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CASE REPORT

Ephemeral Tachyarrhythmia During Laparoscopy: An Enigma

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ABSTRACT

The advent of laparoscopy as a component of enhanced recovery after surgery (ERAS) has had astronomical repercussions from an anaesthetic viewpoint and management of the patient in the perioperative period. The creation of a pneumoperitoneum alters the milieu interieur of the patient in a way that is not quite well understood. Here, we present the case of a 13-year-old female patient ailing from pain abdomen and fever under evaluation posted for diagnostic laparoscopy under ASA I_E. The patient developed unforeseen ECG changes of sinus tachycardia with ST Depressions and T wave inversions in II, III, and aVF immediately post-insufflation of pneumoperitoneum. Despite extensive intraoperative and postoperative work-up the event remains an enigma underscoring the unpredictable repercussions of pneumoperitoneum on the physiology and the role of anaesthesiologists in diagnosing and treating these events in seconds to avoid catastrophic outcomes.

KEYWORDS

• Laparoscopic Appendectomy • Tachyarrhythmia • Pneumoperitoneum • Paediatric Anaesthesia • ST Segment Depression

INTRODUCTION

Despite its conceptual origins in the 1800s, laparoscopy was historically met with scepticism. The surgeons of the old were largely antipathetic towards its adoption well into the 21st century. However, by 1900s, the crucial role that minimally invasive surgeries played in reducing surgical trauma and enhancing patient recovery began to gain traction. It would be an understatement to say that laparoscopy has revolutionized modern surgical practice since then.

While the surgical proficiency in laparoscopy has advanced swiftly, our physiological

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understanding particularly of the effects of pneumoperitoneum remains incomplete. To date, the consequences of CO_2 insufflation are still viewed through a veil. Its effect on paediatric physiology have been studied even less. While anaesthesiologists have evolved with the need to prioritize patient safety and accommodate the surgical process, one should agree that anaesthesiologists are only be able to predict and respond to events they fully understand.[1]

The various mechanical, biochemical, and physiological effects of pneumoperitoneum described in adults can have unpredictable presentations in the paediatric population as the child is not simply a small adult. Children have a high level of vagal tone predisposing them to bradyarrhythmias. Closing capacity in children encroaches the functional residual capacity predisposing them to V/Q mismatch. Other complications include, increased risk of raised intracranial pressure, gastric acid aspiration, and deranged coagulation parameters to state a few.[2]

Case Report

A 13-year-old female patient was brought to the hospital by her parents, who gave a history of abdominal pain and fever on and off for 3 days, gradual in onset and progressive in nature. It was generalized abdominal pain with no diurnal variation; the pain aggravated on movement and was relieved on lying down. There was an elicitable and documented evening rise in temperature. On probing, it was revealed that the patient has been in and out of hospitals on and off multiple times for the last 1 year for similar complaints. In each of the inpatient stays, the patient was treated with intravenous antibiotics and managed conservatively. The interval of hospital admission was about 2 months apart. The patient did not have a history of loose stools, nausea, or vomiting. The patient did not have any history of bowel or bladder disturbances, difficulty, or pain during micturition, cough, expectoration, or dyspnea. The child was apparently normal prior to the onset of symptoms. She was born via elective LSCS in view of her previous cesarean section. The perinatal period was uneventful, and the patient was immunized to date. The mother gave no history suggestive of cyanosis during breastfeeding or physical activity or recurrent lower respiratory tract infections in the past. She achieved milestones appropriate to her age. She was still premenarchal. On examination, the patient was awake and obeying commands GCS:15/15, conscious and oriented but apprehensive. There was no pallor, icterus, cyanosis, clubbing, lymphadenopathy, pitting edema. She Vitals signs were within normal limits: Pulse rate: 92 bpm, normal volume, sinus arrhythmia was noted with respiration; BP: 105/65 mmHg, right upper limb with pediatric cuff; Chest: B/L Air entry was present and no added sounds were appreciated in all zones. S1 and S2 were audible, and no added sounds/murmurs were noted. On per abdominal examination, the abdomen was soft, and tenderness was elicited over the lower abdomen, maximal in the right iliac fossa. The patient was thin built, and airway examination revealed a mouth opening of > 3 cm inter-incisor gap, modified Mallampati Class I, and adequate neck movements.

