



Research Paper

Intraoperative Ventilatory strategies in Anterolateral Transthoracic Approach in Dural Decompression Surgery At D5-D6 Level: A CASE REPORT

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ABSTRACT:- The spectrum of spinal surgery in adult life is considerable. Anaesthesia for major spinal surgery, such as spinal stabilization following trauma or neoplastic disease, or for correction of scoliosis, presents a number of challenges. Protective ventilation refers to the use of low tidal volume (VT), often in the range of 4–8 mL/kg of predicted body weight (PBW). Low tidal volume ventilation is associated with particular clinical challenges and is therefore often underutilized as a therapeutic option in clinical practice.²

A 24 year old female came with chief complaints of bilateral lower limb weakness since 6 months. On evaluation she was diagnosed with potts spine and due to the MRI findings she was taken up transthoracic D5-D6 decompression surgery in left lateral position. Intraoperatively, the patient was ventilated with 3 ml/kg tidal volume and a respiratory rate of 18/minute to maintain MV. We had limited resources such as single lumen intubation was done and absence of invasive monitoring thereby posing a significant challenge. Adequate ventilation is one of the cornerstones of a skilled anaesthesiologist. But sometimes surgery and surgical demands can obtund normal ventilator demands. Thereby, we present a case report here of anaesthetic management of patient undergoing anterior approach transthoracic decompression D6 vertebrae with low tidal volume lung ventilation with single lumen flex metallic endotracheal tube intubation.

KEYWORDS:- low tidal volume, ventilation, anaesthesia, spine surgery.

I. INTRODUCTION

The physiology of the spinal cord is generally similar to that of the brain: CO₂ responsiveness, blood-brain barrier, autoregulation, high metabolic rate and blood flow (although less than the brain), and substantial ischemic vulnerability of grey matter. Measures to reduce spinal cord swelling, analogous to ICP reduction manoeuvres, are, however, rarely used.¹

The spectrum of spinal surgery in adult life is considerable. Anaesthesia for major spinal surgery, such as spinal stabilization following trauma or neoplastic disease, or for correction of scoliosis, presents a number of challenges. They commonly have preoperative co-morbid conditions such as serious cardiovascular and respiratory impairment. Airway management may be difficult. Surgery imposes further stresses of significant blood loss, prolonged anaesthesia, and problematical postoperative pain management. The perioperative management of these patients is discussed. The anaesthetist has an important role in facilitating these methods of monitoring.²

Protective ventilation refers to the use of low tidal volume (VT), often in the range of 4–8 mL/kg of predicted body weight (PBW). Low tidal volume ventilation is associated with particular clinical challenges and is therefore often underutilized as a therapeutic option in clinical practice.²

The overall goal of lung protective low volume ventilation is to minimize lung trauma by avoiding both over distention (and associated elevated pressure) and repetitive alveolar collapse, while providing adequate oxygenation and ventilation.³

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II. CASE REPORT

A 24 year old female came with chief complaints of bilateral lower limb weakness since 6 months. This pain was associated with bilateral tingling and numbness and decreased sensations of both limbs.

The patient was apparently alright 6 months back when she started experiencing bilateral lower limb weakness. This pain aggravated on walking and relieved on rest. When evaluated further she was diagnosed to have Potts spine. Her MRI revealed 'collapse T5 vertebrae, abnormal signal intensity and enhancement of T5, T6 vertebral bodies and pedicles, retropulsion of T5 vertebral body into the spinal canal. Cord edema present. Abnormal pre and paraspinous soft tissues T4-T6 vertebral levels. Increase in kyphosis.' She was empirically started on AKT from the 24th October. The decision to operate was then taken by the multidisciplinary approach taken by the neurosurgeon, orthopaedician and anaesthesiologist.

A thorough pre-operative evaluation was undertaken with consultations from department of pulmonary medicine and neurosurgery.

On preoperative examination she was obese weighing 85 kg and a BMI of 33 kg/m². She was an anticipated difficult airway with MP II, short neck and thyromental distance of 2.5 cm. On neurological examination she had power of 4/5 in both lower limbs with reduced sensation. Bowel and bladder examination was normal. She had tenderness on palpation of spine at lower thoracic levels. She was advised strict bed rest 6 weeks prior to surgery and continuation of AKT. Her routine investigations were revealed to be normal.

Her liver function tests were normal. She was advised pre-operative PFT but was rendered non cooperative.

