Case Report

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Anaesthesia Section

Balancing Cardiac Rhythm and Surgical Risk: Anaesthetic Management of Hepatic Hydatid Cyst in a Pacemaker Patient

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ABSTRACT

Hydatid disease, caused by Echinococcus granulosus, is a parasitic infection that commonly affects the liver and may require surgical intervention as definitive treatment. Anaesthetic management of such cases can be complex, particularly when compounded by significant comorbidities. Patients with cardiac implantable electronic devices such as pacemakers present additional perioperative challenges due to risks of Electromagnetic Interference (EMI) and haemodynamic instability. A 65-year-old male with a history of Complete Heart Block (CHB) and a permanent pacemaker presented with right hypochondrial pain and was incidentally diagnosed with a hepatic hydatid cyst. He was scheduled for marsupialisation of the cyst under General Anaesthesia (GA). The patient had underlying hypertension and was otherwise medically stable. Preoperative preparation included reprogramming the pacemaker to VOO mode to mitigate EMI risks during electrocautery. Intraoperatively, standard ASA monitoring and invasive arterial pressure monitoring were used. GA was induced by Etomidate for cardiovascular stability and was maintained using oxygen, air, sevoflurane, and muscle relaxants. Analgesia was achieved with fentanyl. A transient malfunction of the pacemaker occurred during monopolar cautery, which was recognised early on by the anaesthesia team and recovered spontaneously. Surgical management involved excision and irrigation of the cyst with cetrimide, followed by placement of an omental flap. After full recovery, the patient was extubated postoperatively and shifted to the intensive care unit for monitoring. He remained stable, recovered without complications, and was discharged with instructions for follow-up. This case highlights the importance of coordinated perioperative care and vigilant intraoperative monitoring in patients with cardiac devices undergoing hydatid cyst surgery.

Keywords: Anaphylaxis, Electrocautery, Electromagnetic interference, General anaesthesia, Intraoperative complications

CASE REPORT

A 65-year-old male with a permanent pacemaker for CHB presented with right hypochondrial pain for two weeks. The pain was insidious in onset, slow, intermittent, non-radiating, and relieved by medication without any specific aggravating factors. There was no history of trauma, fever, gastrointestinal or urinary symptoms, or vomiting. He had hypertension for the past 10 years and was on telmisartan 40 mg once daily, with no other comorbidities. The patient was classified as ASA III.

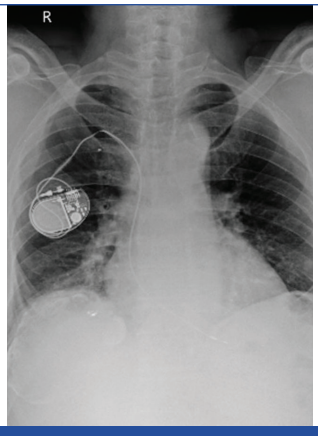
The patient had a history of CHB diagnosed eight years ago, for which a permanent pacemaker was implanted. The underlying aetiology was degenerative conduction system disease rather than ischaemic or structural cardiac pathology. He had remained pacemaker-dependent since implantation and had undergone regular follow-ups, with the device functioning optimally until the current presentation.

Contrast-Enhanced Computed Tomography (CECT) of the abdomen and pelvis revealed a partially calcified hydatid cyst in the right lobe of the liver extending to segments VII and VIII. It was started on Albendazole 400 mg thrice a day. The patient was scheduled for marsupialisation of a hepatic hydatid cyst under GA. Blood investigations [Table/Fig-1] showed stable haematological and biochemical profiles with mild anaemia, mild hypocalcaemia, and hypomagnesemia, which were corrected preoperatively. Preoperative chest X-ray and Electrocardiogram (ECG) are seen in [Table/Fig-2,3]. A cardiology opinion was taken, and the patient was deemed fit for surgery with mild cardiac risk.

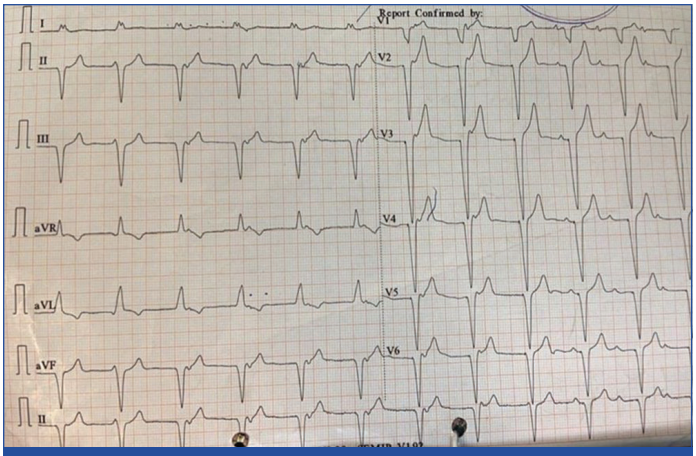
Preoperatively, the pacemaker was reprogrammed to asynchronous ventricular pacing (VOO) mode to prevent intraoperative EMI.

