

# Sole Epidural: A Unique Drug Combination for Abdominal and Orthopedic/lower Limb Surgeries

HN Chandrappa, Murali Raj Warriar

Department of Anesthesiology, Sagar Hospitals (BSK), Bangalore, Karnataka, India

## Abstract

**Context:** Epidural anesthesia is one of the many advances that has gained rapid acceptance due to an evidence-based reduction in morbidity and overall patient satisfaction. **Settings and Design:** We present an audit of 1,143 patients who were administered epidural anesthesia solely, with successful outcomes between January 2009 and August 2014 at Sagar Hospitals, Banashankari, Bengaluru employing conventional techniques with a unique drug combination. **Materials and Methods:** A retrospective followed by prospective data collection of all patients given sole epidural at our hospital was taken and analyzed. The number of conversions to GA due to ineffective anaesthetic block was tabulated and charted for assessment. Laboratory analysis of the drug combination was performed in order to understand the pharmacology better. **Results and Conclusion:** The audit revealed that our technique of sole epidural using the unique drug combination is definitely effective with minimal rates of conversion to GA and negligible complication rates.

**Key words:** Anesthesia, lignocaine heavy (5%), sole epidural, unique drug combination

## INTRODUCTION

Surgical conditions primarily dictate the type of anesthesia performed; nevertheless, most operations below the neck region can be performed under neuraxial anesthesia.

The advantages of using epidural anesthesia is not overemphasized since various studies have already shown a decrease in postoperative morbidity and even mortality<sup>[1-3]</sup> when epidural anesthesia is used either alone or with general anesthesia (GA). Any major surgery induces profound physiological changes during the perioperative period, characterized by the increase in sympathoadrenal and neuroendocrine activity with an increased cytokine production.<sup>[4]</sup> Since epidural anesthesia can attenuate this "stress response" to surgery, improve the quality of postoperative analgesia more efficiently in comparison with systemic opioids, and hasten the recovery of gut function, it has been suggested that conducting surgery under epidural anesthesia (either as the sole anesthetic technique or in combination with GA) may reduce perioperative morbidity and mortality more efficiently compared with GA alone.<sup>[1-3]</sup>

Epidural anesthesia has even been shown to reduce the incidence of venous thrombosis and pulmonary embolism

while also minimizing transfusion requirements and respiratory compromise following thoracic and upper abdominal surgeries.<sup>[3,5,6]</sup>

Prior to 1904, the only drug available for neuraxial use was cocaine and the development of epidural technology was still a long way off. With a larger drug base and advanced equipment, there was an expansion of the role of neuraxial anesthesia, in particular, the epidural technique in anesthetic practices.<sup>[5]</sup>

It is well-documented that the conventionally used epidural drugs/combinations necessitate a long waiting period of 15-20 min<sup>[4,6-8]</sup> before the patient is ready to be positioned for the surgery or before the incision can be put.

## Study design

This audit was initially carried out by a retrospective analysis (January 2009-July 2013) followed by a prospective

**Address for correspondence:** Dr. Murali Raj Warriar, Sagar Hospitals (BSK), Shavige Malleshwara Hills, Dayananda Sagar Institution Campus, Kumaraswamy Layout, Banashankari, Bengaluru - 560 078, Karnataka, India. E-mail: [drmraj314@gmail.com](mailto:drmraj314@gmail.com)

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examination (August 2013-October 2014) of all the surgical cases that were performed under epidural anesthesia as the sole anesthetic technique at Sagar Hospitals, Banashankari, a tertiary care multispecialty hospital. The anesthetic procedure had been carried out either by the authors themselves or under their direct supervision.

## MATERIALS AND METHODS

All 1,143 patients who were administered sole epidural anaesthesia for their surgeries were studied; few through prospective data collection as well. The successful rate of our technique was gauged by the time taken and ease with which patient position followed by surgical scrubbing and incision without patient discomfort could be undertaken. The cases that needed conversion to GA were tabulated and the probable cause for the same, identified. Laboratory analysis of the drug combination was performed to understand the unique pharmacology of the same.

