

Excision of a recurrent mediastinal cyst through mid sternotomy with high thoracic epidural anesthesia as the sole anesthetic - A case report

M Chakravarthy, MD, V Jawali, MCh, M Manohar, DNB, TA Patil, DA, K Jayaprakash, MD, NV Shivananda, DNB
Wockhardt Heart Institute, Bangalore, Karnataka, India

See Editorial

Case Report

A 62-year-old lady, weighing 65 kilos presented to the hospital with complaints of breathlessness, palpitation and chest pain for the past 3 months. She was a hypertensive on treatment with atenolol 50 mg daily. Her heart rate was 62 beats/minute, blood pressure 160/90 mm Hg, auscultation of the chest revealed no abnormality. Electrocardiogram and echocardiogram were normal; chest X ray showed the presence of a recurrent mediastinal mass, which was confirmed by computerized tomographic (CT) scan. The mass was a well-circumscribed cystic attenuating lesion seen in the superior mediastinum extending in to anterior mediastinum on the right side. The lesion extended from the level of aortic arch up to the level of right cardiophrenic recess and the lesion abutted the right atrium. The lesion measured 6 cm antero-posteriorly and 3 cms transversely. There was no evidence of calcification or mural nodule. There was no compression of superior vena cava. Since the tumor did not show evidence of any attachment to major anatomical structure, it was decided to aspirate it percutaneously under imag control. There was no history of muscular weakness or fatigue. Lung function test was normal. In view of the mediastinal swelling, neurologist's consult & electromyogram were obtained and there was no evidence of myasthenia gravis (MG). As per the plan, she underwent a percutaneous aspiration of a mediastinal cyst from the right parasternal space guided by CT scan and the aspirate

was clear fluid through most of the procedure. Towards the end, the aspirate from the cyst turned blood stained; therefore she was kept in the hospital for observation and discharged from the hospital the same evening after confirming that there was no hematoma by a check X ray. After a month the patient had recurrence of symptoms; a repeat chest X ray showed recurrence of the mediastinal mass and therefore repeat CT scan was performed. This scan showed that the mass had not only increased in size but also had inhomogeneous shadow which raised the suspicion of hematoma or organized clot within the cyst thus precluding us from a repeat aspiration of the cyst. There were no communication with either the vascular or the airway structures; therefore it was decided to excise the recurrent cyst via mid sternotomy and we suggested about the possibility of performing the surgery with high thoracic epidural anesthesia (HTEA), as the sole anesthetic. The patient was also informed that she would remain arousable during the surgery and she had the right to reject the proposal. At our unit we have already performed several minimally invasive direct coronary artery bypass surgery, off pump coronary artery bypass surgery under HTEA as the sole anesthetic, hence we were confident of performing this surgery also under similar anesthetic technique. To our suggestion of performing the surgery with HTEA as the sole anesthetic, the patient agreed; therefore the patient's consent and the hospital ethics committee clearance were obtained. Preoperative laboratory tests including clotting profile were normal. Preoperative cell counts and serological tests were normal and the patient's airway assessment did not reveal any abnormality.

Epidural catheterization was performed on the eve of surgery in the surgical intensive care unit. With electrocardiogram, non-invasive blood pressure, and pulse oxymetry as monitors, after obtaining venous access, a 16 gauge epidural catheter was inserted T1-T2 inter space with the patient in sitting position. The epidural space was identified by loss of resistance

Address for correspondence:

Dr Murali Chakravarthy
Chief Consultant Anesthesiologist,
Wockhardt Heart institute
14, Cunningham Road, Bangalore 560052
Karnataka, India
Tel. : 91 080 2281146, 91 080 2261037 (O)
 91 080 6721378, 91 080 6722796 (R)
Fax: 91 080 2281149
email : chakravarthy@vsnl.com, whhi@vsnl.com
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technique; 2-3 cms of the epidural catheter was kept indwelling. The epidural catheter was flushed with saline to check the patency of the catheter; however, as per our protocol, test dose was not administered at that time. The patient was sent back to the preoperative observation room and monitored for any evidence of extradural compression.

