# Awake Epidural Anaesthesia for Laparotomy in an Obese patient with severe Interstitial Lung Disease and Difficult Airway

Ajeeth Baburajan[1], Fijul Komu[1], Kairali Krishnan[2], Salim Valiapurackal[3], Vijayakumar Damodharan[4]

1. Assistant Professor (Anaesthesiology), 2. Professor (Anaesthesiology), 3. Assistant Professor (Surgery), 4. Professor (Surgery)

K.M.C.T. Medical College, P.O.Mukkom, Calicut, Kerala, India

**Corresponding Author:** Ajeeth NB, Chaitanya, Nelliparambil Ph: 91-9895781755, 91-487-2361886, e-mail:ajeethnb@gmail.com

**About the Author:** Dr. Ajeeth NB completed his graduation from Govt. Medical College Trichur in 2001 and his MD Anaesthesiology from Madras Medical College in 2008. He is at present working as Assistant Professor in Department of Anaesthesiology at K.M.C.T. Medical College Calicut. His areas of interests include Regional Anaesthesia, Day care Anaesthesia and Pain Medicine.

**Abstract:** Anaesthetizing a patient for laparotomy who has co-existing lung disease, difficult airway and obesity is a major anaesthetic challenge. We are describing the anaesthetic 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 anaesthesia. The pre-operative problems and peri-operative management is discussed. We suggest that epidural anaesthesia can be used for successfully managing similar patients.

**Key Words:** Segmental epidural, interstitial lung disease, difficult airway, restrictive lung disease, obesity, laparotomy, awake epidural.

**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 litres as against a predicted value of 87.7 litres, FVC of 0.9 litre (36% of predicted value), FEV1 of 0.85 litre (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.

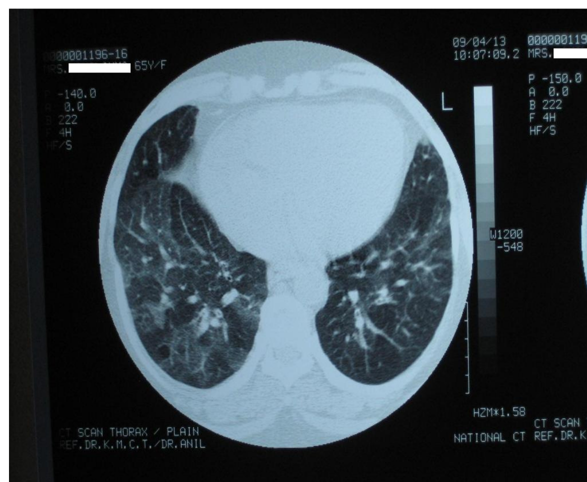


**Figure 1:** CT scan of the chest showing areas of ground glass opacities with normal intervening parenchyma

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 anaesthesia, we felt compelled to do this surgery under awake segmental thoracic epidural anaesthesia. The same was discussed in detail with the surgeon and the patient and after informed consent she was posted for laparotomy under Epidural Anaesthesia.

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 16G Touhy needle (Perifix-402$^{TM}$, 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 with difficulty 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 anaesthetic solution, the sensory block level reached bilaterally to T4 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. $SpO_2$ 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 anaesthetic. 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.

