

Evaluate Post-Operative Analgesic Efficacy of Epidural Injection Sufentanil Citrate (Single Bolus Of 30 Micrograms) in Case of Major Lower Abdominal Surgeries



Medical Science

KEYWORDS : Major lower abdominal surgeries, epidural analgesia, Inj Sufentanil, Post-operative pain

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ABSTRACT

Background: Pain is not just a sensory modality but it is an experience. To define pain is "An unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage".

Anaesthesiologist trained in pain management is in a unique position to contribute multidisciplinary pain management. Aims and objectives of study: (1) To study quality of postoperative analgesia (2) To study duration of postoperative analgesia. (3) To evaluate haemodynamic and respiratory effects of the technique. (4) Cost effectiveness of the technique. (5) To evaluate untoward effects or complications and their severity. (6) Patient and surgeon's acceptance. Material and methods: The study design includes 30 patients aged between 20 to 70 years of ASA Grade I and II. In all patients postoperative analgesia was provided by epidural sufentanil. The patients were scheduled for major abdominal gynaecological and vascular surgeries. All of the patients were underwent surgery under epidural catheter in place. Those patients in whom the necessity for combined general anaesthesia raised due to incompleteness of block were excluded from study. Results: 15 patients (50%) had an onset of analgesia within minutes out of which 8 were male (26.67%) and 7 were female (23.37%), while 13 patients had an onset of analgesic between 6 to 10 minutes. None of the patients had showed onset beyond 16 minutes. 11 patients (36.66%) had a pulse rate changes between 0 and 5 beats/minute from the mean baseline value. 9 patients (30%) had a pulse rate change between 5 to 9 beats/minute. The total number of patients who showed pulse rate change between 10 and 14 beats/minute were 9 (30%). None of the patients had shown pulse rate change between 15 to 19 beats/minute and only 1 patient showed decrease in pulse rate which was decrease in pulse rate > 20 which was accounting for 3.33%. 20 patients (66.66%) had a Blood pressure changes between 0 to 10 mmHg from the mean baseline value. Minimum duration of analgesia observed was 2 hours. Out of 30 patients total of 6 patients (20%) had shown duration of analgesia for 2 hours. At the end of 1 hour all 30 patient had either no pain (0 pain score) or just plain (1-3 pain score). Conclusion: Epidural sufentanil citrate 30 microgram is a safe opioid analgesic for postoperative pain relief because of its less irritable side effects and relative rapid onset of analgesia and moderate duration up to 6 hours. Ideal drug for epidural administration is yet to be established.

Introduction

Pain is not just a sensory modality but it is an experience. To define pain is "An unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage". Anaesthesiologist trained in pain management is in a unique position to contribute multidisciplinary pain management. The concept of postoperative analgesia is growing very fast and is an important part of duties of an anaesthesiologist. Anaesthesiologist can provide best postoperative pain relief. With their knowledge and familiarity with pharmacological, various regional techniques and the neurobiology of nociception anaesthesiologists are continually in the forefront of clinical research advances in post-operative pain management. AIMS AND OBJECTIVES OF STUDY: (1) To study quality of postoperative analgesia (2) To study duration of postoperative analgesia. (3) To evaluate haemodynamic and respiratory effects of the technique. (4) Cost effectiveness of the technique. (5) To evaluate untoward effects or complications and their severity. (6) Patient and surgeon's acceptance.

Material and methods

The study design includes 30 patients aged between 20 to 70 years of ASA Grade I and II.^[1] In all patients postoperative analgesia was provided by epidural sufentanil.^[2] The patients were scheduled for major abdominal gynaecological and vascular surgeries. All of the patients were underwent surgery under epidural catheter in place. Those patients in whom the necessity for combined general anaesthesia raised due to incompleteness of block were excluded from study.

