ECG interference due to nasopharyngeal temperature probe masquerading as ventricular tachycardia - A case study

Dear Editor,

The increasing number of electronic equipment, developed for better patient care, escalates the risk of electrical interference.[1,2] Artefactual signals generated by such equipment may corrupt the normal cardiac signals and thereby result in erroneous tracings that may be non-specific or mimic life-threatening arrhythmias. This has led to misinterpretations, misdiagnoses, and unnecessary therapeutic or diagnostic interventions.[1,2]

We present a case of a 70-year-old lady who was diagnosed with left renal cell carcinoma (RCC) and was scheduled for laparoscopic left radical nephrectomy. Comorbidities included hypertension, type 2 diabetes mellitus, anaemia, and coronary artery disease. She was accepted in American Society of Anesthesiologists (ASA) physical status III under general anaesthesia (GA). Intraoperatively, standard monitoring ensued with nasopharyngeal temperature probe for monitoring core temperature. Standard GA technique was followed. Haemodynamic parameters were within normal limits. The patient was turned supine from the lateral position at the culmination of the surgery. Electrocardiogram (ECG) tracing started to show occasional ventricular premature complexes (VPCs) that subsequently increased in frequency and progressed to monomorphic ventricular tachycardia (VT) [Figure 1a]. However, during this time, the other vital parameters showed no change. Manual palpation of both sides' radial and carotid pulse revealed a regular and normovolemic pulse that was consistent with the heart rate derived from the pulse oximetry with normal morphology. Bedside echocardiography, arterial blood gas with serum electrolytes, and glucose were found to be normal. Inadvertent removal of the nasal temperature probe reverted the bizarre rhythm into a normal sinus rhythm on the ECG trace [Figure 1b]. To recheck, the nasal temperature probe was reinserted, which led to the reappearance of VT. The temperature probe was removed, and the patient was extubated successfully.

Analog filtering and digital signal processing algorithms in an ECG device filter artefact, minimise

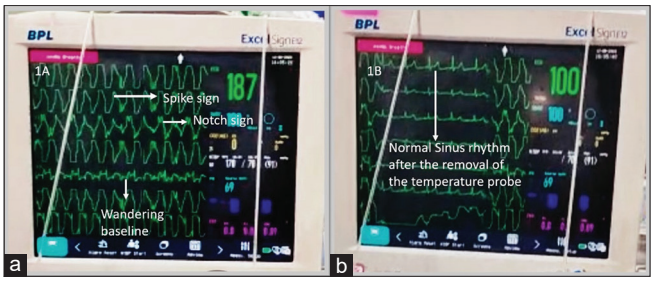

Figure 1: (a) ECG interference mimicking ventricular tachycardia with spike and notch sign. (b) Normal sinus rhythm after the removal of the temperature probe from the nasopharynx

the noise in the acquired data by anti-aliasing which cuts off upper and lower frequencies of the signal, and preserves its integrity.[1-3] Stray currents originate due to motion at the lead-skin interface or interference by main power lines (50/60 Hz). Energy radiation from electrical devices, electromagnetic equipment, radiofrequency, piezoelectric signals, or electrical stimulation can enter via broken or poorly shielded leads.[1,2,4,5] They are corrected with the use of a notch filter.[1,2] However each of these filters have a ceiling limit, beyond which noise, even if present, cannot be filtered. In our case, when we attached the multi-metre to the temperature probe, it recorded a voltage of 15 V, which were in excess as the thermocouple of thermistors usually works at millivolts. Therefore, stray currents that led to the artefactual ECG trace in our case were beyond the filtering capability of the device.

Signals unintentionally produced in one device have the potential to be transmitted to another through a patient by a phenomenon called capacitive coupling.[1,2] In the absence of proper grounding, an electrical current is generated in an isolated circuit of monitoring devices such as those for urine output or core temperature, which passes through the patient and is conducted to the cardiograph leads as an artefactual trace.[1,2] It manifests as a peak, notch, and sinus sign on the ECG and wandering baseline that mimics monomorphic VT [Figure 1a] in a backdrop of normal haemodynamic parameters.[1,2]

Following this incident, a thorough internal audit was done. All monitors in the operation theatres were checked, workshops were conducted to create awareness, and troubleshooting was carried out as per the developed algorithm [Figure 2]. As part of revised standard operating procedure (SOP), capacitor-discharge drill was taught, by removing the multifunctional monitor from the main electrical

