

ADMINISTRATION OF SALINE INJECTION IN EPIDURAL SPACE AVOIDS INTRAVASCULAR CATHETER INSERTION IN PATIENTS UNDERGOING CAESARIAN SECTION: A RANDOMIZE CONTROLLED TRIAL

Muhammad Azam,¹ Naila Akthar,² Tanvir Akhtar Butt³

Abstract

Objective: The objective of this study was to determine if injecting 10 ml saline in epidural space before epidural catheter placement in pregnant women undergoing cesarean section can decrease the frequency of inadvertent intravascular catheter placement.

Study Design: Randomize Controlled Trail.

Place and Duration of Study: Department of Anaesthesia at Gynaecology and Obstetrics operation theater, Jinnah Hospital, Lahore affiliated with College of Physician and Surgeon Pakistan from April 2008 to March 2009.

Methodology: Sixty pregnant patients (ASA I and II) randomly allocated in Group A and B equally for elective cesarean section were selected. In each patient epidural space was identified with LOR technique using air in sitting position. In Group A (dry group),

no saline was injected while in Group B (saline group), 10 ml saline was injected before epidural catheter placement. Using 16 G Toughy needle, catheter was inserted up to 4 cm in the epidural space. To find out inadvertent intravascular catheter placement, epidural catheter was aspirated to exclude blood. After negative aspiration, test dose of 3ml injection xylocain 2% (with adrenaline 1:200,000) was administrated and patient were monitored one minute for increase in heart rate (> 20% of baseline), tinnitus and perioral numbness.

Results: In both group data collected was analyzed in SPSS version 11 and Chi-square test was applied. P value of 0.05 or less was taken significant. Percentage of positive inadvertent intravascular catheterization in term of bloody aspirate (20 and 13.3%) was not significantly different between two groups (P value = 0.488). Increase in heart rate, tinnitus and perioral numbness was not observed in any patient.

Conclusion: There was no significant difference in accidental intravascular catheterization if 10 ml saline is injected through needle before catheter insertion.

Key word: Epidural catheter, accidental intravascular catheterization, anaesthesia.

Azam M.¹

Assistant Professor of Anesthesia
KEMU / Mayo Hospital, Lahore

Akthar N.²

Associate Professor of Anesthesia
KEMU / Mayo Hospital, Lahore

Butt T.A.³

APMO, Dept of Anesthesia, Mayo Hospital, Lahore

Introduction

Regional anaesthesia has become the most common

method for both elective as well as emergency (30.2% epidural and 42.6% spinal) caesarean sections¹. Epidural anaesthesia is preferred over spinal anaesthesia in caesarean sections^{1,2} as placement of catheter can provide prolonged anaesthetic effect and additional drugs can be given to maintain the duration of anaesthesia and postoperative pain relief.³ However, there are chances of un-intentional dural puncture with tuohy needle (16/18G)⁴ and also the potential to produce local anaesthetic induced systemic toxicity by accidental administration of drug through needle / catheter into engorged epidural veins. This could result in serious complications such as irritability, frank convulsions and CVS collapse. The most simple method to avoid toxic reaction is prevention. Incidence of local anaesthetic toxicity can be minimized by careful aspiration of needle or catheter for blood before injection, use of 3 ml xylocaine as test dose and observing for early sign of intravascular catheterization (increase in heart rate > 20% of the baseline, tinnitus, perioral numbness). Different research workers used different methods to expand the epidural space and thus to prevent inadvertent intravascular catheterization.⁵⁻¹² The rationale of our study was to see if injecting 10 ml saline decreased the incidence of inadvertent intravascular catheterization.

Method

After approval of ethical committee, the study was conducted in the department of Obstetrics and Gynaecology in Jinnah Hospital, Lahore Pakistan. 60 pregnant patients ASA – I and II planned to receive epidural anaesthesia for elective caesarean section were included in this study. Patients with pregnancy induced hypertension, pre-eclampsia, history of drug abuse, on anticoagulant therapy, emergency caesarean section and having dural puncture during procedure were excluded from study.

