**ORIGINAL ARTICLE**

# Frequency of Intravascular Placement of Epidural Catheter with and Without Predistension of Epidural Space with Saline

ZIAUDDIN AHMED, MUHAMMAD ABDUL AZIZ[2], RABIA WAHEED[3], *YAASIR IJAZ[4], ABDUL SHAKOOR[5], SAAD ISHTIAQ[6]*
[1]Consultant Anesthetist, Indus Hospital Kahna, Lahore
[2]Consultant Anesthetist, Indus Hospital, Lahore
[3]Consultant Gynecologist & head of Gynae Obstetric Department, Indus Hospital, Kahna Lahore.
[4]Post Graduate Trainee Anesthesia Shaukat Khanum Memorial Cancer Hospital & Research Centre Lahore
[5]Post Graduate Trainee Anesthesia Shalimar Hospital Lahore.
[6]Post Graduate Trainee Anesthesia Shaukat Khanum Memorial Cancer Hospital & Research Centre Lahore
Correspondence to Muhammad Abdul Aziz Email: Muhammad_abdulaziz@yahoo.com Cell: 0333-4205617

## ABSTRACT

**Background:** Epidural anesthesia is a popular technique because of advantages like slower onset of action, controlled hypotension, usefulness in thoracic, abdominal and lower limb surgeries and also for the management of postoperative analgesia in lower abdominal surgeries. But it has several complications like intravascular catheter placement, intrathecal catheter placement and local anesthesia toxicity.
**Aim:** To compare the frequency of intravascular catheter placement with pre-distention and without pre-distention of epidural space with saline.
**Study design:** Randomized controlled trial.
**Setting:** Department of Anesthesia, SKMCH& RC, Lahore.
**Duration of study:** Six months.
**Data Collection Technique:** 140 patients taken from elective general surgical list were included in this study. Epidural was placed with Tuohy needle in sitting position using midline approach. In Group A (distention group). In Group B (non-distention group). The epidural needle was then removed and the catheter withdrawn to leave 5 cm catheter in the space. The catheter was then fixed on the patient's back.
**Results:** In distention group mean age was 46.87 ± 8.87 years and in non-distention group mean age of patient was 46.01±9.52 years. In distention group there were 29 (41.4%) male and 19 (27.1%) female patients and in non-distention group there were 41(58.6%) male and 51(72.9%) female's patients. In all patient's intravascular placement of epidural catheter was observed in 18 (12.9%) of the patients. In which 3 (4.3%) patients were in distention group and 15 (21.4%) were in non-distention group. Intravascular placement of epidural catheter was statistically lower in group A as compared to group B, p-value = 0.002 (< 0.05).
**Conclusion:** Intravascular catheter placement can be minimized with pre-distention with 5ml saline if injected through the epidural needle followed by insertion of the catheter threading it > 5 cm into the epidural space via needle.
**Keywords:** Abdominal surgery, pre-distention, intravascular catheter placement

## INTRODUCTION

Epidural anesthesia can be used for almost any surgery below the neck but it is most effective for surgical procedures on the lower abdomen and lower limbs, it is also used for pain relief during labor, postoperative pain and chronic pain syndromes either in continuous infusion or as incremental boluses[1].[1] Epidural space can be identified by loss of resistance technique to either air or saline.[2] After identification, a catheter is inserted into the epidural space. Insertion of a catheter into the epidural space may lead to complications such as nerve injury, subarachnoid or intravascular catheter placement, paralysis, local anesthesia toxicity, convulsions and post dural puncture headache[3-5].

In studies carried out between 1984 and 2007, the overall incidence of intravascular catheter placement was 6.2%6.[6] One of the methods used to prevent intravascular catheter placement is pre-distention of epidural space with 5 ml of 0.9% normal saline. In a study it was observed that the rate of intravascular catheter placement without pre-distention (non-distention group) was 12.9% and the rate with pre-distention (distention group) was 6.4%[6]. It is postulated that this is due to widening the space and pushing blood vessels away from the epidural needle tip. Evron et al, compared the effects of pre-distention epidural space with saline before catheter insertion. It was observed that with pre-distention (distention group) the incidence of intravascular placement was 2%, whereas without pre-distention (non- distention group) it was 16%[7].

