IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 22, Issue 3 Ser.12 (March. 2023), PP 70-75
www.iosrjournals.org

Study of Efficacy of Dexmedetomidine Versus Fentanyl Added to Levobupivacaine for Epidural Anaesthesia: A Comparative Study

Dr. Pagidela Percy[*1], Dr Sampathi Rao Janaki Rao[2], Dr. Nallapati Supraja[3], Dr Harika Bomidi[4]

[*1](Postgraduate, Department of Anaesthesia, Great Eastern Medical School & Hospital, Srikakulam, Andhra Pradesh, India)
[2](Senior Resident, Department of Anaesthesia, Rangaraya Medical College, Kakinada, Andhra Pradesh, India)
[3](Postgraduate, Department of Anaesthesia, Great Eastern Medical School & Hospital, Srikakulam, Andhra Pradesh, India)
[4](Postgraduate, Department of Anaesthesia, Great Eastern Medical School & Hospital, Srikakulam, Andhra Pradesh, India)

Abstract:
Background*: Epidural anaesthesia is an effective method of providing anaesthesia and postoperative analgesia, which produces intraoperative hemodynamic stability along with reduced perioperative stress response. Adding adjuvants like opioids and alpha 2 agonists to local anaesthetics through intrathecal or epidural routes helps to provide dose sparing effect and improve the quality of analgesia.*
Objective: *This study was done to compare the efficacy of dexmedetomidine and fentanyl, when used as adjuvants to 0.5% levobupivacaine for epidural anaesthesia in patients undergoing infraumbilical surgeries.*
Materials and Methods: *This study was done at tertiary care teaching hospital in the Department of Anaesthesiology at Great Eastern Medical School and Hospital, Andhra Pradesh from January 2021 to July 2022. 60 patients were included as per the eligibility criteria. They were randomized into groups D and F, each group containing 30 patients. Age, gender, ASA grade, onset of sensory and motor blocks, time to achieve maximum sensory height, time required for 1st rescue analgesia were assessed and compared between two groups.*
Results: *There is no significant difference in the mean age, gender, ASA grade of patients between groups D and F. The onset of sensory block and motor blocks was quick in group D patients. Duration of sensory and motor blocks were prolonged in group D patients. Time for 1st rescue analgesia was more significantly in group D patients. There were no major side effects seen in both groups.*
Conclusion: *We highly recommend giving dexmedetomidine with levobupivacaine for epidural anaesthesia in patients scheduled for infraumbilical surgeries, as dexmedetomidine has quick onset of action and more duration of block apart from providing effective postoperative anaesthesia.*
Key Words: *Comparative study, Epidural Anaesthesia, Efficacy, Fentanyl, Infraumbilical surgeries, Levobupivacaine,*

Date of Submission: 07-03-2023 Date of Acceptance: 20-03-2023

I. Introduction

Epidural anaesthesia is an effective method of providing anaesthesia and postoperative analgesia, which produces intraoperative hemodynamic stability along with reduced perioperative stress response. It helps in earlier mobilization of the patient by reducing postoperative pain effectively, reducing the incidence of thromboembolic events[1]. The research for newer and safer anaesthetic agents was one of the primary needs in anesthesiology. Regional anaesthesia techniques underwent various changes over the last two decades with the advent of various novel and safer local anaesthetic agents[2-3]. Benefits of Levobupivacaine, the S enantiomer of bupivacaine over conventional bupivacaine include less cardiovascular system toxicity, reduced motor nerve penetration and blockade; reduced post operative motor blockade and early mobilization of the patients.[4] Adding adjuvants like opioids and alpha 2 agonists to local anaesthetics through intrathecal or epidural routes helps to provide dose sparing effect and improve the quality of analgesia[5]. Commonly used opioids include fentanyl and butorphanol for epidural anaesthesia.[6] Fentanyl a is synthetic opioid and is a strong agonist at mu receptors. But adding opioids may increase the risk of nausea, vomiting, pruritus, urinary retention, respiratory depression.[7-8] Dexmedetomidine is a novel alpha 2 agonist, which has around eight times more selective alpha-2 adrenoreceptor agonist compared to clonidine. It has less alpha 1 effect.[9] It provides hemodynamic stability, anxiolytic, analgesic, neuroprotective, sedative and anaesthetic anaesthetic-sparing. But it produces more sedation and profound motor block.[10-11] The

