



Contents lists available at BioMedSciDirect Publications

International Journal of Biological & Medical Research

Journal homepage: www.biomedscidirect.com

Case report

Anaesthetic management of Laparoscopic cholecystectomy in a patient with mitral stenosis with pulmonary hypertension

Sandhya Gujar

ARTICLE INFO

Keywords:

ABSTRACT

Pneumoperitoneum caused by CO₂ for laparoscopic surgery results into cardiovascular and respiratory changes. In compromised patient with cardiac diseases this cardio respiratory changes aggravate increases in PaCO₂ and enlarge gradient between PACO₂ and PETCO₂.^(1,2) Further increases in abdominal pressure caused insufflation for clear vision will decrease lung capacity by pushing diaphragm upwards and is usually associated with severe hypertension and tachycardia. In a patient mitral stenosis, these changes associated with Laparoscopic surgery may be detrimental resulting into pulmonary edema, cardiac failure, and atrial fibrillation. We describe a case of mitral stenosis patient with pulmonary hypertension posted for laparoscopic cholecystectomy thinking post-operative benefits of laparoscopy. Patient was taken up for surgery under general with epidural anaesthesia for decreasing intraoperative analgesia requirement and post operative pain relief Patient had grade three dyspnoea with associated pulmonary hypertension which had increased risk for anaesthesia Patient was taken up with ASA grade 4 risk and postoperative ventilator was kept ready. Electrolytes and PT, INR levels after stopping antiplatelet agents were normal. after antibiotic prophylaxis for myocardial endocarditis patient was sedated with buprenorphine and midazolam to decrease stress response .Propofol and Sevoflurane was used with MAC levels maintained at 1.2 to 1.5 at end tidal conc. BIS monitor applied to maintain depth of anaesthesia. CVP catheterization was done to prevent excessive increase in venous pressure and concomitant changes of pulmonary edema as Patient already had pulmonary hypertension. Controlled ventilation carried out to maintain ETCO₂ at normal range. Intraoperative intraabdominal pressure maintained at 10-12 mm of Hg . Postoperative patient was monitored for pain hypertension and, tachycardia (inj. morphine 90 µg diluted to 10 ml of normal saline epidural was to control pain and its complication. Changes which are commonly associated with mitral stenosis may be severely accentuated with laparoscopic surgery with Increased ETCO₂ and high intraabdominal pressure with decrease in lung capacity and severe changes in airway resistance Such patient with moderate mitral stenosis with pulmonary hypertension becomes predictors of cardiac morbidity When considering cardiac patient for surgery post operative benefits of laparoscopic surgery must be balanced with intraoperative risk involved

© Copyright 2010 BioMedSciDirect Publications IJBMR - ISSN: 0976:6685. All rights reserved.

Introduction

Pneumoperitoneum by CO₂ for laparoscopic surgery results into ventilatory and respiratory changes. In compromised patient with cardiac disease mainly mitral stenosis with fixed output states and pulmonary hypertension aggravate changes in PACO₂ and enlarge gradient between PACO₂ and PETCO₂.^{1,2} Patient with mitral stenosis of [moderate grade] left atrial dilatation, pulmonary venous as well as arterial hypertension, pulmonary oedema, stasis of blood in left atrium may result into systemic embolization and venous thrombosis can occur because of slow circulation. These patients do not tolerate increases in BP and heart rate with decreases in diastolic filling of left heart and

subsequent severe hypotension and cardiac failure^{3,4} Pulmonary edema is very common occurrence because of chronic pulmonary hypertension even with normal fluid management. These changes which are commonly associated with mitral stenosis may be severely accentuated with laparoscopic surgery with increased ETCO₂ and high intraabdominal pressure with decrease in lung capacity and severe changes in airway resistance ^{5,6}. Such patient with moderate mitral stenosis with pulmonary hypertension becomes predictors of cardiac morbidity. When considering cardiac patient for surgery post operative benefits of laparoscopic surgery must be balanced with intraoperative risk involved.

* Corresponding Author : **Dr.Sandhya Gujar**
 drsandhyagujar@gmail.com

Case report

41 years old female patient came with gall stones and pain in abdomen and was posted for laparoscopic cholecystectomy. Patient had h/o mitral stenosis with rheumatic heart disease in childhood. Patient had h/o balloon mitral valvotomy done in 1987 after that over a period she again developed stenosis of valve with compensatory mitral regurgitation. No h/o cough with expectoration was present. Recent cardiologist opinion and 2-D echo had done for functional status of RA and RV, size of mitral area which was 1.2 cm².

