

## Asystole Due to Saline Irrigation during a Posterior Fossa Surgery: A Case Report

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### Abstract

Posterior fossa surgery (PFS) is one of the most complicated surgeries in the neurosurgery field. Asystole is a severe complication during this type of surgeries. Trigemino cardiac reflex (TCR) is hypothesized to stimulate the asystole. The case of a 40 year old female who established a cardiac arrest is reported when the surgeon was flooding the field with normal saline at the end of the surgery. A good knowledge of TCR is important and a close monitor should continue till the end of surgery.

**Keywords:** Asystole; Neurosurgery; Sitting position

### Introduction

Neurosurgery is known to be one of the most challenging surgeries due to the complications that could be encountered intraoperatively and postoperatively 1. Intraoperatively, severe arrhythmias like ventricular fibrillation, supraventricular tachycardia, severe bradycardia and even asystole could be faced [1,2]. As a matter of fact, experiences and practices proved that patients are prone to asystole mainly when the surgical manipulation is near the brain stem 2, whereby trigemino cardiac reflex (TCR) is hypothesized to be the cause of the asystole. In that context, a case is represented showing an asystole that occurred during a posterior fossa surgery.

Abiding by the ethical principles that stresses on respecting the patient's privacy, the patient was contacted and she authorized a family member to be a substitute decision maker to consent publication. The substitute decision maker reviewed the case report and signed a consent form to publish the report.

### Case Description

A 40 year old female was introduced with no coexisting medical illnesses and was suffering from an occipital headache and vomiting for 3 months. A magnetic resonance imaging (MRI) was performed showing a brain stem mass that was displacing the fourth ventricle. Consequently, the patient was scheduled for a craniotomy in a sitting position.

The preoperative investigations were normal, the echocardiography showed a normal heart with no patent foramen ovale after doing the bubble test.

In the operating room, after induction of anesthesia with propofol and fentanyl and maintenance with propofol (4 mg/kg/h) and remifentanyl (0.1 mcg/kg/h), the patient was placed in the sitting position. Then, a midline suboccipital incision was done.

After four hours of surgery and after the resection of the tumor, as the surgeon was flooding the field with normal saline to clean the field,

the patient developed a brief period of bradycardia for five seconds at a rate of 40 beats per minute, then a flat line on electrocardiogram (EKG) appeared on the arterial line and the peripheral capillary oxygen saturation (spO<sub>2</sub>).

Immediately the surgeon was informed, and 100% oxygen was given. Before any intervention, the asystole reverted back to normal sinus rhythm after 10 seconds.

### Discussion

A review of parasympathetic innervation would help in comprehending the potential reasons for intraoperative asystole. Several causes can lead to bradycardia and asystole during neurosurgery.

Causes to be considered are previous cardiac disease, using of  $\beta$ -blockers, light anesthesia, hypercarbia, hypoxia and many other causes without forgetting neurogenic bradycardia, venous air embolism (VAE) and trigeminocardiac reflex (TCR) [2,3].

VAE is the result of entrainment of air into the venous circulation. It is more common if the venous sinuses are opened with the head elevated above the level of the heart, and is maximal in the sitting position [4,5].

The trigemino cardiac reflex is not fully understood, however, there are some physiological considerations that would assist in understanding the phenomenon. Based on the anatomy, scientists have suggested a hypothesis indicating that the reflex arc is formed by afferent and efferent pathways where the efferent pathway continues to connect with the motor nucleus of the vagus nerve, and as it is well known that the vagus nerve provides parasympathetic innervations to the smooth muscles, abdominal viscera, and heart, therefore, when the trigeminal nerve is stimulated, it results a reflexive response conducted by the vagus nerve, leading to bradycardia and asystole [6-8].

Any intervention in the territory of the trigeminal nerve may be complicated by TCR. The neurosurgeon should always warn the anesthesiologist if he/she approaches the nerve or its branches. In addition, the anesthesiologist should correct any hypoxia, hypercarbia,

and acidosis before any surgical manipulation because they trigger the TCR [6]. Accordingly, the mean arterial blood pressure and the heart rate should constantly be monitored, so in case any hemodynamic changes are faced, the surgeon should be informed to stop his surgical maneuvers.

It has been shown that interrupting the stimulation is sufficient to stop the reflex and re-establish a normal heart rate and blood pressure without the need of anticholinergics. Still, if asystole and hypotension persist after the cessation of the manipulation an anticholinergic should be administered whether it is atropine or glycopyrrolate [6].

As been mentioned earlier in the case presentation, the asystole has occurred when surgical maneuvers had stopped and the surgeon was only flooding the field with normal saline at room temperature (cold). This is in favor of TCR because sinus rhythm resumed after removal of the cause without any treatment.

As literature and other researches indicate, TCR can occur due to three different kinds of stimulation: Chemical stimulation, Mechanical stimulation and Electrical stimulation [9].

Another stimulation is suggested which is the Thermal stimulation, as the asystole is suspected to be associated to the irrigation's temperature, since the normal saline irrigated in this reported case was at room temperature, and there is a possibility that the TCR was stimulated by its low temperature.

In addition to the fact that the normal saline irrigation could increase the intracranial pressure, leading to a stimulation of the TCR. Therefore saline irrigation should always be irrigated slowly.

In conclusion, it is well known that posterior fossa surgery remains one of the most complicated surgeries to the surgeon and the anesthesiologist. Therefore, in the light of this case experience, it is concluded that the complications that are faced in this kind of surgeries require a good knowledge of their occurrence and the procedure that should be performed to manage them.

Comprehension of TCR, its clinical and surgical consideration, and its management is fundamental for neurosurgical patient care. Moreover, another issue that should be taken into consideration is the temperature and the pace of irrigation as they may decrease the asystole likelihood to occur. Finally, close monitoring of the patient should continue till the end of the surgery.

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