

Case report

Management of inadvertent dural puncture following thoracic epidural anesthesia for mastectomy: A case report

ABSTRACT

Background: Thoracic Epidural has been successfully used to administer anesthesia for mastectomy. However inadvertent dural puncture is a major complication occurring in about 0.19 to 3.6% during epidural anesthesia, even in very experienced hands with need for immediate and proper management. We present a case of mastectomy done under thoracic epidural anesthesia following inadvertent dural puncture, using same interspace.

Case presentation: A 62-year-old known hypertensive female patient with good drug compliance, weighing 68kg and 1.68m in height with stage IV right breast cancer. She underwent modified radical right mastectomy, under thoracic epidural anesthesia administered at the T8/T9 interspace using an 18G Tuohy needle. Although there was inadvertent dural puncture, patient recovered without untoward effects.

Conclusion: Epidural anesthesia can be undertaken in the same interspace following accidental dural puncture if necessary precautions are taken.

Key Words: Thoracic epidural anesthesia, Inadvertent dural puncture, Mastectomy, Port Harcourt, Nigeria

INTRODUCTION

The epidural space is very significant in the practice of modern anesthesia,¹ and thoracic epidural has been successfully used to administer anesthesia for mastectomy.² However inadvertent dural puncture is a major complication occurring in about 0.19 to 3.6% during epidural anesthesia,³⁻⁵ even in very experienced hands with need for immediate and proper management. Intraoperative management alternatives include placement of the epidural catheter in another interspace, which does not exclude another accidental dural puncture.^{6, 7} The second option is conversion to spinal anesthesia using the same epidural needle, in which case there is no post operative analgesia. Intrathecal catheterization through the same dural hole in which case loss of CSF is minimized in addition to the possibility of continuous spinal and post operative analgesia. In the extreme, the procedure can be completely abandoned. Our experience points to the fact that following accidental dural puncture, epidural anesthesia can still be safely administered at the same interspace. The use of same interspace for the administration of epidural anesthesia following inadvertent dural puncture has not been fully explored, hence the case report.

Thoracic epidural anesthesia was combined with brachial plexus nerve block for modified mastectomy in Thailand, and the outcome of this procedure was published in 2005.⁸ Although segmental thoracic anesthesia has been known for postoperative pain control, a Korean study in 2006 highlighted its successful use for mastectomy among twenty patients.⁹ Thereafter many other centers have experimented and reported their findings with this technique especially for high-risk patients.¹⁰⁻¹³ In Nigeria, successful use of thoracic epidural anesthesia for major abdominal surgeries was reported in Uyo where two out of the twelve patients had total spinal anesthesia and were resuscitated.¹⁴ Single shot lamina thoracic paravertebral block technique has been used as an adjunct to general anesthesia for modified radical mastectomy.¹⁵ The experience of another researcher in Nigeria is also highlighted.¹⁶

CASE PRESENTATION

Pre-operative Preparation: A 62-year-old known hypertensive female was diagnosed with stage IV right breast cancer at the Rivers State University Teaching Hospital. She had a thorough pre-anesthetic evaluation and informed consent was obtained. General baseline investigations were done, including a full blood count, electrolyte urea and creatinine, clotting profile and a chest radiogram. All results were within normal limits. She had taken her oral antihypertensives drugs in addition to oral diazepam the evening and morning before surgery to ensure anxiolysis and well controlled hypertension. Patient was premedicated with intravenous metoclopramide 10mg 30 minutes before surgery, and preoperative hydration done with 0.9% normal saline 1L.

Intra-operative Procedure: In sitting position, thoracic epidural was aseptically established through a midline approach at T8/T9 interspace with an 18G Tuohy needle. Monitoring was non-invasive, including non-invasive blood pressure (NIBP), pulse rate, electrocardiogram and arterial oxygen saturation. At 6cm depth during the procedure, a clear free flow of cerebrospinal fluid (CSF) was observed, and the Tuohy needle was gradually withdrawn until cessation of CSF flow. A 5 ml syringe was attached to the Tuohy needle and aspiration of CSF was negative. On release, the plunger was sucked inward suggesting correct epidural needle placement and the epidural catheter was threaded to the twelfth centimeter marking. The epidural catheter was further aspirated to exclude accidental intrathecal catheterization. A test dose of 4ml plain lidocaine plus adrenaline (1:200,000) was also administered to rule out intrathecal catheterization. The absence of signs of motor block after 3min and transient tachycardia ruled out intrathecal and intravascular catheterization. The Patient was returned to supine position and epidural anesthesia subsequently activated with 2ml, 3ml and 5ml 0.5% plain bupivacaine, at 0 minute, 3 minutes and 5 minutes intervals, respectively. The catheter and filter were sealed aseptically and labeled to avoid inadvertent epidural administration of other medications. The vital signs were vigorously monitored at 2minutes intervals for 20 minutes. Patient had loss of sensation to needle prick at T₂ level after 15 minutes, and surgery commenced by the twentieth minute and lasted for 72 minutes. Mild anxiolysis was