current study was done to know the efficacy of dexmedetomidine and fentanyl, when used as adjuvants to 0.5% Levobupivacaine for epidural anaesthesia in infraumbilical surgeries.

Aim: The current study was done to compare the efficacy of dexmedetomidine and fentanyl, when used as adjuvants to 0.5% levobupivacaine for epidural anaesthesia in patients undergoing infraumbilical surgeries.

II. Material And Methods

This comparative study was carried out at a tertiary care centre in India from January 2021 to July 2022(18 months)
Study Design: Comparative study
Study Location: This study was done at a tertiary care teaching hospital in the Department of Anaesthesia at Great Eastern Medical School and Hospital, Andhra Pradesh, India.
Study Duration: January 2022 to June 2022
Sample size: 60 Patients

Sampling procedure: Simple random sampling

Subjects & selection method: The study population was drawn from patients who were scheduled for infraumbilical surgeries.

Eligibility criteria:

Inclusion criteria:
1. Patients aged 20 to 65 years
2. Either sex
3. Patients with ASA grade I and II.
4. Patients with BMI below 30 kg/m2
5. Patients scheduled for elective infraumbilical surgeries under epidural anesthesia.
6. Patients who provided informed consent to participate in the study.

Exclusion criteria:
1. Pregnant and lactating women
2. Patients with bleeding abnormalities
3. Patients with allergies to levobupivacaine or fentanyl or dexmedetomidine
4. Patients with spinal deformities
5. Patients with infection at the site of injection
6. Patients with incomplete data.

Methodology:
Patient was shifted to operation theatre and intravenous line was secured using 18 gauze cannula. Monitoring of electrocardiogram, oxygen saturation and blood pressure were done continuously.
All patients received lactated ringer's injection 10ml/kg as preloading solution.
Under strict aseptic precautions, lumbar epidural anesthesia was given using 18 gauze Tuohy needle in sitting position in L3-L4 interspace. The epidural catheter was advanced cephalad 4 to 5 cm into the epidural space. A test dose of lignocaine with adrenaline was given into epidural space and thereafter epidural catheter was secured. Supplemental oxygen was supplied using facemask during surgery and parameters were assessed, compared between groups.

Patients were divided into two groups by randomization.
Randomization is done using blind-envelope technique.

Groups:
Group D: 30 Patients received 15 ml volume of 0.5 % levobupivacaine with 25µg dexmedetomidine
Group F: 30 patients received 15ml of 0.5% levobupivacaine with 50µg fentanyl

Parameters assessed:
- Age
- Gender
- ASA Grade

- Onset of sensory block and motor blocks
- Time to achieve maximum sensory height
- Duration motor blocks
- Postoperative analgesia requirements

Ethical considerations: Every patient was explained the whole process and advantages of the study. After he/she accepts, an informed consent form is given in the local language or the patient's understandable language and the person was asked to sign it or put a thumb impression. Ethical committee approval was taken before conducting the study.

Statistical analysis

Data was analyzed using Epi info software version 7.2.5. Results were expressed as percentages and mean with standard deviation. Results were presented in tabular forms and graphs in pie and bar diagrams. Chi square test was used to compare categorial parameters between two groups. Students T test was used to compare numerical parameters between two groups. P value below 0.05 is considered significant.

III. Results

The current study included 60 patients scheduled for elective infraumbilical surgeries.