### Unique drug combination

In all the cases under this study, a 24-mL drug combination consisting of 4 mL of 5% Heavy Lignocaine and 20 mL of bupivacaine (0.5%) had been kept preloaded into a 20-mL (pre-flushed with adrenaline). The rationale and pharmacology behind its use is discussed after examining the results.

### Anesthesia technique and protocol followed

All the 1,143 patients had been evaluated as per American Society of Anesthesiologists (ASA) grade prior to taking up for proposed surgery. They had been counseled about the proposed anesthetic technique and valid written informed consent was obtained from them. A large-bore peripheral intravenous (IV) access with 18-G/16-G IV cannula had been secured and the basic vital parameter monitoring equipment [electrocardiograph (ECG), noninvasive blood pressure monitoring system (NIBP), and SPO<sub>2</sub> sensor] had been connected. For most of the patients, the premedication included IV administration of glycopyrrolate (0.2 mg) and ondansetron (4 mg).

The sitting position had been used for the epidural procedure for most of the patients while the remaining others needed to be placed in lateral position, ensuring strict asepsis. With a 16-gauge Tuohy needle (B Braun - Perifix<sup>®</sup>) (under local anesthesia), the epidural space had been identified using the Loss of Resistance syringe and reconfirmed with a 2-mL syringe for negative aspiration and vacuum effect.

Once the epidural space was identified and confirmed, suitable volume of the unique drug combination (ranging 14-22 mL) had been administered to all the 1,143 patients under the study. Then, the epidural catheter was inserted 3-4 cm into the epidural space and fixed.

We followed a uniform sedation protocol consisting of slow IV administration pentazocine (0.25-0.5 mg/kg body weight) and slow IV administration diazepam (0.1-0.2 mg/kg body weight). A vigilant watch was kept on the patients' respiration [end-tidal CO<sub>2</sub> (ETCO<sub>2</sub>) included] and hemodynamics.

In case of blood tinge before administering the drug, the full volume was not administered. Epidural catheter was inserted, the absence of blood or cerebrospinal fluid in catheter was confirmed, and thereafter, the drug was administered through the catheter. In case of difficulty in catheter insertion after full volume drug administration, the epidural space was identified again at a different interspace and the catheter placed there. In case of inadvertent dural puncture, another attempt was made by the consultant at a higher epidural space and epidural catheter was inserted first, following which the requisite volume of the drug was administered.

Those cases for which epidural anesthesia was initially attempted but due to inadvertent dural tap converted to spinal anesthesia were not included in the audit. The task of round-the-clock postoperative monitoring and adequate fluid management to identify, document, and treat postdural puncture headache (PDPH) was taken up as well.

## RESULTS

In our study, we looked at 1,143 patients with the age and sex distribution as in chart. The year-wise distribution of cases shows an even distribution of different types of surgical cases performed under sole epidural technique such as obstetric, urologic, orthopedic, plastic, vascular or general, and laparoscopic surgeries [Table 1 and Figures 1-4].

## DISCUSSION

In our study, we found that out of 1,143 patients who had been administered the specific drug combination, 24 (2%) needed supplemental sedation over and above the protocol. Additional doses of IV administration of opioids (including pethidine 0.5-1 mg/kg body weight) for 20 patients and more recently dexmedetomidine maintenance infusion (0.2-0.7 µg/kg/h) for four had been used. Surgery had been successfully completed on them without any further complication or event.

In 1,129 patients (98.77%), the surgery had been successfully completed with nil/minimal discomfort. The average waiting time after drug administration before patient positioning or surgical incision was 4-5 min. This is to be statistically analyzed in further prospective studies.

Only 14 patients (1.2%) needed to be converted to or supplemented by GA due to the occurrence of patchy block (11 cases), excessive restlessness/anxiety (two cases), and pulmonary edema/breathlessness due to fluid overload (one case) [Table 2 and Figure 5].

Two patients needed assisted bag and mask ventilation for a few minutes after the onset of block, probably due to the respiratory depressant effect of the sedative drugs or higher levels of epidural blockade involving the intercostal muscles. One patient, in particular, posted for a laparoscopic mesh repair of inguinal hernia had a hypertensive crisis and a seizure-like episode that was immediately identified and managed due to

persistent high blood pressure. No GA was given for the same since the surgery was postponed to a later date.