Investigations revealed Haemoglobin: 11.1 g/dL; Total Leukocyte Count: 9.62 × 10^3/µL; Platelet count: 332 × 10^3/µL; INR: 1.03; ESR: 110 mm/hr (1st hour); Urea: 27.3; Creatinine: 0.37; Liver function tests were found to be within normal limits. Preoperative ECG showed T wave inversion in III and V_1, Biphasic T waves in V_2 and V_3, and sinus arrhythmia. Preoperative METS were > 4 prior to the onset of symptoms. An ultrasound abdomen done prior to presentation to the hospital revealed a possible pulled caecum with ileo-caecal tuberculosis or a possibility of abdominal lymphadenopathy suggestive of infective aetiology. However, a clinical differential diagnosis of subacute appendicitis possible appendicular lump was also under consideration. The patient was, therefore, posted for diagnostic laparoscopy.

After a thorough pre-anaesthetic evaluation, the patient was deemed to be ASA I_E and was posted for the same.

After ensuring NPO status, the patient was taken on-table, and a 20 G intravenous cannula was secured in the left upper limb. Following adequate preoxygenation with 100% O_2, the patient was induced with Inj. Midazolam 0.5 mg, Inj. Fentanyl 70 µg, Inj. Propofol 50 + 40 mg, and Inj. Atracurium 20 mg. After proceeding with bag and mask ventilation for a period of 4 minutes and attaining an adequate depth of anesthesia using Sevoflurane at a MAC of 1.2. A 6.0 mm ID cuffed ETT was secured under direct laryngoscopic guidance.

After confirming bilaterally equal air entry, the ETT was fixed at 18 cm. Inj. Dexamethasone 4 mg IV stat was given post-intubation. The patient was maintained with Inj. Atracurium 5 mg iv PRN and a mixture of Sevoflurane and Medical Air with a MAC of 1.0 and FiO2 of 0.4. The induction was uneventful, and the patient was handed over to the surgery team shortly afterward. On insufflation of the abdomen and the creation of pneumoperitoneum, the patient developed sinus tachycardia with the heart rate jumping significantly from 86 bpm to 144 bpm. There were concomitant ST segment depressions and T wave inversions noted in leads II, III, and aVF (*Figure 1A and 1B*).

Figure 1: A. First Event - Sinus tachycardia with ST Depressions and T wave inversions in II, III, and aVF immediately post-insufflation of pneumoperitoneum; **B.** Gradual reduction in T wave depth and resolving of ST depressions post-desufflation of the abdomen

The surgeon was immediately alerted on the changes and the pneumoperitoneum was deflated and the patient was observed for any change in other vital parameters. However, the BP and SpO2 remained within baseline limits. The plane of anaesthesia was deepened and adequate analgesia was provided. To accomplish the same, Inj. Dexmedetomidine 2 + 2 + 2 µg, Inj. Fentanyl 10 µg and Inj. Propofol 10 mg. Neuromuscular blockade and Depth of anaesthesia was further increased by dialling up Sevoflurane to a MAC of 1.2. Inj. Paracetamol at a dose of 15 mg/kg was also given. There was gradual reduction in heart rate to baseline levels.

After discussion with the surgical team, the abdomen was resufflated and pneumoperitoneum was recreated with a slower rate of insufflation, about 1-2 LPM. However, the event recurred with similar ST-T changes in inferior leads (*Figure 2*).

