Article published online: 2022-08-16

Case Report

Abrupt Cessation of Atrial Fibrillation in a Neurosurgical Patient: Does Positioning Matter?

Steve Joys, Shalvi Mahajan, Rajeev Chauhan, Sanjay Kumar

Department of Anaesthesia and Intensive Care, PGIMER, Chandigarh, India

Abstract

Atrial fibrillation (AF) has been associated with cancer. However, the literature regarding the occurrence of AF in patients with brain tumors is limited. Neuroanatomic connections between the brain and the heart may affect heart rate and rhythm. We discuss a case of transient AF in a 64-year-old female who was operated for a right-sided sphenoid wing meningioma. The AF might have been related to the positioning of the head and neck of the patient, in whom the intracranial compliance was reduced due to the brain tumor.

Keywords: *Atrial fibrillation, neurosurgery, positioning*

Introduction

Transient atrial fibrillation (AF) is a well-known cardiovascular rhythm disturbance during the perioperative period. It could be due to acute alcohol intake, myocardial infarction, acute carditis, hyperthyroidism, pulmonary embolism, etc., It is associated with increased cardiovascular morbidity and mortality.[1] It has been associated with cancer; however, the literature related to its occurrence in patients with brain tumors is limited.[2,3] Here, we would like to discuss a rare case of transient AF in a patient with a right-sided sphenoid wing meningioma who was posted for surgical excision. For submission of this case report, institutional review board approval is not required, but informed consent was obtained from the patient's gaurdian.

Case Report

A 64 year old female of weight 75 kg and height 160 cm (body mass index [BMI] – 29.3 kg/m^2) presented with urinary incontinence and left-sided weakness. Her only significant past history included regular treatment for hypertension (tablet amlodipine 5 mg/day) for 3 years and no other cardiac abnormality. Preoperative neurological examination revealed left-sided hemiparesis (muscle power – 4/5). The examination of the cardiorespiratory system was unremarkable. She was anticipated to have difficult peripheral intravenous (IV) access. Preoperative assessment was done one day before surgery and was within normal limits, including electrocardiogram (ECG) [Figure 1]. Magnetic resonance imaging (MRI) of the brain revealed a right-sided sphenoid wing meningioma with a mass effect and midline shift of 11 mm. A craniotomy and excision of the tumor under general anesthesia (GA) was planned. On the day of surgery, the American Society of Anesthesiologists standard monitors such as ECG, noninvasive blood pressure (NIBP), and pulse oximetry (SpO_2) were attached in the operation theater. The baseline vitals on the monitor showed heart rate (HR) which varied between 153 and 160/min, NIBP – 126/80 mmHg, and SpO_2 – 99%. On the monitor, ECG showed an irregular rhythm with absent P waves on lead 2 and V5 (new-onset AF). The pulse oximetry waveform was irregular in height and rhythm. The patient's pulse was irregularly irregular on palpation, suggestive of AF. The patient was given IV esmolol 30 mg, which resulted in a decrease of HR by 10 beats/min for 10 min, following which the arrhythmia persisted at the same rate (153–160/min).

Address for correspondence:
Dr. Shalvi Mahajan, Department of Anaesthesia and Intensive Care, PGIMER, Chandigarh - 160 012, India. E-mail: drshalvimahajan@gmail.com

Access this article online

Website: www.asianjns.org

DOI: 10.4103/ajns.AJNS_192_20

Quick Response Code:

How to cite this article: Joys S, Mahajan S, Chauhan R, Kumar S. Abrupt cessation of atrial fibrillation in a neurosurgical patient: Does positioning matter? Asian J Neurosurg 2020;15:1031-3.

