

Intra-operative bradycardia during forceful saline irrigation following temporal lobectomy

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Intra-operative minor cardiac events such as bradycardia, hypotension, hypertension and arrhythmias in neurosurgical patients are commonly reported.^[1] They require strict vigilance for timely detection as they may be easily missed because of their transient nature. The significance of such events lies in the fact that most of the times they indicate a neurologic event. We report a case where forceful irrigation of the surgical site with normal saline after the right temporal lobectomy caused sudden sinus bradycardia.

A 16-year-old male patient (101 kg, 167 cm) diagnosed with intractable complex partial seizures without any co-existing disease was scheduled for the right temporal lobectomy through the right frontotemporal craniotomy approach. All routine investigations were within normal limits. In the operation room, general anaesthesia was induced with intravenous fentanyl 200 µg and propofol 150 mg. To facilitate tracheal intubation, intravenous rocuronium 100 mg was administered. Anaesthesia was maintained with sevoflurane in oxygen and nitrous oxide mixture (40:60) along with intermittent boluses of fentanyl 1 µg/kg and rocuronium 0.2 mg/kg as and when required. Resection of the right temporal lobe was completed uneventfully. The haemodynamic parameters were stable throughout the surgery. To achieve haemostasis, the surgeons irrigated the surgical wound with cold normal saline (4°C). However, during cold saline irrigation, there was a precipitous fall in heart rate (HR) from 73 to 48 beats/min along with a

slight decrease in blood pressure (BP) from 130/86 to 112/74 mm Hg. The operating surgeon was informed immediately who stopped saline irrigation instantly. The HR returned spontaneously close to its baseline value. Hypothesising that the trigger was due to cold saline irrigation, surgical site irrigation was then attempted with warm saline (40°C). However, a second episode of sinus bradycardia followed soon (HR decreased from 70 to 52 beats/min) without change in BP. The crisis resolved spontaneously with the removal of the stimulus. In both the situations, the striking observation was the vigorous and forceful saline irrigation that probably incited the parasympathetic response. The surgeon was then asked to irrigate the surgical site very gently and slowly with warm saline (40°C). No alteration in haemodynamic parameters was observed. Ensuring adequate haemostasis, rest of the surgery was completed uneventfully. Following surgery, neuromuscular blockade was reversed with neostigmine 40 µg/kg and glycopyrrolate 10 µg/kg, and the patient was tracheally extubated. The haemodynamics remained stable during the early and late post-operative period.

Intra-operative bradycardia following saline irrigation during epilepsy surgery has been reported previously by Sinha *et al.*^[2] They hypothesised that the two consequent episodes of bradycardia were mainly due to the effect of saline temperature (warm and cold) on the exposed brain structures. Similarly, the two consecutive episodes of bradycardia in our case (first with cold saline and then with warm saline) could be explained by the same mechanism. However, interestingly, the same warm saline which produced bradycardia on forceful and vigorous irrigation did not produce any haemodynamic repercussions on gentle and slow irrigation. We speculate that it might have been due to transient brainstem stimulation due to the impact of forceful irrigation as also mentioned by Chowdhury *et al.* during cerebellopontine tumour surgery.^[3] Other common causes of intra-operative bradycardia are trigemino-cardiac reflex (TCR), raised intracranial pressure (ICP), venous air embolism (VAE), amygdalohippocampal stimulation or due to the effect of anaesthetic drugs. However, episodes of bradycardia in our case cannot be reliably explained in terms of TCR as the common predisposing factors, known to precipitate it, such as hypercapnia, hypoxaemia, acidosis, light anaesthesia and narcotics such as sufentanil, alfentanil and pre-operative β-blocker or calcium channel blockade were absent.^[4] Due to relaxed brain and absence of other manifestations, the possibility of raised ICP was also excluded. The lack of any change in the end-tidal CO₂ reading and the rapidity with which it resolved, suggest

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that VAE was also an unlikely cause of bradycardia in our patient. Moreover, saline irrigation is not known to cause VAE; rather, it is one of the treatment modalities for VAE.^[5] As the patient remained haemodynamically stable throughout temporal lobe resection and no other drug was administered concomitantly, bradycardia due to amygdalohippocampal stimulation and anaesthetic drugs was unlikely. Thus, the repeat temporal relationship between forceful saline irrigation with bradycardia is highly suggestive of the speed or force of irrigation as the cause of bradycardia.

Thus, one should be cognizant of the preponderance of haemodynamic alterations during forceful saline irrigation of the brain and thus warrants close monitoring. Irrigation should be slow and gentle so as to avoid undue haemodynamic perturbations.

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Conflicts of interest

There are no conflicts of interest.

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