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CASE STUDY

ELECTROCARDIOGRAPHIC ABNORMALITIES AFTER PNEUMOPERITONEUM DURING LAPROSCOPIC CHOLECYCTECTOMY

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ABSTRACT

Laparoscopic cholecystectomy has proven to be a major advance in the treatment of patients with symptomatic gallbladder disease. In general, laparoscopic procedures have a lower risk of morbidity and mortality compared to conventional technique but various ventilatory and hemodynamic complications are associated with it which can result in fatal consequences intraoperatively and become very distressing for the anesthesiologist. We are reporting a case of bradycardia, asystole and interfasicular ventricular tachycardia occurring intaoperatively during laproscopic cholecystectomy after creation of pneumoperitoneum in an otherwise healthy patient having no comorbidity. *Increased awareness, knowledge and experience of the anesthesiologist is required for the diagnosis and management of various ECG abnormality occurring during laparoscopic cholecystectomy, which is the most frequent laparoscopic surgical procedure.*

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INTRODUCTION

The laparoscopic cholecystectomy was introduced by Philip Mouret in 1987. Since its introduction, this technique became extremely popular due to advantages such as shorter hospital stay, better cosmetic value, faster recovery, early return to normal activity and decreased pain. Morbid obesity, compromised cardiopulmonary status and pregnancy were the few traditional contraindications for laparoscopic cholecystectomy. However, in the recent years, development of better surgical skills and enhanced understanding of the pathophysiology of pneumoperitoneum have made it possible to offer laparoscopic cholecystectomy to patients suffering from variety of medical illness. Laproscopic Cholecystectomy is associated with serious, potentially fatal intra-operative complications such as vascular injury, gas embolism, arrhythmias and cardiac arrest. Although rare, such complications can be fatal and challenging for the anesthesiologist. Pneumoperitoneum, using carbon dioxide (CO2), is used to assist laparoscopic surgery by making distension of abdominal cavity and splitting up its content, which improves visualization of various organs but artificial pneumoperitoneum may cause various complications due to increased intraabdominal pressure and hypercarbia. The relationship between ECG changes and acute cholecystitis was described for the first time as "Cope's sign" or cardiobiliary reflex in 1971 (O'Reilly and Krauthammer, 1971).

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Case report

A 47 years old female patient belonging to ASA grade 1 was posted for laparoscopic cholecystectomy. The patient was kept fasting for 6 hours prior to surgery. Pre-medication was given in form of tablet alprazolam (0.25 mg) and tablet ranitidine (150 mg) a night before and two hours prior to surgery with sips of water. On arrival in the operating room, intravenous line was secured with 18 gauge intracath and ringer lactate infusion was started according to the fasting status. Monitoring of non-invasive blood pressure (NIBP), mean arterial pressure (MAP), heart rate (HR),electrocardiogram (ECG) and oxygen saturation (SpO_2) was done on Blease Sirius Anesthesia machine, Spacelab monitor UltraviewSL. Pre-induction of anesthesia baseline variables showed the blood pressure was 138/75 mmHg, pulse-82/min, and SPO2 was 98–99% on room air. Induction of anesthesia was achieved using a standard technique comprising of injection fentanyl 100 mcg , injection propofol 120 mg and injection vecuronium bromide 5 mg was administered to facilitate endotracheal intubation.Following manual ventilation for 180 seconds with 3% sevoflurane and 50% mixture of nitrous oxide and oxygen via face mask at the fresh gas flow of 4litres minite, patient was intubated with endotracheal tube size 7.5mm successfully in a single attempt, confirmed by square wave capnograph curve. The surgical procedure began through three laparoscopic ports, pneumoperitoneum was created keeping the maximum pressure to 15mmHg. Sudden Bradycardia was noticed soon after the insertion of primary trochar, Atropine 0.5mg given

