SUCLA 2 deficiency and mitochondrial cytopathy–Do we have a safe anaesthesia plan yet?

Sir,

Mitochondrial cytopathies or depletion syndromes (MDS) are rare diseases with defects in aerobic metabolism. Since mitochondria are the energy source for cells, high energy-dependent tissues of nervous system, cardiovascular, and skeletal system are maximally affected in these disorders.[1] Two enzyme defects are known because of mutations in succinyl-CoA ligase (SUCLA) 2 and its GDP isoform gene (SUCLG1) which encode for subunits of adenosine diphosphate (ADP)-dependent isoforms of succinyl-coenzyme A synthase (SCS-A) leading to impaired oxidative phosphorylation and reduced adenosine triphosphate (ATP) generation.[2]

Although 70 million people are diagnosed with rare diseases in India (census 2011),[3] there is limited information on each enzyme defect of MDS in Indian population.

This is a case of a male child aged one and half years, weighing 11 kg having SUCLA2 deficiency with left sided non-palpable testis posted for a diagnostic laparoscopy. He presented with features of developmental delay and weakness in bilateral lower limbs. General examination was normal with no gross facial dysmorphism. Neurological evaluation revealed delayed developmental milestones, lower limb hypotonia and macrocephaly with no signs of raised intracranial tension. Other organ systems, airway assessment, and routine haematological parameters were normal. Advanced workup for inborn errors of metabolism showed raised lactate and elevated lactate: pyruvate ratio (>30). Tandem mass spectrometry of blood revealed elevated propionylcarnitine: acyl carnitine ratio (c3: c2 ratio > 0.4). Gas chromatography–mass spectroscopy of urine showed raised levels of methyl malonic acid (>2.5 micromoles per millimol of creatinine), consistent with abnormal fatty acid metabolism.

Anaesthetic management commenced with standard fasting guidelines of 2 h for clear fluids and 6 h for solids with the avoidance of pre-operative sedation. Challenges in general anesthesia included use of total intravenous technique (TIVA) because of complications associated with disturbed energy production and fatty acid metabolism. Hence, a continuous infusion of propofol was avoided. Bolus doses of propofol, narcotics, and muscle relaxants were reported safe. Succinylcholine and halogenated agents were avoided due to risk of malignant hyperthermia (MH). It has also been found that affected patients required lower doses of anaesthetic agents.[4]

Anaesthesia was induced with bolus doses of intravenous (IV) 25 mg propofol and 25 μg of fentanyl. Muscle paralysis was achieved with 5 mg of atracurium. Anaesthesia was maintained with a mixture of oxygen in air and intermittent doses of atracurium in accordance with neuromuscular monitoring as reduced release of acetylcholine from immature nerve endings results in hypersensitivity of the neuronal junction to non-depolarising paralysing agents in paediatric population.[5] Intraoperative management also included infusions of fentanyl in dose of 2–4 μg/kg/h and dexmedetomidine 0.2–0.7 μg/kg/h titrated in

accordance to patient's response. Normal saline was the maintenance fluid of choice to avoid increased lactate levels. Normothermia was maintained and blood sugars were monitored intermittently to avoid hypoglycaemia. At the end of surgery, IV paracetamol 150 mg was administered and arterial blood gases were analysed to rule out acidosis. The child was extubated after reversal of neuromuscular blockage with 0.1 mg glycopyrrolate and 0.5 mg neostigmine and monitored for delayed complications.

To summarise, patients with SUCLA2 deficiency causing fatty acid metabolism defects and depleted energy state require avoidance of prolonged fasting, hypothermia, and acidosis with a high suspicion for malignant hyperthermia. Since glucose containing fluids are contraindicated in patients on ketogenic diet for seizure management, blood glucose monitoring is mandated to avoid hypoglycaemia. Normal saline is the IV fluid of choice. Drugs requiring the acyl carnitine pathway for metabolism like propofol and bupivacaine can be used with caution. Further research would allow using neuraxial techniques as an alternative to prolonged infusions in these disorders.

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Conflicts of interest
There are no conflicts of interest.

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REFERENCES

1. Niezgoda J, Morgan PG. Anaesthetic considerations in patients with mitochondrial defects. Paediatr Anaesth 2013;23:785-93.
2. El-Hattab AW, Scaglia F. SUCLA2-Related mitochondrial DNA depletion syndrome, encephalomyopathic form with methylmalonic aciduria. In: Adam MP, Ardinger HH, Pagon RA, *et al*., editors. GeneReviews®. Seattle (WA): University of Washington, Seattle; 2009. p. 1993-2020.
3. Rarediseasesindia.org [homepage on the Internet].India. Foundation for Research on Rare Diseases and Disorders, Rare Diseases India (RDI), Rare Diseases Reviews (RDR) © 2009-2020. Available from: http://www.rarediseasesindia.org. [Last accessed on 2020 Dec 21].
4. Hsieh VC, Krane EJ, Morgan PG. Mitochondrial disease and anaesthesia. J. Inborn Errors Metab Screen 2017;5:1-5.
5. Maheshwari M, Sanwatsarkar S, Katakwar M. Pharmacology related to paediatric anaesthesia. Indian J Anaesth 2019;63:698-706.

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