



ANAESTHETIC MANAGEMENT OF A GERIATRIC PATIENT WITH AORTIC VALVE REPLACEMENT UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY: A CASE REPORT

Anesthesiology

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ABSTRACT

Elderly patients undergoing Laparoscopic procedures are a challenge to the anaesthesiologist. This is because the pneumoperitoneum causes changes in physiology by virtue of its compressive effects and nature of gas used. Aortic valve replacement on the other hand adds complexity to the procedure due to the hemodynamic and cardiac challenges faced by the anaesthesiologist. In this case report, we present the case of an elderly patient with an aortic valve replacement who has come for laparoscopic cholecystectomy, the anaesthetic implications and how we successfully managed the case.

KEYWORDS

Laparoscopic Cholecystectomy, Aortic Valve Replacement, Elderly, Bio-prosthetic Heart Valve, Invasive Blood Pressure Monitoring

INTRODUCTION

Aortic stenosis is a progressive disease, in which the patient can remain asymptomatic for many years with an associated low mortality. As severity progresses, there is increased left ventricular outflow obstruction and reduced left ventricular compliance leading to a reduction in myocardial function and reduced cardiac output. Severe but asymptomatic Aortic stenosis is associated with a risk of sudden death. Eventually, symptoms of angina, exertional syncope, or heart failure occur and the prognosis becomes poor with average survival being 2 yr, a 50% incidence of sudden death and a monthly mortality of ~2%. There can be a significant increase in the HR after valve replacement due to an increased endogenous catecholamine productions. It is conceivable that such a reflex mechanism might operate after correction of aortic valve disease, with a resulting change in the myocardial pressure-volume relationship. A significant increase in the systemic arterial pressure following aortic valve replacement can be seen. Studies have shown that the central venous pressure was found to be elevated after aortic valve replacement. The increase in the CVP is probably attributable to high filling pressures deliberately maintained in an effort to achieve a maximal cardiac output. Systemic vascular resistance, which may be normal preoperatively, was found to have a significant increase after the valve replacement. reason for such an increase is unclear but could be due to increased adrenergic activity.

In laparoscopy, the main concerns include insufflations of carbon dioxide, patient positioning and increased intra-abdominal pressures. Pneumoperitoneum should be started with reduced gas flow and intra-abdominal pressures should be kept as low as possible to minimize hemodynamic changes. The pressure threshold during pneumoperitoneum, associated with minimal changes in the hemodynamics, is 12 mmHg. An increase in intra-abdominal pressure results in a fall in the preload, and an increase in the afterload, along with an increase in the systemic vascular resistance, and a consequent surge in blood pressure. The high blood pressure tends to affect the upper part of the body mainly. Creation of pneumoperitoneum causes an increase in total peripheral resistance along with a decrease in stroke volume, cardiac and ejection velocity indices.

Case Discussion

A 91-year-old Male, came with history of Aortic Valve Replacement (AVR), with a diagnosis of Cholecystitis, Cholelithiasis, Post MRCP with ERCP Stenting. Patient came for pre anaesthetic check-up with plan for Laparoscopic Cholecystectomy. He was a known case of: T2DM – For 20 years – on Insulin (Human Mixtard 10U BD) Systemic Hypertension – For 15 years – on T.Amlodipine 2.5mg (BD) Hypothyroid – For 15 years – on T.Tyroxine 25mcg (OD) CAD – For 14 years – on T.Carvedilol 3.125mg (BD) + T.Clopidogrel 75mg (BD) + T.Atorvastatin 10mg (OD)

He had hard of hearing and exertional dyspnoea (Grade 1 mMRC). He had undergone coronary artery bypass grafting (Saphenous Vein Graft – Left Anterior Descending Artery) along with aortic valve replacement (Trifecta 21mm), in 2014 under general anaesthesia. He had a post-operative ICU Stay for 3 days for Observation. He had also undergone total hip replacement in the year 2017 under spinal anaesthesia, magnetic resonance cholangiopancreatography and endoscopic

retrograde cholangiopancreatography in August 2020.