achieved with intravenous diazepam 5mg and pentazocine 30mg, respectively, and surgery was successfully completed. Total intraoperative blood loss was about two hundred milliliters (200ml).



Figure 1: Epidural Set used for the procedure (Front View)

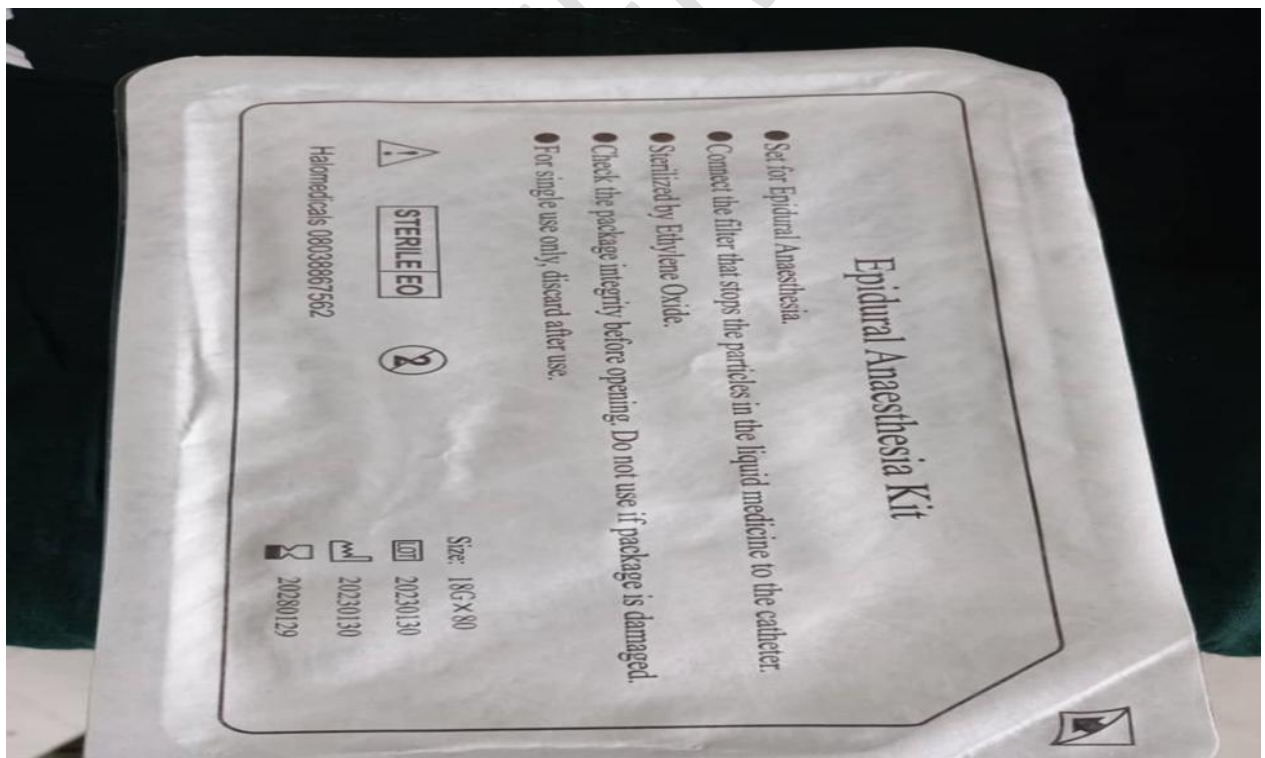


Figure 2: Epidural Kit (Back View)



Figure 3: Epidural Kit (Opened for Use)

Post-operative Care: Oral fluids were commenced about 8 hours following completion of surgery and deep vein thrombosis prophylaxis was started with clexane after 24 hours in line with hospital protocol. Patient was advised to remain in supine position for 24 hours to reduce the risk of post dural puncture headache. The epidural catheter was not used to administer opioids or any other medication in post operative period, and it was removed the morning after surgery.