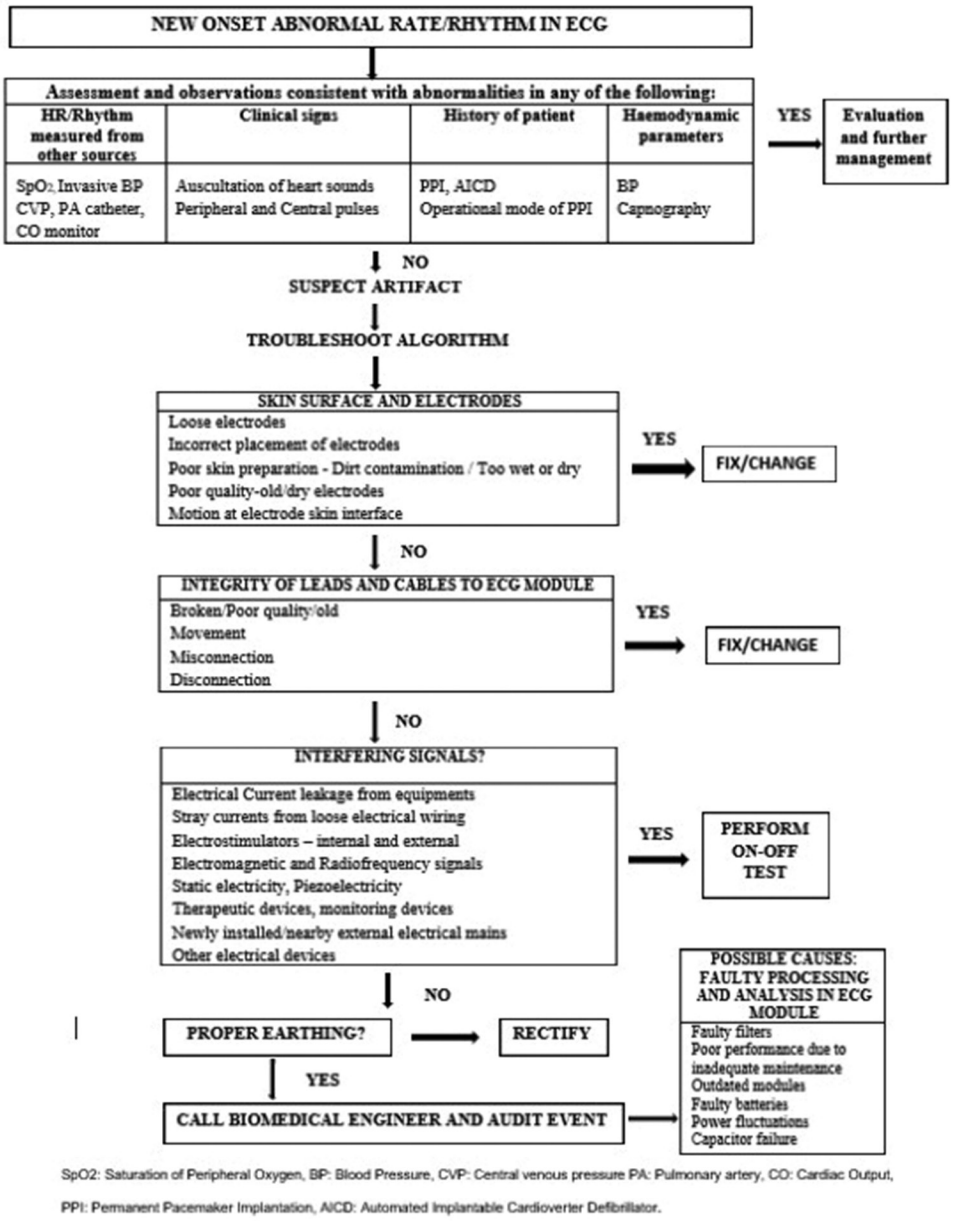

Figure 2: Algorithm demonstrating the approach and troubleshooting in wake of new onset arrhythmias

supply, backup battery of multifunctional monitor was removed and ON button was pressed for five-time constants (approximately equal to 6 seconds) for all capacitors in the multifunctional monitor to discharge.

To conclude, modification in standard practices, inputs from critical incident audits, and regular maintenance with electrical checks should be made mandatory to avert a similar incident in the future.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that her name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Sulagna Basu, Deepak Dwivedi,
Mohammad A. Mateen, Saajan Joshi
Department of Anaesthesia and Critical Care, Command Hospital (EC)
Alipore, Kolkata, West Bengal, India

Address for correspondence:
Dr. Mohammad A. Mateen,
Assistant Professor, Department of Anaesthesia and Critical Care, Command Hospital (EC) Alipore, Kolkata - 700027, West Bengal, India.
E-mail: ashu_mateen@yahoo.com

Submitted: 07-Dec-2022
Revised: 10-Mar-2023
Accepted: 10-Mar-2023
Published: 14-Jun-2023

REFERENCES

1. Patel SI, Souter MJ. Equipment-related electrocardiographic artifacts: Causes, characteristics, consequences, and correction. Anesthesiology 2008;108:138–48.
2. Mond HG, Haqqani HM. The footprints of electrocardiographic interference: Fact or artefact. Heart Lung Cir 2019;28:1472-83.
3. Chatterjee S, Thakur RS, Yadav RN, Gupta L, Raghuvanshi DK. Review of noise removal techniques in ECG signals. IET Signal Process 2020;14:569-90.
4. Imhoff B, Casey W. An unusual ECG artifact caused by faulty cardiac monitor leads. Clin Pract Cases Emerg Med 2021;5:267-9.
5. Prasad S, Praveen R, Sethuraman M, George J. Sequential events of asystole and cranial nerve monitor induced narrow QRS complex ECG artefacts: An uncommon combination during a common neurosurgery. Indian J Anaesth 2022;66:883-4.

Access this article online	
Quick response code	Website: https://journals.lww.com/ijaweb
	DOI: 10.4103/ija.ija_995_22

How to cite this article: Basu S, Dwivedi D, Mateen MA, Joshi S. ECG interference due to nasopharyngeal temperature probe masquerading as ventricular tachycardia - A case study. Indian J Anaesth 2023;67:573-5.