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"Efficacy of Dexmedetomidine Versus Clonidine as Additives to Hyperbaric Bupivacaine In Patients Undergoing Urology Surgeries"

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Abstract:

Background*: Regional anaesthesia has emerged as an essential technique with simplicity, effectiveness, and safety due to various advantages. Most of the patients presenting for endoscopic urological surgery are elderly, usually with coexisting cardiac, pulmonary, or some other co-morbid conditions. Clonidine, an imidazoline derivative is partial α2-adrenoreceptor agonist that is used intrathecally. Dexmedetomidine, a lipophilic α-methlol derivative highly selective α2 agonist, is under evaluation as a neuraxial adjuvant as it provides stable haemodynamic conditions with anα2/α1selectivity ratio eight times higher than clonidine.*

Objective:*The objective is to compare the efficacy of intrathecal hyperbaric bupivacaine with clonidine versus intrathecal hyperbaric bupivacaine with dexmedetomidine in patients scheduled for endoscopic urological procedures.*

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 2020 to January 2023. 120 patients were included as per the eligibility criteria. They were randomized into groups D and C, each group containing 60 patients.Age, gender, ASA grade, onsetof sensory and motor blocks,time to two segment regression, time for 1st rescue analgesia were assessed and compared between groups.*

Results:*There is no significant difference in the mean age, ASA grade of patients between patients of groups C and D. There is no significant difference in the mean onset of sensory block between two groups. Time for onset of motor block is quick in D group patients.Duration of motor block, and analgesia were more in group D patients. Bradycardia is the most common side effect seen overall, followed by shivering.*

Conclusion:*Dexmedetomidine, when used as an adjuvant with low dose 0.5% hyperbaric bupivacaine given intrathecally, has a faster onset and prolonged duration of both motor and sensory block, prolonged duration of analgesia with no significant side effects seen compared to clonidine. Also, it provided early ambulation, which is preferable in short-duration surgeries.*

Key Words: *Bupivacaine, Clonidine, Dexmedetomidine, Endoscopicsurgeries, Spinal anaesthesia*

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I. Introduction

Regional anaesthesia has emerged as an essential technique with simplicity, effectiveness, and safety due to various advantages. Most of the patients presenting for endoscopic urological surgery are elderly, usually with coexisting cardiac, pulmonary, or some other co-morbid conditions. A suitable adjuvant to low-dose local anaesthetics can provide a satisfactory spinal block without compromising safety to reduce the adverse hemodynamic effects associated with a spinal block in these patients.[1] Neuraxial block for urological surgeries is becoming popular as it has many advantages over general anaesthesia[2, 3] Spinal anaesthesia consists of temporary interruption of nerve transmission produced by injecting a local anaesthetic solution in the subarachnoid space. The role of an anesthesiologist is to render surgical procedures pain-free with safety. Local anaesthetic, bupivacaine, is the most common agent used for spinal anaesthesia but it has a relatively short duration of action. Many adjuvants added to local anaesthetics intrathecally improve the quality of intraoperative analgesia and prolong it in the postoperative period.[4] Intrathecally, opioids prolong the duration

of analgesia but can have late and unpredictable respiratory depression, pruritus, nausea, vomiting, and urinary retention.[5,6] α2-adrenergic agonists are new neuraxial adjuvants that improve the quality of spinal anaesthesia in sensory and motor blockades. Many studies are supporting their efficacy as adjuvants individually.[7] Intrathecal α2-agonists are used as adjuvant drugs to localanaesthetics effectively.[8]Their addition to local anaesthetics prolongs the duration of motor and spinal sensory blockade.[9] They potentiate postoperative analgesia and sedation.[10-12] Clonidine, an imidazoline derivative is partial α2-adrenoreceptor agonist that is used intrathecally.[13-15] Dexmedetomidine, a lipophilic α-methlol derivative highly selective α2 agonist, is under evaluation as a neuraxial adjuvant as it provides stable haemodynamic conditions with anα2/α1selectivity ratio eight times higher than clonidine. In view of less Indian studies comparing clonidine with dexmedetomidine, the current study was undertaken.

Objective: The objective is to compare theefficacy of intrathecal hyperbaric bupivacaine with clonidine versus intrathecal hyperbaric bupivacaine with dexmedetomidine in patients scheduled for endoscopic urological procedures.

II. Material And Methods

This randomized study was carried out at a tertiary care centre in India from January 2020to January 2023.

Study Design: Interventional-Randomized 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 2020 to January 2023.

Sample size: 120 Patients

Sampling procedure: Grab/Convenience sampling

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

Inclusion criteria:

1. Patients aged 18 years
2. Either sex
3. Patients with ASA grade I and II.
4. Patients with BMI below 35 kg/m2
5. Patients scheduled for elective endoscopic urological surgeries under spinalanesthesia.
6. Patients who provided informed consent to participate in the study.

