Intraoperative Circulatory Collapse With Paravertebral Block

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Citation

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Abstract

Thoracic paravertebral block is one of the safer and effective techniques for providing postoperative analgesia and as sole anesthetic technique for breast surgery.

We report a case where a middle aged lady was undergoing mastectomy with axillary clearance under general anesthesia with thoracic paravertebral block who suffered a circulatory collapse during the surgery. The likely possibility of such scenario is discussed. The case is particularly important because it suggests the likelihood of more than one condition responsible for it.

INTRODUCTION

Mastectomy with axillary clearance is the standard procedure in operable Ca Breast now. Like any other operative procedure the postoperative pain continues to be one of the major concerns for the patient as well as the treating doctors. Further, regional analgesia techniques have become standard for acute pain relief in per operative period.

Thoracic Paravertebral block (TPVB) is a commonly practiced technique for providing postoperative analgesia in mastectomy patients ([1,2,3,4,5]). In our hospital for last one year TPVB has more or less replaced opiates as the standard regimen for postoperative analgesia in breast surgeries. The block is given just prior to induction, following which general anesthesia is induced.

We wish to report a case which landed in circulatory collapse intraoperatively about 35 minutes in surgery. There exists a strong possibility of two complications occurring together at relatively the same time i.e. pneumothorax which probably was caused during the performance of TPVB and Hypersensitivity to Gelofusine. To the best of our knowledge there is no published report of Pneumothorax leading to perioperative pneumothorax in association with TPVB.

CASE REPORT

A 48year old overweight lady, known diabetic was scheduled to undergo left mastectomy with axillary clearance under general anesthesia with a TPVB as per the standard routine practice in our hospital.

The TPVB was given with the patient in sitting posture at T3 level on left side with 18G Touhy's needle. After preparation of site 2% Lignocaine was infiltrated with a 25G needle to raise a skin wheal 3 cm from midline. The Touhy's needle was introduced perpendicular to all the planes, encountering transverse process at about 3.5 cm. The needle was retracted 2cm and reintroduced with cephalad direction attempting to walk over the bone looking for loss of resistance, which was identified at about 5cm from skin. After aspiration 5ml of saline was injected to facilitate catherization of Paravertebral space. An epidural catheter was introduced 4 cm in the paravertebral space. The introduction of catheter was relatively easy with minimal resistance. The patient was comfortable throughout the procedure. 18ml of 0.5% Bupivacaine was then injected in the space after negative aspiration.

After 15 min the extent of block was checked with loss of sensation to cold and pinprick and was found to be extending from clavicle to T6 on the left side with no extension to other side. Patient was comfortable and had no complaints at this time. The vital signs were stable. Noninvasive monitoring in form of ECG lead II, NIBP every 5 min, SpO2, ETCO2 was commenced.

General anesthesia was induced then with Fentanyl 100 microgram, Thiopentone Sodium 300mg and Tracrium 40 mg patient was then intubated with 7.5mm endotracheal tube

which was secured at 19cm from angle of mouth after, ascertaining bilateral equal air entry. The patient was maintained on Oxygen Nitrous oxide and Sevoflurane on controlled ventilation. The patient was then positioned and surgery started.

After about 20 min of induction of anesthesia the patient had an episode of hypotension which initially responded to fluid challenge with Gelafusine (B Braun) 500ml and ephedrine 6mg. Five minutes later the hypotension recurred again along with loss of pulse oxymeter signals, which did not respond to further dose of Ephedrine. On auscultation the air entry was diminished over the operative left side. The endotracheal tube was checked and was found to be anchored at same level; pulling it back a cm also did not improve the air entry on left side.

A quick diagnosis of Pneumothorax was made and the surgery interrupted to secure an Intercostal tube drain in 5th Intercostal space. A minimal amount of air came from the chest drain. However the situation did not improve and rather continued to deteriorate. Considering acute hypersensitivity reaction to Gelafusine as second possibility, the remaining Gelafusine (2nd pint) infusion was replaced with Hartmann's Solution injection Adrenaline (1:10,000) 0.1ml was given intravenous followed by another 1ml, the patient was then given Injection Hydrocortisone 100mg. Simultaneously the surgical team was advised to put in another intercostals drain 2 spaces inferior again only a minimal amount of air came out and the air column got stabilized. Injection Dopamine infusion started at 10 microgram. The patient started improving about another 10 min later. The trend of vital parameters during the event are as in table 1.

Figure 1

Table 1: Vital parameter of the patient during collapse and subsequent till stabilization

Time post induction	Heart rate (/min)	BP (mm of Hg)	SpO_2 (%)
Pre-block	86	130/76	98
Pre-induction	84	128/ 74	100
10 min	78	126/ 74	100
20 min	90	80/56	100
22 min	94	50/26	98
25 min	64	40/-	Non recordable
28 min	64	Non recordable	Non recordable
32 min	70	36/-	Non recordable
35 min	80	34/-	Non recordable
40 min	86	36/-	Non recordable
45 min	104	70/34	100
50min	110	96/56	100
55min	106	110/56	100
60 min	100	106/60	100
65 min	96	110/68	100
70 min	88	110/68	100

The surgery was recommenced. We were able to wean off the Dopamine infusion slowly over next 90 min during which the surgery was completed. The patient was then reversed and recovered uneventfully. The blood sugar levels were 14mmol. There were no rashes or erythema when checked at the end of surgery.

An X- ray chest was ordered in immediate postoperative. The x ray documented both the chest tubes inside thoracic cage, fully expanded lung and no signs of pneumothorax. The air columns in both the chest tubes were stable by the end of surgery.

