ORIGINAL RESEARCH PAPER

Anaesthesiology

ROLE OF DEXMEDETOMIDINE FOR POST-OPERATIVE PAIN RELIEF IN PATIENTS UNDERGOING HERNIA REPAIR SURGERY.

KEY WORDS: Hernia, Post-operative pain, Dexmedetomidine.

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ABSTRACT

Background: Wound infiltration is a widely used technique for post-operative pain relief in patients undergoing hernia repair surgery. The objective of this study was to assess the efficacy of dexmedetomidine in post-operative pain relief in patients undergoing hernia repair. Patients underwent wound infiltration with dexmedetomidine and the duration of post-operative pain relief was studied.

Materials and Methods: 80 patients undergoing hernia surgery were included in the study. All the patients belonged to ASA grade I to III and had no contraindications for Spinal anaesthesia. 40 patients were infiltrated with 1ml of dexmedetomidine in addition to 29ml of 0.25% bupivacaine and were included in the Study group. The rest 40 patients were infiltrated with 29ml of 0.25% bupivacaine and 1ml of 0.9% saline.

Results: The P value was found to be statistically significant. There was a significant difference in the time required for the first analgesic request i.e. rescue analgesia in both the groups. The Visual Analogue Score was higher in the Study group compared to the Control group.

BACKGROUND:

Absolute pain relief is the need of the hour in any patient undergoing surgery. Optimal pain relief leads to early ambulation, prevention of thrombo-embolic phenomenon and improved well-being of the patient, early recovery and early discharge of the patient from the hospital. Multimodal approach for pain relief is gaining popularity. In our study we assessed the effect of wound infiltration as a part of multimodal anaesthesia in patients undergoing hernia operation. Chou R, Gordon DB et al[1] highlighted on the guidelines of management of post-operative pain. Kaur M et al[2] described the current role of dexmedetomidine in clinical anaesthesia and intensive care.

Dexmedetomidine is an imidazole compound. It has selective alpha-2 adrenoceptor agonistic action. It causes analgesia without delirium or respiratory depression. Activation of the alpha receptors in the brain and spinal cord inhibits neuronal firing. Dexmedetomidine given systemically has been found to decrease anaesthetic and analgesic drug requirement. As the synergistic effects of dexmedetomidine and bupivacaine have been recognized in a progressive manner. The purpose of this study was to examine if dexmedetomidine mixed with bupivacaine produced significant pain relief and extension of post-operative analgesia by performing wound infiltration during the inguinal hernia repair.

AIMS AND OBJECTIVES:

The main aim of our study was to study the effect of dexmedetomidine as an adjuvant in local wound infiltration for post-operative analgesia in patients undergoing hernia repair surgery. The time required for first rescue analgesia was studied. Adverse effects like pruritus, nausea, vomiting, hypotension and bradycardia were also studied.

MATERIALS AND METHODS:

We studied 80 consecutive adult male patients presenting for elective unilateral inguinal hernia repair in a double-blind randomized study. The study was conducted at Yashwantrao Chavan Memorial Hospital in the year 2014 to 2016 and was approved by the Ethical Committee. Written informed consent was obtained from all the patients. All these patients belonged to ASA Grade I to III with co-morbidities under control. There was no contraindication towards spinal anaesthesia in any of these patients. All the patients received spinal anaesthesia for the operative procedure. These patients were divided into 2 groups. The Study group received 29 ml of 0.25% bupivacaine plus 1ml of dexmedetomidine for wound infiltration. The Control group received 29 ml of 0.25% bupivacaine with 1ml of 0.9% normal saline for the local wound infiltration. The exclusion criteria were local infection at the site of injection of spinal anaesthesia, coagulopathies, allergies to the specified drugs, any associated uncontrolled systemic disorders, psychological disorders and patient refusal. Recurrent hernia surgeries were excluded, as the degree of dissection and thus tissue trauma would be expected to be greater than for first repairs.

All the patients were posted for surgery after an appropriate "nil by mouth" period and antacid prophylaxis. In the operation theatre, an intravenous line was established for every patient. The basic vital parameters such as blood pressure, heart rate and oxygen saturation were recorded by attaching multipara parameter to each and every patient. Adequate preloading was done with one litre of crystalloid before giving spinal anesthesia to every patient. Spinal anaesthesia was given in sitting position under strict aseptic precautions. 0.5% heavy bupivacaine was used to give spinal anesthesia. The level of anaesthesia achieved was up to T6 dermatomal level. The vital parameters were monitored throughout the intraoperative period. The duration of surgery was 55 to 60 minutes, and none of the patients had any intraoperative complications.