Exclusion criteria:

1. Patients with bleeding abnormalities
2. Pregnant and lactating women
3. Patients with allergies to bupivacaine or clonidine or dexmedetomidine
4. Patients with spinal deformities
5. Patients with serious cardiac, pulmonary, renal and hepatic disorders.
6. Patients with infection at the site of injection
7. Patients with incomplete data.

Methodology:

After shifting the patient to surgical theatre, intravenous line was secured. Electrocardiogram, oxygen saturation and blood pressure were monitoredcontinuously.

The patient were kept in a lateral decubitus position.

A 25-gauge Quincke needle was inserted into the subarachnoid space at L3 - L4 intervertebral space in the midline. The space is confirmed, and a specified drug (as per the randomization) was injected into space. The drug was prepared under strict aseptic conditions. Patient was then positioned supine immediately after injecting the drug.

Patients were divided into two groups by randomization.

Randomization is done using computer generated software technique.

Groups:

Group D: 60 Patients receivedDexmedetomidine 2 µg + 0.5% low dose bupivacaine 6mg preparation. One ampoule of dexmedetomidine contains 100 µg in 1ml. It is diluted to 10ml with normal saline. From that, 1ml drug is taken in 1ml syringe, and 0.2ml is added to 1.2ml 0.5% hyperbaric bupivacaine

Group C: 60 patients received Clonidine 20µg + 0.5% low dose bupivacaine 6mg preparation.
One ampoule of clonidine contains 150 µg in 1ml. It is diluted to 1.5ml with normal saline. From that, 1ml drug is taken in 1ml syringe, and 0.2ml is added to 1.2ml 0.5% hyperbaric bupivacaine

Parameters assessed:

- Age
- Gender
- ASA Grade
- Onset of sensory block and motor blocks
- Duration of sensory block
- Duration of motor block
- Duration of analgesia

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 were analyzed using SPSS software version 25.0. 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 included120 patients scheduled for elective endoscopic urology surgeries.

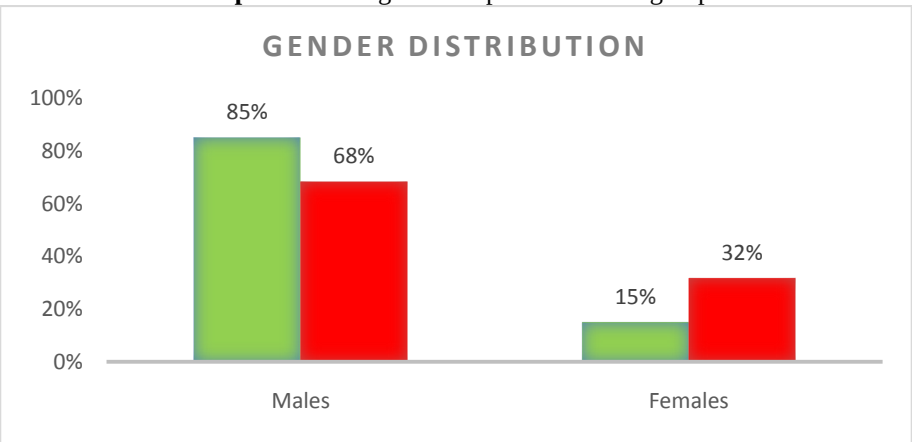
Age:
There is no significant difference in the mean age of patients between groups D and C, as per students t test(p=0.49).

Table 1: Mean age of patients in both groups

Groups	Mean age	P value
D	46.6±16.6 years	0.49
C	42.78±15.4	

Gender:
There is significant difference in gender between two groups, as per chi-square analysis(p=0.03).

Graph 1: Shows gender of patients in two groups



ASA Grade:
Most of patients belonged to ASA grade I in both the groups.
There is no significant difference in ASA grade between two groups as per chi square analysis/(p=0.83).

Graph 2 shows ASA grade of patients

Site of injection: It was given in L3-L4 space in 61% of patients. There is no significant difference in the site of injection between both groups.(p=0.85).

Onset of sensory block:
There is no significant difference in the onset of sensory block between clonidine and dexmedetomidine groups(p=0.274). It was earlier in dexmedetomidine group of patients.

Table 2 shows onset of sensory block

Groups	Mean onset(min)	P value
D	5.48±1.42	0.274
C	5.80±1.82	

Time for regression of sensory block:
There is a significant difference in the time for regression of sensory blockbetweenthe two groups(p=0.008). It was earlier in group dexmedetomidine group of patients.

Table 3shows the time for regression of sensory block

Groups	Mean onset(min)	P value
D	119.58±11.84 mins	0.008
F	114.25±9.65 mins	

Duration of sensory block:
There is no significant difference in the duration ofsensory blockbetween two groups(p=0.07).