Patients were divided randomly by using random Nos. table into two groups of 30 patients in each: Group A (Dry) and Group B (saline injected). Emergency drugs and equipments were prepared and checked. After shifting the patient to operation theater table, monitors were applied to record the heart rate, blood pressure and oxygen saturation. An intravenous line was maintained with 18G cannula. Patient were pre-loaded with 1 litre Ringer Lactate. After taking aseptic measures skin was infiltrated with 3ml of local anaesthetic (xylocaine) in sitting position. The epidural spa-

ce was identified at L₃ L₄ by LOR technique using air. If dural puncture occurred no further study was proceeded in that patient. In group A (Dry group), saline was not injected before epidural catheter placement while in Group B (saline group) 10ml saline was injected through epidural needle before epidural catheter placement. Catheter was inserted till 4 cm in each patient. After catheter insertion, aspiration test was done to exclude blood or CSF. After negative aspiration, test dose of 3ml injection xylocain 2% with adrenaline (1:200,000) was administrated and patients were monitored for increase in heart rate of greater than 20% of baseline to exclude intra vascular catheter placement as well as motor block to exclude intrathecal catheter placement. If no such changes were seen catheter was secured with opsite 20 × 30 cm to patient back. Patients were placed in supine position with a wedge under the right hip. Epidural anesthesia was activated for elective caesarean section.

Data Analysis

The data was analyzed in SPSS version 11 and chi-square test was applied. A p value of 0.05 or less was taken significant.

The demographic and clinical variables were presented as proportion and types. The Mean and Standard Deviation for quantitative data like age were also given.

Results

There was no statistically significant difference between two group in term of age, mean systolic blood pressure and mean diastolic blood pressure before the procedure. Percentage of positive inadvertent intravascular catheterization in term of bloody aspirate (20 & 13.3%) was not significantly different between groups (P value = 0.488). Increase in heart rate, tinnitus and perioral numbness was not observed in any patient.

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

Study Group	Number of Patients	Mean ± SD
A	30	26.9 ± 3.2
B	30	27.1 ± 2.8

Table 2: Comparison of mean systolic blood pressure between two study groups before procedure.

Study Group	Number of Patients	Systolic BP (mm Hg) Mean ± SD
A	30	121 ± 14
B	30	117 ± 8

Table 3: Comparison of mean diastolic blood pressure between two study groups before procedure.

Study Group	Number of Patients	Diastolic BP (mm Hg) Mean ± SD
A	30	73 ± 11
B	30	72 ± 10

Table 4: Comparison of mean heart rate before the procedure, between two study groups.

Study Group	Number of Patients	Baseline HR (per Minute) (Mean ±SD)
A	30	98 ± 9
B	30	95 ± 11

Table 5: Comparison of mean heart rate after the procedure, between two study groups.

Study Group	Number of Patients	HR after the procedure (per Minute) Mean ±SD
A	30	101 ± 8
B	30	95 ± 11

Table 6: Comparison of catheter Aspiration test between two study groups.

Aspiration Test Results	Count and %	Study Groups		Total
		Group A	Group B	
Negative	Count	24	26	50
	%	80.0%	86.7%	83.3%
Positive	Count	6	4	10
	%	20.0%	13.3%	16.7%
Total	Count	30	30	60
	%	100.0%	100.0%	100.0%

Discussion

Pregnant women are prone to develop unintentional intravascular epidural catheterization using epidural anesthesia technique for cesarean section due to engorged epidural veins (Hormone related/ increased intra abdominal pressure). When epidural needle is inserted into epidural space, it increases the chance of accidental venous puncture. Insertion of epidural catheter further increases chance of inadvertent venous puncture. Our study was based on assumption that distention of the epidural space in pregnant women with injection saline could reduce the incidence of accidental intravascular catheterization. The result of our study shows no significant difference between two groups A (dry) and B (Saline) P value is = 0.488. Many studies have been conducted to prevent the risk of intravascular epidural cannulation during epidural catheter placement.