Preoperative preparation: - Detailed history was taken, patients were physically examined and relevant investigations

were carried out. The procedure was explained to the patient and detailed informed consent was taken. No other analgesic was given pre and post operatively. All 30 patients were given (30 minutes prior to surgery): Injection Glycopyrrolate 0.2 mg intravenously, Injection Midazolam 0.03mg/kg intravenously. Procedure: - Patient is either on the side or sitting. Full aseptic precaution was taken. Site of the puncture was selected depending on the site of surgery and level of analgesia required. A wheal is raised with xylocaine 1% in midline between two spines. Epidural space located with 18 gauge Tuohy needle which is inserted and loss of resistance technique is used with syringe filled with saline. After giving bolus dose of local anaesthetic solution (Xylocaine or Bupivacaine) an epidural catheter was placed and sterile dressing with an adhesive tape applied. Top up doses were given depending upon duration of surgery. Preoperative narcotic and any kind of analgesic drug were avoided. Preoperative monitoring: - Usual routine monitoring done with pulse, Blood pressure, Arterial oxygen saturation, Electrocardiogram were done. Supplemental oxygen was given to all patients. Postoperative period: - Postoperatively patients were explained to inform whenever they feel pain. The subjective sense of pain has been assessed by "Visual Analogue scale". Injection Sufentanil 30 microgram preservative free diluted in distilled water was administered epidurally when patient has a pain score 6 or more. Pain Scoring: - Assessment of pain was done using Visual Analogue Scale and analgesic was administered when patients reaches a pain score of 6 or more. Postoperative observation and management: - Patients were observed for 8 hours every hourly. Pulse, Blood Pressure, respiratory rate, SPO2 and other side effects related to narcotic analgesic like nausea and vomiting, itching, urinary retention.

Results

Table – 1 Types of surgical procedures

Surgical Procedure	No. of patients
Pan abdominal Hysterectomy	6
Vaginal Hysterectomy	4
Tubal Recanalization	3
Aortofemoral Bypass	2
Femoropopliteal Bypass	1
Abdominoperineal resection	2
Total Cystectomy with ileal conduit	2
Hemicolectomy	1
Bilateral Hernia Repair	5
10) Ovarian Cystectomy	1
11) Laparotomy	1
12) Nephrectomy	2
Total	30

Table – 2 Onset of analgesia

Onset of Analgesia (Time)	No. of Patients				Total	
	Male		Female		No. of Patients	Percentage
	No. of Patients	Percentage	No. of patient	Percentage		
0 – 5 min	8	26.67	7	23.33	15	50
6-10min	5	16.67	8	26.67	13	43.34
11-15min	1	3.33	1	3.33	2	6.66
16-20min		0	0	0	0	0
Total	14	46.67	16	53.33	30	100

Table – 3 Change in pulse rate

Change in pulse Rate (Mean beats/min) No. of patients	Male		Female		Total		
	Percentage	No. of patients	Percentage	No. of patients	Percentage		
0-5	In-creased	2	6.67	2	6.67	4	13.33
	De-creased	6	20	1	3.33	7	23.33
5-10	In-creased	1	3.33	1	3.33	2	6.67
	De-creased	2	6.67	5	16.67	7	23.33
11-15	In-creased	2	6.67	2	6.67	4	13.33
	De-creased	4	13.33	1	3.33	5	16.67
15-19	In-creased	-	-	-	-	-	-
	De-creased	-	-	-	-	-	-
>20	In-creased	-	-	-	-	-	-
	De-creased	-	-	1	3.33	1	3.33
Total	In-creased	5	16.67	5	16.67	10	33.33
	De-creased	12	40	6	26.67	20	66.67
					30	100	

Table – 4 Change in blood pressure

Change in Blood Pressure (Systolic mmHg) No. of patients	Male		Female		Total		
	Percentage	No. of patients	Percentage	No. of patients	Percentage		
0-10	In-creased	6	20	3	10	9	30
	De-creased	4	13.33	7	23.33	11	36.66

11 – 20	In-creased	1	3.33	1	3.33	2	6.67
	De-creased	2	6.67	1	3.33	3	10
21 – 30	In-creased	1	3.33	1	3.33	2	6.67
	De-creased	2	6.67	1	3.33	3	10
>30	In-creased	-	-	-	-	-	-
	De-creased	-	-	-	-	-	-
Total	In-creased	8	26.66	5	16.67	13	43.44
	De-creased	8	26.66	9	30	17	56.66
						30	100