Physical examination: Afebrile, Regular pulse with good pulse volume and a pulse rate of 70/minute, BP was 120/70 mmHg. Systemic Examination did not reveal any pathology. Airway examination: MPC – III, completely edentulous, Breath holding time was about 13 seconds. ECG had features of Right Bundle Branch Block. Echocardiogram Left Ventricular Ejection Fraction of 63% + Hypokinesia of anterior wall anterior 1/3 of Interventricular Septum. Chest X-Ray: Sternotomy Sutures, no obvious lung parenchymal pathology.

Table 1 : Patient Investigations

Investigation	Report
Blood Group	'B' Positive
Haemoglobin	13.5 g/dl
Haematocrit	39.6
Platelets	2,30,000
Total Count	8880
Fasting / Post-Prandial Blood Glucose	145 / 203
HbA1C	6.8%
Urea	27
Creatinine	1.2
Uric Acid	3.9
Sodium	137.5
Potassium	4.20
Chloride	105.0
Bleeding / Clotting Time	2' 38" / 4' 18"
PT (Test / Control)	14.4 / 11.2
INR	1.30
Bilirubin (Total / Direct)	0.6 / 0.2
SGOT	24
SGPT	22
Alkaline Phosphatase	18
Negative	
Negative	
2.88 / 0.85	
TSH	4.59



Figure 1 : Patient Chest X - Ray



Figure 2 : Patient ECG

Cardiologist opinion was sought in view of current status of the prosthetic aortic valve and was given high risk, T.Clopidogrel 75mg was stopped for 7 days prior to surgery and was asked to restart 2 days after the surgery. Pulmonologist opinion was sought in view of age and was given moderate risk. Patient was thus planned to be taken up for surgery under ASA – III, Anaesthetic procedure explained.

Patient was on NPO from the night before, IVF were given adequately. Insulin was withheld on the day of surgery. Patient was given Antihypertensives and Thyroid medication on the morning of surgery with sips of water. Patient and consents were reviewed on the morning of surgery. Patient was shifted, monitors were connected. Patient in supine position, was adequately Pre-oxygenated and Pre-medicated - Inj. Ondansetron 4mg IV, Inj. Morphine 5mg Intra muscularly were given. Patient was Induced using Inj. Etomidate 20mg, and paralysed with Inj. Succinylcholine. Patient's vocal cords visualised using direct Laryngoscope, intubated using 8 size ETT, fixed at 21cm. Plane of anaesthesia was maintained with O₂ + N₂O + Isoflurane + vecuronium. Nasogastric Tube Secured. Under Aseptic Precautions, right Radial Arterial line was secured for IBP Monitoring. Surgical procedure was started. As soon as the intra-abdominal pressure was raised by CO₂ insufflation, Tidal volume was decreased & Respiratory Rate was increased. Intra-abdominal pressure was maintained within 12 – 13 mmHg. Procedure lasted for 2 hours, Patient was kept warm throughout the procedure. Total intraoperative blood loss - about 70ml. Intravenous fluids- 3 pints of warm Ringer lactate Crystalloid Solution. Due to intraoperative rise in blood pressure, patient was started on Nitroglycerine Infusion at 3ml/hour and titrated according to blood pressure. Anaesthesia was smooth and uneventful. Patient was Extubated on table, shifted to ICU for Observation and Monitoring. Patient was given adequate analgesics (Inj. Paracetamol 1g TDS).

DISCUSSION

Bio-prosthetic Valves do not carry a significant risk of Thromboembolism, does not need anticoagulant coverage lifelong.

Table 2 : Specific Considerations of Laparoscopic Surgeries

Specific Considerations	Laparoscopic Surgeries
Patient Specific Contraindications	- Severe IHD - Valvular Disease - Renal Dysfunction - ESRD
Surgical Risk	- Vascular Injury - Retroperitoneal Hematoma - Venous Gas Embolism
Positioning	↑ Risk of Cerebral Oedema - FRC, V/Q mismatch - worsened - ET Tube might migrate Endobronchially' - Well Leg Compartment Syndrome'

Laparoscopic Surgery: Shortened Recovery Time, Reduced manipulation of bowel and peritoneum, Small access points minimize pain, better wound healing, Reduced infections, No Post-operative deterioration in respiratory function (occurs in large incision).