On the day of surgery her AKT was continued. 2 large bore IV cannula were secured of 18 G each. She was kept NBM twelve hours prior to surgery and therefore fluids were started according to the NBM guidelines. General anaesthesia was given. Patient was premedicated with injection glycopyrolate 0.2 mg IM given 15 minutes prior to surgery. Difficult airway cart was kept ready. Patient was sedated with injection midazolam 1mg IV and injection fentanyl 50 ug IV prior to induction. Induction was done with injection thiopentone sodium 5-6 mg/kg IV in titrated doses followed by intubation under the effect of injection rocuronium 0.8 mg/kg IV. A cuffed flexometallic tube of size 7.5 inserted. After confirmation of placement of ETT patient was put on ventilator on VCV mode, TV 500 ml, RR 12/minute, I: E 1:2.

Standard intraoperative monitoring was done. NIBP, ECG and SPO2 monitors were applied. End tidal carbon dioxide monitor and temperature monitoring was done.

Patient was started on injection dexmed with loading dose of 1 ug/kg over ten minutes and then maintenance on 0.3 ug/kg to 0.6 ug/kg throughout the surgery.

Injection vecuronium was infused on a continuous maintenance dose of 4 mg/hr.

Maintenance was done by using oxygen with nitrous oxide and inhalational agent isoflurane 0.2-0.6%.

Patient was given left lateral position. Adequate precautions were taken for positioning of the patient with padding under all the pressure points. Throughout the surgery the patient was then ventilated with a tidal volume of 250 ml and respiratory Rate of 18 / minute to ensure adequate minute ventilation. The patient's ETCO₂ and airway pressures were given special attention to watch out for atelectasis. Intraoperatively ABG was done which showed a normal oxygenation status and confirmed absence of hyper apnoea or associated respiratory alkalosis.

The surgeon performed an anterolateral transthoracic approach for corpectomy with dural decompression surgery at D5 – D6.

Intraoperatively adequate analgesia was provided by intermittent bolus doses of injection fentanyl. Fluids were adequately infused as per requirements and intraoperative blood loss was compensated by infusion of 250 ml of colloid.

Prior to reversal of patient an ICD was inserted in thoracic cavity, and patency was confirmed. Patient was reversed in standard method with inj. Neostigmine 0.04mg/kg and inj. glycopyrolate 0.01mg/kg.

Patient was extubated uneventfully after 8 hours of surgical intervention and neurological adequacy was ensured by the surgeon. Patency of ICD was confirmed. Patient was shifted to ICU for further haemodynamic and neurological monitoring.

III. DISCUSSION

Adequate ventilation is one of the cornerstones of a skilled anaesthesiologist. But sometimes surgery and surgical demands can obtund normal ventilator demands. This patient required low volume ventilation throughout surgery to avoid damage to the inflated lungs during intervention.

The goal of anaesthesia during this procedure was essentially to avoid hypoxia, hypercapnoea and prevent atelectasis of this patient.

Maintenance of minute ventilation was the most important aspect of this procedure. We increased the respiratory rate of the patient when tidal volume was reduced to maintain MV.

Patients undergoing spinal surgery frequently have significant co-morbidity. Surgery imposes the further stresses of significant blood loss, prolonged anaesthesia, and difficulties in acute postoperative pain management.

Surgeons prefer patients to be conscious and able to respond to command immediately after anaesthesia, for early neurological assessment. It is also important that patients are able to expectorate, and to comply with physiotherapy as early as possible in the postoperative period. Chest drains, if present, should be checked regularly to ensure patency; obstruction may lead to Pneumo- or haemothorax. Our patient had a chest drain in situ with adequate patency.^{1,4}

Pain management can be a considerable challenge. Patients undergoing spinal surgery, particularly through a thoracic approach, may have a large incision extending over several dermatomes.

Techniques like Intrapleural infusions of local anaesthetic and/or opioids may be considered after a thoracotomy. Intrapleural infusions of local anaesthetic agents have been reported to reduce systemic opioid requirements in such circumstances.²

The use of protective ventilation does require more advanced knowledge of ventilator management, and, depending on the availability of local expertise, clinicians may be unable or reluctant to make the necessary adjustments.

In order to maintain adequate minute ventilation, one is often required to aggressively increase the respiratory rate, sometimes above 30 breaths/min. This may lead to the development of dynamic hyperinflation and auto-PEEP which can have significant negative respiratory and hemodynamic

consequences. We had maximally increased the respiratory rate to 18/ minute in this surgery. The patient's hemodynamic status was stable all throughout the surgery. There was no significant fall in blood pressure or hyper apnoea. Thus, low tidal volume ventilation is a difficult entity and requires thorough knowledge of ventilation, experience to ensure success.

IV. CONCLUSION

In spite of limited resources, a single lumen endotracheal intubation and absence of invasive hemodynamic monitoring, absence of neurological monitoring like SSEP and BISS this patient was effectively managed intra and post operatively. Appropriate knowledge of ventilation and vigilance and skilled anaesthesiologist is the key to a successful patient outcome.

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