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Cardiac Arrest During Laparoscopic Cholecystectomy: A Case Report

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Abstract

Laparoscopy is becoming increasingly popular in gynecological and general surgical operations. There are complications that are inherent to the laparoscopy techniques; amongst them is bradycardia after gas insufflations that result from peritoneal stretching and should be taken seriously as it may develop a cardiac arrest. This can occur due to high flow rate of gas during peritoneal insufflation, a practice still happening nowadays. It is also important for the anesthetist to be vigilant and ready to manage such complications. We report a case of 42 year old female with hypertension posted for elective laparoscopic cholecystectomy. The patient underwent general anesthesia and developed severe bradycardia immediately after peritoneal insufflation. The management started immediately by stopping the insufflation and deflating the abdomen followed by administrating atropine intravenously. Despite this, patient progress to cardiac arrest and CPR was started according to the ACLS protocol. After 20 minutes, patient revived and vitals were stabilized; shifted to Intensive care unit for post cardiac arrest care.

Keywords: Laparoscopic, peritoneal insufflations, bradycardia, cardiac arrest

Introduction

Laparoscopic surgery is extremely popular nowadays for emergency and elective procedures in general surgery and gynecology fields[1]. Artificial pneumoperitoneum using carbon dioxide insufflations at a rate of 4-6 liter/min to a pressure of 10 to 15mm Hg is essential to separate the abdominal wall around the viscera for visualization[2]. the capnoperitoneum is maintained by constant gas flow of 200-400ml/min. Advantages of laparoscopic surgery include decreased postoperative pain, better cosmetic outcome, improved pulmonary function, shorter hospital stay, and reduced overall cost of health services. However, there are specific complications inherent to laparoscopy, including major vascular injury, gas embolism[3], and hemodynamic instability[4]. Among the major complications of laparoscopy is vagal-mediated bradycardia, although this complication is rare. Several case series report that the incidence of bradyarrhythmia during laparoscopy in healthy individuals ranges from 14% to 30%[5-7]. The management of bradycardia should be effective and definitive as it may be a warning for cardiac arrest. This management includes intravenous atropine administration and deflation of pneumoperitoneum. If bradycardia developed to cardiac arrest the management includes intravenous epinephrine and CPR according to the ACLS protocol.

Case Report: A 42-year-old female patient, known to be hypertensive on medical treatment, was planned for elective laparoscopic cholecystectomy for cholelithiasis. The patient was seen in the anesthesia clinic preoperatively, where her medical history was taken, and physical examination was performed. The patient had a past medical history of hypertension on medication tablet amlodipine 5mg and telmisartan 40mg daily. Physical examination shows blood pressure of 144/86 mmHg and abdominal ultrasound was only significant for cholelithiasis..

Electrocardiogram (ECG) was performed before the anesthesia clinic visit and was normal (Figure 1). The patient was scheduled for surgery and admitted for the operation on the following day.

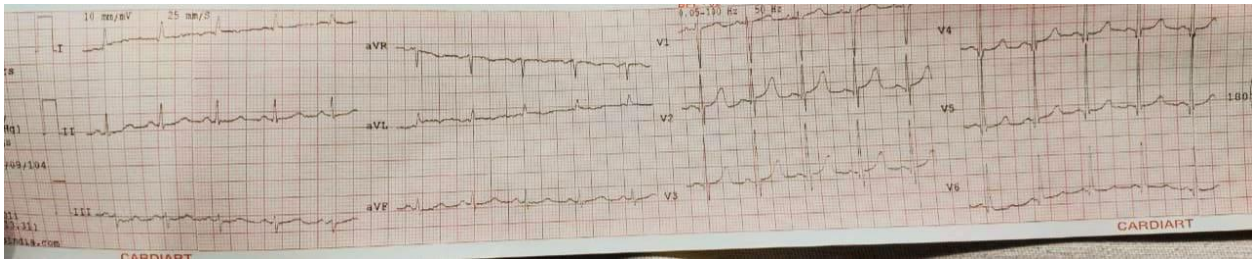

Figure 1: Preoperative ECG of the patient.

After admission, the patient's blood pressure was continuously monitored. Her routine investigation, including blood electrolyte, were within normal limits. On the day of surgery Tab telmisartan 40mg was omitted and anti aspiration prophylaxis was given in the form of Inj Rantidine 50mg and inj metaclopromide 10 mg intravenously 30 mins prior to surgery. On arrival to the theatre, her blood pressure (BP) and heart rate (HR) were 130/80 mmHg and 82 beats per minute (bpm), respectively, and oxygen saturation (SpO_2) was 100%. Induction of general anesthesia was achieved using an intravenous injection of 120 milligrams of propofol and 100 micrograms of fentanyl. Muscle relaxation was achieved using 30 milligrams of intravenous atracurium. The patient was intubated using an endotracheal tube of size 7.5mm ID fixed at 20cm; she was then connected to mechanical ventilation using volume control mode with a tidal volume of 380 ml, respiratory rate of 12 per minute. End-tidal carbon dioxide ($ETCO_2$) was maintained at about 32 mmHg and peak inspiratory pressure (PIP) was maintained at 15 centimeters of water (cmH_2O). Anesthesia was maintained with 40% oxygen mixture with nitrous oxide and inhalation of 0.2-1% isoflurane.