intravenously (IV) but there was no response and instantly it progressed to asystole. Immediately inhalational agent was ceased, and oxygen was given by endotracheal tube at a rate of 6-8 liters/min. The surgeon was asked to desufflate the abdomen at once and chest compression started, a second Atropine 0,5mg (IV) given, but then patient had episodes of wide complex tachycardia with severe hypotension which required synchronised DC cardioversion with 100-150 joules biphasic energy. An infusion of dopamine was also started at the rate of 10 mcg/kg/min. Cardiologist was urgently summoned in the operation the ater who diagnosed it as interfascicular ventricular tachycardia on 12 lead ECG and advised amidarone infusion. A loading dose of 150 mg of amiodarone was administered over 10 min intravenously, the rhythm was reverted to sinus and the heart rate was 100-110 bpm. The surgery was abandoned and the patient immediately shifted to ICU without reversal of anesthesia. CVP monitoring and invasive BP monitoring was instituted in ICU. The patient's hemodynamic status in ICU was stable. Amiadarone infusion was continued at 1 $mgmin^{-1}$ for 6 hours and 0.5 $mgmin^{-2}$ for subsequent 18 hours. All her biochemical parameters were normal. The patient was weaned off inotropes over a period of 6 hours, the tracheal tube was subsequently removed.The patient was conscious, well oriented and shifted to ward the next day.

DISCUSSION

Laproscopic Cholecystectomy has overtaken open abdomen surgery as the preferred approach to cholecystectomy. Although it was initially used mostly in healthy and young patients but now with improving surgical expertise, more extensive and prolonged laparoscopic procedures are proving to be successful and safe in a wide range of patients. Despite several advantages like less pain, faster recovery and possibly less morbidity and mortality, laparoscopic surgeries are not risk free, hence the anesthesiologist should be very vigilant and have prudent response for any crisis. Laparoscopic cholecystectomy related cardiovascular changes are determined by the interaction of various factors: the establishment of the pneumoperitoneum, increased intra-abdominal pressure and systemic absorption of carbon dioxide (CO_2). These result in drop in heart rate with an increase in the mean arterial pressure and the systemic vascular resistance. In addition to this, elevated intra-abdominal pressure and reverse trendelenburg position reduces the venous return and preload leading to decrease in cardiac output. This combination of decreased preload and increased afterload increase cardiac work load and could precipitate cardiac ischemia or infarction. In our case the cause of sudden severe bradycardia in an otherwise healthy patient could have been rapid peritoneal stretching and increased intraabdominal pressure due to pneumoperitoneum and trochar insertion leading to significant vagal stimulation and asystole. Similar incidence was noted by Yong et al and Makkieh emphasizing that bradycardia is a common occurrence during laparoscopy, it should be considered a critical clinical mark for cardiac arrest (Jonathan Yong *et al*., 2015; Makkieh, 2017). Gautam *et al* also reported cardiac arrest during laproscopic cholecystectomy (Gautam and Shrestha, 2009). Sympathetic stimulation due to hypercarbia could have been the causative factor for interfasicular ventricular tachycardia in our case. Similarly Rewari *et al* also reported introperative occurrence of wide complex tachycardia during laproscopic cholecystectomy in a patient with known cardiac illness but in our case the patient had no history of any cardiac disease (Vimi Rewari *et al*., 2014). *Hence occurrence of bradycardia in settings of pneumoperitoneum should be responded very promptly as it could be precursor of much larger event such as asystole in an otherwise normal patient with no associated comorbidity*. Reed DN Jr *et al* also reported four cases of bradycardia during CO_2 insufflation in patients that were considered to be low risk (Reed and Nourse, 1998; Reed and Duff, 2000). Jung *et al* reported that insufflation with high flow rate when establishing artificial pneumoperitoneum may increase intraabdominal pressure instantaneously and unexpected cardiovascular changes, such as hypotension, bradyarrhythmia or cardiac arrest, may occur. In our case we strictly adhered to the protocol of slow flow rate (Jung and Kim, 2013). The treatment of bradycardia in such case scenarios is to suppress the vagal stimulus by quick desufflation of the abdomen and pharmacological treatment with atropine at a dose of 0.5 mg that may be repeated up to a maximum 3 mg dose (0.04 mg/kg), and a dopamine infusion at a 5–20 mcg kg min dose.

Furthermore, an arrhythmogenic etiology different from ischemia should be kept in mind, in addition to consideration of vagal stimuli and the anesthesiologist should be adequately prepared to diagnose and treat any such irregular rhythm occurring intraoperatively. All the cases mentioned in other articles with Bradycardia progressed to cardiac arrest in young healthy patient, were associated with effective reversal of cardiac arrest with no reported mortality.

Conclusion

The appearance of any kind of sustained arrhythmia under anesthesia requires early diagnosis and accurate management of the arrhythmia, haemodynamic maintenance, and exclusion of ongoing myocardial ischemia simultaneously. Bradycardia during creation of pneumoperitoneum is not always an isolated event it may be an initial alarming signal for impending and unexpected cardiac arrest so it should always be addressed with great vigilance.

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