There were seven obstetric and gynecological patients (0.6%) who needed conversion to GA [Table 2 and Figure 5]. This is attributed to the inadequacy of motor blockade at higher thoracic levels where retractors are being used. The same

can be avoided or managed either by using a top-up epidural dosing or initial higher volume epidural drug administration or by conversion to GA. This is much lesser compared to a study by Kinsella *et al.*<sup>[9]</sup> with conversion rates to GA ranging 5-13%.

Over a period of 5 years, it has been seen that the number of conversions to GA has progressively reduced [Figure 5].

We have not encountered a single case of total spinal or brainstem anesthesia. This was achieved by adopting a meticulous and disciplined regimen for identifying epidural space and vigilant monitoring after the epidural drug and sedation were administered.

**Pharmacology of the unique drug combination - how it works**

A unique combination of 4 mL of lignocaine heavy (5%) and 20 mL of bupivacaine (0.5%) was studied in Neon Laboratories Ltd. Their reports showed that the mixture had a pH of 6.2 and a slightly higher specific gravity of 1.011 compared to bupivacaine 0.5% that had a pH of 5.9 and specific gravity of 1.005. Alkalinization of the combination may play a role in the early onset of sensory-motor blockade observed in our study.<sup>[10]</sup>

The combination results in a final concentration of lignocaine 0.88% and bupivacaine 0.42%, thus substantially reducing the combined potential for neural toxicity. None of our patients had any clinical evidence of nerve injury or motor weakness though no nerve study test was done to prove it.

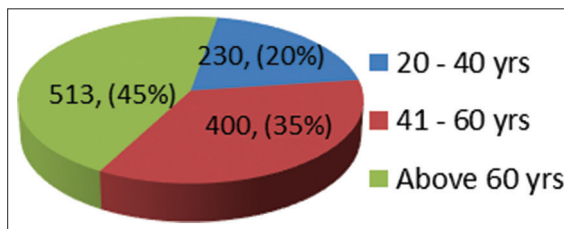
**Table 1: Year-wise distribution of surgical cases for whom sole epidural anesthesia was used**

Year	Gynecological	Urological	Orthopedic	General/ others	Total
2009	23	16	43	31	113
2010	29	39	82	66	216
2011	5	21	121	45	192
2012	23	12	78	37	150
2013	88	25	90	47	250
2014	73	19	110	20	222
Total	241	132	524	246	1,143

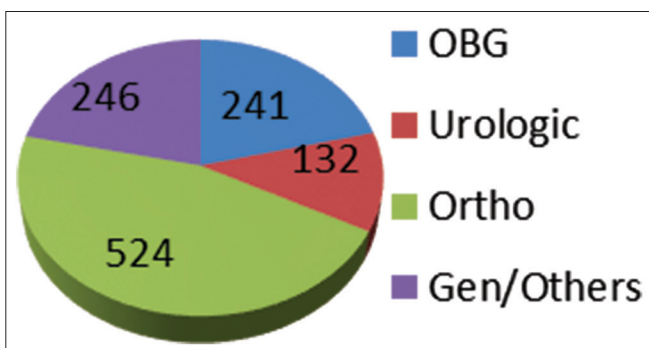
**Table 2: Findings of audit: Cases that needed conversion to GA**

Type of surgery	Numbers (%)	Conversion to GA (%)	Remarks
OBG	241 (21.08)	7 (0.6)	5 - Patchy block 2 - Restlessness
Urological	132 (11.5)	-	
Orthopedic	524 (45.8)	4 (0.35)	1 - Breathlessness 3 - Patchy block
General/others	246 (21.5)	3 (0.26)	3 - Patchy block
Total		14 (1.2)	1,129 Successful/ uneventful

