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Post-operative Analgesic effect of Bupivacaine with Dexmedetomidine VersusBupivacaine Alone in Wound Infiltration in Total Abdominal Hysterectomy

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Abstract:
Background*: Local infiltration of a surgical wound is becoming one of the essential components of pain relief in the postoperative period.There is considerable new interest in searching for alternative methods for pain treatment, requiring minimal post-operative standard monitoring. Wound infiltration with local anaesthetics like bupivacaine is an alluring method because of its safety, simplicity and low cost. Dexmedetomidine is a potent α2 adrenoceptor agonistand is approximately eight times more selective towards α2 adrenoceptors than clonidine.*
Aim:*This study was done to determine the postoperative analgesic effect of the addition of dexmedetomidine to bupivacaine for local infiltration of the surgical wound.*
Materials and Methods:*Sixty women belonging to American Society of Anaesthesiologists (ASA) grade 1 or 2 posted for abdominal hysterectomy were allocated randomly into two groups. Group I (control group) patients received 20 mL 0.25% bupivacaine and 1cc normal saline at the end of surgery for wound infiltration.In Group II, patients received 20ml 0.25%bupivacaine and 1.0 mcg/kg dexmedetomidine for wound infiltration. Age, ASA grade, duration of analgesia wasassessed.*
Results:*There is no significant difference in the mean age and ASA grade of patients of both groups. Most of the patients were males. There is significantly less pain as per the Visual analogue scale(VAS)in group II patients compared to group I patients. Total dose of diclofenac and fentanyl consumed was less in group II patients compared to controls.*
Conclusion:*From our study results, it is concluded that wound infiltration with dexmedetomidine and bupivacaine provides superior pain relief compared to bupivacaine alone.*
Key Words: *Bupivacaine, Dexmedetomidine, Hysterectomy, Postoperativeanalgesia,Woundinflitration*

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I. Introduction

Pain is a fundamental biological phenomenon experienced by humans. According to the International Association for Study of pain, it is an unpleasant emotional & sensory experience which is associated with actual or maybe potential tissue damage or described in terms of such damage. Pain is always underestimated and undertreated. Hence the relief of pain during surgery is a significant part of anaesthesia. Abdominal hysterectomy is the second most common surgery performed in females aged between 25 and 50 years and is associated with moderate to severe post-operative pain. Postoperative pain delays recovery and can also cause chronic pain. The current standard in peri-operative pain management is to approach in a multimodal way. Some consider epidural analgesia to be the gold standard for pain management after abdominal surgeries. Nevertheless, concerns remain over the complications after neuraxial blocks, specifically in older patients.Thus, there is considerable new interest in searching for alternative methods for pain treatment requiring minimal post-operative standard monitoring. Wound infiltration with local anaesthetics is an alluring method because of its safety, simplicity and low cost. Adjuvants can be added to local anaesthetic infiltration that can improve the duration and quality of analgesia. The added adjuvants are ketorolac, epinephrine, opioids, clonidine. Dexmedetomidineis a potent α2 adrenoceptor agonistand is approximately eight times more selective towards α2 adrenoceptor than clonidine.[1-2]When dexmedetomidine is given I.V., it has a significant opioid-sparing effect as well as a decreased requirement of anaesthetic agents. Dexmedetomidine can also be used as an adjunct to

local anaesthetics for various local infiltrations. The present study was aimed to test the hypothesis that when dexmedetomidine is added as an adjuvant to local anaesthetic bupivacaine for post-operative wound infiltration after abdominal hysterectomy effectively decreases diclofenac and fentanyl consumption in first 24 hours of entering the post-operative care unit (PACU).0.25% Bupivacaine is the most commonly used drug for the procedure. It is a long-acting amide local anaesthetic. In higher concentrations, it causes cardiotoxicity as well as CNS toxicity.Among the recent developments in wound infiltration, Ropivacaine which is a newer longer-acting local anaesthetic belonging to group aminoamides of local anaesthetics just like Bupivacaine.[3-5] It is a pure S(-) enantiomer, unlike Bupivacaine, which is a racemate, developed to reduce potential toxicity and improve relative sensory and motor block profiles.[6]Dexmedetomidine, a newer α2-adrenoreceptor agonist, is currently in focus for its sedative, anxiolytic, and analgesic properties. It results in a dose-dependent increase in the duration of sensory.

