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## **A rare case of asystole during a laparoscopic appendectomy in a young patient**

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## Abstract

Laparoscopic surgery has become the mainstay of treatment for uncomplicated appendicitis cases. We describe a case of a 29 year old male with a pertinent past medical history of poorly controlled hypertension who was undergoing a routine laparoscopic appendectomy for confirmed appendicitis and developed bradycardia and subsequent asystolic cardiac arrest approximately one hour into the operation. Urgent cardiopulmonary resuscitation and intravenous (IV) atropine were required to reinitiate cardiac rhythm. Following his operation, the patient was admitted to the intensive care unit for close monitoring, where he had an uncomplicated postoperative period and an unremarkable cardiac work up. He was discharged the day after his procedure. Numerous causes of cardiovascular collapse during laparoscopic procedures have been discussed in the literature including mechanical obstruction of the vagal nerve, high intraabdominal pressures and gas embolism.

## Keywords

asystole, laparoscopy, appendectomy, arrhythmia, cardiac arrest

## Introduction

Laparoscopic operations are extremely common procedures that have become the standard of care for many conditions including uncomplicated appendicitis.<sup>1,2</sup> Although most laparoscopic appendectomies proceed without complications, the procedure is not without its intraoperative problems. Intraoperative complications that result in cardiovascular problems in particular have a plethora of etiologies in the literature.<sup>1</sup> A rare but serious cardiovascular complication is asystole which our patient encountered and is the main focus of this paper.

## Case Presentation

A 29 year old male patient with a pertinent past medical history of poorly controlled hypertension and a three pack year smoking history presented with symptoms consistent with appendicitis. The patient stated that he was non-compliant with his antihypertensive medications due to lack of insurance. He was not taking any other medications. The patient reported a three day history of gradual onset of right sided abdominal pain which was non responsive to over the counter pain medications. Additionally, he reported subjective fevers and headaches with intermittent nausea. He denied any vomiting or diarrhea. The pain increased in severity which brought him to the emergency department.

Physical examination revealed an afebrile patient with a heart rate of 80 beats per minute and a blood pressure of 162/99. All other vital signs were normal. Palpation of his abdomen demonstrated right lower quadrant tenderness. Rovsing's sign was negative. There were no additional findings on physical examination such as organomegaly, dullness to percussion or peritoneal signs. Additionally, the patient's lung examination was normal on auscultation.

The patient weighed 140 kilograms and had a height of 193 centimeters (body mass index (BMI) = 37.6). Preoperative electrocardiogram (EKG) demonstrated a sinus rhythm with no evidence

of arrhythmias or other cardiac problems. A complete blood count showed mildly elevated white cell count of 12,000 with a normal differential. Lipase and amylase levels were normal. Abdominal and pelvic computerized tomography (CT) scan with contrast was performed, which confirmed acute uncomplicated appendicitis.

As a result of these findings, the patient was prepared for a laparoscopic appendectomy and IV ampicillin and sulbactam were started. The anesthesia team also completed a preoperative assessment on the patient to assess his risk for being placed under general anesthesia. Their assessment was unremarkable and they did not recommend any special measures to be taken. In preparation for the operation, anesthesia was induced with IV propofol and maintained with IV desflurane. Muscle relaxation was induced with IV rocuronium and IV fentanyl was used for analgesia. The majority of the operation progressed without concerns, with the abdomen insufflated to 15 mmHg and the appendix appropriately visualized and removed. However, during closure of the final fascial stitches, the procedure was complicated by profound bradycardia that led to asystole. Immediate cardiopulmonary resuscitation (CPR) and 1 mg of IV atropine were administered in order to achieve return of spontaneous circulation. A total of 15 seconds of compressions were needed in order to reinitiate sinus cardiac rhythm. The patient's oxygen saturations remained normal. Unfortunately, there was no EKG record on file to demonstrate this episode of asystole.

Postoperatively, the patient was transferred to the intensive care unit for close monitoring. The cardiology team was consulted to investigate the underlying cause of the asystole. Cardiac work up included a transthoracic echocardiogram and EKG. The echocardiogram demonstrated a normal ejection fraction of 55% - 60% and normal pressures in all chambers of the heart without any valvular defects. The EKG was also found to be normal. The patient ultimately had an uneventful post-operative period and was discharged with anti-hypertensive medications on the day after his laparoscopic appendectomy.

## Discussion

Hemodynamic cardiovascular complications during laparoscopic procedures have been reported in the past. Bradycardia in particular during a laparoscopic procedure is a common finding. However, progression to asystole is a rare complication with an estimated incidence being reported at anywhere between 2-40/100,000 laparoscopic cases.<sup>3,4</sup> Bradycardia often precedes asystole in the majority of these cases.<sup>4</sup>

Proposed mechanisms discussed in the literature include caval compression.<sup>4</sup> A significantly inflated peritoneum can lead to inferior vena cava compression and thus result in a reduction of cardiac preload. However, this mechanism is likely to be associated with a drop in blood pressure and tachycardia which our patient did not experience. CO<sub>2</sub> gas embolisms have also been noted in the literature to potentially cause cardiac arrhythmias during laparoscopic procedures.<sup>5</sup> This scenario would be associated with clinical findings such as low end tidal CO<sub>2</sub>, diminished lung sounds and a cardiac murmur which our patient did not demonstrate.<sup>3,5</sup>

Another cause that is often reported is that of vagal stimulation during peritoneal insufflation.<sup>3,4</sup> This can be seen when the peritoneum is rapidly inflated thus leading to mechanical compression

of the vagal nerve which can result in profound bradycardia and asystole.<sup>6</sup> The patient described in this paper suffered a cardiac arrest close to the conclusion of the procedure as opposed to during abdominal insufflation. Given the timing of our patient's complications, it suggests that vagal compression is less likely to be the mechanism of asystole in our case as the abdomen was already deflated by this stage.

Cardiac arrhythmia secondary to hypercarbia is a possibility in our patient.<sup>7</sup> A tendency for patients who are obese to have increased level of carbon dioxide immediately post deflation of the abdomen has been described in the literature.<sup>7</sup> Given the timing of the asystole our patient endured and his underlying obesity (BMI = 37.6), this is a potential mechanism by which the cardiac asystole could have occurred. While the patient denied any personal or family history of cardiac arrhythmias, there have been reports in the literature of previously asymptomatic patients experiencing cardiac arrhythmias from hypercarbia.<sup>7</sup> Unfortunately, there was no documentation of an end tidal carbon dioxide level. Though there have been documented cases of bradycardia during laparoscopic appendectomies, to our knowledge this is the first reported case that has resulted in cardiac asystole during a laparoscopic appendectomy. The other reported cases of bradycardia and asystole were not during laparoscopic appendectomies. Hence, it is important that physicians be aware of this potential complication.

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