

## Hemodynamic disturbance during watertight dural closure? Mind the direction of saline irrigation!!!

Sir,  
Hemodynamic disturbances can occur during neurosurgery due to raised intracranial pressure (ICP), stimulation of cranial nerve(s), inadequate anesthetic depth, seizures, venous air embolism, hypothalamic/brain stem manipulation, sudden enormous blood loss, and acid–base or electrolyte abnormalities.<sup>[1]</sup> There are very few reports in the available literature about hemodynamic disturbance occurring due to improper saline irrigation during dura mater closure. We report a case of hemodynamic disturbance during watertight

dura mater closure in a patient of trigeminal neuralgia who underwent microvascular decompression (MVD).

A 24-year-old male with 63 kg was diagnosed to have trigeminal neuralgia and was scheduled for MVD. He did not have any cardiorespiratory abnormality and his systemic examination and routine investigations were normal. Intraoperatively, he had stable hemodynamics till the time of dural closure. The neurosurgeons attempted a watertight dural closure and they rapidly injected 10 ml of normal saline

into the dural compartment. The initial injection of 5 ml saline did not produce any hemodynamic disturbance but remaining 5 ml was injected in a different trajectory which produced sudden bradycardia (heart rate dropped from 90 to 42 beats/min) and hypotension (invasive blood pressure dropped from 132/84 to 85/58 mmHg). The surgical team was asked to stop further saline injection, but the hemodynamic disturbance was persistent for more than 1 min and that normalized only after administration of 0.6 mg of injection atropine intravenous. Thereafter, the patient had stable vitals, his trachea was extubated at the end of the surgery, and was shifted to Intensive Care Unit for further management.

The possible causes of sudden hemodynamic change in our case were inadequate anesthesia and/or analgesia, surgical manipulation of brain stem region, massive blood loss, or transient increase in ICP causing Cushing's reflex. In our case, there were no signs of inadequate anesthesia/analgesia and there were no signs of brain stem manipulation intraoperatively. The total intraoperative blood loss was around 500 ml, and there was no sudden blood loss during the procedure. Transient increase in ICP (in the posterior fossa of the brain) due to saline injection leading to Cushing's reflex is an unlikely cause of the event because Cushing's reflex usually manifests as bradycardia and hypertension and the hemodynamic disturbance did not occur initially but occurred on injection of saline in a different trajectory. Hence, the most probable cause of sudden bradycardia and hypotension in our case was due to a stimulation of brain stem due to the injected saline.

The watertight closure of the dura mater is fundamental to intracranial procedures in neurosurgery<sup>[2]</sup> and after the dural closure the cavity is irrigated with saline to check effective dural closure and to flush out the blood clots and air from the operative cavity. In our case, the direction of the saline jet was the initiating factor of hemodynamic disturbance. The saline jet injected in different trajectory probably hit the brain stem area stimulating either the trigeminal nucleus or the cardioinhibitory parasympathetic efferents of the nucleus ambiguus. Stimulation of nucleus or divisions of trigeminal nerve or stimulation cardioinhibitory parasympathetic efferents of the nucleus ambiguus can cause sudden bradycardia, hypotension.<sup>[3-5]</sup>

Stimulation of trigeminal nerve nucleus in the brain stem can result in trigeminocardiac reflex (TCR) causing bradycardia and hypotension. Abrupt and sustained stimulation of trigeminal nerve nucleus is more likely to cause TCR,<sup>[6]</sup> and TCR can cause sustained hemodynamic disturbances.<sup>[7]</sup> Hence, the most probable explanation for the hemodynamic disturbance in our case was due to brainstem stimulation by saline jet resulting in TCR leading to hemodynamic disturbance.

This report cautions against blind injection of saline into dural cavity, especially in posterior fossa or cerebellopontine

angle surgery. We suggest a slow injection of saline into dural cavity preferably away from brain stem region to avoid such catastrophic hemodynamic disturbances.

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#### Conflicts of interest

There are no conflicts of interest.

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