous epidural fentanyl with saline. To compare efficacy of combined drugs with regards to onset, duration and quality of analgesia ,onset of degree of sedation, effects on respiratory and cardiovascular system, incidence of side effects, sensory motor disturbances, patients acceptance and surgeons response and to encourage ambulation.

Material and Method: We assessed the analgesic efficacy of postoperative epidural fentanyl with or without bupivacaine 0.1%. In this prospective randomized double blind study of 50 ASA (American society of anaesthesiologist) physical status 1-2 patients' age 30-60rs, ht145-165cms, wt40-65kgs, undergoing elective major lower abdominal and orthopaedic surgery. Epidural catheter was placed before induction of anaesthesia. After surgery the epidural infusion was compared. 25 Patients divided into two groups. Group F-Continuous epidural infusion of fentanyl 2microgram/ml with normal saline at the rate of 5 ml/hr (fentanyl 4 microgram/ml for 48hrs).group FB: continuous epidural infusion of fentanyl 2 microgram/ml with bupivacaine 0.1% at the rate of 5 ml/hr (fentanyl 4 microgram/ml for 48hrs).total volume of infusion is 100ml.

Observations and Results: Intravenous rescue analgesia and epidural topup provide to all patients accordingly to need. The BF group received less rescue analgesia over 48 hrs infusion period than group F .motor block was negligible for the study duration in both groups. Patient's satisfaction was excellent the incidence of side effects such as nausea, hypotension, itching were similar. Conclusion: Addition of bupivacaine0.1% to continuous epidural fentanyl infusion improves analgesia significantly with advantage of sedation along with reduced analgesic requirement and minimal side effects.

Introduction: For all the happiness mankind can gain is not in pleasure but in rest from pain**.-Jhon**Druden. Acute postoperative pain may be the worst experience in life of patient, as most of them perceive it as one of the most ominous aspect of surgery. Inadequate pain relief is associated with increase in morbidity and mortality after surgery.[1]The occurrence of postoperative pain is inextricably linked to the inflammatory and stress response, which is not limited to the intra operative period but persist after operation. The benefit of epidural analgesia results from attenuation of the same and provision of good analgesia. And continuous epidural infusion in postoperative period extends these beneficial effects. It also allows the patient to mobilize and resume normal activities unlimited by pain. Epidural local anaesthetic and opoid infusion reduces the chances of postoperative atelectasis and pulmonary infection and improve postoperative oxygenation. It also allows the patient to take deep breath, cough, and cooperate with physiotherapy. It also avoids high dose systemic opoids should reduce respiratory depression by blocking nociceptive and sympathetic reflexes it improves intestinal motility and reduces the duration of postoperative ilieus permitting earlier enteral feeding.[2]

The duration of postoperative analgesia from local anaesthetics even with long acting agents is usually not sufficient leads to inadequate pain relief. concentration of bupivacaine 0.125%-0.0625% bupivacaine have been used as continuous infusion at rate of 6-10ml/hr. Side effects such as hypotension increases with increased dose of bupivacaine. Total spinal anaesthesia may occur following dural tap. This led researchers to use lipid soluble opoids-local anaesthetic combination for postoperative analgesia. the ideal opoid must cross dura rapidly and enter the spinal cord where it should bind with strong affinity to the opoid receptors in substanscia gelatinosa to provide effective analgesia at sufficient low dosage to limit side effects. Fentanyl if given epiduraly reduces the risk of respiratory depression as it is more lipophylic drug rapidly absorbed into the spinal cord and nearby vessels decreases concentration in cerebrospinal fluid more rapidly and reduces risk from cephalhead CSF spread.[3]

Addition of fentanyl to local anaesthetic reduces its requirement by synergistic effect of opoid receptors in spinal cord. This reduces the chances of motor blockade and hemodynamic perturbation.

Hence we decided to compare efficacy, quality and duration of analgesia by adding fentanyl to lowest concentration of bupivacaine and thereby reduces chance of postoperative motor block.

Material and method: following institutional approval and written consent ASA physical status 1-2 patients undergoing elective orthopaedic or lower abdominal surgery who

Volume : 4 | Issue : 10 | October 2014 | ISSN - 2249-555X

had agreed to receive postoperative epidural analgesia were considered for study. Exclusion criteria included local site infection , age> 75 yrs, weight >80kg, patients with past history of allergy to local anaesthetic, patient with preexisting neurological defect, and/or psychiatric history,. Thorough physical systemic examinations were done to exclude any abnormalities. Vital data in form of pulse, temperature, blood pressure, and respiratory rate, spo_2 were recorded. Routine investigations like hemoglobin, random blood sugar, renal function test, coagulation profile were done in all case. Each selected patient was informed in detail regarding procedure of study. Epidural catheter were placed preoperatively at a spinal level appropriate for the proposed surgery and were used to provide both intraoperative and postoperative analgesia.A18g epidural touhy needle and 19g epidural catheter (portex) were used and a elastomeric infusion pump with one way valve with fixed infusion rate of 2ml/hr lasting for 48 hours was used to deliver drugs epidurally. Catheter fixation was achieved with a clear adhesive dressing placed over site. Patients received general or spinal anaesthesia according to surgical procedure.