Table – 5 Change in respiratory rate

Respiratory Rate (breaths/minute)	No. of Males		No. of Females		Total	
	Number	Percentage	Number	Percentage	Number	Percentage
Increased from Baseline	-	-	-	-	-	-
No Change	2	6.67	3	10	5	16.67
-2 to -4	6	20	8	26.67	14	46.67
-4 to -6	3	10	6	20	9	30
-6 to -8	1	3.33	-	-	1	3.33
-8 to -10	-	-	-	-	-	-
-10	1	3.33	-	-	1	3.33
Total	-	-	-	--	30	100

Table – 6 Pain scoring

Pain score	Number of patients							
	1 hr.	2 hr.	3 hr.	4 hr.	5 hr.	6 hr.	7 hr.	8 hr.
0	23	15	3	3	-	-	-	-
1	4	6	7	4	-	-	-	-
2	2	4	3	3	1	1	-	-
3	1	3	4	5	4	1	-	-
4	-	2	1	3	2	3	-	-
5	-	-	4	3	2	3	-	-
6	-	-	4	4	6	6	4	-
7	-	-	3	3	12	13	15	10
8	-	-	1	2	3	3	6	8
9	-	-	-	-	-	-	4	7
10	-	-	-	-	--	-	2	5

Discussion

There are various methods of postoperative pain relief, but after discovery of opioid receptors in brain and spinal cord, with epidural and subarachnoid narcotics have gained great popularity by which post-operative analgesia provides without autonomic block and with minimal side effects.^[3] Trials with new drugs are to find a suitable agent which could give a high quality of analgesia for a reasonable duration and with minimal side effects. This study was conducted to evaluate the effects of a single dose epidural sufentanil citrate 30 microgram for post-operative pain relief. In 1994 Ellmauer S. demonstrated that Epidural application of 10-50 micrograms sufentanil provides rapid and effective pain relief within 5-7 min for a period of 3-7 h. Doses of more than 50 micrograms seem to increase the risk of respiratory depression without further improvement of analgesia.^[4] Poopalalingam R, Chow MY demonstrated that while giving Patient-controlled epidural analgesia after thoracic and upper abdominal surgery using sufentanil with and without bupivacaine 0.125%.^[5] The addition of bupivacaine to sufentanil did not significantly reduce the amount of sufentanil required, the pain scores or the side effects. In 1987 T. H. MADEJ, L. Strunin *et al* demonstrated Analgesia and side effects after a single bolus dose during elective Caesarean section in a comparative study of epidural fentanyl with sufentanil.^[6] Duration of analgesia and side effects following single bolus doses of epidural fentanyl (100 µg) or sufentanil (10, 20, 30 or 50 µg) were studied in 50 patients who underwent Caesarean section under epidural anaesthesia. Fewer patients experienced pain preop-

