

Off pump coronary artery bypass grafting in awake patient

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Article Info

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Presentation of Case

Dr. Md. Sazzed-Al-Hossain: A 60-year-old male patient was admitted into the department as a diagnosed case of ischemic heart disease and his coronary angiogram reveals triple vessel disease (80-90% lesion in the mid part of left anterior descending artery; 90% lesion in the distal part of obtuse marginal and 99% stenosis in the distal part of right coronary artery). The patient was suffering from chest pain for last 3 months which aggravated by exertion and radiates along the neck and left arm. The patient was non-diabetic and non-hypertensive. After evaluation, we decided to perform myocardial revascularization with off pump coronary artery bypass graft surgery under traditional technique (general anesthesia with endotracheal intubation). However, after discussion among our team members and proper counselling of the patient, we decided to perform the operation under awake condition (thoracic epidural anesthesia).

The advantages and disadvantages of the procedure were discussed with the patient, who was enthusiastic and well-motivated to accept the technique. After prepping and draping, the standard median sternotomy was performed during breath hold on expiration. The blade of the sternal retractor was opened very gently to judge the pain tolerance of the patient and to lessen the tension on the chest wall which allowed spontaneous breathing.

During harvesting left internal mammary artery, careful dissection as carried out to avoid accidental opening of pleura. Systemic heparinization was done before completion of the left internal mammary artery harvest with activated partial thromboplastin time more than 350 sec. The left internal mammary artery was anastomosed with left anterior descending artery by standard beating heart technique. The graft flow found satisfactory. Meanwhile, great saphenous vein was harvested from the left leg was anastomosed in following manner: Reverse saphenous venous graft to distal right coronary artery (1.5 mm shunt), reverse saphenous venous graft to 1st diagonal (1.75 mm shunt). As both the pleura was intact, only 2 medias-

tinal chest tubes were placed. The sternum was approximated with stainless steel and the skin closed in layer. The heart rate, mean arterial blood pressure, arterial blood gas analysis, continuous ECG monitoring result were noted at half hour before anesthesia, half hour after anesthesia, 1st hour, 2nd hour, 4th hour, 12th, 24th hour of anesthesia and found satisfactory (Table I). The arterial blood pressure was maintained within the normal range by infusion of inotropes, adequate volume and appropriate dose of glycerin trinitrate. The full dose of heparin was used for anticoagulation which was reversed with protamine at the end of the operation.

The patient was well-tolerated in each phase of the operation and remained hemodynamically stable throughout the procedure. During the whole procedure, he was verbally communicating, normotensive and all other parameters within the normal limits. The total operating hours were 3 hours 45 min, and then the patient was transferred to the intensive care unit. Because of the need for continuous analgesic administration, we kept the epidural catheter for three days. We maintained analgesia with 0.25% bupivacaine in syringe pump at the rate of 5 mL per hour. No oral or intramuscular non-steroidal anti-inflammatory drug or opioid was needed. The effective pain management enabled faster post-operative mobilization and allowed the patient to be discharged from the intensive care unit on the 2th post-operative day. No significant post-operative event like hemorrhage, arrhythmia, respiratory failure, etc. was noticed. The post-operative period was uneventful and the patient got discharged on 7th post-operative day with good recovery.

Discussion

Dr. Redoy Ranjan: What are the advantages of epidural anesthesia that has intended to perform in the case over general anesthesia?

Dr. Sazzed -Al- Hossain: General anesthesia with endotracheal intubation is one of the most commonly used anesthetic techniques for all kinds of cardiac operations including off pump



Table I

Respiratory and hemodynamic parameter

Parameters	Thoracic epidural anesthesia					
	0 hour	0.5 hour	2 hours	4 hours	12 hours	24 hours
Respiratory rate/min	16	13	15	18	16	12
Peripheral oxygen saturation	95	100	100	97	99	98
Partial pressure of oxygen in arterial blood	77.7	167.8	122.1	143.9	126.4	132.1
pH	7.4	7.3	7.3	7.3	7.4	7.4
Heart rate	85	63	61	75	77	74
Systolic arterial blood pressure (mmHg)	154	129	120	129	138	135
Diastolic arterial blood pressure (mmHg)	75	68	62	67	73	69
Mean arterial blood pressure (mmHg)	101	88	81	87	94	90

coronary artery bypass surgery. However, it has significant adverse effects like coronary artery vasoconstriction, perioperative myocardial ischemia, tachycardia, aspiration pneumonia, atelectasis, intubation and mechanical ventilation related trauma, aggravated sympathetic activity causing prolong intensive care unit stay and ultimately increasing cost burden of the patient.^{1,2} Due to its nature, awake coronary artery bypass surgery offers several advantages over general anesthesia, including better analgesia, improve myocardial perfusion, improved ventricular function, avoidance from tracheal intubation and mechanical ventilation, improved pulmonary function, reduced stress response and preservation of fibrinolytic system. Cardiac sympatholysis achieves bradycardia, dilates coronary arteries and in situ grafts, improves left ventricular function, and prevents arrhythmia, thereby, making coronary anastomosis less challenging using Awake CABG technique.^{3,4} Awake coronary artery bypass surgery also promotes neurological vigilance by using patient's mental status as a monitor of cerebral ischemia during the procedure. In addition to these intraoperative advantages, post-operative pain management is facilitated by continuous epidural application of analgesia. Such effective pain management improves post-operative mobilization and recovery after beating-heart surgery.^{3,5,6}