The next day the patient was premedicated with fentanyl, 2 micrograms/kg body weight, midazolam 50 micrograms/kg intramuscularly in addition to 150 mg of tablet ranitidine and 10 mg of tablet metoprolamide, orally, ½ an hour before the surgery. In the operating room, ECG monitoring, pulse oxymetry monitoring was commenced. Left radial arterial line (20 gauge) & 14-gauge single lumen central venous catheter (via right internal jugular vein) were inserted under local anesthesia. 2 ml of 2% xylocaine with 1:200,000 adrenaline was administered as a test dose once the monitoring lines were in place. After confirming the absence of untoward reaction 12 ml of 0.5% bupivacaine was administered and the level of analgesia was noted to be at about T3 dermatome, and a further 5 ml of 0.25% bupivacaine achieved analgesia above T1 level. Additional fentanyl 25 micrograms was administered in the epidural catheter. Level of sensory loss was maintained between C7 and T9 level. A nasopharyngeal airway was passed & a naso-gastric (NG) tube was placed in the stomach through the nasopharyngeal airway. The NG tube was aspirated rolled up, blocked and kept under the facemask. A stiff transparent oxygen mask with hooks for the harness was placed on the patient's face, and the patient breathed a mixture of 70 % oxygen & air. Ability to assist the ventilation was checked and found to be adequate after securing the harness. The mask was connected to the circle absorber via a "Y" connection to ensure unidirectional flow of gases of Aestiva™ (Datex-Ohmeda, FIN-00031, Helsinki, Finland) anesthetic machine. To the "Y" connection of the breathing circuit, the end tidal carbon dioxide (ETCO₂) connector was connected and ETCO₂ monitoring was commenced. The expired tidal volume (VTe), respiratory rate ('f') and expired minute volume (MVe) were continuously noted on the ventilator monitor. The VTe was 600 ml, 'f' 10 per minute, MVe varied from 6 to 7 L per minute. Airway equipments such as laryngoscope, endotracheal tube, esophageal tracheal double lumen airway (combitube®, Sheridan catheter corp, Argyle, NY12809) and the laryngeal mask airway were kept in readiness. The patient's lower limbs were taped to prevent accidental movements during the surgery. The surgery commenced allowing access to the airway. Skin incision was made

starting from the angle of Luis and a complete sternotomy was performed taking care to preserve the pleural integrity. The cyst was found to be adherent to the right pleura and pericardium. The patient remained asleep but arousable during the surgery. During the release of the tumor, the pleura was opened and the right lung collapsed, following this the inspired oxygen concentration was increased to 1.0. The arterial blood gases and ETCO₂ remained within normal limits when the patient was breathing spontaneously (refer table 1); the 'f' increased from a basal value of about 10 per minute. Therefore it was decided to leave the pneumothorax alone and the lung remained collapsed for 15 minutes. During this phase of spontaneous respiration, the VTe reduced by 35%, the 'f' increased to 18 breaths per minute and the MVe continued to be the same. The patient did not complain of any difficulty in breathing or pain. The surgery was completed without any further events, about 350 ml of blood stained cyst contents was removed. The sternum was closed and the subcutaneous tissue was closed after inserting a 32 French intercostal drainage tube in to the right pleura. Soon after this, negative pressure of 50 cms of water was applied on the intercostal tube, while applying continuous positive pressure airway pressure (CPAP) to the patient's airway (10 cms of H₂O); this resulted in abolition of the pneumothorax, which was confirmed by bilateral air entry on auscultation. The duration of surgery was 45 minutes; she received 750 ml of lactated ringer's solution during the surgery, the blood loss was 250 ml. The hemodynamic and the blood gas changes are recorded in table 1. The patient was nursed in the intensive care unit for 2 hours and after confirming absence of pneumothorax by chest X ray, she was transferred to the wards. Before transferring her to the ward, her experience was sought for; the patient had no unpleasant and/or painful experience during the perioperative period. She did well postoperatively and was discharged from the hospital on the 3rd postoperative day.