Parameter	Value	Reference range
Haemoglobin (Hb) (g/dL)	10.8	13-17
Total leukocyte count (/mm^3)	7,800	4,000-11,000
Platelet count (/mm^3)	2.1 × 10^5	1.5-4.5 × 10^5
Serum sodium (mmol/L)	138	135-145
Serum potassium (mmol/L)	4.2	3.5-5.0
Serum calcium (mg/dL)	8.0	8.5-10.5
Serum magnesium (mg/dL)	1.5	1.7-2.2
Renal function tests	Within normal limits	–
Liver function tests	Within normal limits	–

[Table/Fig-1]: Laboratory investigations of the patient.



[Table/Fig-2]: Preoperative chest X-ray showing pacemaker in situ.



[Table/Fig-3]: Preoperative ECG showing a ventricular paced rhythm.

Standard ASA monitors were utilised in the operating room, and an arterial line was inserted for continuous blood pressure monitoring. A defibrillator and external pacing system were kept ready. He was administered midazolam 1 mg for anxiolysis and fentanyl 2 mcg/kg for analgesia. Due to its cardiovascular stability, Etomidate (10 mg) was used for induction. Intubation was facilitated using 6 mg of vecuronium and a 7.5 mm cuffed endotracheal tube.

Anaesthesia maintenance was facilitated with the use of oxygen and air (50:50), and sevoflurane at (1-1.5 MAC). Boluses of vecuronium were administered intermittently to maintain muscle relaxation. Analgesia was supplemented with intermittent boluses of fentanyl, based on haemodynamic responses. Fluid management was achieved using Ringer's lactate. A precautionary low-dose noradrenaline infusion was prepared but was not used.

Ventilation was managed with a lung-protective ventilation strategy, tidal volumes of 6-8 mL/kg and a Positive-End Expiratory Pressure (PEEP) of 5 cmH_2O, with an end-tidal carbon dioxide goal of 35-40 mmHg. Despite these protective manoeuvres, a transient pacemaker loss of capture did happen when monopolar cautery was applied. The anaesthesiology team was able to recognise the occurrence immediately. Exemplifying readiness and watchfulness, they quickly checked the patient's rhythm and haemodynamic status, verified stability and were ready with external pacing equipment. Fortunately, pacemaker function was restored spontaneously in seconds, and no haemodynamic compromise ensued.

Through a right subcostal incision, the liver was explored. A calcified hydatid cyst attached to the diaphragm was encountered. After adhesiolysis with care, the area was dissected using cetrimide-saturated mops to prevent dissemination. The cyst's wall was opened, approximately 10 mL of contents were aspirated, and various daughter cysts were evacuated. The cavity was irrigated thoroughly with cetrimide solution, and an omental flap was placed in the remaining cavity. A 32 French abdominal drain was inserted, and layer closure of the abdomen was done.

At the end of surgery, the patient was weaned off anaesthesia slowly. Neuromuscular blockade was reversed using neostigmine 50 mcg/kg and glycopyrrolate 10 mcg/kg. Following full recovery of consciousness and muscle strength, the patient was successfully extubated and shifted to the intensive care unit for postoperative management.

In the postoperative period, the patient was haemodynamically stable. Analgesia was managed with intravenous paracetamol 1 g eight-hourly. Antibiotic prophylaxis using ceftriaxone-sulbactam 1.5 g and metronidazole 400 mg was continued. Incentive spirometry, chest physiotherapy, and nebulisation using salbutamol 2.5 mg and budesonide 0.5 mg were promoted to optimise respiratory function. The patient was shifted to the ward on the second postoperative day and recovered uneventfully. The abdominal drain was removed when the drainage was minimal. Discharge was done in stable condition on postoperative day 5 with directions to continue albendazole 400 mg and telmisartan 40 mg. At one-week follow-up, the patient remained stable with good wound healing, no recurrence of symptoms, and normal pacemaker function on evaluation.

DISCUSSION

Anaesthesia management of elderly pacemaker patients involves carefully assessing the preoperative device function. These encompass the type of device used, pacing mode, battery lifespan, and cardiac conduction of origin. The investigation of the device and reprogramming, when warranted, must be performed by either a cardiologist or an electrophysiologist. For procedures using monopolar electrocautery, asynchronous pacing modes are generally preferable to avoid inappropriate inhibition by EMI. The primary anaesthetic challenge in such patients is balancing surgical needs with the risk of pacemaker malfunction, particularly during the use of cautery [1].