The patients were randomly divided into two groups. All the patients received an infiltration of 30 ml mixture into the surgical wound. Patients in the study group underwent wound infiltration with 29 ml 0.25% bupivacaine and one ml dexmedetomidine. Patients in the control group underwent wound infiltration with 29 ml 0.25% bupivacaine & one ml of 0.9% saline. Before closure the surgeon infiltrated the wound in three stages. In the first stage, the surgeon blocked the ileo-inguinal and ileo-hypogastric nerves. In the second stage the external oblique aponeurosis was infiltrated, along with the Scarpa's fascia. Finally, the incision site and the underlying subcutaneous fat was infiltrated.

The patient, surgeon and all the other medical staff and nursing staff were blinded to the patient's treatment. Postoperatively the patient's data was recorded by the surgery resident and ward nurses. They were totally unaware of the group to which the patient belonged. They recorded the timing of rescue analgesia after the surgery and total opioid analgesic requirement after the surgery up to 12 hours. The

visual analogue pain scores were also recorded at rest and on coughing up to 12 hours after the surgery. The patients were asked to indicate the degree of pain on a grading scale of 10. The two ends indicated "No pain" and "Worst imaginable pain". The type of surgical repair and the duration of surgery were recorded along with any complications which required treatment. The complications like nausea, vomiting, hypotension, bradycardia and sedation were also monitored. The residents were instructed to give injection Ephedrine 6mg intravenously if the systolic blood pressure went below 90mm of Hg and injection Atropine in case of bradycardia, (heart rate < 50/min). If the patient had a sedation score of 3 or more, then they were given supplemental oxygen via face mask at 10 litres/min. In any of the above instances the consultant anesthesiologist had to be informed immediately. Rescue analgesia was provided with injection Tramadol 2mg/kg intravenously. Side effects such as nausea, vomiting, respiratory depression and deep sedation were checked for and taken care of.

Statistical analysis:

40 patients received 0.25% bupivacaine with one ml dexmedetomidine (Study group) and 40 patients received 0.25% bupivacaine with one ml of 0.9% saline (Control group). Both the groups were matched for age, BMI, duration and type of surgery (Table 1). The results were analyzed using the SPSS software. The time required for rescue analgesia was calculated. The total required dose of injection tramadol up to 12 hours was also calculated. P value < 0.05 was considered as statistically significant. The P test and the Z test were used to analyze the statistical data.

RESULTS:

The period following the wound infiltration up to the requirement of rescue analgesia was observed and studied for 12 hours. The hemodynamic parameters were also monitored. Rescue analgesia was given when the patient complained of pain and demanded pain relief. The total dose of injection tramadol required was also calculated. The sedation score was recorded on the Modified Ramsay Score from one to six, according to the level of activity of the patient. Nausea and vomiting was recorded on a four point scale (0-none, 1-nausea, 2- retching and 3-vomiting). Any patient with a score of more than one was treated with injection ondansetron 4mg intravenously. The patients were observed in order to calculate the time at which the rescue analgesia was required and the total dose of opioid required.

In the study group 3 patients required injection atropine 0.6mg for bradycardia and 2 patients received injection ephedrine 6mg intravenously in view of hypotension (BP<86mm of Hg). Hypotension or bradycardia was not seen in the control group patients. The average time at which the first dose of opioid required was 723 minutes (SD 53.214) in the study group compared to 371 minutes (SD 63.520) in the control group. The P value of this difference was found to be < 0.0001, which was statistically significant. The patients who received dexmedetomidine had a sedation score of 3 in comparison to the control group who had a score of 2. Two (5%) patients had nausea in the study group in contrast to five (12.5%) patients in the control group.

The total requirement of opioid analgesic in the study group was 92.250 mg (SD 9.736). In contrast, the control group required 200 mg (SD 10.213). The P value of this difference was statistically significant (P < 0.0001).

Table 1. Demographic data

Parameter	Study (n=40)		Control (n=40)		Z Value	P Value
	Mean	SD	Mean	SD		
Age (Years)	62.025	4.2576	63.600	3.9275	1.72	0.089
BMI	23.500	2.0878	23.475	2.2869	0.05	0.96
Mesh repair (n, %)	13	32.5%	11	27.5%	0.49	0.63
Duration(min)	57.275	4.2365	57.300	4.2979	0.03	0.98

Table 2: Sedation score

Level of Activity	Modified Ramsay Score
Anxious, agitated, restless.	1
Cooperative, oriented, tranquil.	2
Responsive to commands only.	3
Brisk response to light, glabellar tap or loud auditory stimulus.	4
Sluggish response to light, glabellar tap or loud auditory stimulus.	5
No response to light, glabellar tap or loud auditory stimulus.	6

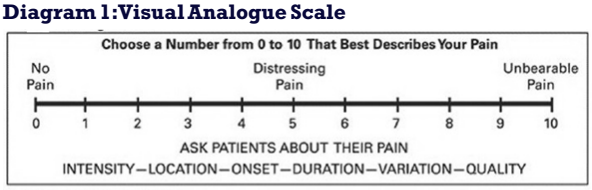
Table 3. Comparison of Rescue analgesia, Total Tramadol requirement and incidence of nausea in Study group and Control group