Aim:
This study was done to determinethe postoperative analgesic effect of dexmedetomidine when added to Bupivacaine for local infiltration of the surgical wound.

II. Material And Methods

This comparative study was carried out at a tertiary care centre in India from March 2020 to July 2022.
Study Design: InterventionalRandomizedstudy
Study Location: This study was done at a tertiary care teaching institute in the Department of anaesthesia at Great Eastern Medical School and Hospital, Srikakulam, Andhra Pradesh, India.
Study Duration: March 2020 to July 2022
Sample size: 60 Patients
Simple random sampling was the sampling procedure used.

Sample size calculation: Considering 30% improvement in pain score as per the previous study, at 80% confidence intervals, at an error of 8%, the minimum sample size came to be 54. So, we included 60 patients in our study.

Subjects & selection method:
The study population includes patients who were scheduled for electivetotal abdominal hysterectomy.

Group DBpatients received 20mL 0.25%bupivacaine with 1ug/kg dexmedetomidine for wound infiltration.
Group PBpatients received 20mL 0.25%bupivacaine with normal saline 1cc for wound infiltration.

Eligibility criteria:

Inclusion criteria:
1. Patients aged above 35 years scheduled for elective total abdominal hysterectomy.
2. Patients who provided informed consent to participate in the study.

Exclusion criteria:
1. Patients with morbid obesity
2. Patients with Raynaud's disease
3. Patients with incomplete data

Total volume of drug given was kept constant in both the groups.

Methodology:
All patients underwent a thorough preoperative examination including history, general physical examination and necessary blood investigations. All patients were kept fasted for at least 6 hrs for solid food before the procedure, and informed consent was be taken prior to the surgery.In the operating room, a multi-parameter monitor for electrocardiograph (ECG), heart rate (H.R.), oxygen saturation (SpO2) and non-invasive blood pressure were attached to the patient, and the baseline vital parameters were recorded.Intravenous (IV) line secured with 18guage cannula. All patients were preloaded with ringers' lactate 15ml/kg over 10 minutes.
Under strict aseptic precautions, spinal anaesthesia was performed at the L3-L4 inter-spinal space with the patient in a sitting position.A total of 3ml of 0.5%bupivacaine injected over 30seconds through 23 guage spinal needle (BD Quincke spinal needle).The patients were placed in supine position immediately after spinal injection to achieve the satisfactory level of the block up to T6 spinal level, assessed and confirmed with a cold

sponge. Intraoperatively monitoring of blood pressure, pulse rate, saturation and respiratory rate were done at 5min interval for one hour. Mean arterial pressure (MAP) and heart rate (HR) was maintained within 20% of the preoperative value.Hypotension (MAP <20% of baseline or <60mm hg) was treated with infusion of normal saline and if required injection mephentermine 3-6mg boluses I.V.Bradycardia (HR<40BPM) was be treated with I.V atropine 40mcg/kg bolus.
All patients received paracetamol 20mg/kg I.V, as part of multi modal analgesia.
At the end of the surgery.
In the postoperative period rescue analgesia was given with Diclofenac 75mg I.M, whenever VAS score was >4 and if not sufficient with Fentanyl 10ug boluses

Parameters assessed:

- Age
- ASA grade
- Duration of surgery
- Total rescue analgesia consumed

Postoperative pain was assessed using visual analogue scale score, which is a 11 point scale in which 0 indicates no pain, 5 indicates moderate and 10 indicates worst pain.

Statistical analysis: Data was analyzed using Epi info software version 7.2.5. Results were expressed as percentages and mean with standard deviation. Students t test was used to compare numerical parameters between two groups and chi square test was used to compare categorical parameters between two groups. P value below 0.05 is considered significant.

