Role of Regional Anesthesia in Open heart Surgery

Essay

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List of Abbreviations

aPTT : Activated Partial Thromboplastin Time

AT : Antithrombin

CABG : Coronary Artery Bypass Grafting

cm : Centimeter

CN : Cranial Nerve

CNS : CentraL Nervous System

CO : Carbon Monoxide

CSF : Cerebrospinal fluid

ECC : Extracorporeal Circulation

GA : General Anesthesia

H : Hour

IB : Intercostal nerve Block

ICU : Intensive Care Unit

Kg : Kilogram

LA : Local Anesthesia

LV : Left Ventricle

mg : Milligram

MHz : Mega Hertz

mins : Minutes

ml : Milliliter

mmHg : Millimeter Mercury

MV : Mechanical Ventilation

OLA : Open Lung Approach

PPD : Postoperative Pulmonary Dysfunction

PVB : Paravertebral Block

PVNB : Paravertebral nerve block

PVS : Paravertebral Space

TEA : Thoracic Epidural Anesthesia

U : Unit

UFH : Unfractionated Heparin

US : Ultrasound

µg : Microgram

µml : Microliter

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Introduction

Induction of anesthesia in cardiac surgery requires titration of drugs in order to avoid increased oxygen consumption and decreased oxygen supply **(Barnes *et al*., 2002)**.

During induction, hypertension and tachycardia in patients with normal ventricular function occurs. Hypertension should be avoided in patients with left ventricular (LV) hypertrophy, also hypotension and myocardial depression should be avoided in patients with depressed ventricular function or stenosis. Induction of anesthesia in open heart surgeries should also provide smooth intubating conditions for those patients. These major concerns of cardiac anesthetic practice can be managed by using small doses of vasopressors for hypotension and by deepening anesthesia or administering β-blockers for the hyperdynamic responses. In terms of intraoperative ischemia, postoperative myocardial infarction or death, there is no single technique superior to others **(London *et al*., 2008).**

At the beginning of the modern cardiac surgery era, routine overnight ventilation was one of the essential components of postoperative care. But recently low dose,

short acting anesthetic agents replacing the former high dose opioid regimens offers a faster postoperative recovery and decreases the need for mechanical ventilatory support. The choice of the anesthetic method depends mainly on LV function and whether the patient is suitable for early extubation or not. LV function determines the dosages of the anesthetic agents depending on the hemodynamic response of the patient. Early extubation is a desired method in order to reduce the postoperative need for mechanical ventilation resulting in shorter periods of ICU stay, decreasing the cost **(London *et al*., 2008).**

Fast-track (FT) anesthesia is a sequence of applications aimed at early extubation (6-8 hours after the operation) and early discharge from the intensive care unit (ICU) (before 24 hours) and from the hospital on 5^{th} postoperative day. This process is intended to ensure that the patient returns to his normal activities as early as possible without risking patient safety and compromising the quality of care **(Torman *et al*., 2004).**

Till late nineties, cardiac surgeries involved the use of high dose of opioid agents and prolonged postoperative elective mechanical ventilation which in turn led to prolonged ICU stay and a protracted recovery. Fast-track anesthesia for cardiac surgeries was introduced during early nineties with the advent of new surgical techniques, warm

by-pass and short acting anesthetic drugs. Fast-track anesthesia involves early extubation after cardiac surgeries, leading to early mobilization and rehabilitation of these patients. Early extubation is known to improve cardiac performance due to increased ventricular filling and reduces the incidence of postoperative pulmonary complications such as atelectasis and pneumonia. Early mobilization has shown to improve patients' psychological well-being. Fast-tracking is also known to shorten ICU and effective hospital stay resulting in reduction of cost and better fund utilization **(Cheng *et al*., 2003).**

Postoperative pulmonary dysfunction (PPD) is a frequent and significant complication after cardiac surgery. Many factors have been described to contribute to this inflammatory response, including surgical procedure with sternotomy incision, effects of general anesthesia, topical cooling, extracorporeal circulation (ECC) and mechanical ventilation (MV). Certain factors cannot be altered like general anesthesia, sternotomy incision and ECC. However, morbidity and mortality can be significantly reduced if we adopt protective ventilation strategy like 'Open Lung Approach' (OLA), continuous positive airway pressure (CPAP) during ECC, maintaining normothermic perfusion and early extubation and noninvasive mechanical ventilation postoperatively **(Sundar *et al.*, 2011).**

Early extubation after cardiac surgery is a welcome step, as the incidence of pulmonary complications decreases significantly. However, during initial stages, the incidence of re-intubation was high with its added set of complications. The incidence of re-intubation in the FT method ranges from 1% to 7% **(Camp *et al.*, 2009)**.

There is an interest in the use of neuraxial anesthesia in cardiac surgery, because experimental and clinical studies have suggested that central neuraxial blockade attenuates the response to surgical stress and improves myocardial metabolism and perioperative analgesia, thus enabling earlier extubation and a smoother postoperative course (**Scott *et al*., 2001**).

Advances in anesthesiology improves outcome after cardiac surgeries by combining the regional anesthesia techniques with general anesthesia. Thoracic epidural anesthesia (TEA) may enhance coronary perfusion, improve myocardial oxygen balance, reduce the incidence of tachyarrhythmias, perioperative myocardial ischemia through sympatholytic effects; and also by providing superior analgesic effect it facilitates early tracheal extubation and may prevent respiratory complications **(Svircevic *et al* .,2011).**

Thoracic epidural anesthesia (TEA) has been established as a cornerstone in the perioperative care after thoracic surgery providing most effective analgesia. Beyond its analgesic properties, thoracic epidural anesthesia effects on the postoperative stress response, cardiovascular pathophysiology and intestinal dysfunction have been in the focus of both clinical and experimental investigations for years. However, as an invasive technique TEA is related to specific complications even when contraindications are properly considered. There is an ongoing debate whether these risks of TEA and its consumption of procedural resources in the perioperative period are worth the benefits with respect to outcome and organ protection ***(*Hugo *et al*., 2010*).***

Aim of the Work

To assesse the benefits and hazards of regional anesthesia during open heart surgeries.