eratively in the fentanyl group than in a joint group of those given sufentanil 20 or 30 μg ($p < 0.05$). The combined fentanyl and sufentanil 50 μg groups had fewer patients in pain than the sufentanil 10 μg group at 3 hours after injection ($p < 0.05$). Patients given fentanyl also had a longer pain-free interval than those who received sufentanil 10 μg ($p < 0.02$). The sufentanil 50 μg groups had more patients asleep than the 10 μg group and also had more patients with pruritus than the 10 μg or 30 μg groups ($p < 0.02$). The patients given sufentanil 30 and 50 μg had more emetic squal than those who received sufentanil 10 and 20 μg or fentanyl 100 μg ($p < 0.05$). There was no detectable excretion of drug into breast milk and no significant respiratory depression at the time of first postoperative analgesia in the patients or 30 μg or less of sufentanil. Donadoni R, Rolly G, Noorduyn H, Vanden Bussche G. studied the epidural sufentanil for postoperative analgesia. An open pilot study was undertaken to evaluate the analgesic properties of epidurally administered sufentanil in the early postoperative period.^[7] After orthopaedic surgery of the lower extremity, four different groups of five adult patients each received 15 micrograms (group 1), 30 micrograms (group 2), 50 micrograms (group 3) or 75 micrograms (group 4) sufentanil via an epidural catheter previously used for the surgical procedure. Results were satisfactory in groups 3 and 4 with very good relief of pain and a mean duration of action of 372 and 307 minutes respectively. Dosage above 50 micrograms did not seem to improve the quality or duration of pain relief, although the onset of action was faster with 75 micrograms. Sedation was always present in patients with effective analgesia. In the present study respiratory depression was not evident, but three patients complained of itching and two of urinary retention. Verborgh C, Claeys M, Vanlersberghe C, Camu F studied Postoperative pain treatment after cholecystectomy with epidural sufentanil at lumbar or thoracic level.^[8] The difference in analgesic activity following lumbar (group I) or thoracic (group II) epidural administration of 50 micrograms sufentanil was studied after cholecystectomy. Fifteen patients in each group were evaluated for pain relief using a linear analog scale (LAS), heart rate (HR), mean arterial pressure (MAP), respiratory rate (RR), peak expiratory flow (PEF), forced vital capacity (FVC), forced expiratory volume (FEV1) and arterial Co_2 tension (PaCo_2). In five additional patients in each group 75 micrograms sufentanil was injected for determination of serum levels. Pain scores were lower than three in both groups after 10 min, while mean pain scores remained below one from 20 min until 2 h following injection in both groups. Satisfactory pain relief lasted for 4 h. RR was significantly decreased from two until 360 min. in the lumbar group and from five until 120 min in the thoracic group. PaCo_2 was raised in both groups only during the first hour. PEF and FVC were significantly improved compared to control 1, 2 and 4 h following injection. Serum sufentanil levels reached a maximum of $0.299 \pm 0.052 \text{ ng.ml}^{-1}$ in the lumbar group and $0.377 \pm 0.076 \text{ ng.ml}^{-1}$ in the thoracic group after 5 min. There were no significant differences between the two groups in the variables studied. In our study, minimum duration of analgesia observed was 2 hours while maximum duration of analgesia was 6 hours. VAS score^[9] of 6 or more was considered as severe unbearable pain and when patients reached the score of 6 or more intervention with rescue analgesic was done. Out of 30 patients total of 6 patients (20%) has shown duration of analgesia for 2 hours. Of these patients 2 patients (6.67%) were male while rest 4 patients (13.33%) were female. 8 patients (26.67%) have shown duration of analgesia for 3 hours. Of these patients 2 patients (6.67%) were male while rest 6 patients (20%) were female. 7 patients (23.33%) have shown duration of analgesia for 4 hours. Of these patients 5 patients (16.67%) have shown duration of analgesia for 5 hours. Of these patients 3 patients (10%) were male while rest 2 patients (6.67%) were female. 4 patients (13.33%) have shown duration of analgesia for 6 hours. Of these patients 3 patients (10%) were male while rest 1 patients (3.33%) were female. No patient had duration of analgesia more than 6.5 hours. Increasing