Table 3 : Effects Of Geriatric And Laparoscopic Surgeries On Various Organ Systems

Effects on Organ Systems	Laparoscopic Surgery	Geriatric Surgery
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CVS	↑ SVR ↓ Preload, CO ↓ Arterial Pressure	↓ β receptor Stimulation response ↓ HR response to Catecholamine, Exercise ↓ Baroreceptor Reflex - Myocardial, Vessels Stiffening ↑ Sympathetic Activity ↓ Parasympathetic Activity - Conduction System Changes
RS	↑ Intra-Thoracic pressure ↑ PVR ↓ Pulmonary Compliance ↓ FRC	- Chest Wall Stiffening ↓ Parenchyma Elasticity ↑ Closing Capacity ↓ Alveolar Surface Area ↓ Response to Hypercapnia, Hypoxia - Upper Airway Obstruction ↑ Post-op Hypoxia, Pneumonia
CNS	↑ ICP - Cerebral Oedema	↓ Brain Mass - Atherosclerosis - Cognitive Impairment
Others	↓ Abdominal wall Compliance ↑ IAP - Blood Flow to kidney, liver - compromised ↓ Mesenteric, Gastrointestinal mucosal blood flow - AKI 25% ↓ GFR	- Hypothermia ↓ Vasoconstriction ↓ Metabolic Heat Production

Table 4 : Peri – Operative Management

	Laparoscopic Surgery	Geriatric Surgery
Peri-operative Management	- Airway: Cuffed ETT, positive pressure ventilation (prevent aspiration), ↓ Bag-mask ventilation time, Nasogastric Tube (deflate stomach) - Ventilation: PCV – higher instantaneous flow peaks, minimizing peak pressures, improved alveolar recruitment, oxygenation - Analgesia: Opioid analgesics, Subdural, epidural, TAP block, Local infiltration - Antiemetics: Multimodal regimes – ondansetron, cyclizine, dexamethasone, deflating stomach - Monitoring: Capnography, Pulse-oximetry, Peak, Plateau airway pressures, Delivered Tidal Volume, IBP - Postop: Shoulder tip pain, Maximum pain in first 2 hours postop, Supplemental Oxygen	- Pre-op: Drug Interactions, Dehydration, Malnutrition - Intra-op: Small Doses for Induction, ↓ BP - Post-op: Inadequate pain relief - Sleep Deprivation, RS impairment, Insulin Resistance, Tachycardia, Hypertension

As discussed in the above tables, there are various limitations in performing a laparoscopic surgery in elderly patients. But these have been overcome in the case discussed by, proper preoperative assessment, preparation of a plan of anaesthesia, execution of that plan as a team. The patient was adequately hydrated with intra venous fluids before the surgery. Cuffed endotracheal tube was used to prevent aspiration. To reduce time of bag and mask ventilation, Inj. Succinylcholine can be used for intubation. To deflate stomach, ryles tube was secured. Opioid analgesics can be used for pain relief. Pressure controlled ventilation is ideal but Volume controlled ventilation can also be used by decreasing the tidal volume and increasing the respiratory rate. Invasive blood pressure monitoring is a must, in cases of known cardiac conditions. Raised intra abdominal

pressure causes increase in blood pressure which can be maintained by appropriate antihypertensives. To prevent Hypothermia, Warm IVF and Warmer can be used. Postoperative Extensive Monitoring for prevention of hypothermia, adequate pain relief, supplemental oxygen is required in all cases of elderly undergoing laparoscopy. Repeat Hb must be done so as to transfuse the patient if necessary. Postop Delirium and Cognitive Dysfunction is common in elderly, to prevent it proper pain relief is needed (postoperative Acetamenophen).

CONCLUSION

The major purpose of presenting this case is to emphasise the need for extensive monitoring and special care and preparedness to maintain a stable cardiac and respiratory function. These include, a thorough preoperative assessment, optimizing the cardiac status, proper anaesthetic plan, intraoperative and postoperative monitoring, prompt recognition and management of complications.

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