Awake epidural anesthesia for laparotomy in an obese patient with severe lung disease and difficult airway

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Abstract

Anaesthetizing a patient for laparotomy who has co-existing lung disease, difficult airway and obesity is a major anesthetic challenge. We are describing the anesthetic management of an obese patient suffering from severe interstitial lung disease and a difficult airway who underwent laparotomy for excision of a large mesenteric cyst. Surgery was successfully performed under segmental epidural anesthesia. The pre-operative problems and peri-operative management is discussed. We suggest that epidural anesthesia can be used for successfully managing similar patients.

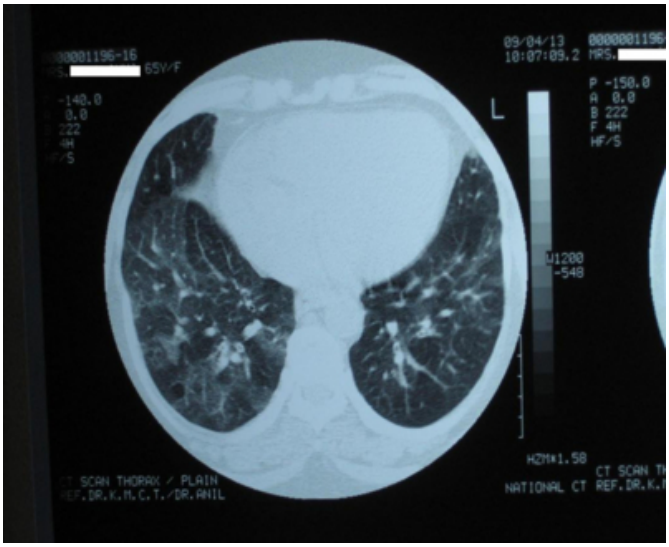
Support was provided solely from institutional and departmental sources. The authors have obtained Institutional Review Board approval and informed written consent from the patient for publishing the details of her treatment.

CASE REPORT

A 64 Year old female, with a BMI of 31.2 was scheduled to undergo laparotomy for excision of a suspected large mesenteric cyst. She is suffering from an interstitial lung disease - Non Specific Interstitial Pneumonia for past 10 years. She had a stable clinical course and the disease was under control with steroids. On examination, she was found to be obese with a cushingoid habitus and was dyspneic on minimal exertion. She was hypertensive and had mild central cyanosis and a room air oxygen saturation of 88-92% which improved to 100% with supplemental oxygen. Chest auscultation revealed bibasilar inspiratory crackles. Two specific factors predicting likely difficult intubation were identified; she had short neck and a modified Mallampati score class IV airway. She had a mouth opening of 3.5 cm, Thyro-mental distance of 6cm, Sterno-mental distance of 12cm and a normal range of neck movements. The routine blood investigations including clotting function tests were under normal limits. Chest X-ray showed bilateral patchy opacities, predominantly over the lower zones. Her ABG revealed hypoxemia with a ph of 7.45, arterial oxygen tension of 65 mmHg, carbon dioxide tension of 38 mmHg and Bicarbonate: 36 mmol. Her Pulmonary Function Test showed a Maximum Voluntary Ventilation of 37 liters as against a predicted value of 87.7 liter, FVC of 0.9 liter (36% of predicted value), FEV1 of 0.85 liter (39% of predicted value) and FEV1/FVC of 94.4%; all of them were suggestive of severe restrictive lung disease. CT scan of the chest showed basilar predominant ground glass opacities with no evidence of fibrosis or honey combing.

Figure 1

Figure 1: CT scan of the chest showing areas of ground glass opacities with normal intervening parenchyma. Her Echo-cardiogram and Doppler studies revealed an ejection fraction of 71.8% with a severe concentric LVH, but no evidence of right ventricular hypertrophy, pulmonary artery hypertension or regional wall motion abnormalities.



Considering the twin problems of severe interstitial lung disease and a difficult airway and the peri-operative

complications associated with endo-tracheal intubation and positive pressure ventilation and our experience in conducting laparotomies under awake epidural anesthesia, we felt compelled to do this surgery under awake segmental thoracic epidural anesthesia. The same was discussed in detail with the surgeon and the patient and after informed consent she was posted for laparotomy under Epidural Anesthesia.

All the equipments for emergency airway management including the equipment and personal for tracheostomy was kept ready and after preloading with 500 ml normal saline, a 16GTouhy needle (Perifix-402 ™ , B-Braun) was introduced in T 10-11 inter-spinous space and advanced till epidural space was identified by loss of resistance to air technique. Epidural space was identified at 7 cm from the skin and a 19 G catheter was threaded 5 cm cephalad. After the test dose, epidural was activated with 13.5 cc of 2 % Lignocaine with 5µg/ml Adrenaline. Fifteen minutes after the injection of local anesthetic solution, the sensory block level reached bilaterally to T_4 dermatome cranially and L3 level caudally and the motor block level reached to Bromage 3(Unable to flex knees, but with free movement of feet) on both lower extremities. Spo2 dipped to 80% following a sedating dose of 0.5mg Midazolam IV, which was treated by waking up the patient and by administering supplemental oxygen via Venturi mask. Thereafter no further IV sedatives or Opiods was given. Surgical access was through a midline incision. Adequate surgical conditions were maintained with 2 more doses of 6 cc of 2% Lignocaine with Adrenaline at 45 minutes interval. Patient remained awake and communicating throughout the procedure and at no point during surgery did the patient experience any pain, or ask for additional anesthetic. Apart from 2 instances of mild hypotension following epidural lignocaine boluses, which was treated with IV Mephentermine 6mg, the surgical procedure was completed un-eventfully and a thin walled serous retroperitoneal cyst measuring 15cm diameter was excised.

