Appendectomy at world’s highest altitude operation theatre in a remote set-up: A rare anaesthetic scenario and a short literature review

Sir,

Approximately 140 million people worldwide live permanently at altitudes greater than 9,000 feet and many of them might require surgical care. We describe a case of an emergency open appendectomy in a high-altitude environment in an underground dug-in forward surgical centre in an austere environment.

A 27-year-old male patient residing at an altitude of 16,000 feet was posted for emergency open appendectomy. The nearest tertiary care hospital was 1,000 km by road and the weather was not conducive for air evacuation. The patient was well acclimatised, residing there for the last 4 months, with an oxygen saturation of 98% on room air. He was taken up for surgery under spinal anaesthesia (SA). A spinal dermatomal blockade up to T6-T8 level
was achieved with 3.0 mL (15 mg) bupivacaine (hyperbaric). SA was later supplemented with general (GA), as the appendix was subhepatic, with intravenous (IV) midazolam 75 µg/kg, fentanyl 100 µg, propofol 5 mg/kg, and ketamine 3 mg/kg in incremental doses as the appendix was subhepatic. Controlled mechanical ventilation was delivered via a mechanical ventilator (Neptune) and using i-gel size 4. The oxygen saturation was maintained at 100%. The duration of surgery was 4.5 h and the FiO₂ was maintained at 100% throughout. The patient was haemodynamically stable. Post-operative oxygen supplementation was given via a face mask at 5 L/min for 4 h and IV paracetamol 1 gm was given 8 hourly. Oxygen saturation remained at 99% and the postoperative recovery was uneventful.

The physiology of spinal anaesthesia at high altitudes is not well understood and evidence on this has to build up. Lower pH of the cerebrospinal fluid has been reported in high-altitude natives.[5] Also, the duration of motor block and sensory block time with intrathecal hyperbaric bupivacaine have been found to be higher at sea level compared with that at moderate high altitude, thus, pointing toward the need for an increase in the dose of intrathecal hyperbaric bupivacaine at high altitudes.[6] The incidence of post-dural puncture headache (PDPH) is higher than that at sea level and is attributed to intracranial pressure changes that take place. Nevertheless, we used a 25-gauge Quincke spinal needle and PDPH did not occur in our patient.

As the risk of infection was high, we got the dug-in operation theatre (OT) in tent cleaned, fumigated, and made airtight by placing rocks around the tent. The outside temperatures were sub-zero (−15 to −20°C) along with the associated wind chill factor. The OT was maintained at ambient temperature with the help of kerosene heaters that were placed away from the oxygen source. Electricity was supplied with a generator. The floor inside the tents was uneven, and the operation table, lights, and monitoring equipment needed frequent adjustments. Limited manpower in an unfamiliar environment made the surgery even more challenging.

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Declaration of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.

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