The patient was completely pain free at the end of surgery. It was decided to maintain the catheter in situ for further top ups as well as for the radio imaging study if the patient gave the consent. However neither the patient any top up nor gave the consent for radio imaging study and catheter was removed after 24hrs.

DISCUSSION

TPVB is amongst the safest and effective techniques of anesthesia for breast surgery for postoperative analgesia as well as sole anesthetic technique for breast surgeries. As such it has become a standard in many institutions ([1,2,3,4,5]). Usually it is given before induction of general anesthesia.

This case also received TPVB along with general anesthesia, suffered a circulatory collapse midway in the surgery which did not respond to fluid and ephedrine. In this case the circulatory collapse could have been due to either a complication of TPVB namely pneumothorax, exaggerated hypotension secondary to TPVB, central (extradural)

migration of Bupivacaine or due to anaphylaxis to Gelofusine.

Pneumothorax is one of the known complications of the paravertebral block ([1,6,7]) having an incidence of !5 of which 0.5% require treatment ([7]). But to best of our knowledge in none of the reported cases it was severe enough to cause a circulatory collapse. The absence of breath sound on the operative side on auscultation, properly positioned endotracheal tube and failure of breath sounds to improve even after retraction of ETT, is indicative of pneumothorax. However the little amount of air which came from the drain, early stabilization of air column as well as the persistent low pressure on ventilation is against a massive tension pneumothorax that could have caused the circulatory collapse.

Further, to avoid pneumothorax while performing TPVB it is advised to restrict the needle insertion to 3-4 cm from skin and attempt to strike the bone (transverse process of the corresponding vertebrae). Before advancing the needle any further, if the needle does not meet bone with in this distance then to withdraw the needle and reinsert it a cm cephalad or caudad to the initial insertion site ([1,2,4,6,7,8.,9,10]). The direction of needle should be perpendicular to all the planes a medial angulation carries the enhanced risk of central block and spread of drug into epidural or spinal space, while lateral angulation carries the enhanced risk of pneumothorax. Some authors have also advocated use of sonogram ([9]) and nerve stimulator ([10]) to avoid the danger of injuring pleura while performing TPVB. All these guidelines were adhered to while performing the block. Further, considering the fact that the patient was overweight the likelihood of encountering pleura at this level is less likely.

Hypotension secondary to sympathetic block is known to occur in about 4% ([4,7]) of all TPVB although the extent is claimed to be less than in epidural block. This hypotension usually responds to fluid challenge and small aliquots of vasopressor ([4,7]). To what extent this effect was responsible for the present condition can not be commented on with certainty however it can be contributory to some other mechanism.

Central extension of drug is also a possibility. In a series of case reports in which medial approach to TPVB was taken the incidence of subarachnoid spread was reported to be less than 1% ([11]). However the relatively lateral approach to the TPV space discounts the possibility of dural puncture sub-arachnoid spread of drug can be discounted based on the time course of event (i.e. after about 35 min) and lack of sensory block on other side. Migration of tip of catheter via intervertebral foramina to the extradural or subarachnoid space has also been reported ([12]) The epidural spread of drug from TPVB is a known entity ([1,4,6,7]) but the lack of spread of effect to contra lateral side and the volume of drug injected , negates the possibility to a large extent. A radio imaging study could have helped to locate the position of tip of catheter and spread of drug but the rapid sequence of events in the operative period did not permit it intraoperatively but unfortunately the patient did not consent for it postoperatively.

Possibility of an acute anaphylactic reaction to Gelafusine is another condition which merits consideration. Weiss ([13]) reported an incidence of 0.78% of allergic reactions to Haemaccel, another gelatin based plasma volume expander, in a multicenter prospective study. He also commented that most of these reactions are mild and non life threatening. Most of these reaction present as bronchospasm and in about 3% it may be the only feature ([14]). These reactions are believed to be due histamine release. However Duffy et al ([15]) also advocated an immunological basis for such reactions. Although as the production technique for the gelatin based plasma expanders has improved the rate of allergic reactions has probably reduced. Further although Gelofusine is a newer gelatin based plasma expander claimed to have a lower incidence of allergic reactions but the cross sensitivity between Haemaccel and Gelofusine has also been reported in the literature([16]).

Traditionally skin testing has been advocated to detect the hypersensitivity to gelatin and other drugs; however the validity of such testing has also been questioned ([17]). Other modalities suggested to confirm it are detection of invitro whole blood basophil activation by flow cytometry for CD63 surface activation which has a high sensitivity of 100% and specificity of 87.5%([18]). Serum mast cell Tryptase levels > 13.5 IU; in sample taken 30 min after onset of allergy are also advocated to be confirmatory for hypersensitive reaction ([19]). However such sophisticated tests are not readily available in all places.

The improvement in patient's status after injection adrenaline and hydrocortisone and withdrawal of Gelofusine is suggestive of hypersensitivity to Gelofusine as a likely cause of the problems in this case. However patient declined to give consent for further tests to confirm this.

As the circulatory collapse in this patient occurred while

under surgery a quick working diagnosis was made of pneumothorax secondary to TPVB was made and intercostal drain (ICD) inserted without any further investigation as patient's condition did not allow it. However when the patient's condition did not improve with ICD, the possibility of anaphylactoid reaction to gelatin was also considered and treatment was instituted for it. Because the patient did not consent for further diagnostic study to identify the cause, we can not say what was responsible for the circulatory collapse that the patient suffered from.

This case is presented to share our experience that even the procedures deemed to be quite safe and practiced routinely can have their complications manifested despite all the precautions. The key in combating them lies in having a high index of suspicion and prompt management of them. Also the possibility of two side effects occurring together should always be kept in mind.

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