At the beginning of wound closure group F received epidural bolus of fentany 150microgramme with normal saline(total 10 ml) followed by continuous infusion of fentanyl 3 microgramme/ml with normal saline at a rate of 5ml/hr. for 48 hrs. while group BF received epidural bolus of fentanyl 150microgramme with 0.1% bupivacaine (total 10ml) followed by continuous epidural infusion of fentanyl 3microgamme/ml with 0.1% bupivacaine at a rate of 5ml/hr for 48hrs.

Postoperatively patient remained in recovery room or ICU for 48 hrs. Patients vital parameters checked at 5min, 15min, 1hr, 6hr, 12hr, 36hr, 48hrs.at the same interval motor block, sedation score, vas score also checked. Motor power grading by modified bromage scale was done. Pain scoring done by vas score. Vitals were monitored and recorded. Side effects like bradycardia, hypotension, nausea, and vomiting, urinary retention were recorded if any.

During infusion if vas score>3,epidural bolus of 25 µg fentanyl diluted upto10ml with normal saline in group F and epidural bolus of fentanyl 25 µg with 0.1% bupivacaine total 10 ml in group BF was given.

Analgesia was assessed using visual analogue score (vas 0=no pain, vas 100=worst pain).Side effects were measured using the following scale;

Somnolence:

0=alert,

1=drowsy,

2=sleepy but arousable,

3=sleepy but not arousable.

Sensory loss was determined by response to pinprick, motor blockade was quantified using a modified bromage scale.

Duration of post infusion analgesia was noted. Rescue analgesia given either in form of epidural bolus as mentioned earlier in both group or in form of intravenous analgesia (tramadol or diclofenac). We have also noted how much frequency of rescue analgesia needed in both groups.

OBSERAVATION AND RESULTS:

In our study, values were presented as mean ± standard deviation. Where appropriate for comparison between two groups. A paired student t test was applied. Difference were considered statistically significant if p>.05.We had used trial version of spf 15.0.

Fifty patients studied in the study.25 patients in group-F and 25 patients in group BF. There were no significant differences between the two groups with respect to age, gender, height, weight. (**table-1).**

Pain score evaluated by visual analogue score at different measurement times are shown in figure-1.The mean VAS scores ranged between 0-7 during study period. There was a difference in the VAS scores among the two groups over the study period, p<0.01.the plain fentanyl group had higher VAS score then the group BF.**(fig-1).**

Fig-2 shows percentages of patients needed rescue analgesia during continuous epidural infusion in both groups. In which among group BF 68% patients did not need any rescue analgesic and they are comfortable with continuous epidural infusion of fentanyl-bupivacaine mixture.Only12% patients of group BF needed single rescue analgesic while 20 % patients needed two time rescue analgesic doses. In group F 72% patients needed three time rescue analgesia, 16% needed two time and 12% patients needed four time doses of rescue analgesia which shows inadequate analgesia in group F during continuous epidural infusion for 48 hrs**. Fig- 3** shows duration of postinfusion analgesia. In group BF,3 patients had 6hrs of postinfusion analgesia,5 of them had 5 hrs,6 of them had 4hrs and 8 patients had 3hrs of postinfusion analgesia,3 patients had 2hrsof postinfusion analgesia. While in group BF 6 patients had no analgesia, 4 patients had only 1hr of postinfusion analgesia, 7 patients had 2hrs, 6 patients had 3hrs and 2 patients had 4hrs of postinfusion analgesia.

In group F 5 patients experienced nausea, 2 had vomiting and 3 patients had hypotension. In group BF 3 patients hd vomiting, 2 patients had hypotension which was treated with small dose of epinephrine. All side effects were mild and were treated with medicines.

Above results shows that bupivacaine-fentanyl mixture for continuous epidural infusion provide analgesia better in terms of quality as well as duration of analgesia.

