

## **ORIGINAL ARTICLE**

# **Effect of injecting saline into epidural space before catheter insertion on frequency of intravascular placement**

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## **ABSTRACT**

**Objective:** The objective of the study was to determine if injecting 10 ml saline before threading epidural catheter can decrease the accidental intravascular placement in epidural space.

**Study Design:** Interventional: experimental study.

**Place and Duration of Study:** Department of Anaesthesia, Hameed Latif Hospital Lahore, affiliated with College of Physicians Surgeons Pakistan, from September 2008 to August 2009.

**Methodology:** One hundred healthy women requesting Epidural labour analgesia were prospectively randomized to receive either no epidural injection (dry group,  $n = 50$ ) acting as a control or epidural 10 ml saline injection (saline group,  $n = 50$ ) before epidural catheter placement. A nylon multiport catheter was then threaded 3 cm into the epidural space and the needle was removed. We diagnosed *iv* catheter placement if blood was freely aspirated, or if the mother became tachycardic after injection of epinephrine 15  $\mu$ g.

**Results:** The groups were similar in age ( $P$  value=0.32). We identified *iv* catheter placement in 2/50 saline group and 7/50 dry group patients (4% vs 14%,  $P$  value= 0.16). Intravenous catheter placement was identified by initial blood aspiration (two saline, seven dry group patients). No anesthetic complications occurred, including hypoxemia, patient complaint of difficulty swallowing, intrathecal catheter placement, respiratory arrest, or subsequent *iv* or intrathecal catheter migration.

**Conclusion:** Our study results have shown that injecting 10 ml saline before threading epidural catheter has insignificant effect on decreasing the accidental intravascular placement in epidural space.

**Key words:** Epidural; Labour Analgesia; Blood tap.

**Citation:** Effect of injecting saline into epidural space before catheter insertion on frequency of intravascular placement. *Anaesth Pain & Intensive Care* 2011;15(3):153-156.

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## **INTRODUCTION**

Epidural anaesthesia 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<sup>1</sup>; it is also used for providing relief from pain during labour,

postoperative pain and chronic pain syndromes either in continuous infusion or as incremental boluses<sup>2,3</sup>.

Insertion of a catheter into the epidural space may lead to complications such as parasthesias; inadvertent vascular

or subarachnoid cannulation and these may in turn lead to transient or permanent paralysis, convulsions and post dural puncture headache<sup>4</sup>. Inappropriate catheter placement within the epidural space may result in unilateral or incomplete block<sup>5</sup>.

Identification of the epidural space is often performed using the loss-of-resistance technique, commonly with air or saline<sup>6</sup>. Its identification with air is more difficult and causes more dural punctures than with lidocaine or air plus lidocaine<sup>7</sup>. It has been suggested that if saline is injected through epidural needle before threading the catheter it significantly decreases accidental venous catheter placement during combined spinal-epidural labor analgesia<sup>8</sup>. It is postulated that this is due to widening the space and pushing blood vessels away from the epidural needle tip. There is no difference in the frequency of intravascular placement between threading the epidural catheter 5 cm and threading the catheter 10 cm and retracting it by 5 cm<sup>9</sup>. Epidural vein cannulation has long been recognized as a problem in parturients 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 parturients<sup>10</sup>. The unintentional and unrecognized cannulation of an extradural vein is a potentially serious complication of an epidural anesthetic.

In a prospective audit of 380 parturients opting for epidural analgesia for labour pain in year 2002 in our department of Hameed Latif and Allied Hospitals, the frequency of blood tap with catheter insertion was found to be 9.2% (35 cases)<sup>11</sup>. Clinical observation indicates that the frequency of blood tap is reduced after prior injection of saline into the epidural space. We aimed and conducted a study to formally assess this hypothesis.

## **METHODOLOGY**

This Interventional experimental study was conducted at the Department of Anaesthesia, Hameed Latif Hospital Lahore, affiliated with College of Physicians Surgeons Pakistan.

After approval from Hospital Ethical Committee and obtaining an informed consent, 100 patients taken from labour room were included in the study. The demographic information and ASA status were recorded. The patients were randomly allocated to one of the two groups by draw method with exclusion [from the slips labeled Group A (50 slips) or Group B (50 slips) in a box]. 20G intravenous cannula was passed and vital signs were checked before the procedure. L3-L4 or L4-L5 inter vertebral space was targeted with Touheys' needle 16G (Portex® Epidural minipack system 1 with clamp, clear catheter, open end) in sitting position using midline approach. Identification of epidural space was done with loss of resistance technique with air in both groups. In Group A (saline group), 10 ml preservative-free normal saline was injected through the epidural needle over less than ten seconds; this was followed by insertion of the catheter threading it > 5 cm into the epidural space via needle. In Group B (dry group) which acted as a control, epidural catheter was inserted > 5 cm into the epidural space without prior fluid injection. The epidural needle was then removed and the catheter withdrawn to leave 3 cm catheter in the epidural space. The catheter was then fixed on the patient's back.