Submitted: 02-May-2020 **Revised:** 25-May-2020
Accepted: 06-08-2020 **Published:** 19-Oct-2020

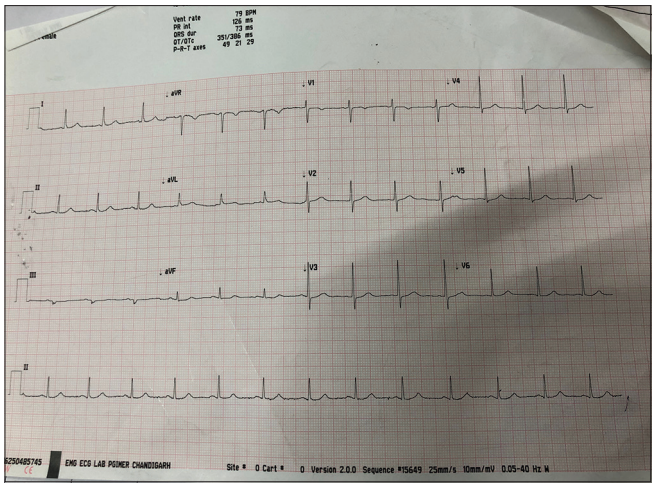

Figure 1: Preoperative electrocardiogram

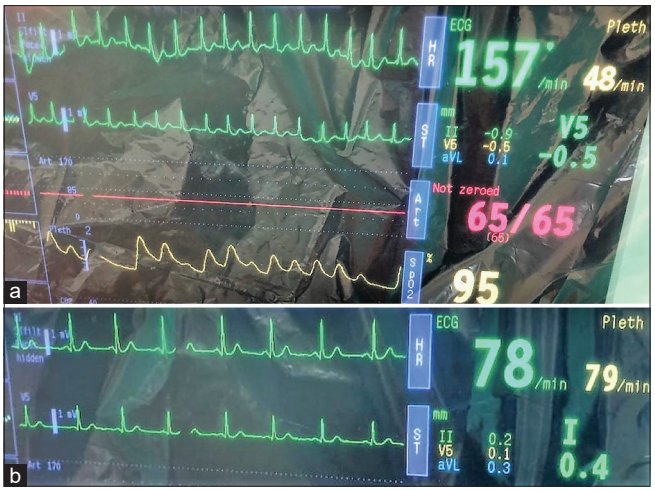

Figure 2: (a) Intra-operative baseline electrocardiogram suggestive of atrial fibrillation (b) Normal sinus rhythm

Transthoracic echocardiography done intraoperatively revealed grossly normal cardiac contractility with no clot in the left atrium, and the decision to proceed with surgery was made in view of the neurosurgical emergency after taking high-risk informed consent for perioperative major adverse cardiovascular events from the patient's guardian. Emergency cardiac drugs were kept ready. The left radial artery was cannulated for invasive blood pressure monitoring before the induction of anesthesia. GA was induced with IV morphine 9 mg, propofol 100 mg, and atracurium 30 mg. GA was maintained with isoflurane/oxygen. The patient was anesthetized and intubated with a 7.5 mm cuffed endotracheal tube. Postintubation, the patient's head was kept in the neutral position for insertion of the central line in the right subclavian vein, by removing the pillow under the patient's head and placing a sandbag in the interscapular area. Just after positioning the patient as such, the arrhythmia reverted to normal sinus rhythm on ECG with a HR of 72 beats/min [Figure 2a and b]. The patient continued to have normal sinus rhythm for the rest of the intraoperative period. Surgical positioning was done, i.e., supine position with the head rotated to the left side by 30° and neck slightly extended with the malar eminence as high as possible. The patient's head was secured with four pins and was in an extended position at a face plane angle of 25°–30° and the neck relatively less flexed at an angle of 30°. Moreover, it was ensured that a gap of at least two fingers was present between the mentum and clavicle to avoid extensive rotation of the neck and venous engorgement. The surgery was completed successfully. Postoperatively, ECG showed normal sinus rhythm and HR. The patient was extubated on postoperative day (POD) 2 and discharged on POD 5 in stable condition.

Discussion

Different types of cardiovascular changes have been described in the literature following acute brain insults due to trauma, intracranial hemorrhage, stroke, etc. However, we could not find relevant literature where inappropriate head-and-neck positioning in the less compliant brain due to brain tumor has resulted in transient cardiac arrhythmias.