DISCUSSION:

Injury in terms of surgery by deceasing nociceptive thresholds peripherally and in the spinal cord especially spinal dorsal column receptive fields enlarges with time in the presence of nociceptive stimuli. Persistence of such stimuli gives rise to postoperative pain[4]. The epidural analgesia as it provides dynamic pain control is most commonly used modality for postoperative analgesia. Localanaesthetic agents, most commonly used in epidural act by differential nerve block according to concentration used and fibers blocked. Minimal concentration to be used to minimize incidence of motor block. The addition of fentanyl to lowest concentration of bupivacaine in term of continuous epidural infusion. In this study we utilized the same to achieve most effective analgesia with minimal side effects. It also covered the entire duration of high intensity noxious stimuli and provides to be the effective analgesic regimen [5].

Volume : 4 | Issue : 10 | October 2014 | ISSN - 2249-555X

We compared both fentanyl and fentanyl with bupivacaine in continuous epidural infusion for postoperative analgesia. The analgesic effect of fentanyl alone is less only for 1-2 hrs which was explained by high vas score of groupf at 8,12,24,48 hrs postoperatively and also patients of Group-F needed more rescue analgesic as compared to Group-BF

A study done in 1994 compared three groups fentanyl, bupivacaine and fentanyl bupivacaine mixture for postoperative analgesia in abdominal surgery and concluded that using single bolus of any of above makes no difference in term of analgesia instead using single bolus of o.5%bupivacaine causes significant hypotension in number of study cases so they recommended extradural analgesic infusion in place of single bolus to reduce workload and to reduce possible delay in demand dosing[6]. Similar study done for postcholecystectomy patients with comparison of two different concentrations of fentanyl with bupivacaine and fentanyl alone they found using .0005% fentanyl with .1%bupivacaine provides synergistic analgesia with minimal side effects[7]. Various other studies done using different concentration of fentanyl as well as different concentration of bupivacine to provide optimal balance between pain relief and side effects with minimal concentration of fentanyl as well as bupivacaine[8,9]. This hypothesis can be explained by mean duration of postinfusion analgesia in our study which is 3.78hrs in group BF and 1.58hrs in group-f lower than group BF.

The use of bupivacaine opoid mixture in our study. A study designed with epidural versus intravenous fentanyl for postoperative analgesia in orthopaedic surgery and showed same analgesic effect in both routes but later group needed less supplemental analgesia. This suggests spinal action in addition to systemic action of fentanyl[10].

The randomized double blind study of 40 patients done by [11]showed; by direct spinal action fentanyl when given extradurally synergises with bupivacaine and provides improved quality of analgesia while decreasing side effects by using lower dose of bupivacaine in our study we utilized this mechanism.

Another double blind randomized study was undertaken to determine the most effective diluents volume of fentanyl .they diluted single 50microgramme dose of epidural fentanyl with varying volume of normal saline. The result was that 50microgramme of fentanyl diluted to ten ml of normal saline achieves longer duration of analgesia with shorter onset of action[12]. In past, study demonstrated same analgesic effect in both epidural as well as intravenous fentanyl but epidural fentanyl gives analgesia via systemic action[13]. Studies also reported that excellent and long-lasting postoperative analgesia with minimal side effects can be achieved by combining low concentration of narcotics to dilute solution of local anaesthetic as narcotic can minimized postoperative pain by stabilizing effect on sensory blockade in postoperative period and it also minimizes the increase in spinal excitability after peripheral trauma[14,15,16].We had combine fentanyl to lowest concentration of bupivacaine to achieve above mentioned effect of fentanyl in our study. met analysis done for acute postoperative pain relief and suggested the preemptive epidural analgesia as a good analgesic regimen amongst others as it attenuate postoperative pain scores, reduce supplemental postoperative analgesic requirements and also prolongs the first rescue analgesic request[17,18]. Therefore to establish preemptive analgesia in our patients we gave epidural topup before starting continuous epidural infusion.

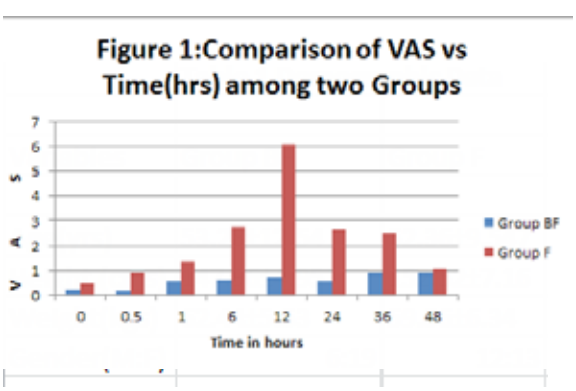
Number of study evaluated side effects of epidural infusion of opoids bupivacaine mixture and resulted that fentanyl had lowest incidence of severe nausea and vomiting as well as insignificant ventillatory depression[19,20,21]. Regular assessment is necessary to minimize complications and early intervention required to manage complications in epidural analgesia in tertiary hospital in their study. Various studies had used epidural fentanyl in ceaserian section and reported that it decreases nausea vomiting during uterine manipulations without causing neonatal depresson[22,23,24].