All catheters were observed for spontaneous fluid return and aspirated with a 5 ml syringe. On appearing of freely flowing blood, intravascular catheter placement was diagnosed. In case of no free flow blood or CSF was aspirated, 3ml lidocaine 2% plus epinephrine 15 µg was injected and observed with the pulse oximeter for a tachycardic response to epinephrine (25 beats/min increase in maternal heart rate). When the aspiration or epinephrine test result came out positive, the catheter was removed and was replaced. The investigator studied the frequency of intravascular placement on a specially designed Proforma.

Data was entered in S.P.S.S. version 10 and analyzed. Descriptive statistics were calculated. Age was presented as Mean ± SD.

Outcome was compared for frequency of blood taps between two groups. Then these were tested for statistical significance by applying Fisher's Exact test as the data was mainly be qualitative. A p-value of 0.05 or less was considered as significant.

## RESULTS

No statistically significant difference was observed in the two study groups in mean ages, in demographics, the amount of air used to identify the epidural space or the depth of catheter insertion. We identified IV catheter placement in 2/50 saline group and 7/50 dry group patients (4% vs 14%,  $P > 0.05$ ). Intravenous catheter placement was identified by initial blood aspiration in two saline, seven dry group patients (Table 2). Percentage of blood tap complication in group B (dry group) was 14.0% as compared to 4.0% in group a (saline group) but this difference was not statistically significant at  $p = 0.05$ . No anesthetic complications occurred, including hypoxemia, patient complaint of difficulty swallowing, intrathecal catheter placement, respiratory arrest, or subsequent *in* or intrathecal catheter migration.

**Table 1: Comparison of mean age between two study groups.**

Group	No.	Mean Age in years	Std. Deviation
Group A (saline)	50	27.76	4.168
Group B (Dry)	50	26.98	3.622

Statistical Analysis  
t-value = 1.00      P = 0.32 (P > 0.05)

**Table 2: Comparison of blood tap complication with and without saline injection before the insertion of catheter.**

Intravascular Catheterization	Count / Percentage	Group		Total
		Group A (saline)	Group B (Dry)	
Yes	Count	2	7	9
	%	4.0%	14.0%	9.0%
No	Count	48	43	91
	%	96.0%	86.0%	91.0%
Total	Count	50	50	100
	% within group	100.0%	100.0%	100.0%

**Statistical analysis**

Test applied = Fisher Exact test

Two tailed 'P' value for Fisher's Exact test = 0.16 (P > 0.05)

## DISCUSSION

We found that injecting 10 ml saline through the epidural needle immediately before threading a nylon multiport epidural catheter lowered the incidence of intravenous placement of catheters from 14% to 4% during epidural in labour analgesia.

There were no cases of difficulty swallowing, hypoxemia, or respiratory arrest. The fact that we encountered no

untoward side effects in this study suggests but does not prove the safety of injecting saline through the epidural needle in the context of epidural for labour.

Studies by Rolbin et al<sup>12</sup> and Scott and Beilby<sup>13</sup> used the method of epidural space priming with saline and they found no advantage of this; however they used very small volumes of normal saline for priming (3ml and 5ml respectively). Tilakaratna et al found that epidural space pre-extension can successfully be done with 5 to 10 ml of saline without spilling back.<sup>14</sup> Other researchers also used 10 ml of saline for epidural space pre-distension before catheter insertion and found significant reduction in catheter related complications.<sup>8,15,16</sup>

Evron S et al<sup>17</sup> pre-distended the epidural space with 5ml of saline used for identification of epidural space and compared it with LOR to air. They found significant reduction in incidence of intra-vascular catheter placement.

Test doses and aspiration cannot reliably detect intravenously located multiport epidural catheters. Injected test doses lack sensitivity with partially in multiport catheters, for injectates preferentially exit the proximal hole while the distal hole is the one most likely to be located intravenously.<sup>18</sup> Aspiration test may be negative but intravenously located multiport epidural catheters have been reported.<sup>19</sup>

Our study found a high incidence of venous cannulation in the dry group. Other centres, using different epidural needles, catheters, or placement techniques, may have a lower baseline incidence of venous cannulation. In addition, the anesthesiologist who tested the catheter for intra-vascular placement knew the patient's group assignment. We attempted to compensate for this logistically necessary design flaw by establishing strict criteria for the diagnosis of intra-vascular catheter placement.

