Anaesthesia for frameless stereotactic neurosurgery in a patient with Cheyne-Stokes respiration

Sir,

Frameless stereotactic biopsy is commonly employed for precision neurosurgery to increase diagnostic yield and patient safety. This technique avoids patient discomfort and allows for better airway management.[1] Most patients receive general anaesthesia and perioperative complications are rare. There are no previous reports on anaesthetic management in a patient with Cheyne–Stokes respiration (CSR) and hence this report.

A 52-year-old gentleman presented with complaints of progressive drowsiness since 2 months. Frame-based stereotactic biopsy for right capsuloganglionic lesion extending into the brainstem performed elsewhere did not yield conclusive results. Currently, he presented to our hospital with drowsiness and drooping of the left eyelid. On examination, he was drowsy but arousable with weakness on the right side and left third nerve palsy. Cardiac workup did not suggest evidence of heart failure. Magnetic resonance imaging revealed left midbrain [Figure 1a] and right capsuloganglionic lesion, suggestive of lymphomas. He was scheduled for a frameless stereotactic navigation-guided biopsy of the right capsuloganglionic lesion. Pre-anaesthetic evaluation revealed oxygen saturation (SpO₂) of 91% with irregular respiration (hyperventilation with periods of apnoea). Considering various factors, i.e., apnoea-hyperventilation breathing pattern, history of snoring, midbrain pathology, neurological status, minimally invasive diagnostic nature of the surgery and proposed early discharge, we planned awake surgery with incision-site local anaesthetic infiltration with 6 mL of 1% lignocaine and dexmedetomidine to retain spontaneous respiration close to his preoperative physiological status. Dexmedetomidine infusion was started at 0.5 µg/kg/h and titrated between 0.5 to 1 µg/kg/h during surgery after 1 µg/kg bolus dose over 10 min. No other opioid/non-opioid analgesia or sedation was used. Conscious sedation was maintained with Ramsay sedation score between 2 and 4.

After establishing a path to the target using neuronavigation system (Brainlab Varioguide® frameless stereotactic system), burr-hole was made and needle passed to yield biopsy tissue. A total of three biopsies were taken and the procedure was completed in 20 min [Figure 1b]. Patient remained cooperative, immobile and comfortable for surgery with no additional neurological deficits. Though, CSR persisted throughout surgery [Figure 2], patient was stable with SpO₂ in the range of 96%–99%, heart rate 64–88/min and mean blood pressure 62–84 mmHg with supplemental oxygen at 6 L/min. Post-operative imaging demonstrated biopsy tract within the lesion. He was discharged with the same neurological status on prednisolone and levetiracetam medications.
Histopathology report suggested diffuse B-cell lymphoma. He was on chemotherapy with improved clinical status at 3-months follow-up.

The CSR is a breathing disorder characterised by cyclical episodes of apnoea and hyperventilation and is mostly seen in heart failure.\(^2\) Mesencephalon and thalamus stroke also result in central apnoea, obstructive apnoea and pathological respiratory events.\(^1\) Central hyperventilation is known in pontine malignant lymphoma.\(^4\) Shibata et al. reviewed 13 patients with neurogenic hyperventilation of which 10 had pontine involvement, highlighting the impact of brainstem lesions on respiratory pattern. Patients with intracranial pathology present with weaning difficulty from neurogenic respiratory failure.\(^3\)

There are several implications of CSR for anaesthesiologists.\(^6\) First, though under-reported in anaesthesia literature, it is not an uncommon occurrence. It is mostly described in patients with cardiac failure who should be thoroughly evaluated and optimised before surgery. Second, in the absence of heart failure, CSR due to neurological pathology should be evaluated for obstructive and central sleep apnoeas. Third, patients with CSR exhibit extreme sensitivity and vulnerability to respiratory depressant effects of anaesthetic agents, opioids and neuromuscular blocking drugs. General anaesthesia, where possible, should be avoided as these patients are at an increased risk of adverse perioperative respiratory events (apnoea, airway obstruction, hypoxaemia and difficulty in weaning and extubation). Dexmedetomidine on the contrary, has no/minimal effect on the respiratory pattern in CSR, provides conscious-sedation and results in patient comfort and satisfaction during stereotactic neurosurgeries.

Loco-regional anaesthesia with dexmedetomidine\(^7\) provides desirable conditions and is therefore preferable for awake neurosurgery in patients with CSR.

**Declaration of patient consent**

Written informed consent was obtained from the legal guardian of the patient for scientific dissemination of the case.

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Nil.

**Conflicts of interest**

There are no conflicts of interest.

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Sir,

The internal jugular vein (IJV) has become the preferred central vein for anaesthesiologists and it is also an important anatomical landmark for the upper extremity nerve blocks. However, under certain circumstances, the IJV can be mistaken for the carotid artery. The circumstances leading to the mistake include rotation of the head (which changes their relative position and overlap) and, in particular, the presence of retrograde blood flow. The reversal of the blood flow through the IJV is a consequence of occlusion of the large veins in the superior mediastinum: The brachiocephalic vein (BCV) or the superior vena cava (SVC). The causes include malignancies, external compression by mediastinal fibrosis or aneurysm or thrombosis of the thoracic aorta, use of catheters or pacemaker electrodes or drug infusions.

In addition to the occlusion, a prerequisite for the flow reversal is the damage of the IJV valve, which is present in about 90% of people and ensures unidirectional blood flow. Of note, the IJV valve can be damaged by a central venous catheter. Regardless of its mechanism, the obstruction of SVC or its major tributaries may affect the upper limb function and lead to the development of SVC syndrome. We present here two cases of arterialised blood flow in the IJV in patients with upper extremity arteriovenous fistula (AVF) for dialysis.

In the first patient, who had a right AVF, an orientational sonographic scan was performed before insertion of a central venous line via IJV. The subclavian veins (SCVs) and IJVs were patent bilaterally but the flow in the right IJV was reversed. Subsequent imaging revealed the right BCV occlusion, apparently due to complications of the SCV dialysis catheter placement in the past. Colour Doppler ultrasonography (CDUS) of the neck and right upper arm confirmed BCV occlusion and also showed engorged veins in the upper arm with some collateral veins in the axilla. Since one BCV was obstructed, and the SVC was open, the blood flow on the side of obstruction was mainly directed retrograde through the ipsilateral IJV, sigmoid and transverse sinus, to the contralateral IJV and BCV, to finally reach the SVC.

In the second patient, who had a left AVF, a sonographic scan was performed before a nerve block.

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