In our study we didn't find respiratory depression in any of patient. Only two patients experienced motor blockade which was of grade 2 and didn't require any treatment. Careful selection of patient, proper placement of epidural catheter and regular monitoring of patient postoperatively till 2nd postop day enabled us for success of our study. We didn't face any major complication during study. Early experiences with fentanyl in patient controlled epidural analgesia have been encouraging and this method could provide the ultimate solution if an optimum regimen can be determined and its safety, efficacy adequately shown in future studies.

CONCLUSION: As Fentanyl acts by different mechanism, if combined with extradural bupivacaine , it provides high quality analgesia and prolong the duration of analgesia. Combination of two drugs able to reduce single drug dosage and thereby minimize complications.

Table 1 Demographic Data

Variables	Group BF	Group F
Age(yrs)	53.28±12.54	52.36±9.547
Height.(cms)	147.96±4.95	152.52±7.16
Weight(kgs)	62.44±5.53	59.56±6.34
Gender(M:F)	6:19	12:13



Volume : 4 | Issue : 10 | October 2014 | ISSN - 2249-555X

Figure 2:Rescue analgesia during infusion among two groups

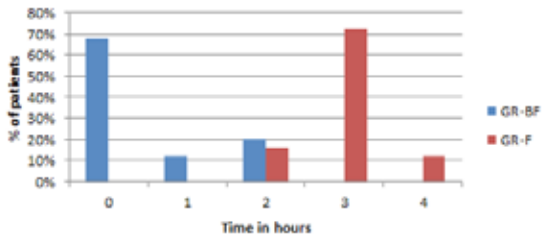
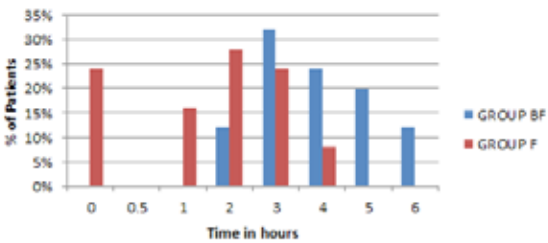