Rolbin SH et al, in their study compared three groups

with different volume of fluid that is 3 ml saline, 3 ml xylocaine and no fluid to expand epidural space in pregnant women.⁵ Their results were in consistent with our study as they could not find out any significant difference in three groups regarding accidental intravascular catheterization. Scott DA et al used small amount of fluid i.e. 5 ml as compared to 10ml saline in our study and could not demonstrate any increase of accidental venous puncture while performing epidural anesthesia technique.⁶ This could be due to the study being conducted in non pregnant females as epidural veins are not engorged in these patients.

Han CB et al studied 300 women randomly divided in three patient groups undergoing Cesarean section. Group I (n = 102) received an epidural injection with 5 ml normal saline; group II (n = 93) received 5 ml normal saline containing adrenaline (5 µg/ml); group III (n = 100) received direct epidural catheter place-

ment. There were no significant differences in the incidence of bloody fluid in the epidural catheter or in the incidence of intravascular epidural catheter placement between the three groups.⁷ The result of our study are supported by Saddik Sayyed et al who could not find significant difference between blood vessel trauma by 2 ml and 10 ml injection of saline prior to epidural catheter insertion in parturient.⁸

However a large number of studies showed significant decrease in accidental intravascular catheterization with saline predistention in epidural space before catheter placement.

Contrary to our results Everon S et al predistended epidural space with 5ml saline and found significant reduction of intravascular catheterization⁹. Gadalla et al, injected 10ml normal saline before epidural catheter insertion and their results showed a reduction in incidence of intravascular catheter placement from 20% to 2%. This was different from our result due to variation in technique used and catheter type inserted.¹⁰

Cesur et al, found decrease in incidence of intravascular injury (8.2% to 2%) when he compared adding 20 ml xylocain in epidural space before catheter insertion with a control group.¹¹ This difference from the results of our study (20% vs. 13.3%) could be due to the greater volume of fluid injected (20 ml vs. 10 ml). Okutomi T et al studied with large of amount of fluid injected prior to local anaesthetic and found that complication could be reduced but it affected the quality of anaesthesia and analgesia.¹²

Previous researchers have also conducted studies to determine the effect of patient position, type of catheter, holding of syringe plunger on incidence of intravascular catheterization. Manion D et al assessed patient position, diameter of epidural catheter and injection of normal saline before epidural catheterization. He used 18 G epidural needle, patients were in sitting position and 10 ml saline was injected. In his study, complication of venous catheter insertion decreased from 16% to 10% as compared to our 20% vs 13.3%.¹³ The reason could be due to difference in the size of epidural needle as we used 16 G needle.

Henry D et al, compared lateral recumbent head down position with sitting position and found a decrease in incidence of intravascular catheterization from 15.7% to 3.7% as compared to our study 20% to 13.3% in sitting position.¹⁴ The difference could be due to less venous engorgement as Head down position facilitates venous drainage. Similarly Behar M et al achieved small degree of accidental venous puncture

in obese and non-obese parturient (11% to 2%)¹⁵ as compared to ours (20% to 13.3%). His patients were also placed in lateral recumbent head down position. Landa SE et al, found in his study that by simply making angle of needle at insertion site decreased the risk of accidental intravascular catheterization.¹⁶ D Anglo et al, studied various catheter length inserted i.e. 2, 4, 6, 8 cm within epidural space and found 3 cm length catheter insertion was optimal to prevent inadvertent intravascular catheterization.¹⁷ Banwell BR et al, concluded that if soft epidural catheter was used for epidural in parturients, it decreased the incidence of accidental venous puncture.¹⁸ Moreover his study revealed that this complication could be decrease if anaesthetist was experienced in epidural technique.

The discrepancy in our results could be explained by different methodology, prolonging distension time, delay in injection of local anesthetic and make of catheter used. Studies have suggested decrease in incidence of vessel injury with saline pre distension of epidural space before catheter insertion. In our research 10 ml saline pre injection in epidural space did show a decrease in intra vascular catheter insertion (13.3% vs 20%) but it was not significant statistically ($p = 0.4$). We did not evaluate the quality of anesthesia and used a fix dose of local anesthetic in both groups. Future studies can be done with larger sample size to evaluate the effect of saline on number of dermatomes blocked, the quality of anesthesia and analgesia. In conclusion, pre distention of epidural space with 10m saline has no effect on incidence of intravascular catheter insertion.