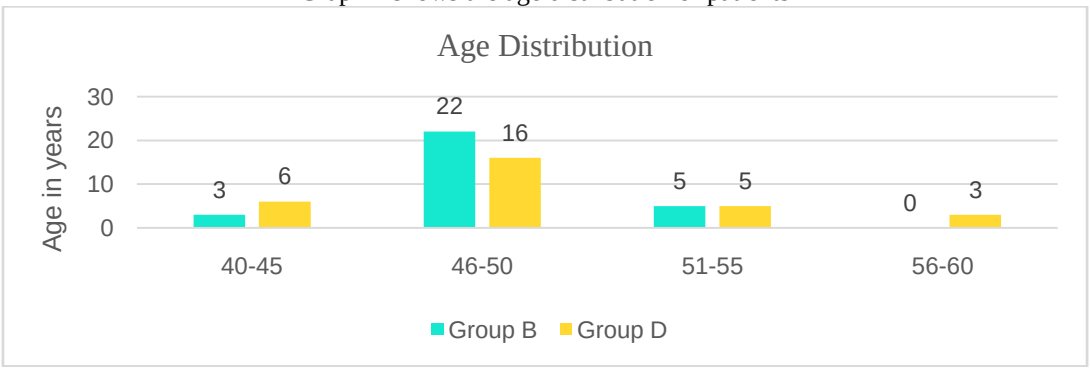
Ethical considerations: Informed consent was taken from every patient participated in the study.

III. Results

The current study included 60 patients scheduled for elective total abdominal hysterectomy.

Age:
Most of the patients were aged 46 to 50 years.

Graph 1 shows the age distribution of patients



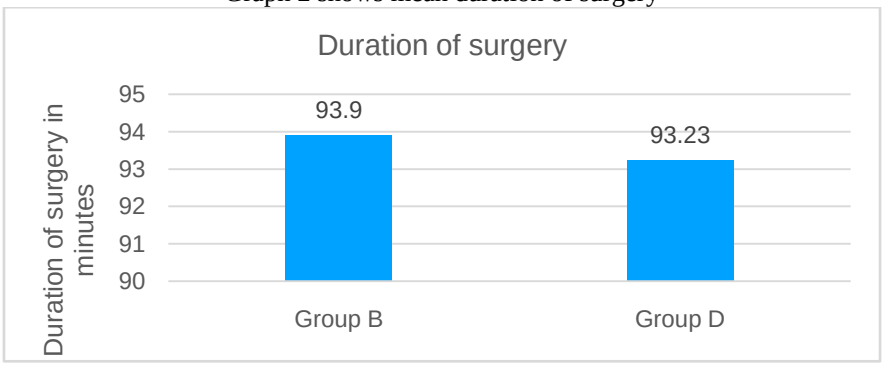
ASA Grade:
Most of the patients belonged to ASA grade I in the current study.

Table 1 shows ASA grade of patients

Grade	ASA Status				Total	
	PB (n=30)		DB (n=30)			
1	20	66.66%	21	70.00%	41	68.33%
2	10	33.33%	9	30.00%	19	31.67%
Total	30	100.00%	30	100.00%	60	100.00%

Mean duration of surgery:
There is no significant difference in the mean duration of surgery(p=0.73).