Table 1: Changes during surgery

Time in minutes from basal	0 Basal	20 Epidural	40 Incision	45 Sternotomy	55 Pleura open	70 Closure-skin	85 Transfer to ICU
HR	64	60	56	59	69	64	66
MAP	94	84	80	81	87	81	89
CVP	6	5	4	5	7	5	7
PO ₂	#160	179	199	175	139*	267	290
PaCO ₂	39	34	36	37	46	40	32
ETCO ₂	33	38	31	45	48	36	30

ICU- intensive care unit, HR - Heart rate in beats per minute, MAP - Mean arterial pressure in mm Hg, CVP - Central venous pressure, PO₂ - Partial pressure of Oxygen in mm Hg, PaCO₂ - Partial pressure of carbon dioxide in arterial blood in mm Hg, ETCO₂ - End tidal carbon dioxide in mm Hg.

= Fractional inspired oxygen 0.7

* = Fractional inspired oxygen concentration increased to 1.0

Discussion:

Here we describe the excision of mediastinal cyst via a mid sternotomy with HTEA as the sole anesthetic in an elderly lady. Surgeries requiring mid sternotomy have been performed under HTEA as the sole anesthetic has been described^{1,4}. It is a well-known fact that a well-conducted general anesthesia provides good control on the ventilation, hemodynamics and scope for other interventions such as trans esophageal echocardiography etc. The general anesthesia is one of the main aspects of cardiothoracic surgery which was instrumental in wide spread acceptance and popularity of cardiothoracic surgery. Advent of minimally invasive surgery inevitably affected the anesthetic approach as well. Newer strategies such as better analgesia, early extubation, improved respiratory function, earlier ambulation and reduced narcotic requirement⁹. Although general anesthesia has been used for a larger number of patients daily without significant complications, documented hemodynamic responses to tracheal intubation, suction of the endotracheal tube, and extubation may lead to myocardial ischemia and poses a potential risk in patients with coronary artery disease^{10,11}. Further more in an era of patient satisfaction, eliminating endotracheal intubation and hence tube suctioning and extubation experience in a cardiac surgical patient may be considered a less invasive approach¹. If surgery can be performed technical problems and at the same time assuring the patient of comfort and satisfaction, HTEA as the sole anesthetic can be applied for selected cases in the cardiothoracic surgical practice⁴. The issue of avoiding general anesthesia with endotracheal intubation is said to offer more risks with little advantage¹² while exposing the patient to risks, which he otherwise not be incurring (epidural hematoma, pneumothorax in a spontaneously breathing patient and so on), and therefore the issue of HTEA as the sole anesthetic in cardiothoracic surgery remains controversial.

The fear of pneumothorax in a spontaneously breathing patient has been one of the concerns for the anesthesiologist and it has been largely alleviated^{4, 6}. The pneumothorax in the present case did not cause any disturbance to the surgical field, hemodynamic parameters, blood gases or the patient. The operating surgeon felt that a collapsed lung in a spontaneously breathing patient offers better surgical exposure when compared to one-lung anesthesia. The difference between one lung ventilation with general anesthesia and spontaneously breathing patient with pneumothorax is that in the latter case the lung with

the intact pleura moves away from the surgical field during inspiration; while it moves towards the surgical field during the inspiratory phase of the controlled ventilation. The spontaneously breathing patient with a collapsed lung does not interfere with the surgical field at all and if all this is achieved without general anesthesia or endotracheal intubation it is indeed a step towards simplifying the procedure without compromising patient safety. Although this least invasive method of isolating lung from the surgical field is superior to other conventional means, the fear of adverse effects of ventilation perfusion mismatch is the limiting factor. Therefore this technique may prove useful for surgeries that require pleural opening or collapse of the lungs for shorter duration. at any time during the surgery if the gas exchange were to deteriorate, the situation can be brought under control by applying CPAP to the patient through the face-mask which is usually in place before the commencement of surgery. Authors have reported 3 cases of CPAP ventilation to control pneumothorax during 15 cardiac surgeries via thoracotomy and by mid sternotomy¹⁵. The authors are confident that pneumothorax can be easily controlled by CPAP as has been described in their work. It is vital that patients chosen for this anesthetic technique should not suffer from any obvious airway abnormalities precluding the possibility of requirement of quick intubation. It is the practice in the author's unit to assess the airway by a combination of Mallampati¹³ and other conventional scoring such as the thyromental distance, receding chin, protruding maxillary incisors and inability to extend the neck¹⁴. In a case report of a redo off pump coronary artery bypass surgery, by the authors, the possibility of using high TEA technique for thymectomy in patients suffering from myasthenia gravis (4) and transmyocardial revascularization by laser technique was suggested and the same has also been suggested by others⁵. Thymectomy under HTEA has been described through mid sternotomy^{7,8} with acceptable and reproducible results.

