

Epidural analgesia in high risk cardiac surgical patients

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ABSTRACT

Cardiac surgery is associated with high morbidity and mortality in patients with renal, hepatic or pulmonary dysfunction, advanced age and morbid obesity. Thoracic epidural analgesia is associated with decreased morbidity in these patients. Thoracic epidural analgesia in cardiac surgery is associated with haemodynamic stability, decreased catecholamine response, good pulmonary function, early extubation and discharge from intensive care unit. It is an important component of fast tracking in cardiac surgery as well. Its use has significantly increased over the years and has been used as an adjuvant to general anaesthesia as well as the sole anaesthetic technique in selected groups of patients. Proper selection of patients for thoracic epidural analgesia is mandatory. Timing of epidural catheter insertion and removal should be judiciously selected. The risk of epidural hematoma secondary to anticoagulation or residual effects of antiplatelet drug that can be reduced by taking standard precautions. In conclusion thoracic epidural analgesia in high risk cardiac surgery might decrease pulmonary, cardiovascular or renal complications, provide excellent analgesia and allow early extubation.

Keywords: *thoracic epidural, high risk cardiac surgery, analgesia.*

High risk cardiac surgery with associated co-morbidities like renal or hepatic dysfunction, advanced age, airway disease or morbid obesity still has significant morbidity and mortality despite advances in surgical and perfusion techniques.

Any technique that reduces the morbidity without significant collateral damage is desirable. Epidural analgesia at high thoracic level is may be associated with decreased morbidity in patients undergoing cardiac surgery. Thoracic epidural analgesia (TEA) was among the first regional techniques de-

scribed for coronary artery bypass grafting (CABG) (1). However, initially it became unpopular because of perceived risk of epidural hematoma secondary to the heparinization required for cardiopulmonary bypass (CPB).

TEA reduces myocardial oxygen consumption, maintains hemodynamic stability, reduces intra and postoperative myocardial ischemia, reduces catecholamine response associated with surgery, diminishes cortisol response and produces superior analgesia leading to good pulmonary functions after cardiac surgery (2-8). All these factors can lead to early extubation, ambulation and discharge from the intensive care unit (9). Our studies using TEA in patients with morbid obesity (10) and chronic ob-

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structive pulmonary disease (COPD) were in favor of this technique (11). We found early extubation, earlier oxygen withdrawal, significant postoperative analgesia and better pulmonary functions in patients who received TEA. We have also studied the effect of regional techniques like TEA and paravertebral block in patients undergoing minimally invasive and robotic assisted cardiac surgery (12), with favorable results. Suryaprakash et al studied the effect of TEA on oxygen delivery and found no significant effect on tissue oxygenation despite decrease in arterial pressure and cardiac output (13).

The drug choice for thoracic epidural analgesia depends upon the characteristics of the patient. It may include local anesthetic alone, opioid alone or a combination of local anesthetic and opioid. Local anesthetics alone should be used in patients with obstructive sleep apnea (OSA) or in patients with opioid related side effects such as postoperative ileus, severe nausea and vomiting. Moreover its use is also limited by hypotension and motor blockade. OSA patients are generally obese with already compromised pulmonary function and the possibility of worsening if systemic opioids are administered. We have successfully used TEA in patients with severe OSA undergoing off pump coronary artery bypass grafting (OP-CABG) (14). Combining thoracic epidural local anesthetics and opioids produces superior analgesia. However, close titration of local anesthetic and opioid concentration is required to attain balance between providing optimal effects and avoiding unwanted side effects.

TEA has been used as a sole anesthetic technique in patients undergoing OPCABG, is commonly known as “conscious OPCABG” (15) and requires good coordination between surgeon and anesthesiologist, proper selection and counseling of the patients. Furthermore, opening of the left

pleura during left internal mammary artery (LIMA) dissection may lead to left lung collapse with respiratory distress which may require continuous positive airway pressure (CPAP) and lead to surgical difficulty, due to exaggerated diaphragmatic movements.

In high risk cardiac surgery, TEA produces cardiac sympathectomy. That in turn will lead to stable hemodynamics, minimal humoral, metabolic, homeostatic alterations and immunosuppression. Moreover, it will cause hypodynamic circulation leading to positive myocardial oxygen balance, protection of the myocardium and abdominal organs (redistribution of blood flow within the myocardium or abdominal organs), and protection against b-receptor down regulation (2, 3).

Basal atelectasis develops early during anesthesia and persists into the postoperative period. After median sternotomy respiratory muscle weakness contribute to restrictive ventilatory defect together with reduced and uncoordinated rib cage expansion. Postoperative pain may further cause hypoventilation, retention of secretions and aggravation of impaired lung functions. TEA improves pulmonary dynamics by improvement in vital capacity and peak expiratory flow rate. It also blocks reflex inhibition of the normal abdominal muscle activity leading to more pronounced respiratory effort (10).

TEA is an important component of fast tracking in cardiac surgery. The positive effects of TEA like incisional and visceral nociception, early extubation, early removal of chest drains and catheters, early mobility and discharge from the intensive care unit may help in fast tracking.

Scott et al. (16) presented the first randomized evaluation of the impact of perioperative TEA on outcome in a large series of 400 patients with normal ventricular function undergoing CABG in whom the epidu-

ral catheters were placed immediately before surgery. There was a reduction in the incidence of supraventricular arrhythmias (SVA), postoperative confusion, lower respiratory tract infections, renal failure and early extubation in TEA patients compared with a control group treated with a target controlled postoperative infusion of alfentanil.

To counterbalance the above mentioned advantages of TEA, there is the risk of epidural hematoma due to anticoagulation during surgery as well as residual effects of antiplatelet therapy. Therefore the timing of epidural catheter insertion and stopping of the antiplatelet medication prior to surgery is of utmost importance. Moreover the timing of removal of the epidural catheter is as important as the positioning and should not be performed if the patients receive anticoagulation.

A mathematical analysis and estimation of the risk of spinal cord injury from an epidural hematoma based on a large number of cases of TEA for cardiac surgery reviewed by Ho et al. (17), was estimated with 95% confidence to be between 1:1,500 to 1:150,000 and with 99% confidence up to 1:1000, a theoretical but not insignificant risk. If basic standard precautions like withholding antiplatelets and anticoagulants, inserting the epidural catheter at least ninety minutes before heparinization, using a midline approach, postponing surgery in case of bloody tap etc. (18, 19) are followed, the risk of epidural hematoma is supposed to be insignificant. Moreover a prospective audit of 2113 epidurals in cardiac surgery patients over a 13-year period reported only four temporary neurological deficits (18).

To conclude, TEA in high risk cardiac surgery patients acts as an adjuvant to general anesthesia. This technique might decrease pulmonary, cardiovascular and renal complications after cardiac surgery, provide an-

algesia and lead to early extubation without affecting length of hospital/intensive care unit stay or mortality.

The small risk of epidural hematoma can be minimized by ensuring normal hemostasis and by adopting standard precautions both during positioning and removal of the catheter. The jury is still out for TEA in cardiac surgery.

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