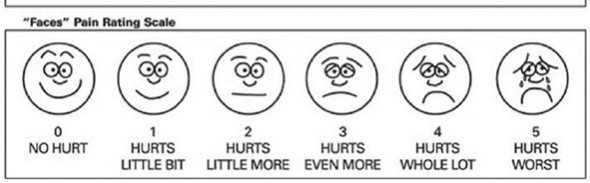
Parameter	Study (n=40)		Control (n=40)		Z Value	P Value
	Mean	SD	Mean	SD		
Rescue analgesia (min)	723.000	53.2146	371.000	63.5206	26.87	<0.0001
Total Tramadol (mg)	92.250	9.7369	200.000	10.213	69.99	<0.0001
Nausea (n, %)	2	5%	5	12.5%	1.20	0.23

Table 4: Comparison of VAS score in study and control group

VAS score	Study (n=40)		Control (n=40)		MW test Z Value	P Value
	Mean	SD	Mean	SD		
At 1hr (rest)	.075	.2667	.100	.3038	0.39	0.69
At 1hr (coughing)	1.075	.8286	2.900	.9001	6.61	<0.0001
At 6hrs (rest)	.575	.6360	3.900	.9554	7.79	<0.0001
At 6hrs (coughing)	2.950	1.0365	6.125	1.2442	7.39	<0.0001
At 12hrs (rest)	4.000	1.0127	4.050	1.1311	0.14	0.89
At 12hrs (coughing)	5.050	1.3388	6.975	1.3490	0.26	0.80

Diagram 1: Visual Analogue Scale





DISCUSSION:

We chose elective hernia surgeries for our study since 'wound infiltration' is an established and an effective method of postoperative analgesia. We devised a standardized technique for wound infiltration which was done in 3 stages to provide a reliable distribution of the local anesthetic. C.A. Harrison and F. Morris et al[3] studied the effect of ilioinguinal and ilio-hypogastric nerve block and wound infiltration with 0.5% bupivacaine on postoperative pain after hernia repair in 40 adult males. Postoperative pain relief was studied in the first 24 hrs after the hernia surgery. The time to first analgesia was delayed in the bupivacaine group and was not followed by a rebound increase in requirement for analgesia. There was no significant difference in VAS scores at rest but there was a significantly higher pain score with movement in the saline group. Tverskoy et al[4] studied postoperative pain relief with different modalities of anaesthesia in 36 patients

undergoing inguinal herniorrhaphy. He concluded that addition of local anaesthesia significantly decreased the intensity of all types of postoperative pain. Dierking G et al[5] studied the effects of wound infiltration with bupivacaine versus saline on the postoperative pain and opioid requirement after herniorrhaphy and found that pain at rest, during mobilisation and during cough was significantly decreased in patients receiving bupivacaine when compared with a placebo. Michael F Mulroy et al[6]studied the effect of different concentrations of ropivacaine by infiltrating it into the wounds of 110 healthy patients following their hernia repair under spinal anaesthesia. They concluded that 0.25% and 0.5% ropivacaine provided adequate pain relief following surgery in contrast to saline or 0.125% ropivacaine. Obayah, Gihan, M Refaie et al[7] studied the addition of dexmedetomidine to bupivacaine and concluded that greater palatine nerve block with this combination, increased the duration of analgesia after repair of a cleft palate by 50% with no clinically relevant side effects in 30 children. H Kang[8] studied the combination of dexmedetomidine and ropivacaine infiltration on post-operative pain after inguinal herniorrhaphy, in 52 male patients. He concluded that addition of dexmedetomidine to pre-emptive ropivacaine infiltration reduces the pain during the postoperative period after inguinal herniorrhaphy. He highlighted on the ease of technique and also emphasized on the minimal or nil side effects. Esmaoglu et al[9] evaluated the effect of adding dexmedetomidine to levobupivacaine and concluded that dexmedetomidine shortens the onset time and prolongs the duration of the block, thus prolonging the postoperative analgesia. Marhoffer D and Kettener SC et al[10] studied the effect of dexmedetomidine as an adjuvant to ropivacaine and concluded that dexmedetomidine prolongs the peripheral nerve block by 10%, in comparison to ropivacaine used alone. Naaz S. et al[11] reviewed the use of dexmedetomidine and confirmed that dexmedetomidine, an alpha-2 adrenergic receptor agonist, is 10 times more selective than clonidine. It is an intense analgesic, has an anesthetic sparing effect along with cardiovascular stability. It reduces delirium and preserves the respiratory function which is more beneficial than clonidine. In our study, the addition of dexmedetomidine significantly reduced the need for rescue analgesia with opioids thus reducing the total requirement of opioids

CONCLUSION:

Dexmedetomidine as an adjuvant in wound infiltration reduced the total opioid requirement in patients undergoing hernia repair surgery. The duration of rescue analgesia was also increased. This concludes that postoperative wound infiltration with dexmedetomidine is beneficial for postoperative analgesia.

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