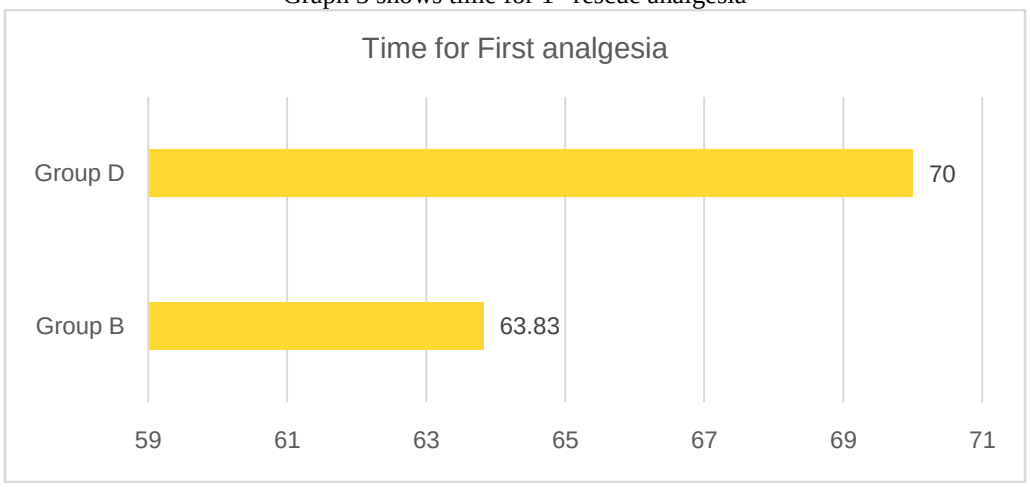
Graph 2 shows mean duration of surgery



Time for 1st rescue analgesia:

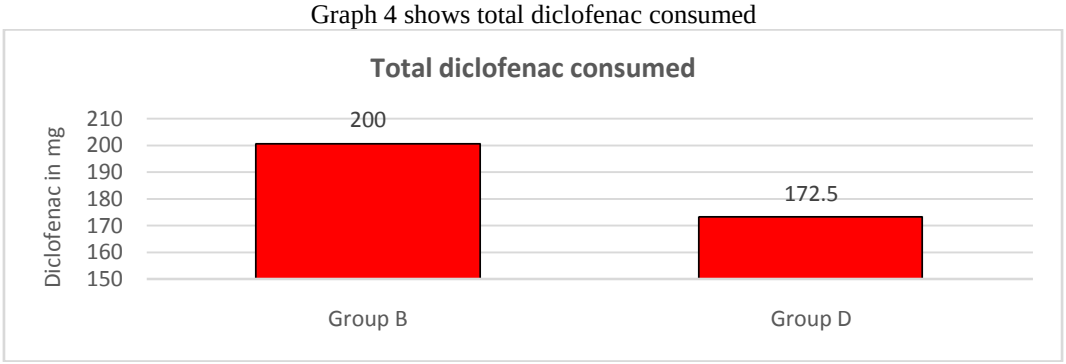
The mean time for the administration of first rescue analgesia in group PB was 63.83 +/- 13.43 minutes and in group DB was 70 +/- 16.29 minutes. On comparison P value is 0.1152 which is not significant.

Graph 3 shows time for 1st rescue analgesia



Total diclofenac(rescue analgesia) consumed:
The total dose of diclofenac consumed in group PB was 200 +/- 35.96 mg and in group DB was 172.5 +/- 34.96 mg. On comparison P value is 0.0039 which is significant.

Graph 4 shows total diclofenac consumed



VAS Score:
The vas score for both groups were compared at 0 hrs that is immediately after entering the postoperative care unit at 2 hrs, 4 hrs, 6 hrs, 12 hrs, 24 hrs. The mean vas scores for group PB at 0,2,4,6,12,24 hrs were 6.13, 3.73, 5.23, 5.3, 4.9, 3.87 respectively and for Group DB at 0, 2, 4, 6, 12, 24 hrs were 3.6, 2.2, 3.43, 4.23, 2.87, 3.77 respectively. There p values were as follows:

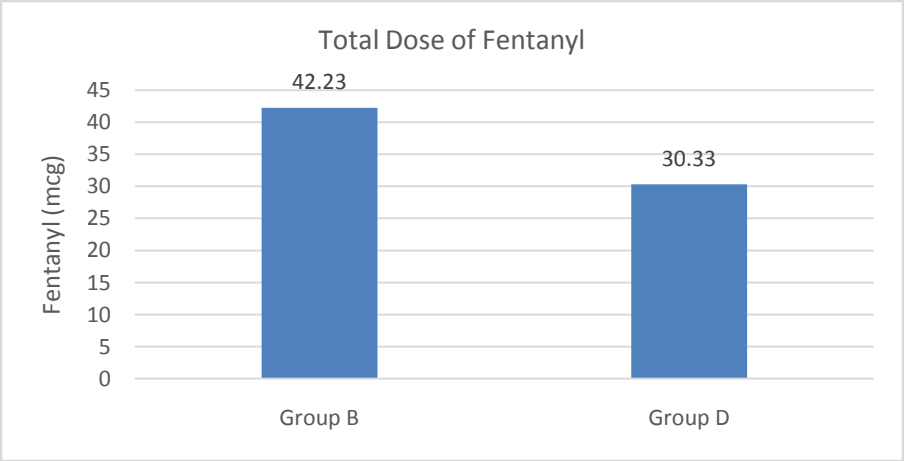
Table 2 shows VAS score in both groups

Vas score	PB Group (n=30)		DB Group (n=30)		t-statistic	P-Value	Inference
	Mean	SD	Mean	SD			
0 hrs	6.13	1.01	3.6	1.65	7.16	<0.05	Significant
At 2 hrs	3.73	1.51	2.2	1.1	4.5	<0.05	Significant
At 4 hrs	5.23	1.52	3.43	1.68	4.35	<0.05	Significant
At 6 hrs	5.3	1.73	4.23	1.22	2.76	<0.05	Significant
At 12 hrs	4.9	1.27	2.87	1.38	5.93	<0.05	Significant
At 24 hrs	3.87	1.14	3.77	0.86	0.86	>0.05	Not Significant

Total dose of fentanyl consumed:

Total dose of fentanyl consumed was noted in both the groups. There mean was 42.23 and 30.33 respectively in groups PB and DB. There p value was 0.0001 which was significant.

Graph 5 shows total dose of fentanyl consumed



IV. Discussion

The current study included sixty women belonging to ASA grade 1 or 2 posted for abdominal hysterectomy who were allocated randomly to two groups. Group I (control group) patients received wound infiltration with 20 mL 0.25% bupivacaine and 1cc normal saline at the end of surgery. In Group II, patients received wound infiltration with 20ml 0.25% bupivacaine and 1.0 mcg/kg dexmedetomidine.Results showed that there is no significant difference in the mean age and ASA grade of patients of both groups. Most of the patients were males. There is significantly less pain as per the Visual analogue scale (VAS) in group II patients compared to group I patients.

Mandal et al[7] reported that dexmedetomidine, when added to 2 percent lignocaine with adrenaline for infiltration at the trauma site, found to reduce bleeding and peri-operative fentanyl consumption. It provided better surgeon's satisfaction score and lesser side effects.

In another study, **Kim and Kang**[8] reported that adding dexmedetomidine to ropivacaine for perianal injection, may have an additive effect in reducing postoperative pain and fentanyl consumption in patients who underwent hemorrhoidectomy.

Akimoto et al[9]reported that dexmedetomidine improved tissue distribution and anaesthetic action of lidocaine; this effect might be related to vasoconstriction caused by dexmedetomidine.

Masuki et al[10]also reported that dexmedetomidine could cause more α2-selective vasoconstriction than clonidine in the human forearm.

K Govindaraj[11] compared analgesic effects of levobupicaine, levobupivacaine and clonidine and levobupivacaine and dexmedetomidine. All the groups required post-operative analgesia for 24hrs and the time for first rescue analgesia even though was greater for levobupivacaine and dexmedetomidine group compared with other two groups, it was not statistically significant.

Abd el hamid[12] et al.compared post-operative analgesic effect of intravenous dexmedetomidine with a combination of Bupivacaine and dexmedetomidine wound infiltration for lower segment caesarean section. They concluded that opioid consumption was found to be significantly less in patients receiving dexmedetomidine by either route, similar to our study.

Dexmedetomidine increased the duration of bupivacaine anaesthesia and sciatic nerve block among rats without causing any histopathological damage to the nerve.[13-14]Dexmedetomidine added to ropivacaine increased sciatic nerve blockade duration among ratsin another study.[15]Adding dexmedetomidine with clonidine for nerve block, increased local anaesthetic action of lignocaine by adrenoceptors.[16]

V. Conclusion

From our study results, it is concluded that wound infiltration with dexmedetomidine and bupivacaine provides superior pain relief compared to bupivacaine alone. The study is self-sponsored. There were no conflicts of interest.

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