Conclusion

Our case report highlights the possibility of tackling mediastinal, pericardial and pleural problems with regional anesthesia alone even if the surgery requires opening of the pleura.

Reference

1. Karagoz HY, Sonmez B, Bakkaloglu B, et al. Coronary artery bypass grafting in the conscious patient without endotracheal general anesthesia. *Ann Thorac Surg*, 2000; 70: 91–96.

2. Vanek T, Straka Z, Brucek P, Widimsky P. Thoracic epidural anesthesia for off-pump coronary artery bypass without intubation. *Eur J Cardiothorac Surg*, 2001; 20: 858–60.
3. Aybek T, Dorgan S, Neidhart G et al. Coronary artery bypass grafting through complete sternotomy in conscious patients, The Heart Surgery Forum, 2002; 5: 17–21.
4. Chakravarthy M, Jawali V, Patil TA et al. High thoracic epidural anesthesia as the sole anesthetic in awake patient for a redo off pump coronary artery bypass surgery through mid sternotomy (in print- to be published in the J Cardiothorac Vasc Anesth vol 17: No 1, 2003)
5. Lansing AM: Transmyocardial revascularization-late results and mechanism of action: *J Ky Med Assoc*, 2000; 98: 406–412.
6. Anderson MB, Kwong KF, Furst AJ: Thoracic epidural anesthesia for coronary bypass via left anterior thoracotomy in the conscious patient. *Eur J Cardiothorac surg* 2001; 20: 415–417.
7. Saito Y, Sakura S, Takatori T, Kosaka Y. Epidural anesthesia in a patient with myasthenia gravis. *Acta Anaesthesiol Scand* 1993; 37: 513–15.
8. Akpolat N, Tilgen H, Gursoy F et al. Thoracic epidural anaesthesia and analgesia with bupivacaine for transsternal thymectomy for myasthenia gravis. *Eur J Anaesthesiol* 1997; 14: 220–23.
9. Mehta Y, Swaminathan M, Mishra Y. A comparative evaluation of intrapleural and thoracic epidural analgesia for postoperative pain relief after minimally invasive direct coronary artery bypass surgery *J Cardiothorac Vasc Anesth*, 1998; 12: 162–65.
10. Mikawa K, Nishina K, Takao Y, Shiga M, et al. Attenuation of cardiovascular responses to endotracheal extubation: comparison of verapamil, lidocaine and verapamil and lidocaine combination, *Anesth Analg*, 1997; 85: 1005–10.
11. Paulissian R, Salem MR, Joseph NJ, et al. Hemodynamic responses to endotracheal extubation after coronary artery bypass grafting. *Anesth Analg*, 1991; 73: 10–15.
12. Liem TH, Williams JP, Hensens AG, et al. Minimally invasive direct coronary artery bypass using a high thoracic epidural plus general anesthetic technique. *J Cardiothorac Vasc Anesth*, 1998; 12: 668–72.
13. Mallampati SR, Gatt SP, Gugino LD, et al: A Clinical sign to predict difficult tracheal intubation: a prospective study. *Can Anesth Soc J*, 1985; 32: 429–34.
14. Rose DA, Murray WB, Rout CC, et al. Relative risk analysis of factors associated with difficult intubation in obstetric anesthesia. *Anesthesiology* 1992; 77: 67–73.
15. Chakravarthy, Jawali, Patil, et al. 2003 high thoracic epidural anesthesia as the sole anesthetic for performing multiple grafts in off pump coronary artery bypass surgery, (in print- to be published in journal of Cardiothoracic and vascular anesthesia; vol 17, April 2003)