Dr Kamrun Nahar: Would you please brief us the entire procedure especially anesthetics technique and drug dosage?

Dr. Sazzed-Al-Hossain: In this case, antiplatelet drug (aspirin, clopidogrel, etc.) was stopped 5 days prior to the procedure. Premedication consisted of midazolam 7.5 mg, pantoprazole 20 mg orally at night before surgery. The patient received usual oral cardiac medications with sips of water in early morning on the day of surgery. Injection morphine 0.1 mg/kg intramuscularly was given 2 hours before being taken to the operating room. On the

day before operation, the patient was placed in a sitting position and a 20-gauge flexible tip epidural catheter was inserted through a Tuohy needle through the T₁-T₂ intervertebral space using the median approach and hanging drop technique.⁷ The catheter was directed cephalad and advanced 3 to 4 cm into the epidural space. Initially a test dose of 5 mL of lignocaine (2%) was administered epidurally. As epidural anesthesia agent, bupivacaine 0.5% was used. The loading dose of 0.5% bupivacaine was 0.75 mL/10 cm of height of the patient was given epidurally as a bolus over 10-15 min. The level of the block was tested by assessing both temperature and pinprick discrimination. Motor block of the intercostal muscles was assessed visually by monitoring the loss of intercostal movement. Sensory block level was maintained at the T₁-T₈ level.^{7,8} Maintenance of epidural anesthesia was achieved by continuous infusion of bupivacaine 0.50% at 5 mL/hour.^{5,7,9} No muscle paralyzing agent or other anesthetic agent was used throughout the operation and the patient spontaneously breathe oxygen via a oxygen mask. To provide a sedative effect and avoid apprehension of the patient, we used dexmedetomidine at a dose of 1 µg/kg/hour intravenously. Central venous catheter and arterial pressure measuring catheter were given using local anesthetic (2% lidocaine) before the surgical procedure.

Dr. Sanjoy Kumar Saha: What are the known complications that an anesthesiologist and surgeon should keep in mind during the procedure?

Dr. Sazzed-Al-Hossain: The major known complication of thoracic epidural anesthesia is the risk of epidural hematoma formation leading to quadriplegia. Anesthesiologist may also face difficulties in achieving the anesthetic level.

Dr. Ranjan: You have mentioned that surgeon must be careful during sternotomy and left internal mammary artery harvesting to avoid accidental opening of pleura. So, what will be happen if there

is so and how you will manage it to overcome it?

Dr. Sazzed-Al-Hossain: Accidental opening of pleura will cause development of pneumothorax that will impair spontaneous breathing of the patient. Ultimately the patient will have impaired respiratory function. In that case, we do tube thoracostomy to overcome the situation.

Dr. Asit Baran Adhikary: Is there any precaution to prevent epidural hematoma as it is a major risk?

Dr. Sazzed-Al-Hossain: The risk of epidural hematoma formation is estimated to be 1 in 150,000 cases. This complication can be avoided by strict adherence to a principle and that is a minimum time delay of 60 min between epidural puncture and heparinization and willingness to postpone the surgical intervention for at least 24 hours if a bloody tap occurs.⁸⁻¹⁰

Dr. Golam Mursalin: What are the challenges have you faced during the entire procedure?

Dr. Sazzed-Al-Hossain: Patient selection was of prime importance as well as pre-operative counseling. Whole the surgical team and anesthetic team were not well oriented about the procedure as it is relatively new technique.

Dr. Adhikary: Off pump coronary artery bypass grafting is a commonly performed cardiac surgical procedure for which general anesthesia with endotracheal intubation is most widely used anesthetic technique.^{5,8,10-12} But the adverse effect of general anesthesia increases the invasiveness of the procedure. To minimize the adverse effect of general anesthesia and to make the procedure less invasive, awake coronary artery bypass grafting using thoracic epidural anesthesia is a new horizon in the field of cardiac surgery.^{13,14} During our experience, the use of thoracic epidural anesthesia for awake coronary artery bypass graft was found feasible and the patient was comfortable, pain-free, and remained hemodynamically stable. However, further randomized multi-centered study is required to fully evaluate the extent and limitation of this procedure.

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