During surgery, intraoperative EMI due to electrocautery remains a serious issue. Techniques to minimise this include the use of bipolar cautery or ultrasonic devices (e.g., harmonic scalpel) where feasible, placement of the return electrode (grounding pad) to direct the current away from the pulse generator, and the use of short bursts of cautery at the lowest effective energy. Electrocardiography and invasive arterial pressure monitoring must be continuously monitored to identify pacemaker failure or haemodynamic instability promptly. Defibrillation and external pacing equipment must be promptly accessible [2,3]. This case emphasises the intraoperative challenge of transient pacemaker malfunction due to EMI, necessitating vigilant monitoring and immediate readiness with external pacing and defibrillation.

From the anaesthetic drug point of view, drugs with minimal cardiovascular depressive effects are to be preferred. The choice of induction agent itself is an anaesthetic challenge, as haemodynamic depression can precipitate pacemaker dependence and compromise perfusion. Etomidate is widely used to induce patients with compromised cardiac function as it is haemodynamically inert. Inhalational agents like sevoflurane are used in maintenance due to their titrability and relatively favourable cardiac index. Opioids titrated to the extent of haemodynamic stability ensure safe anaesthetic conduct [4,5].

Echinococcosis by Echinococcus granulosus predominantly involves the liver. Pericystectomy, cystectomy, or marsupialisation, depending on the cyst's size, location, and relationship to the surrounding tissues, are a few treatment options. From the anaesthetic point of view, the two major concerns are the risks of rupture of the cyst with subsequent spillage of the hydatid fluid and a secondary risk of eliciting an anaphylactic reaction. To minimise this risk, careful surgical technique is paramount. The anaesthetic staff must be capable of recognising and treating anaphylaxis rapidly. This includes using secure intravenous access, the readiness with vasopressors, corticosteroids, antihistamines, and epinephrine, and preparedness for airway management if bronchospasm or airway oedema ensues. Thus, anaesthesiologists face the dual challenge of managing pacemaker-related risks along with the possibility of severe intraoperative anaphylaxis. Preoperative premedication with H1 and H2 blockers and corticosteroids may be performed in high-risk patients. Ventilatory management should also consider the anatomic proximity of the cyst to the lungs and diaphragm. Low tidal volumes controlled ventilation with minimal amounts of PEEP can be used to maintain oxygenation without causing barotrauma [6,7].

[Table/Fig-4] summarises selected case reports that illustrate various anaesthetic challenges encountered during such procedures, including intraoperative anaphylactic reactions due to hydatid cyst fluid leakage and transient pacemaker malfunction due to electrocautery-induced EMI [8-10].

Study	Presentation	Anesthetic challenge	Outcome
Bajwa SS et al., 2011 [8]	A 45-year-old female with liver and lung hydatid cysts near the heart	Risk of cyst rupture and anaphylaxis; bradyarrhythmias during thoracoscopy	Managed with lidocaine and amiodarone; successful recovery
Davarci I et al., 2015 [9]	50-year-old female with hepatic hydatid cyst (76×69 mm) in segments VI & VII	Severe anaphylaxis (SpO_2 60%, bradycardia, hypotension) due to presumed cyst fluid leakage	Treated with adrenaline and supportive therapy; stable postoperative course
Abdelmalak B et al., 2011 [10]	A 74-year-old male with T8-T9 spinal cord compression and a permanent pacemaker	Pacemaker interference due to monopolar electrocautery caused bradycardia and transient asystole	Managed by repositioning the return electrode and switching to short-cutting bursts; uneventful outcome

[Table/Fig-4]: Summary of case reports describing anaesthetic challenges in hydatid cyst and pacemaker patients [8-10].

CONCLUSION(S)

Anaesthetic care of pacemaker patients during procedures like marsupialisation of hepatic hydatid cysts must be done with meticulous planning and caution. Thorough preoperative evaluation of pacemaker function, mode adjustment appropriately to avoid intraoperative EMI, and monitoring for haemodynamic or rhythm disturbances are essential considerations. Anesthesiologists should be ready for complications related to hydatid cyst surgery, specifically anaphylaxis from cyst spillage and rupture. This includes maintaining the correct depth of anaesthesia, preparedness with emergency drugs, and stable haemodynamics during surgery. These high-risk patients can be effectively and safely managed with well-planned perioperative protocols and coordination between surgical, anaesthetic, and cardiologic teams.

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