does beyond 50 microgram does not increase the duration of analgesia rather it contributes to increased incidence and frequency of side effects. Van der Auwera D, Verborgh C, Camu F. studied Analgesic and cardiorespiratory effects of epidural sufentanil and morphine in humans and concluded that 5 mg morphine injected epidurally provides longer lasting analgesia than does 50 micrograms sufentanil, but that in the first hours analgesia is better after sufentanil.^[10] Injection of either drug was accompanied by remarkable cardiovascular stability. R. DONADONI et al compared Epidural sufentanil 50 mg was with intramuscular buprenorphine 0.3 mg for postoperative pain relief. Patients were assigned randomly to one of two treatment groups and received both an intramuscular and epidural injection, one of which was a placebo. Onset of pain relief was faster and quality of analgesia superior during the first 2 hours in the patients who received epidural sufentanil but the duration of analgesia was longer in the buprenorphine group. Cardiovascular variables remained stable. In all patients and no respiratory depression was observed. Side effects were more frequent following buprenorphine. In this study there was no significant changes in pulse rate and blood pressure in 20 patients (66.67%) and 25 patients (83.33%) respectively. The criteria for significant change in pulse rate and blood pressure were adopted from a study conducted by Dr. Darshan Shelat, October – 2005. Topic is “Comparison of Epidural Tramadol and Epidural Fentanyl for postoperative pain relief.” According to this study the pulse rate change of 10 beat/minute from baseline value was considered significant while for blood pressure change of 20 mmHg of systolic from baseline systolic pressure was considered as significant. According to these criteria only 4 patients (13.33%) had significant increase of pulse rate while 6 patients (20%) have significant decrease in pulse rate. While for blood pressure only 3 (6.67) patients had an increase in blood pressure significant while 3 patients (10%) had decreased blood pressure significantly. Whiting WC, Sandler AN, Lau LC, Chovaz PM, Slavchenko P, Daley D, Koren G. studied Analgesic and respiratory effects of epidural sufentanil in patients following thoracotomy.^[11] Immediately following thoracotomy, 22 patients were entered into a randomized, double blind study comparing the effects of three lumbar epidural doses of sufentanil on postoperative pain and respiratory pattern. Patients were given either 30 micrograms (group I), 50 micrograms (group II), or 75 micrograms (group III) of epidural sufentanil in 20 ml N Saline. Repeat doses were given on request for the 24-h study period. Linear analogue pain score (PS), heart rate (HR), and mean arterial pressure (MAP) were measured at 15-min intervals after each dose. Respiratory depression was assessed by the presence of: 1) slow respiratory rate (SRP—less than 10 breaths per minute for greater than 5 min), 2) apnea (AP—cessation of tidal ventilation for greater than 15 s), and 3) increased paCO_2 in arterial blood gases (ABG) drawn at regular intervals. SRR and AP were measured using respiratory inductive plethysmography (RIP). A further group of ten patients (group IV) underwent preoperative RIP monitoring during sleep and in the absence of any drug. Maximum analgesia was achieved within 15 min after dose of sufentanil for all groups. Analgesia was not significantly prolonged by increasing the dose of sufentanil. SRR occurred in all four groups (group I: 2/9; group II: 2/6; group III: 7/7; group IV: 2/10 P less than 0.05 I, IV: II, I, IV: III, II: III). The number if episodes of SRR/hr. was highest in group II (group I: 0.6 ± 0.8 , group II: 4.12 ± 0.6 , group III: 1.8 ± 2.0 , group IV: 0.5 ± 0.2) (NS). Szilvia Szarvas, Dominic Harmon, Damian Murphy studied Neuraxial opioid-induced pruritus. When intrathecal and epidural opioids are administered, pruritus occurs as an unwanted and troublesome side effect. The reported incidence varies between 30% and 100%. The exact mechanisms of neuraxial opioid-induced pruritus remain unclear. Klepper ID, Sherrill DL, Boetger CL, Bromage PR have studied Analgesic and respiratory effects of extradural sufentanil in volunteers and the influence of adrenaline as an adjuvant.^[12] Moderate drowsiness occurred in most subjects, while other side effects of itching, nausea and urinary retention oc-

curred less frequently and were not severe. Cohen SE, Labaille T, Benhamou D, Levron J. studied the Respiratory effects of epidural sufentanil after cesarean section. The presence and severity of sedation and other nonrespiratory side effects were evaluated throughout the study. Analgesia was similar in both groups. Side effects, particularly sedation, were more severe with the 50 micrograms dose. We conclude that 30 micrograms of epidural sufentanil is preferable to the higher dose with regard to both respiratory and nonrespiratory side effects. Even with the lower dose, monitoring of ventilation is advisable for a minimum of 2 h. Coda BA, Brown MC, Schaffer R, Donaldson G, Jacobson R, Hautman B, Shen DD. Studied pharmacology of epidural fentanyl, alfentanil, and sufentanil in volunteers. They concluded that Lumbar epidural fentanyl, alfentanil, and sufentanil produce selective lower-extremity analgesia. Low plasma opioid concentrations measured after small epidural opioid doses suggest a spinal mechanism for analgesia. Larger doses of epidural opioids result in systemic absorption and are likely to produce supraspinal analgesia and other side effects. The incidence of side effects is very less and that too are of minor type. Only 1 of 3 patients who had severe vomiting required treatment while none of other side effects required treatment. Respiratory depression was managed by supplemental oxygen and intravenous naloxone.

CONCLUSION

Epidural sufentanil citrate 30 microgram is a safe opioid analgesic for postoperative pain relief because of its less irritable side effects and relative rapid onset of analgesia and moderate duration up to 6 hours. Ideal drug for epidural administration is yet to be established.

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