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## Short Communication

## Augmented reality: A potential aid for preoxygenation in children

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Preoxygenation is performed for denitrogenation and entails providing an oxygen reservoir to increase the duration of apnea without desaturation. It involves spontaneous breathing of 100% oxygen administered through a well-fitting face mask for 3 minutes. Young children are at a higher risk for developing hypoxemia during periods of apnea while attempting intubation/supraglottic insertion, due to smaller functional residual capacity and a higher oxygen consumption than adults and inherent difficulty in securing airway. This makes preoxygenation essential for patient safety during apnea in paediatric patients. However, it has always been challenging to preoxygenate young children. The unfamiliar operation room environment, separation from parents, fear of the unknown, increased anxiety and mask phobia make mask acceptance and maintaining mask seal for the duration of preoxygenation difficult in these patients.

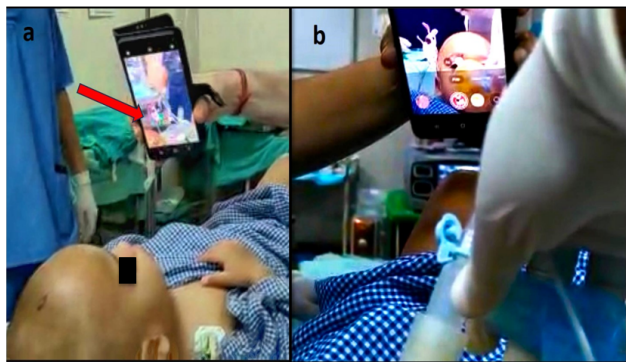
Augmented reality (AR) allows the simultaneous view of the real-world environment with a digital image overlay, permitting easy interaction with the surroundings and people present. Recently, AR glasses have been used for preoperative anxiety alleviation<sup>1,2</sup> and facilitation of IV cannulations<sup>3</sup> in children aged 5-17 years. The present report evaluated the potential of mobile phone application for facilitating preoxygenation in a 1-year-old child.

A 1-year-old male with a left inguinal hernia was scheduled for herniotomy. Written and informed consent

was taken from his father. In the preoperative area, the child was very anxious and his anxiety as assessed using a modified Yale preoperative scale (mYPAS) [standard criterion for assessing anxiety in children during anesthesia] was 57. The child was then exposed to AR using a mobile phone application. The AR application displayed a dancing rabbit as a cartoon character on the mobile screen, superimposed around the child's face to engage him. Reassessment of anxiety showed a reduction in mYPAS score to 20 (a decrease of 65%). The child was shifted into the operation room (OR) while keeping him engaged in AR application. In the OR, all standard monitors were attached. With distraction using AR application (Camera fun mode, Samsung Android F62 mobile); the child was captivated and engaged while looking at the dancing rabbit (Figure 1), and a transparent facemask was placed on the child's face. A good facemask acceptability was noted. Preoxygenation was then started with 100% oxygen. While being engaged in AR application, he could be preoxygenated easily for 3 minutes without any mask removal. The efficacy of preoxygenation was confirmed by an end-tidal oxygen of 90% on the monitor. Inhalational induction was then performed using oxygen and nitrous in the ratio of 2:1 for the initial three breaths and thereafter incremental increase of sevoflurane dial concentration of 1% every 3 breaths till 4%, when the loss of eyelash reflex was achieved. The induction compliance checklist score was zero and induction was easily accomplished. The intraoperative course was uneventful.

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**Figure 1:** The child is captivated and engaged using Augmented Reality application (dancing rabbit; 1 **a**) and showed good mask acceptability during preoxygenation (**b**) while watching the Augmented Reality application

This case describes the successful use of the mobile phone AR application in a 1-year-old child to achieve mask acceptance and hence adequate preoxygenation. Good mask acceptability ensured effective preoxygenation and a smooth induction for the child by diverting his attention away from an apparently frightening and unfamiliar hospital environment to a more playful and pleasant stimulus. This could be useful for preoxygenation of patients with limited reserves and an airway anticipated to be difficult, where increasing the duration of apnea without saturation could be life-saving. The current report holds promise for further randomised control studies to check mask acceptance and adequacy of preoxygenation in young children/infants using the mobile phone AR application and other antianxiety

techniques. Though limited by a single report and lack of comparator, the mobile AR application holds promise as an aid to preoxygenation in this population.

### 1. Conflict of Interest

None.

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