Case Report

Combined Spinal Epidural Anaesthesia with BiPAP- A case report

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ABSTRACT

We report three cases where BiPAP was used with CSEA to overcome hypoventilation due to preoperative poor respiratory reserves and additive effect of sedation. This combination provided safe alternative to conventional general anesthesia, as it avoids need for postoperative ventilatory support and its deleterious effects (Rawal Med J 2009;34:117-119).

Key Words: BiPAP, COPD, Combined spinal epidural anaesthesia, laparoscopic cholecystectomy

INTRODUCTION

Severe COPD cases for surgery carry high risk of perioperative morbidity and mortality. General anesthesia if possible, is better avoided due to risk of impending respiratory failure and need for postoperative ventilatory support.\textsuperscript{1,2} Spinal and epidural anesthesia provides safe and effective anaesthesia in such high risk patients.\textsuperscript{3} Upper abdominal operations require adequate analgesia up to T4 which always compromises respiratory muscle functions and with sedation hypoxia is inevitable. However, this hypoxia can be prevented by using intraoperative Bi-level positive airway pressure (BiPAP), as it supports the patient’s own respiration without interfering airways by maintaining
functional residual capacity (FRC). This concept has been used recently in patients of severe COPD for various surgical procedures.\textsuperscript{4, 5} We report use of combined spinal epidural anesthesia (CSEA) and BiPAP in three patients of severe COPD under going inguinal hernia repair, laparoscopic cholecystectomy and radical hysterectomy.

**CASE PRESENTATIONS**

**Patient-1:** An 82 years old male presented with obstructed right inguinal hernia. He suffered from COPD, cor-pulmonale and pulmonary hypertension. He was confined to bed with oxygen support at most of the time of the day, and was unable to lie flat. Echocardiography showed mild aortic regurgitation with decreased left ventricular function. ECG showed ST depression in inferior leads. Blood investigations and electrolytes were normal.

**Patient-2:** A 65 years old female with gall stones was scheduled for laparoscopic cholecystectomy. She was confined to bed due to Potts’s paraplegia for 2 months. She also had COPD, old pulmonary tuberculosis, NIDDM and ischemic heart disease with recurrent chest pain. ECG showed LBBB, old anteroseptal infarction with left axis deviation and echocardiography showed thin and hypokinetic intraventricular septum and 44% left ventricular ejection fraction. She had history of untoward cardio-respiratory event under general anesthesia and intensive care admission during ERCP two weeks before in another hospital.

**Patient-3:** A 70 years old 86 kg female (Fig. 1) was scheduled for hysterectomy. She had hypertension, diabetes mellitus, COPD and episodes of sleep apnea. She had history of difficulty in maintaining airways under general anesthesia in last surgery for cervical biopsy 7 days before in our hospital which was managed with bag and mask oxygenation by two anesthetists.

**ANESTHESIA TECHNIQUE**

Standard monitoring was commenced with, i.v. access and oxygen through nasal prongs. Combined spinal epidural technique by needle through needle (CSE Cure, Portex) Combined Spinal/Epidural mini pack 27G/18G) was used for anesthesia. An 18G
Epidural catheter was inserted through Tuohy needle 3-4 cm in epidural space and after negative aspiration test for blood and CSF, 2ml saline was used to flush the catheter to know the patency. Level of block was decided by nature of operation and epidural top-up were given as required (table-1).

**Fig 1. Photograph of patient #3 with difficult airway.**
(Consent for Photograph and publication taken).

Sedation was given when patient requested for sleep or showed undue anxiety or uncooperative behavior. Initially with 0.5mg increments of midazolam and 10-20mg bolus of propofol, infusion of propofol was started @ 0.5mg/kg/hr. BiPAP (BiPAP® Auto-M Series RESPIRONICS®) was started when SpO2 did not improve with oxygen by nasal prongs or Polly mask. In first two patients, IPAP-14 and EPAP-5 adequately maintained oxygenation, in hysterectomy patient IPAP-20 was required when SpO2 did not improve above 87%. ABG was done after one hour of BiPAP commencement (table-2). It was gradually withdrawn (depending up on patients’ acceptance) and oxygen was continued by Polly mask in postoperative period.
Fig. 2. Patient #2 (laparoscopic cholecystectomy) showing BiPAP machine, oxygen source and protective eye pads.

Postoperative analgesia was provided with 6ml epidural injection of 0.125% bupivacaine+ buprenorphine 100 -300 µg on demand basis. All three patients had uneventful recovery and were discharged from the hospital. They were highly satisfied with anesthesia and postoperative care.