References

1. Chan YK, Ng KP, Chiu CL. Trends in obstetric anaesthesia and analgesia over a ten year period. *Int J obstet anaesth.* 2002; 11: 176-9.
2. Schneck H, Scheller M, Wagner R. Anaesthesia For cesarean Section and acid aspiration prophylaxis. *Anesth Analg.* 1999; 89: 533.
3. Sadeque N, Critical Procedure; technique of providing epidural analgesia. *Professional Med J.* 2005; 12: 105-9.
4. Choan U., Hamadni G.A. Post dural puncture headache. *Journal of Pakistan of Medical Association,* 2003; 53: 359-67.
5. Rolbin SH, Halpern SH, Braude BM, Kapala D, Unger R, Radhakrishnan S *Can J Anaesth* Fluid through the epidural needle does not reduce complications of epidural catheter insertion, 1990; 37: 337-40.
6. Scott DA, Beilby DS. Epidural catheter insertion: the effect of saline prior to threading in non-obstetric pati-

- ents. *Anaesthesia intensive Care*, 1993; 21: 284-7.
7. Han CB, Yu L, Qian YN, Ding ZN, Jiang JD, Zhou QH, Sun J., Effects of predistention with normal saline containing adrenaline on blood – vessel injury during epidural catheter placement. *J Int Med Res*. 2011; 39: 2302-6.
 8. Siddik-Sayyid SM, Taha SK, Aouad MT, Daadoul DG, Deeb PG, EI Khatib MF, Baraka AS. The effect of injection of two vs. 10 mL saline on the subsequent spread and quality of epidural analgesia in parturients. *J Clin Anesth*. 2006; 18: 575-9.
 9. Evron S, Gladkov V, Sessler DI, Khazin V, Sadan O, Boaz M, Ezri T. Predistention of the epidural space before catheter insertion reduces the incidence of intravascular epidural catheter insertion. *Anesth Analg*. 2007 Aug; 105: 460-4.
 10. Gadalla F, Injection saline through the epidural needle decreased the Intra vascular epidural catheter placement rate during combined Spinal –epidural labor analgesia. *Can J Anaesth*. 2003; 50: 4: 382-85.
 11. Cesur M, Alici HA, Erdem AF, Silbir F, Yuksek MS. Administration of local anesthetic through the epidural needle before catheter insertion improves the quality of anesthesia and reduces catheter related complications. *Anesth Analg*. 2005 Nov; 101: 1501-5.
 12. Okutomi T, Hoka S, Epidural Saline Solution prior to local anaesthetic produces differential nerve block. *Can J Anaesth*. 1998; 45: 1091-3.
 13. Mannion D, Walker R, Clayton K, Extradural Vein puncture – an avoidable complication. *Anaesthesia*, 1991; 46: 585-7.
 14. D. Harney, C.A Moran, R. Whitty, S. Harte, M. Geary and J. Gardiner. Influence of posture on the incidence of vein cannulation during epidural catheter placement. *European Journal of Anaesthesiology*, 2005; 22: pp 103-106.
 15. Bahar M, Chanimov M. Cohen ML, Friedland M, Grinshpon Y, Brenner R, Shul I, Datsky R, Sherman DJ. Lateral Recumbent head – down posture for epidural catheter insertion reduces intravascular injection. *Can J Anaesth*. 2001; 48: 48-53.
 16. Landa SE, Pai K, Winkoff SP. The insertion Angle of epidural needle affect the success of the block (abstract). *Anesthesiology*, 2003; 98: A113.
 17. D. Angelo R, Foss ML, Livesaych: A comparison of multiport and Uniport epidural catheter in Labouring patients. *Anesth Analg*. 1997; 84: 1276.
 18. Banwell BR. Morley – Forster P, Krause R. Decreased incidence of complications in parturients with the arrow (flexTip Plus) epidural catheter. *Can J Anaesth*. 1998; 45: 370-2.