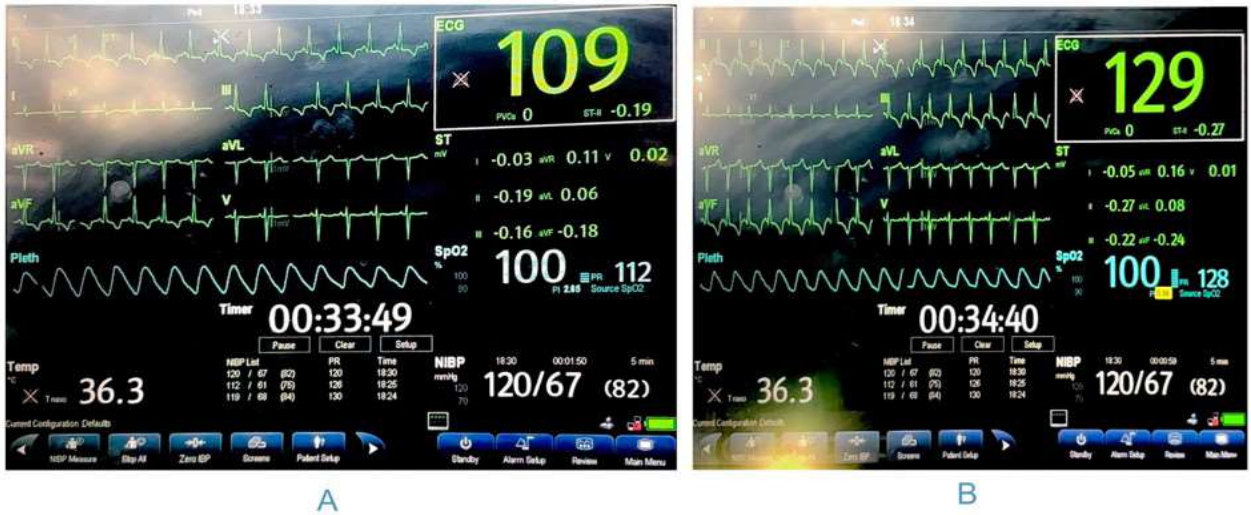

Figure 2: A. Pre-insufflation, **B.** Post-insufflation slowly with 1-2 LPM rate of insufflation, Second Event

Following the recurrence, the pneumoperitoneum was desufflated and the HR and ST-T changes gradually returned back to normal. In the short duration of insufflation, the surgical team could rule out abdominal Koch's and identify an inflamed appendix.

After discussing the case with senior consultants and the decision to perform an open appendectomy was taken. The rest of the procedure went by the book and gradually the ECG returned back to the baseline levels and the ST-T changes completely disappeared (*Figure 3*).

Intraoperative ABG was obtained. It revealed a pH: 7.359, PCO_2: 31.9 mmHg; PO_2: 224.8 mmHg; SpO_2: 99.6%; HCO_3: **17.6 mmol/L** and B.E: -7.2 mmol/L; Na^+: 141.6 mmol/L; K^+: **3.14 mmol/L**; iCa^{2+}: **0.917 mmol/L**.

The patient remained vitally stable at the end of the procedure. Upon adequate reversal of neuromuscular blockade with Inj. Neostigmine 1.5 mg and Inj. Glycopyrrolate 0.3 mg, the patient was extubated. Postoperatively the patient was observed in PACU for 2 hours at the end of which she had a Modified Aldret Score of 10/10 and minimal pain (VAS < 3). The patient was therefore shifted to ward.

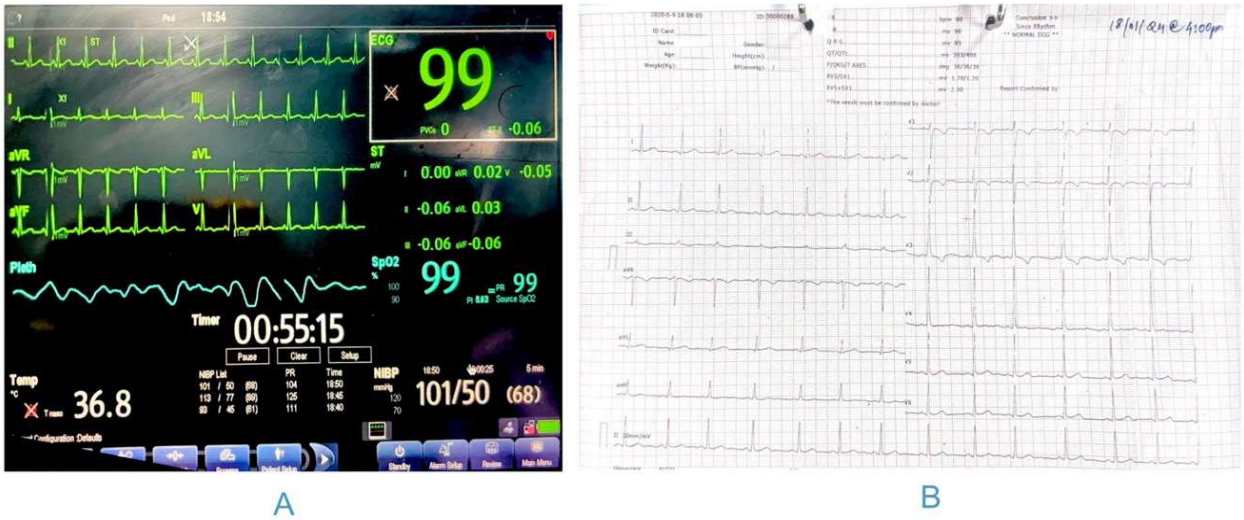

Figure 3: A. ECG returned to baseline levels by the end of the procedure, **B.** Postoperative 12 lead ECG done in ward

A 12 lead ECG performed in ward again showed normal sinus rhythm with the changes of T wave inversion in III and V_{1-3}, and sinus arrhythmia, which were similar to the preoperative status. The patient did not complain of any chest pain, dyspnoea, palpitations, or orthopnoea, nor did she show signs of any cardiac failure. In the postoperative period, serum electrolyte levels were obtained: Na^+: 138 mEq/L, K^+: 3.5 mEq/L, S. Ca^{2+}: 9.4 mg/dL, and S. Mg^{2+} levels were also found to be within normal limits. A screening Echocardiography revealed No Regional Wall Motion Abnormality, Normal LV Function with an LVEF: 60%. No. MR/AR, Trivial TR, No PAH, No evidence of clot/vegetation. No active intervention was suggested by the cardiology team. She was mobilized on POD 1 and was started on and accepted fully oral diet by POD-2. The patient was discharged on POD-3. The postoperative period remained uneventful.