Patient was taking low dose heparin and inj. prednisolone with antibiotic prophylaxis. X ray chest showed signs of pulmonary hypertension such as increased pulmonary vascular congestion with dilatation of right atrium. Preoperatively patient was advised nebulization, oxygen, bronchodilators, antibiotics and steroids in order to decrease of effects of pulmonary hypertension.

After assessment of perioperative risk involved patient was given fitness for surgery with ASA grade IV risk and required informed high risk consent taken for the same. 2-D echo report showed biventricular functions was normal, mitral orifice was 1.2 cm² and there was no vegetation or thrombi in left atrium. Patient had pulmonary hypertension of moderate degree. Differentiation between whether it is pulmonary venous pressure or pulmonary arterial pressure was important for management and risk calculation for the patient 7,8,9. With informed high risk consent and after explanation of risk involved with laparoscopic surgery to both patient as well as surgeon, patient was posted for surgery. Medication was atenolol and lasilactone. Preoperative S. electrolytes, PTINR were normal. Patient was given nebulisation, chest physiotherapy to keep lungs clear of secretions. (10,11,12,) Premedication included ondansetron, with avoidance of glycopyrrolate, inj. Nephine [Buprenorphine 90 µg iv] with 1 mg of midazolam. Central venous catheterization was done to monitor CVP. Epidural catheter (16 gauge needle) passed at level T10-12 with all aseptic precautions in order to decrease anaesthetic requirement intraoperatively and better management of pain in post operative period to avoid complications associated with tachycardia and hypertension. Patient was induced with titrated doses of inj. Propofol and intubated after 10 % Lignocaine spray to prevent sympathetic response associated with intubation after giving scoline. Patient was maintained on Sevoflurane and oxygen. N₂O was avoided as patient had pulmonary hypertension. Vital parameters were monitored rigorously. Intraoperative Surgeons were asked to insufflate CO₂ very slowly to attenuate abdominal stretch response with resultant rise in BP and pulse rate and throughout surgery intraabdominal pressure was maintained below 10 mm of Hg. Intraoperative increase in BP and pulse rate managed by small doses of β blocker Esmolol. Patient was given inj. Bupivacaine 0.125% for intraoperative analgesia through epidural catheter. Vecuronium was used as muscle relaxant as it causes bradycardia. ETCO₂ was controlled with IPPV up to 30 to 35 mm of Hg. BIS monitor was attached (bi spectral index monitor) and depth of anaesthesia was maintained at BIS score of 50-60. At time of reversal inj. glycopyrrolate was avoided and inj. neostigmine was given very slowly in titrated doses. Patient was extubated after adequate power returned. Throughout perioperative period fluid infusion was strictly monitored according to CVP measurement. Patient Controlled Analgesia was given through epidural catheter. Patient was observed in SICU for 24 hours as complications are most common in period. Patient was discharged from SICU after fulfilling discharge criteria.

Discussion

Successful perioperative evaluation and treatment of cardiac patient undergoing noncardiac surgery requires team work and communication between patient, surgeon, Cardiologist and anaesthesiologist. The main concern in management of patient with mitral stenosis with pulmonary hypertension are

Preload: strict I/O chart and judicious use of i.v. fluids to maintain cardiac output.

SVR: increases in SVR can be detrimental in patient with fixed cardiac output status, avoided by lumbar epidural analgesia by local anaesthetic agent with systemic vascular dilatation.

Heart rate and rhythm: Tachycardia and atrial fibrillation which is very common in this patient should be totally avoided by use of β blockers and avoidance of pain in perioperative period by liberal use of opioid analgesics.

PVR (Pulmonary Vascular Resistance): Acute increase in PVR can result from hypoxia, hypercarbia, acidosis, increased sympathetic tone and pulmonary vasoconstriction. This is avoided by limiting rises in ETCO₂.

Maintenance of airway and O₂ saturation with IPPV is important as high O₂ conc. is pulmonary vasodilator and low O₂ conc. and high CO₂ conc. is vascular constrictor which should be avoided. Avoid introduction of air into venous system.

In patient with mitral stenosis most important factors are area of mitral valve, degree of pulmonary hypertension which can be due to increased in left atrial pressure with increased PAP or because of increased PVR. Patient with increased PVR have severe RV failure and can develop pulmonary edema and cardiovascular collapse with further increase in PVR associated with laparoscopic surgery. Choice of anaesthesia and surgery is important for risk and benefit ratio associated with laparoscopic procedure.

Important step in management of patient are:

[1] Preoperative evaluation and risk assessment by ECG, X ray, arterial blood gases, 2-D echo, coagulation profile.