Almost ten to fifteen minutes, the surgical team proceeded with Veress needle insertion and peritoneal insufflation was started at a flow rate of 4 liters per minute to achieve an intraperitoneal pressure of 15 mmHg. Immediately after starting peritoneal insufflation, the patient developed sinus bradycardia and her heart rate started to drop reaching 40 to 45 bpm within a few seconds. The anesthetist immediately instructed the surgeon to stop the insufflation and deflate the abdomen. Intravenous injection of atropine (0.6 mg) was given immediately and flushed with intravenous saline. But it rapidly progress to severe bradycardia (HR-25bpm), inj. Atropine 0.6 mg given again; inhalation agents stopped and 100% oxygen given. Suddenly monitors showed flat line in ECG, the anesthetist started chest compressions and an injection of adrenaline (1 mg) was given intravenously. CPR continued for 20 minutes according to ACLS protocol. After 20 minutes, heart beat started to appear on monitor, carotid pulsation felt and heart rate became 70-80 beats per minute; Infusion of nor-epinephrine at the rate of 0.05-0.15 mcg/kg/min started to maintain the mean arterial pressure of > 65 mm Hg. After stabilizing the vitals of patients, surgery was deferred and patient shifted to intensive care unit for post cardiac arrest care with vitals [heart rate of 84 bpm, blood pressure was 110/70 mmHg on nor-epinephrine infusion at 0.1 mcg/kg/min, SpO_2 was 97%, and $ETCO_2$ was 38 mmHg]; blood samples were taken to check for blood electrolytes, gases levels, and cardiac markers, including troponin and creatine kinase-MB (CK-MB).

In ICU, the results of the blood gases and electrolytes came back and were normal; in addition, there were no changes in the patient's ECG and cardiac markers were mildly elevated (Figure 2). The patient was assessed by a cardiologist before discharge and was deemed free from cardiovascular problems. The patient was discharged from the ICU to the surgical ward after 1 day following extubation with stable vitals and fully conscious, with no complains. The patient was counseled about the intraoperative events by the surgical and anesthesia teams and was discharged on 5th day. She was scheduled for a routine follow-up visit to the surgical outpatient clinic following discharge for open cholecystectomy.

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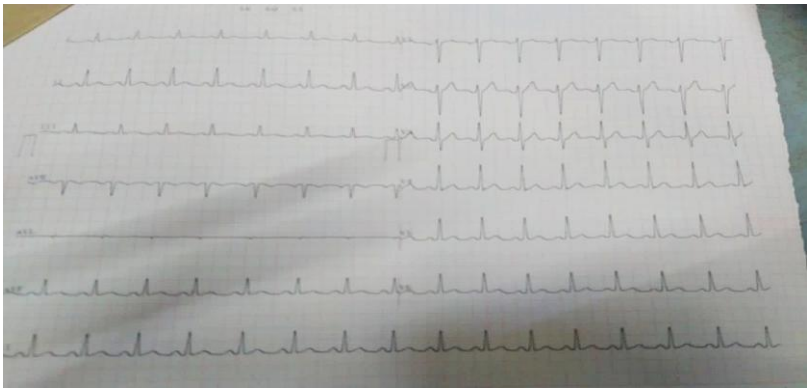

Figure 2: ECG of the patient performed in ICU.

Discussion

Bradycardia progressing into cardiac arrest has been recognized as a complication of laparoscopy since its development. Many factors related to peritoneal insufflation have direct effects on the cardiovascular system. Peritoneal stretch due to insufflation leads to strong and fast vagal response[3]. Several precautions have been implemented to prevent this from happening, including limiting the filling pressure of the peritoneum to 15 mmHg[2]. The risk of developing bradycardia or cardiac arrest intraoperatively increases with coexisting comorbidities. Cardiovascular disease and the use of antihypertensive medications could exacerbate the effect of vagal bradycardia. Medications that lower the heart rate, such as beta blockers, might also increase the risk of developing intraoperative bradyarrhythmia progressing into cardiac arrest. It is important to consider the effect of anesthetic agents on the patient's cardiac status. In our patient, the heart rate did not go below 60 bpm after induction. Additionally, almost ten to fifteen minutes have elapsed after induction when the patient started to deteriorate. We believed that it would be in the best interest of the patient to abort and reschedule, as subjecting the patient to anesthesia and laparoscopy a second time could have increased the risk of morbidity and mortality. Our patient was discharged after all involved teams, including surgeons, anesthetists, and physicians, reassured that she was stable and fit for home follow-up, as should always be the case in such patients.

Conclusion

Although, bradycardia is common during laparoscopy surgeries. It should be considered a critical clinical mark for cardiac arrest. Vagal response to rapid peritoneal stretch is usually the main cause, and it can happen due to high flow rate of gas insufflation. The management consists of cessation of gas insufflation, deflating the abdomen, and administering atropine. Supportive management should be performed accordingly, and the patient should be followed closely afterwards, although most patients recover without significant harm.

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