In this study, although the percentage of blood tap in group B (dry group) was 14.0% as compared to 4.0% in group A (saline group); it failed to reach statistical significance at  $p = 0.05$ . This may be due to a small sample size; a larger sample size may be able to manifest the significance of this difference.

## CONCLUSION

In summary, we report that the administration of normal saline through the epidural needle before catheter placement reduced the frequency of intravascular catheter placement from 14% to 4% but the difference did not reach statistical significance.

## REFERENCES

1. Morgan GE, Mikhail MS, Murray MJ. Regional anaesthesia and pain management. 3rd ed. 2002: 253282.
2. Abbas A. Comparison of continuous epidural technique with administration boluses during labour analgesia (dissertation) Karachi. College of Physicians & Surgeons Pakistan, 2002.
3. Khan MA. The role of epidural analgesia in sitting position for analgesia during second stage of labor (dissertation) Karachi. College of Physicians & Surgeons Pakistan, 2005.
4. Browne IM, Birnbach DJ, Stein DJ, O'Gorman DA, Kuroda M. A comparison of Espocan and Tuohy needles for the combined spinal-epidural technique for labor analgesia. *Anaesth Analg* 2005; 101: 53540.
5. Portnoy D, Vadhera R. Mechanism and management of an incomplete epidural block for cesarean section. *Anesthesiol Clin North America* 2003; 21: 3957.
6. Beilin Y, Arnold I, Telfyan C, Bernstein HH, Hossain S. Quality of analgesia when air versus saline is used for identification of the epidural space in the parturient. *Reg Anesth Pain Med* 2000; 25: 5969.
7. Evron S, Sessler D, Sadan O, Boaz M, Glezerman M, Ezri T. Identification of the epidural space: loss of resistance with air, lidocaine, or the combination of air and lidocaine. *Anesth Analg* 2004; 99: 24550.
8. Gadalla F, Lee SH, Choi KC, Fong J, Gomillion MC, Leighton BL. Injecting saline through the epidural needle decreases the IV epidural catheter placement rate during combined spinal-epidural labour analgesia. *Can J Anaesth* 2003; 50: 3825.
9. Cartagena R, Gaiser RR. Advancing an epidural catheter 10 cm then retracting it 5 cm is no more effective than advancing it 5 cm. *J Clin Anesth* 2005; 17: 52830.
10. Harney D, Moran CA, Whitty R, Harte S, Geary M, Gardiner J. Influence of posture on the incidence of vein cannulation during epidural catheter placement. *Eur J Anaesthesiol* 2005; 22: 1036.
11. Sheikh AN. A prospective audit to study the frequency of complications of epidural analgesia during labour. (dissertation) Karachi. College of Physicians & Surgeons Pakistan, 2004.
12. Tilakaratna PN, Stocks GM, Plaat F. Epidural volume extension at Caesarean section. *Br. J. Anaesth.* 2007; 98(3): 405-9.
13. Evron S, Gladkov V, Sessler DI, Khazin V, Sadan O, Boaz M, and Ezri T. Predistention of the Epidural Space Before Catheter Insertion Reduces the Incidence of Intravascular Epidural Catheter Insertion. *Anesth. Analg* 2007; 105(2): 460 - 4.
14. Kucukguclu S, Unlugenc H, Gunenc F, Kuvaki B, Gokmen N, Gunasti S, et al. The influence of epidural volume extension on spinal block with hyperbaric or plain bupivacaine for Caesarean delivery. *Eur J Anaesthesiol.* 2008; 25(4): 307-13.
15. Riley ET, Carvalho B. The Episire syringe: a novel loss of resistance syringe for locating the epidural space. *Anesth Analg.* 2007; 105(4): 1164-6.
16. Carden E and Ori A. The BiP Test: a modified loss of resistance technique for confirming epidural needle placement. *Pain Physician.* 2007; 10(2): 383-5.
17. Bell DN, O'Connor A, Leslie K. The influence of flushing epidural catheters before use on detection of intravenous placement: an in vitro and in vivo study. *Anaesth Intensive Care.* 2007; 35(6): 932-8.
18. Lyons GR, Kocarev MG, Wilson RC, and Columb MO. A Comparison of Minimum Local Anesthetic Volumes and Doses of Epidural Bupivacaine (0.125% w/v and 0.25% w/v) for Analgesia in Labor. *Anesth Analg* 2007; 104: 412-15.
19. Kim JT, Lee JH, Yoon SZ, Lim YJ, Bahk JH, Kim CS, et al. Effect of lumbar flexion on the extent of epidural blockade *Reg Anesth Pain Med.* 2007; 32(6): 471-4.
20. Habib AS, George RB, Allen TK, Olufolabi AJ. A pilot study to compare the Episire Autodetect syringe with the glass syringe for identification of the epidural space in parturients. *Anesth Analg.* 2008; 106(2): 541-3.