Table 1. Level of CSE, duration and nature of surgery, amount of spinal and epidural drugs and settings of BiPAP.

<table>
<thead>
<tr>
<th>Operative procedures</th>
<th>Level of CSEA</th>
<th>Dose of 0.5% heavy bupivacaine for spinal</th>
<th>First Dose of epidural Xylocaine 2% with adrenaline</th>
<th>Epidural Top-ups Xylocaine 2% with adrenaline</th>
<th>Duration of surgery (minutes)</th>
<th>IPAP</th>
<th>EPAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inguinal hernia repair</td>
<td>L3/L4</td>
<td>1.0 ml</td>
<td>5.0 ml</td>
<td>10 ml</td>
<td>156</td>
<td>14</td>
<td>05</td>
</tr>
<tr>
<td>( bilateral)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laparoscopic cholecystectomy</td>
<td>T9/T10</td>
<td>2.0 ml</td>
<td>10.0 ml</td>
<td>10 ml + 10ml</td>
<td>160</td>
<td>14</td>
<td>05</td>
</tr>
<tr>
<td>Radical hysterectomy</td>
<td>L2/L3</td>
<td>3.0 ml</td>
<td>3.0 ml</td>
<td>17 ml + 15 ml</td>
<td>190</td>
<td>20</td>
<td>06</td>
</tr>
</tbody>
</table>

IPAP= Inspiratory positive airway pressure, EPAP= Expiratory positive airway pressure
DISCUSSION

Compared with general anesthesia, the maintenance of spontaneous breathing means there is less cephalad displacement of the diaphragm and less risk of atelectasis, closing capacity and FRC are less affected and pulmonary gas exchange is better maintained.\textsuperscript{3} However, sedation given in conjunction with a regional block decreases sensitivity to CO\textsubscript{2} and hypoxia, and thus these patients are unable to deal effectively with hypercarbia and hypoxia. Moreover, combined effects of pneumoperitoneum (as in laparoscopic cholecystectomy) and sedation can lead to hypoventilation and arterial oxygen desaturation.\textsuperscript{6} Superior postoperative analgesia without risking respiratory depression, and avoidance of the strong stimulation of intubation or the risk of bronchoconstriction on extubation, are benefits that have been reported with the use of combined spinal and epidural anesthesia for abdominal aortic aneurysm repair in patients with severe COPD.\textsuperscript{5}

We used combination of BiPAP and CSEA in our three high risk patients for inguinal hernia repair, laparoscopic cholecystectomy and hysterectomy having multiple systemic diseases including poor respiratory reserves due to severe COPD. CSEA is a better option in high risk patients because, it provides safe and effective Neuraxial block than either spinal or epidural alone.\textsuperscript{7} BiPAP helped our patients to maintain oxygenation (Table-2) when patients were sedated with propofol and were unable to maintain oxygenation\textsuperscript{8} with conventional methods e.g. nasal prongs and Polly mask. General anesthesia could have been an alternative with intubation and IPPV but there was likelihood that these patients
would need postoperative ventilation and general anesthesia it self has detrimental effects on postoperative respiratory functions.  

Table 2. ABG values after one hour of BiPAP application with 3l/min Oxygen.

<table>
<thead>
<tr>
<th>Patients</th>
<th>PO2</th>
<th>PCO2</th>
<th>pH</th>
<th>O2 saturation</th>
<th>BiCarb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inguinal hernia repair (bilateral)</td>
<td>86.1</td>
<td>38.1</td>
<td>7.43</td>
<td>95.9</td>
<td>34</td>
</tr>
<tr>
<td>Laparoscopic cholecystectomy</td>
<td>107</td>
<td>45</td>
<td>7.414</td>
<td>98.9</td>
<td>27</td>
</tr>
<tr>
<td>Radical hysterectomy</td>
<td>88</td>
<td>36.1</td>
<td>7.35</td>
<td>95.9</td>
<td>22</td>
</tr>
</tbody>
</table>

Noninvasive ventilation and propofol sedation with spinal, epidural and CSEA has been used and accepted clinically practicable method in various surgical procedures and it helps to corrects alveolar hypoventilation during spinal anaesthesia.  

The use of BiPAP from beginning and in planed manner is ideal to avoid poor patient compliance. This is achieved by a controlled, gradual introduction, checking its tolerability before performing the spinal, and then the use of target-controlled sedation during the operation.  

We would recommend this technique in any patient with advanced lung disease who would otherwise be likely to require postoperative ventilation.

REFERENCES