Table 3 shows duration of sensory block

Groups	Mean duration(min)	P value
D	188.33±16.79	0.07
C	180.92±26.67	

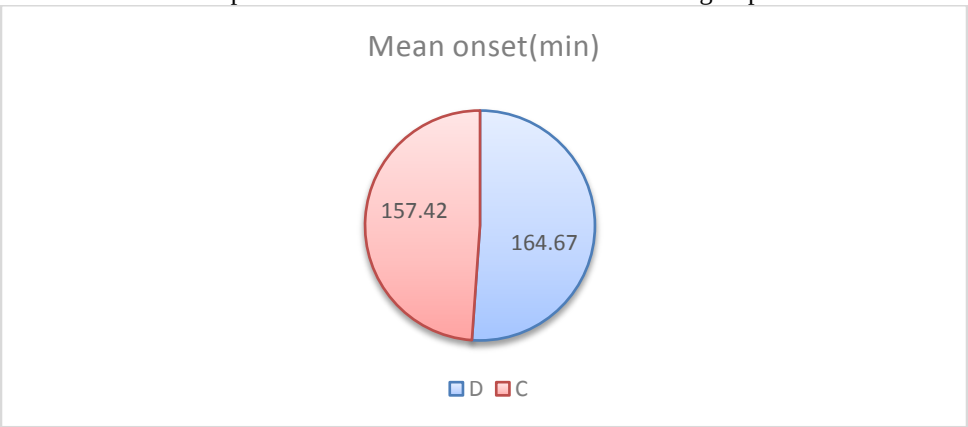
Onset of motor block:
There is significant difference in the onset of motor block between groups D and C(P=0.007).

Table 4 shows duration of sensory block

Groups	Mean onset(min)	P value
D	10.37±1.50min	0.007
C	11.25±2.01 mins	

Duration of motor block:
There is a significant difference in duration of motor block between two groups(p=0.005). It was more in dexmedetomidine group.

Graph 4 shows duration of motor block in both groups.



Duration of analgesia
Duration of analgesia was significantly more in group D patients. (p=0.0001).

Table 5 shows time required for 1st rescue analgesia

Groups	Mean duration(min)	P value
D	278.42±25.78	0.0001
C	257.58±23.64	

Side effects:
The most common side effect seen is bradycardia, seen in 6 patients overall. Shivering was seen in 6 patients; hypotension was seen in 2 patients and nausea was seen in 3 patients overall. There was no statistically significant difference between the two groups concerning the occurrence of adverse effects. (p=0.39).

IV. Discussion

Clonidine provides good sensory, motor block prolongation intraoperative, and prolonged postoperative analgesia with minimal side effects.[16-21] Unlike spinal opioids, clonidine, a selective partial α2-adrenergic agonist, is evaluated as an adjuvant to intrathecal local anaesthetics without any clinically significant side effects.[22, 23] Dexmedetomidine is a useful adjuvant when used with local anaesthesia for the subarachnoid block in urology surgeries by increasing the speed of onset of sensory and motor block, intra & postoperative analgesia with good hemodynamic stability and minimal side effects.[24]

In the current study, 120 patients were included. There is no significant difference in the mean age, ASA grade, onset of sensory block of patients between groups dexmedetomidine and clonidine.Onset of motor block was quick in dexmedetomidine group patients. Duration of motor block and analgesia were more in dexmedetomidine group patients.There was no statistically significant difference between the two groups concerning the occurrence of adverse effects in our study.

In the study done by**Chandra G.P et al**[25]. patients in group C received 2.5ml of 0.5% hyperbaric bupivacaine with 50µg clonidine and patients in group D received 2.5ml of 0.5% hyperbaric bupivacaine with 5µg dexmedetomidine. Authors found a significantly longer time for onset of the sensation in the clonidine group compared to dexmedetomidine group.

In the study of**Prakash C.S et al.**[26]patients of group C received 2.5ml of 0.5% hyperbaric bupivacaine with 50µg clonidine and patients of group D received 2.5ml of 0.5% hyperbaric bupivacaine with 5µg dexmedetomidine. Onset of sensory block was quick in D group, similar to our study.

In the study of **Mahendru V et al**.[27]done on 120 patients, the mean duration of motor blockade was significantly more in dexmedetomidine group compared to clonidine group, similar to our study.

Suthar et al.[28]found thatthe total duration of analgesia to be more in dexmedetomidine group compared to clonidine group, similar to our study.

Limitations:
Hemodynamic parameters were not assessed.

Sample size is small.

V. Conclusion

Dexmedetomidine, when used as an adjuvant with low dose 0.5% hyperbaric bupivacaine given intrathecally, has a faster onset and prolonged duration of both motor and sensory block, prolonged duration of analgesia with no significant side effects seen compared to clonidine. Also, it provided early ambulation, which is preferable in short-duration surgeries.

The study is self-sponsored. There were no conflicts of interest.

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