Figure 3:post infusion analgesia among two groups



REFERENCE

1)Shafiq, F., Hamid, M., Samad K.et al. Complications and interventions associated with epidural analgesia for postoperative pain relief in a tertiary care hospital.Middle East Journal of Anesthesiology 2010;20:827-32. | | 2)Susan M Nimmo. Benefit and outcome after epidural analgesia. Continuing Education in Anaesthesia, Critical Care & Pain 2004;4:44-47. | | 3)Scott, David A.; Beilby, David S. N.; McClymont, Calum ET et al. Postoperative Analgesia Using Epidural Infusions of Fentanyl with Bupivacaine: A Prospective Analysis of 1,014 Patients Anesthesiology 1995 ;83: 727-737. | | 4)DanielBoudreault, , Louis Brasseur, Kamran Samii, and Jean-Pierre Lemoingd'Anestht!sie et al-Comparison of Continuous Epidural Bupivacaine Infusion Plus Either Continuous Epidural Infusion or Patient-Controlled Epidural Injection of Fentanyl for Postoperative Analgesia. Anesthesia & Analgesia 1991;73:132-7. | (5)PramodKumar,KanuTaral et al.Preemptive postoperative analgesia using preoperative versus intra and postoperative infusion of fentanyl:Indian J PAIN 2009;23:241-245. | 6) T. A. Torda, P. Hann, G. Mills, G. De leon D. Penmanet al.Comparison of extradural fentanyl, bupivacaine and two fentanyl-bupivacaine mixtures for pain relief after abdominal surgery British Journal of Anaesthesia 1995; 74: 35-40. | 7) Huang FY, Fan SZ, Wang MS, Chen TL, Sun WZ, Lin SY et al.Comparison of continuous epidural infusion of fentanyl and fentanyl-bupivacaine for post cholecystectomy pain control. Ma ZuiXueZaZhi. 1990;28:9-13. | 8) C. N. H. Tan,A. Guha, N. D. A. Scawn, S. H. Pennefather and G. N. Russell et al.Optimal concentration of epidural fentanyl in bupivacaine 0.1% after thoracotomy. BRIT J ANAESTH2004;92:670-674. | 9)Neal H. Badner, Rakesh Bhandari,Wendy E. Komaret al. Bupivacaine 0.125% improves continuous postoperative epidural fentanyl analgesia after abdominal or thoracic surgery. Canadian Journal of Anaesthesia 1994;41:387-392. | 10) Marcelo SoaresPrivadol, Adriana Machado IssyII, Vera Lucia LanchoteIII, João Batista Santos GarciaIV, RiokoKimikoSakataVet al. Epidural versus intravenous fentanyl for postoperative analgesia following orthopedic surgery: randomized controlled trial Sao Paulo Med J 2010;128:5-9. | | 11)D. W. Cooper, D. M. Ryall W. R. Desiraet al. Extradural fentanyl for postoperative analgesia: predominant spinal or systemic action? British Journal of Anaesthesia 1995;74:184-187. | | 12) David J. Birnbach, Mark D. Johnson, Thomas Arcario, Sanjay Datta, J. Stephen Naultv, and Gerard W. Ostheimeret al. Effect of Diluent Volume on Analgesia Produced by Epidural Fentanyl ANESTH ANALG 1989;68:808-10. | | 13)Alan N. sandler, Davld stringer, Larry Panos., Neal Badner Mark Frtedtander, Gideon Koren, Joel Katz,.,S Julia Kteinet al. Analgesic, pharmacokinetic and respiratoryEfects. A Randomized, Double-blind Comparison of Lumbar Epidural and Intravenous Fentanyl Infusions for Postthoracotomy | Pain Relief Anesthesiology 1992;77:626-34. | 14)Fischer, Ronald L. Lubenow, Timothy R; Liceaga, Alvero; McCarthy, Robert J. PharmD; Ivankovich, Anthony D et al. Comparison of Continuous Epidural Infusion of Fentanyl-Bupivacaine and Morphine-Bupivacaine in Management of Postoperative Pain .Anesthesia & Analgesia1988;67:559-63. | 15) Rajib Bhattacharyya, Bhaskar Dutta et al. Postoperative Analgesia with Local Anaesthetic and Opioid Combinations, Using Double Space CSE Technique Indian J Anaesth 2007;51:409. | 16)N.-C. Hjortser, C. Lund, T. Mogensen, D. Bigler, and H. Kehlet et al. Epidural Morphine Improves Pain Relief and Maintains Sensory Analgesia during Continuous Epidural Bupivacaine after Abdominal Surgery. ANESTH ANALG 1033 1986;65:103-34. | 17) Allan Gottschalk; David S. Smith; David R. Jobes; Sean K. Kennedy; Sara E. Lally, BA; Vicki E. Noble, BA; Kathy F. Grugan, RN, MSN; Harry A. Seifert; Albert Cheung; S. Bruce Malkowicz; Brett B. Gutsche; Alan J. Wein et al. Preemptive Epidural Analgesia and Recovery From Radical ProstatectomyA Randomized Controlled TrialFREEJAMA. 1998;279:1076-1082. | 18) Cliff K.-S. Ong, Philipp Lirk, Robin A. Seymour, Brian J. Jenkins et al. The Efficacy of Preemptive Analgesia for Acute Postoperative Pain Management: A Meta-Analysis AnesthAnalg 2005;100:757-73. | 19) J. A. Gedney and E. H. C. Liu Side-effects of epidural infusions of opioid bupivacaine mixtures Anaesthesia 1998;53:1148–1155. | 20) B. Renaud, , J. F. Brichant, F. Clergue, M. Chauvin, J. C. Levron, P. Viars et al.Ventilatory Effects of Continuous Epidural Infusion of Fentanyl. AnesthAnalg 1988;67:971-5. | | 21) J. N. Cashman and S. J. Dolin Respiratory and haemodynamic effects of acute postoperative pain management: evidence from published data. British Journal of Anaesthesia2004;93:212–23. | 22) Terrance W. Breen, James A. Janzen. Epidural fentanyl and Caesarean section: when should fentanyl be given? canadian journal of anaesthesia1992;39:317-2. | 23)Gaffud, MaritesP,Bansal, Pratibha ; Lawton, Charles ; Velasquez, Norma ; Watson, William A. et al. Surgical Analgesia for Cesarean Delivery with Epidural Bupivacaine and Fentanyl. Anesthesiology 1986 ;65: 331-334. | 24) Paech MJ, Westmore MD, Speirs HM et al. A double-blind comparison of epidural bupivacaine and bupivacaine-fentanyl for caesarean section. Anaesthesia and intensive care 1990;18:22-30. |