DISCUSSION

Dealing with tachyarrhythmia during laparoscopic surgery, especially in a paediatric patient, is a unique challenge. This can be mainly attributed to the unpredictable nature of these events in children. The event in this 13-year-old really pushes us to think deeply about the causes and our response as anaesthesiologists.

The shift in the entire haemodynamic landscape secondary to creation of pneumoperitoneum[3] reduced venous return, increased resistance, and myocardial strain can all appear suddenly. The moment pneumoperitoneum was created it led to a cascade of events the patient's heart rate skyrocketed, and everything seemed to hinge on how we responded. Tachycardia, ST segment depressions, and T wave inversions in inferior leads could be indicative of myocardial stress/ischemia that could have escalated if

missed. The changes that we noticed in the ECG remind us that real-time monitoring isn't just a protocol it's a lifeline. Collaboration with the surgical team is key. In this case, despite reducing insufflation rates, the arrhythmias recurred and that's a lesson in itself.

The immediate differential diagnoses[4] that came to our mind included:

- Hypercarbia
- Stretch reflexes
- Dyselectrolytemia
- Pain response
- Anaesthetic depth

Each of the above possibilities were anticipated and treated for. However, despite desufflation, adequate analgesics and maintaining adequate depth the ECG changes persisted for quite some time before reverting back to normal baseline levels. The intraoperative arterial blood gas analysis ruled out dyselectrolytemia. This suggested that there could have been other causes of myocardial strain beyond the various autonomic and electrolyte disturbances.

An isolated case report in the past has described similar ECG changes secondary to insufflation in a paediatric patient scheduled for laparoscopic Nissen fundoplication. On further evaluation, intraoperative chest x-ray was suggestive of pneumomediastinum.[5] Similar Case Report of pneumopericardium after insufflation have also been described in adult patients.[6,7] While we did attempt to evaluate for a pneumomediastinum with an echocardiography in the postoperative period, it was not fruitful and the troponin I levels were also negative.

CONCLUSION

The tachyarrhythmia and myocardial stress that occurred in this child during laparoscopic surgery remains an enigma, representing the complexity and unpredictability of changes to physiology in the intraoperative period.

Such events highlight not only the significance of eternal vigilance that anaesthetists must exercise and but also our ability to interpret and respond with precision to manage unexpected events as and when they arise, in addition to adhering to established plans. By fostering effective communication, staying adaptive, and refining our approaches continually, we can turn challenges like this into opportunities to enhance patient safety and outcomes.

Conflict of Interest: The authors declare no conflict of interest related to this case report.

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Ethics Declaration: The case report involves a single patient and does not involve any experimental procedures and written informed consent was obtained from the guardians of the patient and strict anonymity of the patient has been maintained.

REFERENCES

1. Alkatout I., Mechler U., Mettler L., Pape J., Maass N., Biebl M, *et al.* The Development of Laparoscopy—A Historical Overview. Front Surg. 2021; 8.
2. Gupta R., Singh S. Challenges in Paediatric Laparoscopic Surgeries. Indian J Anaesth. 2009 Oct; 53(5): 560-6.
3. Srivastava A., Niranjan A. Secrets of safe laparoscopic surgery: Anaesthetic and surgical considerations. J Minimal Access Surg. 2010; 6(4): 91.
4. Hanna E.B., Glancy D.L. ST-segment depression and T-wave inversion: Classification, differential diagnosis, and caveats. Cleve Clin J Med. 2011 Jun; 78(6): 404–14.
5. Alshahrani W., Almaary J. Pneumomediastinum and ECG changes during laparoscopic Nissen fundoplication in a child; Case report. Int J Surg Case Rep. 2020 Nov 24; 77: 830-3.
6. Knos G.B., Sung Y.F., Toledo A. Pneumopericardium associated with laparoscopy. J Clin Anesth. 1991 Jan; 3(1): 56-9.
7. Galindo D., Martin E., Franzen D. Pneumopericardium after Laparoscopic Hernia Repair Presents with ST-segment Changes: A Case Report. Clin Pract Cases Emerg Med. 2021 Mar; 5(2): 178-81.