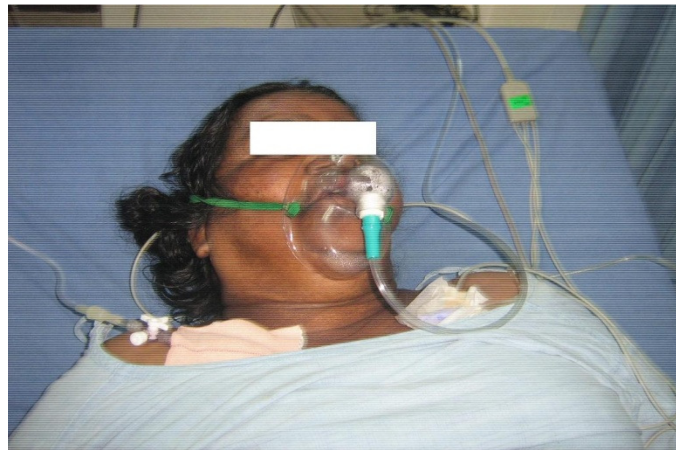

**Figure 2:** The patient recovering in the post operative Intensive Care Unit on the 1st post-operative day

**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 anaesthetic 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 anaesthesia 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 anaesthesia. 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 anaesthesia can provide adequate anaesthesia without the need for airway instrumentation or respiratory support. But the motor and sympathetic block resulting from epidural anaesthesia 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[8,9,10] and moreover when compared to laparotomy without epidural, these effects were so small that the advantages of epidural anaesthesia lead to a better post-operative pulmonary function.[11,12,13] Most of these studies have shown that following epidural anaesthesia Functional Residual Capacity, Closing Capacity and distribution of ventilation and perfusion remains unchanged.[14,15] The arterial oxygenation and carbon dioxide elimination are well maintained and there is a significant increase in cardiac output.[16,17] 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 anaesthesia 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 anaesthesia was used as the sole anaesthetic for performing laparotomy in patients suffering from severe COPD.[20,21,22]

Apart from her poor pulmonary status the presence of obesity and difficult airway also influenced our decision to choose regional anaesthesia over general anaesthesia. Obesity worsens arterial oxygenation because of the marked reduction in Functional Residual Capacity which is intensified following neuromuscular blockade.[23,24,25]

The question of anaesthetic 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 anaesthetic technique is

influenced by coexisting illness especially pulmonary and the familiarity of the anaesthesiologist with the particular regional anaesthesia technique.

A medline search did not reveal any previous case report of segmental epidural anaesthesia in anaesthetic 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 anaesthesia in patients with severe lung disease and difficult airway.[26,27,28,29] 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 anaesthesia had the advantage of avoiding endo-tracheal intubation with positive pressure ventilation and also the magnitude of hemodynamic changes resulting from epidural anaesthesia is significantly less than that seen with comparable levels of subarachnoid block.[30] It also scores over spinal anaesthesia with its ability to provide prolonged anaesthesia, effective post-operative analgesia and marked decrease in post operative pulmonary complications.

The other anaesthetic 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 anaesthesia can be an attractive option for performing laparotomy in patients with severe pulmonary, airway and cardiovascular problems.

**References:**

1. Tokics L, Hedenstierna G, Strandberg A, Brismar B, Lundquist H: Lung collapse and gas exchange during general anesthesia: Effects of spontaneous breathing, muscle paralysis, and positive end-expiratory pressure. Anesthesiology 1987; 66:157-67.
2. Duggan, Michelle; Kavanagh, Brian P. Pulmonary Atelectasis: A Pathogenic Perioperative Entity. Anesthesiology; April 2005; vol102-issue4-pp838-854.
3. Luiz Marcelo Sá Malbouisson, et al. Atelectasis during anesthesia: pathophysiology and treatment. Rev. Bras. Anestesiol. vol.58 no.1 Jan./Feb. 2008.
4. Valerie A. Lawrence, Rahul Dhanda, Susan G. Hilsenbeck and Carey P Risk of pulmonary complications after elective abdominal surgeries. Chest 110: 744, 1996
5. Lundh R, Hedenstierna G: Ventilation-perfusion relationships during anesthesia and abdominal surgery. Acta Anaesthesiol Scand 1983; 27:167-73.
6. Barash PG, Cullen BF, Stoelting RK: Clinical Anesthesia, 5th edition. Philadelphia, Lippincott-Raven Publishers, 2006, pp 809.