Neuroanatomic connections between the brain and the heart are provided by parasympathetic ganglia and the intermediolateral gray columns of the spinal cord, thereby affecting the HR and rhythm. The right side is predominantly associated with HR control and the left side with the origin of arrhythmias. Loss of right-sided predominance of parasympathetic control has been shown to cause sinus tachyarrhythmias only in patients with right-sided strokes.[4] Pawar *et al*. have reported a case where a 57 year old woman suffered a road traffic accident following syncopal attacks, and on presentation, AF was present; further, brain imaging revealed a left temporal mass.[3] In our case, the patient had a right-sided sphenoid wing meningioma, and hence laterality of the tumor may have also played a role in the onset of AF.

Abrupt occurrence and cessation of AF is an unusual finding in our case which lead to the hypothesis that the pillow placed under the patient's head resulted in neck flexion and engorgement of neck vein in a patient with compromised intracranial compliance whose MRI already demonstrated raised ICP.[5] The raised ICP might have caused transient AF, which reverted to normal sinus rhythm with a neutral placement of neck while positioning for central line insertion.

A pillow of 7–9 cm height has been advised to obtain the "sniffing position" with approximately 35° cervical flexion (to align the pharyngeal and laryngeal axis) and maximal head extension at the atlanto-occipital joint (to align the oral axis with pharyngeal and laryngeal axis) for intubation. Park *et al*. compared three different pillow heights (3, 6, and 9 cm) with a sniffing position to determine the optimal pillow height for the best laryngoscopic view and found that best views were

obtained with the use of a 9 cm pillow.[6] However, pillows of 6 cm height were better suited in short-necked patients with the thyromental distance of <7 cm.[6,7] Our patient had a short neck, the pillow with 9 cm height might have caused more neck flexion than required. This might have contributed to transient AF in our case. A "ramped" position with horizontal alignment of the external auditory meatus with the sternum is recommended in obese patients. Although this patient did not classify as obese by definition (BMI ≥30), a ramped position might have been a more appropriate position during intubation (BMI 29.3 kg/m^2 with a short neck).[8]

In 15 patients undergoing elective neurosurgery (with ICP <20 mmHg, majority of patients had intracranial tumors), Mavrocordatos *et al*. observed collective effects of head, neck, and operation table on ICP in 15 different positions.[5] They demonstrated that flexion with rotation caused significant increases in ICP (neutral position– 8.8 mmHg, right rotation and flexion– 16.2 mmHg and left rotation and flexion- 15.8 mmHg).Hence, the changes in ICP associated with head and neck positioning may contribute to cardiovascular disturbances in susceptible patients who lie on the steep part of the intracranial compliance curve. This may lead to unnecessarily delay in the surgical procedure which can further worsen neurological status and affect overall outcome.

None of the anesthetic drugs routinely used are known to control AF. However, propofol has been shown to have both pro and anti-arrhythmic properties.[9] Case reports have suggested the role of propofol in the reversion of AF; however, its effect was noted at 90 s after administration of propofol bolus of 1 mg/kg (peak action of IV propofol).[10] Animal studies have indicated that morphine may have antiarrhythmic properties, but other studies have found no effects.[11] A review of literature did not reveal antiarrhythmic properties for any of the other drugs used. The patient continued to have AF after receiving all these agents, and hence it is unlikely that these agents had any effect on the suppression of AF. IV esmolol 30 mg was also given to counter the AF, but it did not produce the desired result. Moreover, the suppression of AF was a sudden occurrence, immediately after removing the pillow from under the patient's head. No drug bolus/new drug was introduced at that point, and hence it is unlikely that the suppression of AF was a response to the effect of any drugs used.

To conclude, in neurosurgery, head-and-neck position is an important component of the armamentarium to prevent or treat raised ICP. Our case highlights an unusual occurrence of transient AF in patient with a brain tumor that may be attributed to the disturbances in the neurocardiac axis following head-and-neck positioning during a neurosurgical intervention. Hence, the neuroanesthetist should always be more vigilant regarding the optimal head-and-neck positioning to prevent undue venous congestion, rise in ICP, and cardiac arrhythmias.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient's guardian has given her consent for her images and other clinical information to be reported in the journal. The guardian 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.

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