# Challenges of repetitive sedation in a 16-month old child undergoing proton beam therapy

Sir,

Anaesthesia for proton beam therapy (PBT) demands excellence in paediatric anaesthesia[1] and an understanding of functioning of PBT and the limitations of working in a shared workspace.

A 16-month-old child with grade-3 anaplastic ependymoma weighing 8.5 kg with delayed motor milestones and a large head due to hydrocephalus was referred to us. He had undergone two craniotomies, a shunt revision and had completed five cycles of chemotherapy. He was on levetiracetam and had moderate iron deficiency anaemia with a haemoglobin of 9.2 g/dL.

Planning phase involved magnetic resonance imaging (MRI), immobilisation device making and computed tomography (CT) and lasted 180 min. The amount

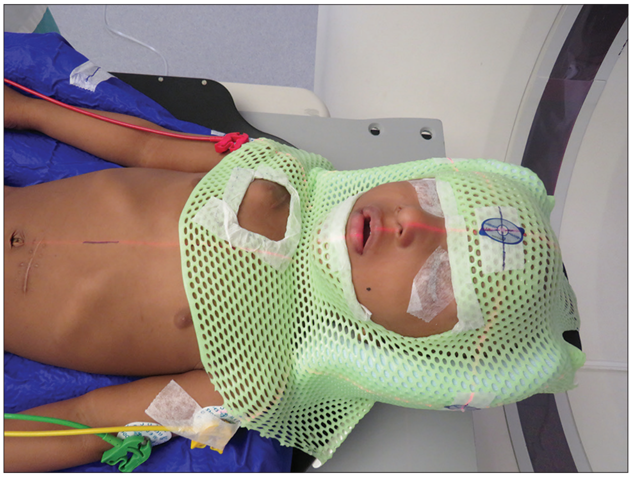

**Figure 1:** Face mask with adequate mouth opening and a window for chemo port access

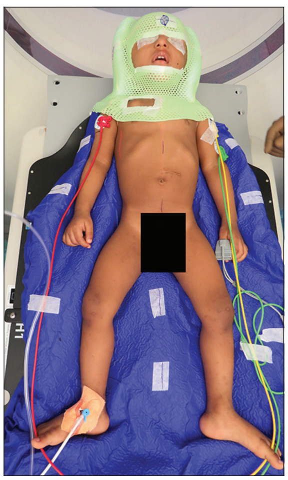

**Figure 2:** Craniospinal mould with whole body exposed. Position of limbs, electrodes and wires need to be reproduced daily

of mouth opening and head extension to maintain spontaneous respiration without use of artificial airway, the position of spine and limbs were confirmed during planning phase as this needed to be reproduced during therapy [Figures 1 and 2]. Therapy phase involved 33 sessions and 2 quality assurance CT and was done 5 days a week. Each session lasted about 35 min (range; 20–80). 1–2 mg/kg of propofol administered in 1 mL incremental boluses to achieve immobilisation followed by a maintenance dose of 10 mg/kg/h was used. No repeat bolus was required during therapy. No adverse anaesthesia events were observed.

PBT sedations are associated with challenges of non-operating room anaesthesia (NORA)[2] but are different from conventional radiotherapy with regard to the younger age, longer in room time and stringent immobilisation techniques necessitating deep sedation. A lighter plane may result in incomplete mouth opening and airway obstruction when the mask is applied. Incompletely relaxed limbs and spine will need repositioning. Irradiation to head and neck can cause airway and oesophageal oedema, increased secretions and hyper-reactive airway, coughing and laryngospasm.

Hypothermia from exposure (cling wraps were used to cover the child), hypoglycaemia due to unplanned delay arising from technical issues (dextrose containing fluids were used), the physiological effects of radiation like anaemia and weight loss (haemoglobin was 7.2 g/dl and weight was 7.6 kg towards the end of therapy) that affect anaesthesia outcomes and ensuring feeding and discharge within an hour daily were other challenges.

Though multicentric trials[3,4] suggest safety of short exposure to general anaesthesia, there is no literature on the effects of successive sedation on neural development. Neurosurgery, chemotherapy, radiation and anticonvulsant medications also affect cognition.[5] Guidelines on the age for the first anaesthetic application, importance of duration, number or interval between two consecutive anaesthesia applications are ill defined. Choosing the least harmful anaesthesia technique for safe and effective sedation daily in a NORA setup for a very small child with cancer is the real challenge in PBT.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the legal guardian has given his consent for images and other clinical information to be reported in the journal. The guardian understands that names and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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