7. Groeben H Epidural anesthesia and pulmonary function. Journal of Anesthesia 2006; 20(4):290-9.
8. Spence AA, Logan DA: Respiratory effects of extradural nerve block in the postoperative period. Br J Anaesth 1975; 47(suppl):281-3.
9. Donald D. Moir and James G. Mone British Journal of Anaesthesia, 1964, Vol. 36, No. 8 480-485.
10. Wahba WM, Craig DB, Don HF, Becklake MR: The cardiorespiratory effects of thoracic epidural anesthesia. Can Anaesth Soc J 1972; 19:8-19.
11. Jayr C, Thomas H, Rey A, Farhat F, Lasser P, Bourgain JL: Postoperative pulmonary complications: Epidural analgesia using bupivacaine and opioids versus parenteral opioids. Anesthesiology 1993; 78:666-76
12. Rigg JR, Jamrozik K, Myles PS, Silbert BS, Peyton PJ, Parsons RW, Collins KS: Epidural anaesthesia and analgesia and outcome of major surgery: A randomised trial. Lancet 2002; 359:1276-82
13. Ballantyne JC, Carr DB, deFerranti S, Suarez T, Lau J, Chalmers TC, Angelillo IF, Mosteller F: The comparative effects of postoperative analgesic therapies on pulmonary outcome: Cumulative meta-analyses of randomized, controlled trials. Anesth Analg 1998; 86:598-612
14. Manikian B, Cantineau JP, Bertrand M, Kieffer E, Sartene R, Viars P: Improvement of diaphragmatic function by a thoracic extradural block after upper abdominal surgery. Anesthesiology 1988; 68:379-86
15. McCarthy GS: The effect of thoracic extradural analgesia on pulmonary gas distribution, functional residual capacity and airway closure. Br J Anaesth 1976; 48:243-8.
16. Ward RJ, Bonica JJ, Freund FG, Akamatsu T, Danziger F, Englesson S: Epidural and subarachnoid anesthesia: Cardiovascular and respiratory effects. JAMA 1965; 191:275-8
17. Yamakage M, Namiki A, Tsuchida H, Iwasaki H: Changes in ventilatory pattern and arterial oxygen saturation during spinal anaesthesia in man. Acta Anaesthesiol Scand 1992; 36:569-71
18. DONALD D. MOIR: Ventilatory function during epidural analgesia. Br J Anaesth 1963; 35:3-7.
19. Warner, David O, Mark A, Ritman, Erik L. Human chest wall function during anesthesia. Anesthesiology: October 1996 - Volume 85 - Issue 4 - pp 761-773.
20. Savas J F, Litwack R, Davis K, Miller TA. Regional anesthesia as an alternative to general anesthesia for abdominal surgery in patients with severe pulmonary impairment Am J Surgery 2004 Nov; 188(5):603-5
21. Kalko Y, Ugurlucan M, Basaran M, Aydin U, Kafa U, Kosker T, Suren M, Yasar T. Epidural anaesthesia and mini-laparotomy for the treatment of abdominal aortic aneurysms in

patients with severe chronic obstructive pulmonary disease. Acta Chir Belg. 2007 Jun; 107(3):307-12.

22. Groeben H, Schäfer B, Pavlakovic G, Silvanus MT, Peters J. Lung Function under High Thoracic Segmental Epidural Anesthesia with Ropivacaine or Bupivacaine in Patients with Severe Obstructive Pulmonary Disease Undergoing Breast Surgery.Anesthesiology. 2002 Mar; 96(3):536-41.
23. Pelosi P, Croci M, Ravagnan I, Tredici S, Pedoto A, Lissoni A, Gattinoni L: The effects of body mass on lung volumes, respiratory mechanics, and gas exchange during general anesthesia. Anesth Analg 1998; 87:654-60
24. Hedenstierna G, Santesson J: Breathing mechanics, dead space and gas exchange in the extremely obese, breathing spontaneously and during anaesthesia with intermittent positive pressure ventilation. Acta Anaesthesiol Scand 1976; 20:248-54
25. Vaughan RW, Wise L: Intraoperative arterial oxygenation in obese patients. Ann Surg 1976; 184:35-42.
26. Loo K, Bacjman S, Moore A, Schricker T Epidural analgesia for a laparotomy in a morbidly obese patient with a history of difficult intubation cja 50:312-313 (2003).
27. Segmental spinal anaesthesia for cholecystectomy in a patient with severe lung disease. A. A. J. van Zundert, G. Stultiens, J. J. Jakimowicz,B. E. E. M. van den Borne, W. G. J. M. van der Ham and J. A. W. Wildsmith. British Journal of Anaesthesia 2006 96(4):464-466.
28. D. S. Sulemanji, A. Donmez, and G. Arslan. Epidural anaesthesia for laparoscopic cholecystectomy in a patient with scleroderma. Br. J. Anaesth., November 1, 2006; 97(5): 749 - 749.
29. G. Tzovaras, K. Pratsas, S. Georgopoulou, I. Ahmed, A. A. J. van Zundert, and J. A. W. Wildsmith. Laparoscopic cholecystectomy using spinal anaesthesia. Br. J. Anaesth., November 1, 2007; 99(5): 744 - 745.
30. Cynthia Wong, McGraw-Hill Professional; 2006; Spinal and Epidural Anesthesia; page116.