Features of Epidural Puncture: Patient complained of mild neck stiffness on the second day post operative but could sit upright in bed, and tolerated her meals. There were no complaints of headache, residual motor weakness or fever. She was followed up until discharge on the seventh day post op.

DISCUSSION

A chronicle of neurologic complications following thoracic epidural anesthesia has already been reported in literature.^{17, 18} In this report, we highlighted that thoracic epidural anesthesia (TEA) using same interspace following accidental dural puncture is possible and can be safely used for modified radical mastectomy. Our patient had hypertension which posed a challenge to the safe conduct of general anesthesia (GA). We therefore preferred thoracic epidural anesthesia over GA as it involves the blunting of stress response and avoidance of airway manipulation. Moreover, TEA has other widely reported advantages in the literature, including hemodynamic stability, lower analgesic consumption, superior postoperative analgesia, reduced postoperative nausea and vomiting (PONV), early alimentation and shorter hospital stay. However, in our patient, adequate analgesia was achieved with epidural bupivacaine supplemented with intravenous diazepam and pentazocine.

In general, the paucity of literature on the use of same interspace for epidural anesthesia following accidental dural puncture for oncologic breast surgeries may be due to the fear of inadvertent intrathecal catheterization apart from other potential complications like spinal cord injury, respiratory complications, spinal/epidural hematoma, and post-dural puncture headache. Our experience however suggests that with experience and due precautions, these complications can be circumvented. The innervation of the breast, axillary nodes, and pectoral muscles are derived from multiple sources, including branches from the first to the sixth intercostal nerves, brachial plexus, intercostal brachial nerve (T2-T3), supraclavicular nerve, and lateral and medial pectoral nerves from the cervical plexus.¹⁹The supplementation of TEA with interscalene block in patients undergoing modified radical mastectomy(MRM) has been shown to improve pain scores and reduce opioid consumption during the first 24 hours postoperatively.²⁰However, this was not done in our patient, who rather had mild anxiolysis with good patient satisfaction. The use of cervical epidural anesthesia for modified radical mastectomy has also been widely documented in the literature. The concern, however, is possible compromise of the pulmonary function and poor cardiovascular reserve. Our patient was elderly and a known hypertensive. This is in addition to the likelihood of paralysis of the phrenic nerve with a cervical epidural block.²¹

One of the advantages of TEA is adequate postoperative epidural analgesia, with improved perioperative outcome in patients at high risk for postoperative pulmonary complications. We successfully avoided the addition of opioids by giving incremental doses of bupivacaine which was supplemented with mild anxiolysis. The success of our case is a clear indication that the same interspace can be used successfully for epidural anesthesia following inadvertent dural puncture. This approach is preferred to using another interspace which is fraught with the possibility of another accidental dural puncture in low-income countries where landmark technique is commonly used.

The limitation of this report is the absence of a definitive study like ultrasound or MRI to ascertain the actual level of the epidural catheter placement.

CONCLUSION

A careful, skillful withdrawal of the Tuohy needle into the epidural space, confirmation of correct epidural space catheter placement and careful titration of the local anesthetic to effect can serve as a safe alternative anesthetic technique in the event of inadvertent dural puncture during epidural anesthesia for mastectomy. Also, the absence of significant complications with a smooth anesthesia after catheterization of same interspace following accidental dural puncture is good reason for a case series. Management of PDPH, if it occurs, should be along established treatment guidelines.

REFERENCES

1. Fyreface-Ogan S. Anatomy and clinical importance of the epidural space. *Epidural Analgesia- Current Views and Approaches*. 2012;12:1-12.