Her close monitoring was continued into the post-operative period. Adequate Post-operative analgesia was ensured with a continuous epidural infusion of 0.125% Bupivacaine with 3µg/ml Fentanyl at 6 cc /hour for 48 hours. She had an un-eventful post-operative recovery, with no further deterioration in her respiratory status and the patient was discharged from hospital on 7 th post-operative day.

Figure 2

Figure 2: The patient recovering in the post operative Intensive Care Unit on the 1 post-operative day

DISCUSSION

Interstitial lung disease is a heterogeneous group of disorders affecting lung parenchyma which share similar pathological, physiological, clinical and radiographic features. More than 150 individual diseases come under the classification of ILD. It is characterized by acute or chronic inflammatory changes in the pulmonary interstitium leading to decreased lung compliance and a restrictive pattern in pulmonary function tests.

Low oxygen reserve and low lung compliance are the two major factors influencing the anesthetic management of ILD. The low oxygen reserve arising from the decreased Functional Residual Capacity (FRC) and V/Q mismatching predisposes to rapid hypoxemia. In a person with normal pulmonary function, FRC falls by 15-25% following General anesthesia with muscle relaxation. [1,2,3] In addition upper abdominal surgery can cause a fall in FRC to 50% of pre-operative value and lower abdominal surgery can result in 30% fall in FRC. [4,5] Therefore there can be a profound fall in FRC if this patient with severe restrictive disease is subjected to an abdominal procedure under general anesthesia. Moreover, positive pressure ventilation of a low compliant lung necessitates higher inflation pressures which can potentially result in barotrauma, volutrauma and ventilation induced cardiovascular depression. [6]

In this clinical scenario epidural anesthesia can provide adequate anesthesia without the need for airway instrumentation or respiratory support. But the motor and sympathetic block resulting from epidural anesthesia can have effects on pulmonary function. However a recent article by Groeben [7] and many other studies earlier have

shown that these effects were insignificant under low thoracic anesthesia [8910] and moreover when compared to laparotomy without epidural, these effects were so small that the advantages of epidural anesthesia lead to a better post-operative pulmonary function. [111213] Most of these studies have shown that following epidural anesthesia Functional Residual Capacity, Closing Capacity and distribution of ventilation and perfusion remains unchanged. [1415] The arterial oxygenation and carbon dioxide elimination are well maintained and there is a significant increase in cardiac output. [1617] Some of the studies showed small reduction in minute ventilation, inspiratory reserve volume and peak expiratory flow rate, but the ability to cough was not impaired. [18] Warner et al did electromyographic study of respiratory muscles in volunteers subjected to high thoracic anesthesia and found that rib cage expansion continued to contribute to tidal volume and that the activity of unblocked respiratory muscles like scalenes do not increase in response to rib cage paralysis. [19] Similar results were found in studies where epidural anesthesia was used as the sole anesthetic for performing laparotomy in patients suffering from severe COPD. [202122]

Apart from her poor pulmonary status the presence of obesity and difficult airway also influenced our decision to choose regional anesthesia over general anesthesia. Obesity worsens arterial oxygenation because of the marked reduction in Functional Residual Capacity which is intensified following neuromuscular blockade. [232425]

The question of anesthetic management of a patient with difficult airway throws up two approaches. And most often the choice between securing the airway versus circumventing a potential difficult airway by resorting to a regional anesthetic technique is influenced by coexisting illness especially pulmonary and the familiarity of the anesthesiologist with the particular regional anesthesia technique.

A medline search did not reveal any previous case report of segmental epidural anesthesia in anesthetic management of severe interstitial lung disease. There are case reports of laparotomies and laparoscopies performed with other regional techniques like combined spinal epidural and segmental spinal anesthesia in patients with severe lung disease and difficult airway. [26272829] We did not consider the option of subarachnoid block as the high level of sensory and motor blockade necessary for performing laparotomy under subarachnoid block could result in marked decrease in preload and perfusion pressure, which in a patient with severe left ventricular hypertrophy has the potential to lead to significant diastolic dysfunction and end organ damage. Segmental epidural anesthesia had the advantage of avoiding endo-tracheal intubation with positive pressure ventilation and also the magnitude of hemodynamic changes resulting from epidural anesthesia is significantly less than that seen with comparable levels of subarachnoid block. [30] It also scores over spinal anesthesia with its ability to provide prolonged anesthesia, effective post-operative analgesia and marked decrease in post operative pulmonary complications.

The other anesthetic options do not provide the right balance of such features, although we realize that others with different set of skills and expertise might have chosen a different method. Nevertheless we seek to highlight the fact that segmental epidural anesthesia can be an attractive option for performing laparotomy in patients with severe pulmonary, airway and cardiovascular problems.

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