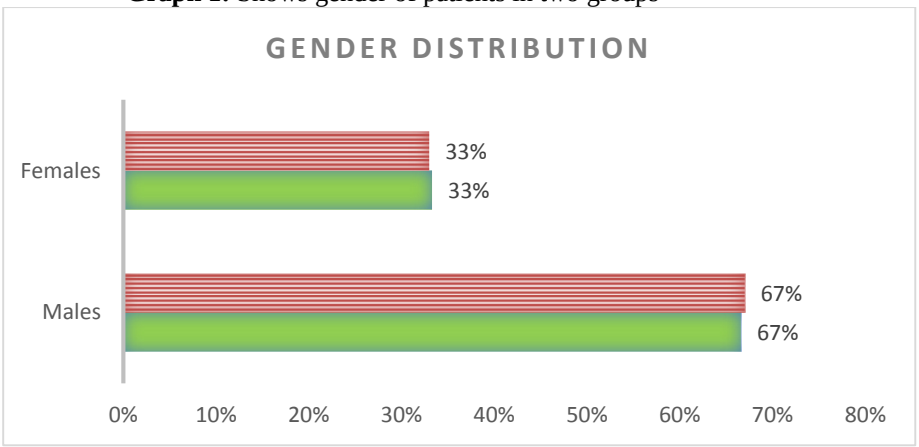
Age: There is no significant difference in the mean age of patients between two groups, as per t test(p=0.61).

Table 1: Mean age of patients in both groups

Groups	Mean age	P value
D	42.13±11.75 years	0.61
F	43.57±10.15	

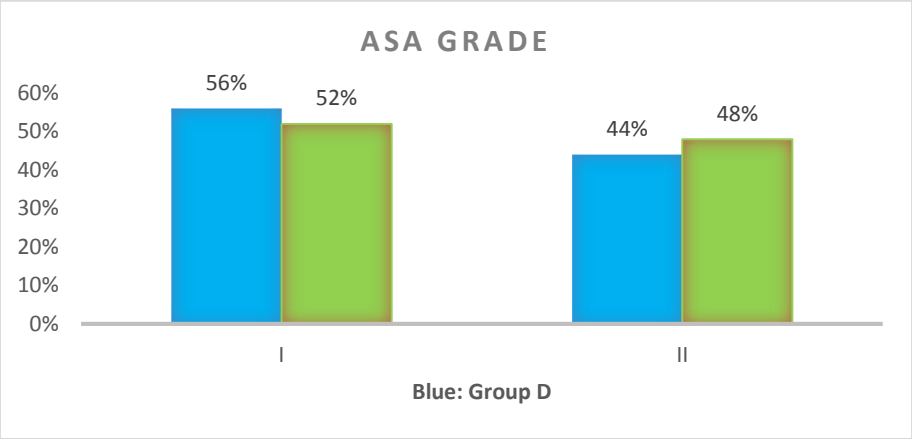
Gender: There is no significant difference in gender between two groups, as per chi-square analysis(p=1).

Graph 1: Shows gender of patients in two groups



ASA Grade: There is no significant difference in ASA grade between two groups(p=0.42).
57% of patients belonged to ASA grade I in this study.

Graph 2 shows ASA grade of patients



Onset of sensory block:
There is significant difference in the onset of sensory block between two groups(p=0.003). It was earlier in group D.

Table 1 shows onset of sensory block

Groups	Mean onset(min)	P value
D	8.43±2.76	0.003
F	10.47±2.3	

Time to achieve maximum sensory height:
There is a significant difference in the time to achieve maximum sensory height between the two groups(p=0.001). It was earlier in group D.