2. Trikha A, Sadhasivam S, Saxena A, Arora MK, Deo S. Thoracic epidural anesthesia for modified radical mastectomy in a patient with cryptogenic fibrosing alveolitis: a case report. *Journal of clinical anesthesia*. 2000;12(1):75-9.
3. Berger CW, Crosby ET, Grodecki W. North American survey of the management of dural puncture occurring during labour epidural analgesia. *Canadian journal of anaesthesia*. 1998;45:110-4.
4. Gleeson C, Reynolds F. Accidental dural puncture rates in UK obstetric practice. *International Journal of Obstetric Anesthesia*. 1998;7(4):242-6.
5. Choi PT, Galinski SE, Takeuchi L, Lucas S, Tamayo C, Jadad AR. PDPH is a common complication of neuraxial blockade in parturients: a meta-analysis of obstetrical studies. *Database of Abstracts of Reviews of Effects (DARE): Quality-assessed Reviews [Internet]: Centre for Reviews and Dissemination (UK)*; 2003.
6. Apfel C, Saxena A, Cakmakkaya O, Gaiser R, George E, Radke O. Prevention of postdural puncture headache after accidental dural puncture: a quantitative systematic review. *British journal of anaesthesia*. 2010;105(3):255-63.
7. Cesur M, Alici HA, Erdem AF, Silbir F, Celik M. Decreased incidence of headache after unintentional dural puncture in patients with cesarean delivery administered with postoperative epidural analgesia. *Journal of anesthesia*. 2009;23:31-5.
8. Sundarathiti P, Pasutharnchat K, Kongdan Y. Thoracic epidural anesthesia (TEA) with 0.2% ropivacaine in combination with ipsilateral brachial plexus block (BPB) for modified radical mastectomy (MRM). *J Med Assoc Thai*. 2005;88(4):513-20.
9. Ok SY, Park SW, Kim SI, Kim SC, Lee MH. Thoracic Epidural Anesthesia for Mastectomy. *Korean Journal of Anesthesiology*. 2006;50(6):646-9.
10. Belzarena SD. Comparative study between thoracic epidural block and general anesthesia for oncologic mastectomy. *Revista brasileira de anesthesiologia*. 2008;58:561-8.
11. Helal SM, Aziz AAA, Gab-Allah KA, Ramadan EG. Comparative study between thoracic epidural and ultrasound-guided thoracic paravertebral block in perioperative pain management for mastectomy. *Menoufia Medical Journal*. 2019;32(4):1191.
12. Srivastava A, Jamil S, Khandelwal A, Raj M, Singh S. Thoracic epidural anesthesia for modified radical mastectomy in a high-risk patient: a case report with literature review. *Cureus*. 2021;13(6).
13. Abdel-Momen MA, Elkhateeb SEM, Abdel-Raouf HS, Mohamed MAE. Comparative study between ultrasound guided pectoral nerves block and thoracic epidural as analgesia in breast surgeries. *The Egyptian Journal of Hospital Medicine*. 2018;72(9):5304-12.
14. Etta OE, Umeh K, Akpan SG. Thoracic epidural anaesthesia for major abdominal surgeries: experience in private hospital setting in Uyo, South-South Nigeria. *Southern African Journal of Anaesthesia and Analgesia*. 2016;22(3):17-9.
15. Rukewe A, Afuwape OO, Ugheoke A, Fatiregun AA. Single-shot lamina thoracic paravertebral block with ketofol for modified radical mastectomy. *Local and Regional Anesthesia*. 2016:83-6.
16. Etta OE, Udemé N. Thoracic epidural for modified radical mastectomy in a high-risk patient. *Malawi Medical Journal*. 2017;29(1):61-2.
17. Giebler RM, Scherer RU, Peters J. Incidence of neurologic complications related to thoracic epidural catheterization. *The Journal of the American Society of Anesthesiologists*. 1997;86(1):55-63.
18. Scherer R, Schmutzler M, Giebler R, Erhard J, Stöcker L, Kox W. Complications related to thoracic epidural analgesia: a prospective study in 1071 surgical patients. *Acta anaesthesiologica scandinavica*. 1993;37(4):370-4.
19. Woodworth GE, Ivie RM, Nelson SM, Walker CM, Maniker RB. Perioperative breast analgesia: a qualitative review of anatomy and regional techniques. *Regional Anesthesia & Pain Medicine*. 2017;42(5):609-31.
20. Kaya M, Oğuz G, Şenel G, Kadioğulları N. Postoperative analgesia after modified radical mastectomy: the efficacy of interscalene brachial plexus block. *Journal of anesthesia*. 2013;27:862-7.
21. Wenk M, Massoth C, Pöpping DM, Möllmann M. Feasibility of cervical epidural anesthesia for breast cancer surgery. *Anesthesiology Research and Practice*. 2017;2017.