Unintended epidural vein catheterization complicates as many as 9% of epidural catheter placements[6]. If unrecognized, the consequences of intravascular local anesthetic administration can lead to life-threatening complications including seizures, cardiovascular toxicity and cardiovascular collapse[6].

The rationale of my study is to find an effective way of reducing the incidence of intravascular catheter placement during epidural anesthesia. As intravascular catheter placement can lead to devastating complications, this study will affect the patient's safety during epidural catheter placement and reduce the morbidity and mortality of patient. Normal routine practice of epidural catheter

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placement is without pre-distention of epidural space. If there is any significant difference in intravascular catheter placement with or without pre-distention, it will improve routine epidural anesthesia practice.

The objective of the study was to compare the frequency of intravascular catheter placement with pre-distention and without pre-distention of epidural space with saline.

**OPERATIONAL DEFINITIONS**

**Intravascular Placement:** Epidural catheter misplaced into a vein, with presence of blood on aspiration.

**Pre-distention:** Injection of 5 ml saline into the epidural space after identification of the space by loss of resistance technique.

## MATERIAL AND METHOD

This randomized controlled trial was conducted in the Department of Anesthesia, SKMCH& RC, Lahore during a period of six months i.e., from 23rd Aug 2013 till 22nd Feb 2014. A total of 140 patients divided in two groups of 70 patients, with 5% level of significance and 90% power of study and taking expected incidence rate of intravascular placement of catheter in 2% of epidural pre-distention population and 16%[7] in no pre-distention population. Nonprobability purposive sampling technique was used.

**Inclusion Criteria:**

1. Age: 25 to 55 years
2. Patients of American Society of Anesthesiologists (ASA) class I & II
3. Patients scheduled for elective Abdominal surgery

**Exclusion Criteria:**

1. Hypersensitivity to any local anesthetic
2. Spine deformity on examination
3. Cutaneous infections at the injection site on examination
4. Coagulation derangement (PT > 14sec, APTT >31sec and INR>1.5)

**Data Collection Procedure:** After approval from Hospital Ethical Committee and obtaining an informed consent 140 patients taken from elective general surgical list were included in this study. The demographic information and ASA status was recorded. The patients was randomly allocated to one of the two groups by draw method with exclusion [from the slips labeled Group A(70 slips) or Group B(70 slips) in a box]. Intravenous cannula was passed and vitals (heart rate, noninvasive blood pressure and oxygen saturation) were checked before the procedure. All epidurals were given by consultant anesthetists. Epidural was placed with Tuohy needle in sitting position using midline approach. Identification of epidural space was done by loss of resistance technique with air in both groups. In distention group, 5ml saline was injected through the epidural needle; this was followed by insertion of the catheter threading it > 5 cm into the epidural space via needle. In non-distention group which will act as a control, epidural catheter was inserted > 5 cm into the epidural space without prior saline injection. The epidural needle will then be removed and the catheter withdrawn to leave 5cm catheter in the space in both groups. The catheter is then fixed on the patient's back. All catheters were observed for spontaneous fluid or blood return and then aspirated with a syringe, if free flowing blood appears, intravascular catheter placement will be diagnosed. I shall study the frequency of intravascular placement on a specially designed Proforma.

**Data Analysis:** Data was entered in S.P.S.S. version 20 and analyzed. Mean and SD of Age and Weight was calculated. Frequency and percentage was calculated for intravascular placement of epidural catheter in both groups. Chi square test was the test of significance for categorical data to compare the intravascular placement in both groups.

## RESULTS

In distention group mean age was 46.87 ± 8.87 years and in non-distention group mean age of patient was 46.01 ± 9.52 years. In distention group there were 29 (41.4%) male and 19(27.1%) females and in non-distention group there were 41(58.6%) male and 51 (72.9%) females patents. In distention group mean weight was 80.27±20.21kg and in non-distention group the mean weight 73.97± 20.26 kg with insignificant p-value in both study groups, p-value > 0.05 (Table 1).