Table 2 shows the time to achieve maximum sensory height

Groups	Mean time(min)	P value
D	13.17±2.73	0.0001
F	16.50±2.10	

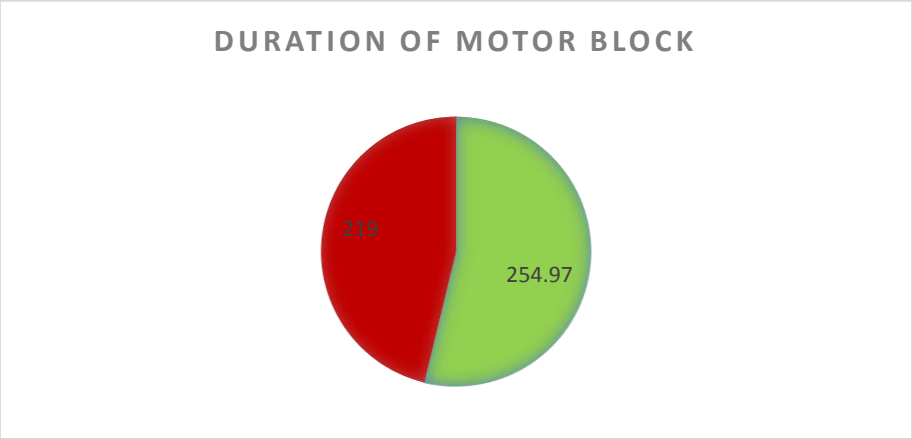
Onset of motor block:
There is a significant difference in onset of motor blocks between two groups(p=0.001). It was earlier in group D.

Table 3 shows onset of motor block

Groups	Mean onset(min)	P value
D	19.33±3.46	0.0001
F	22.67±2.55	

Duration of motor block:
There is a significant difference in duration of motor block between two groups(p=0.001). It was more in group D.

Graph 3 shows duration of motor block in minutes



Time required for 1st rescue analgesia:
More time was required for 1st rescue analgesia among patients of group D. There was significant difference as per students t test(p=0.0001).

Table 4 shows time required for 1st rescue analgesia

Groups	Mean duration(min)	P value
D	338.23±31.61	0.0001
F	291.73±28.75	

IV. Discussion

The pharmacological effects of α2 adrenergic agonists were thoroughly broadly studied and used to attain required effects in regional anaesthesia.[12] Early onset action of local anaesthetic effect, quick establishment of sensory and motor blocks, more duration of post operative analgesia, make these group of medications as effective additives in neuraxial anaesthesia.[13-14] Introduction of dexmedetomidine improved the scope of alpha-2 agonist agents in regional anaesthesia. Fentanyl is one of most commonly used opioids.
There is no significant difference in the mean age, gender, ASA grade of patients between groups D and F. The onset of sensory block and motor blocks was quick in group D patients. Duration of sensory and motor blocks were prolonged in group D patients. Time for 1st rescue analgesia was more significantly in group D patients. There were no major side effects seen in both groups in our study.
Mahilamani PP et al[15] did a study in 2016 on 60 patients who were scheduled for elective lower extremity surgeries under epidural anaesthesia using levobupivacaine with dexmedetomidine or fentanyl. They found that administration of dexmedetomidine caused faster onset of sensory blockade at T10 compared to fentanyl addition. This finding was similar to our study findings.

Karthik G et al[16] did a study in on 50 patients scheduled for orthopedic surgeries using 0.5% Levobupivacaine and 1.5 µg/kg of dexmedetomidine and 2µg/kg of clonidine. Results showed that addition of dexmedetomidine to levobupivacaine caused quick onset of sensory blockade at T10 compared to clonidine. In our study also dexmedetomidine produced quick onset of sensory block.

Bajwa et al[17] did a study in 2011 on 100 patients posted for orthopaedic surgeries using 0.75% Ropivacaine with 1µg/kg of dexmedetomidine and fentanyl. Results showed that the maximum sensory level was less significantly in the dexmedetomidine group. Time to 1st rescue analgesia was more in dexmedetomidine group, similar to our study.

V. Conclusion

We highly recommend giving dexmedetomidine with levobupivacaine for epidural anaesthesia in patients scheduled for infraumbilical surgeries, as dexmedetomidine has a quick onset of action and more duration of block apart from providing effective postoperative anaesthesia.
The study is self-sponsored. There were no conflicts of interest.

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