[2] Attempts to decrease pulmonary hypertension by oxygen, bronchodilators, antibiotics, steroids, and vasodilators.

[3] Perioperative monitoring of [a] CVP: to maintain preload, [b] arterial cannulation: beat to beat variability in BP, ABG measurement and [c] PCWP by pulmonary artery catheterization to measure CVP, PAOP, PAP, CO, PVR and SVR. Pulmonary arterial catheterization can cause arrhythmia so can be avoided.

CHOICE OF ANAESTHETIC TECHNIQUE

In a patient for laparoscopic surgery general anaesthesia is first choice with endotracheal intubation and controlled ventilation to maintain PETCO₂ between 30 -35 mm of Hg.

Along with general anaesthesia patient is given lumbar epidural analgesia to decrease intraoperative requirement of general anaesthesia drugs and decreasing SVR by vasodilatation and in post operative period, Opioid analgesic can be given- for excellent for pain relief and avoid its complication

Ventilator management should use high conc. of O₂, moderate tidal volume, rate sufficient to achieve hypocarbia and low level of PEEP.

Management of emergence from anaesthesia requires haemodynamic stability and proper alveolar ventilation. Narcotic or opioid analgesic given through epidural catheter can allow extubation in lighter planes of anaesthesia without increasing sympathetic tone.

All these factors discussed above has further significance with laparoscopic technique which itself is associated with increase ET/CO₂, PVR, increased intraabdominal pressure with decrease in CO so in this patient post operative benefits of laparoscopic surgery must be balanced with intraoperative risk involved. Precaution taken during laparoscopic technique are [1]slow insufflation of CO₂ [2]low intraabdominal pressure.

Post operative management: first 24 hours after surgery patient with mitral stenosis are at risk of pain, hypertension, tachycardia, myocardial ischaemia, cardiac failure and pulmonary edema and sudden death

Monitoring should be continued in post operative period with same vigilance and opioid analgesic should avoid other complications.

Conclusion: Safe management of patient with CVS disease for laparoscopic surgery is based on physiological principles and may subsequently benefit from multiple post operative advantages offered by this technique

References

1. Struthers AD, Cushier A; Cardiovascular consequences of laparoscopic surgery. *Lancet*, 1998;352(9127):568-570.
2. Iwase K, Takenaka H, Yagura A, Ishizaka T, Ohata T, Takagaki M et al.; Haemodynamic changes during laparoscopic cholecystectomy in a patient with heart disease. *Endoscopy*, 1992; 24(9):771-3.
3. Yao FSF, Malhotra V, Fontes ML; Yao and Artusio's Anesthesiology, 7th edition, Wolters Kluwer, 2011
- 4) John M Jackson and Stephen J Thomas. Valvular Heart Disease. In: Joel A Kaplan. Cardiac Anaesthesia, third edition, 1993, chapter 20, 629-680.
- 5) Gebhardt H, Bautz A, Ross M, Loose D, Wulf H, Schaube H. Pathophysiological and clinical aspects of CO₂ Pneumoperitoneum (CO₂-PP) *Surg Endosc*. 1997; 11: 864-867. doi: 10.1007/s004649900473.[PubMed] [Cross Ref]
- 6) Westerband A, Water JM, Amzallag M, et al. Cardiovascular changes during laparoscopic cholecystectomy. *Surg Gynecol Obstet*. 1992;175(6):535-538.[PubMed]
- 7) Carmosino MJ, Friesen RH, Doran A, et al. Perioperative complications in children with pulmonary hypertension undergoing noncardiac surgery or cardiac catheterization. *Anesth Analg*. 2007;104:521-7.
- 8) Blaise G, Langleben D, Hubert B. Pulmonary arterial hypertension: pathophysiology and anesthetic approach. *Anesthesiology* 2003;99:1415-32.
- 9) Chan SY, Loscalzo J: Pathogenic mechanisms of pulmonary arterial hypertension. *J Mol Cell Cardiol*. 2008;44:14-30.
- 10) Benza RL, Park MH, Keogh A, Girgis RE. Management of pulmonary arterial hypertension with a focus on combination therapies. *J Heart Lung Transplant* 2007;26:437-46.
- 11) Friesen RH, Williams GD. Anesthetic management of children with pulmonary arterial hypertension. *Paediatr Anaesth* 2008;18:208-16
- 12) Fox C, Kalarickal PL, Yarborough MJ, et al. Perioperative management including new pharmacological vistas for patients with pulmonary hypertension for noncardiac surgery. *Curr Opin Anaesthesiol* 2008;21:467-72.