Intravascular placement of epidural catheter was observed in 3(4.3%) patients in distention group and 15 (21.4%) in non-distention group. Intravascular placement of epidural catheter was statistically lower in distention group as compared to non-distention group, p-value=0.002 (p<0.05) (Table 2).

Table -1: Baseline characteristics of patients (n=140)

| | Distention | Non-distention |
|---|---|---|
| No. of patients | 70 | 70 |
| Age (years) | 46.87±8.87 | 46.01±9.52 |
| Male | 29 (41.4%) | 19 (27.1%) |
| Female | 41 (58.6%) | 51 (72.9%) |
| Weight (kg) | 80.27±20.21 | 73.97±20.26 |

Table 2: Comparison of intravascular placement of Epidural catheter in both groups

| Intravascular placement of Epidural catheter | *Study Groups* | | *Total* |
|---|---|---|---|
| | Distention | Non-distention | |
| Yes | 3 (4.3%) | 15 (21.4%) | 18 (12.9%) |
| No | 67 (95.7%) | 55 (78.6%) | 122 (87.1%) |
| Total | 70 (100%) | 70 ()100% | 140 (100%) |

P-value = 0.002

## DISCUSSION

Insertion of a catheter into the epidural space may lead to complications such as paraesthesias; inadvertent vascular or subarachnoid cannulation and these may in turn lead to transient or permanent paralysis, convulsions and post dural puncture headache[8]. A systematic review reported that inappropriate catheter placement within the epidural space may result in unilateral or incomplete block[9]. Identification of the epidural space is often performed using the loss of resistance technique, commonly with air or saline.[10] Moreover unintended epidural vein injury complicates as many as 9% of lumbar epidural catheter

placements, with higher rates reported in pregnant patients compared with non-pregnant patients[11]. Epidural vein cannulation has long been recognized as a problem in patients due to distension of epidural veins. Epidural vein engorgement is maximal when the pregnant woman is in the supine position and minimal in the lateral position. The risk of epidural vein cannulation is significantly higher in the sitting position compared with the lateral position in the patients[12.].

A previous study analyzed 1427 women undergoing caesarean sections with epidural anaesthesia in eight clinical centers and found that the incidence of blood-vessel injury was 12.9% (77/595) compared with 6.4% (53/832) after pre-distention with epidural space fluids before catheter insertion[11].

Evron et al. showed that, in laboring women, pre-distention of the epidural space with 5 vs 2 mL saline before epidural catheter insertion decreased the incidence of accidental venous cannulation and the number of unblocked segments (16% vs 2%, respectively). The quality of analgesia was similar between the two groups[7]. Similarly, another study reported that patients during the first stage of labor with injection of 10 vs 2 mL saline after identification of the epidural space was associated with a higher total number of dermatomes blocked for cold and pinprick sensation. Also, there was a trend towards a lower incidence of blood vessel trauma in the 10mL group as compared with the 2mL group (3.8% vs 1.9%)[13]. We in this study found that intravascular placement of epidural catheter was observed in 18(12.9%) of the patients. In which 3(4.3%) patients were in group A and 15 (21.4%) were in group B. Intravascular placement of epidural catheter was statistically lower in group A as compared to group B, p-value = 0.002 (< 0.05). Our findings are similar to Evron S, et al who also favored distention group.

Previously an additional issue regarding this subject is that a large volume of normal saline in the epidural space may dilute local anesthetics, thereby reducing the potency of analgesia[14,15]. However, Siddik-Sayyid SM et al found an adequate analgesia in both groups, which may be attributed to the use of a test dose lidocaine 2% to be followed by bupivacaine 0.1% and fentanyl 2µg/kg[13].

## CONCLUSION

Our experience shows that intravascular catheter placement can be minimized with pre-distention with 5ml saline if injected through the epidural needle followed by insertion of the catheter threading it > 5 cm into the epidural space via needle. So pre-distention of epidural space must be used to avoid such complication in elective abdominal surgeries.

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