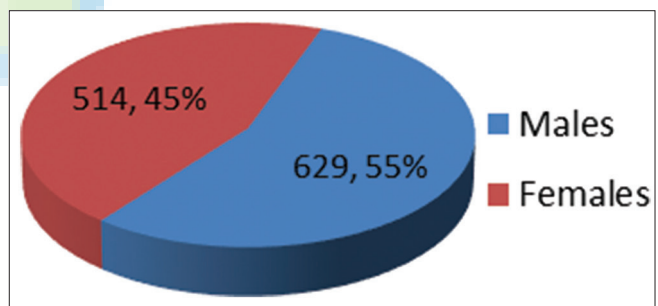
OBG: Obstetrics and Gynecology



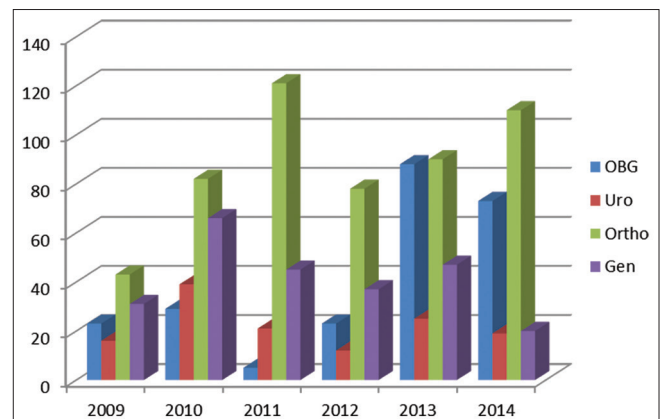
**Figure 1: Age distribution of 1143 surgical cases**



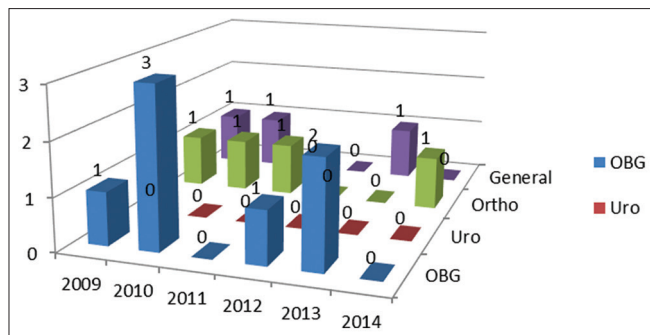
**Figure 3: Specialty-wise distribution of 1143 surgical cases**



**Figure 2: Sex distribution of 1143 surgical cases**



**Figure 4: Year-wise distribution of 1143 surgical cases in each specialty**



**Figure 5:** Year-wise distribution of conversion to general anaesthesia following ineffective sole epidural

The presence of minimal amount of similarly diluted dextrose probably plays a role in increasing viscosity and thus, helps to better spread the anesthetic.<sup>[11]</sup>

Hemodynamics in these patients, using our drug combination, were found to be no different from those using other drug combinations and were stable throughout the surgeries with no unexpected shifts.

Therefore, with this unique combination, we achieved an early onset of optimal surgical anesthesia with the added advantage of sufficient duration of action, without facing the unwanted complications of spinal anesthesia such as precipitous hypotension and PDPH.

Most probably, this unique combination has not yet been studied, and therefore, in spite of an extensive search, no references have been found for the same.

## CONCLUSION

Epidural anesthesia/analgesia is definitely a technique of choice for abdominal as well as orthopedic/lower limb surgeries. With our technique of confirmed epidural space identification and catheter placement and using this unique drug combination, we have convincing evidence to substantiate its efficacy as a sole technique providing excellent surgical conditions. The onset of action and duration are well-suited for the various surgical procedures at our hospital. It ensures a smooth perioperative period and an excellent postoperative analgesia.

It also helps to achieve good operative surgical conditions comparable to spinal anesthesia without its associated complications and PDPH.

Further prospective studies to show that statistical significance are in progress to ascertain the waiting period taken before the patient can be positioned for surgery or before the incision can be undertaken. Larger prospective randomized studies comparing our drug combination with other conventionally used combinations are warranted to discuss the advantages and disadvantages (if any) of using this specific drug combination for sole epidural anesthesia purposes.

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## Conflicts of interest

There are no conflicts of interest.

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