

The utility of the oxygen reserve index™ in a neonate undergoing re-exploration of a tracheoesophageal fistula

Sir,

We would like to share our experience of using the Oxygen Reserve Index™ (ORi™) (Masimo, Irvine, California, USA) in a neonate. The ORi™, a new continuous and non-invasive measurement supplementing routine pulse oximetry, provides a unit-less index ranging from 1 (increased reserve) to 0 (no reserve), predicting impending desaturation before any drop in saturation occurs.^[1] In addition, a positive correlation has been shown between the ORi™ value and the arterial oxygen tension.^[2] A 13-day neonate, an operated case of tracheoesophageal fistula with suspected mediastinal leak was posted for re-exploration. Preoperatively, the child was tachypnoeic maintaining saturation (SpO₂) of 90% on 0.6 inspired oxygen concentration (FiO₂) delivered through a high flow nasal cannula. On shifting to the operating room, standard monitors were attached along with the ORi™ and child was pre-oxygenated with 100% oxygen with face mask. Initial slight improvement of SpO₂ was noted to 99% with the ORi™ value remaining at 0.

Following induction SpO₂ rapidly dropped to 76%, increasing after successful endotracheal intubation. Subsequently, there were frequent desaturation episodes occurring during surgery with lung retraction. Throughout this period ORi™ values remained at 0 despite maintaining FiO₂ of between 0.8 and 1.0. Intraoperatively, the surgical team noticed a tracheal rent. Following successful repair of the tracheal rent and improvement in ventilation, appearance of the ORi™ was observed with a dramatic rise to 1.0. Following this increase, FiO₂ was then titrated to 0.4–0.5 to maintain an ORi™ value of between 0 and 0.3 and SpO₂ above 97%. Surgery proceeded uneventfully with no further desaturation episodes and stable ORi™ values between 0 and 0.3 [Figure 1].

Neonates represent a precarious group requiring careful titration of oxygen therapy, with excessive oxygen being associated with complications such as retinopathy

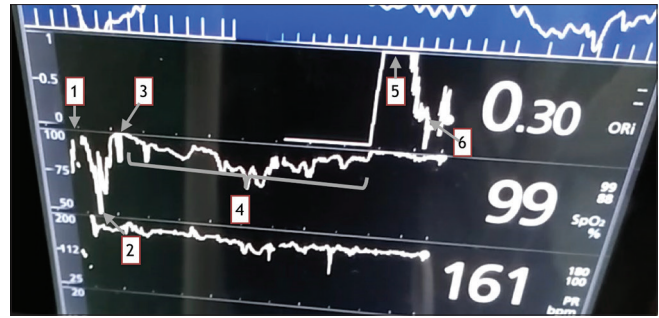


Figure 1: Trends in ORi™ and O₂ saturation displayed on the Masimo SET® Monitor. Preoxygenation (1), Desaturation after induction (2), Improvement after intubation (3), Intraoperative desaturation episodes (4), Appearance of ORi™ after repair of tracheal rent (5), FiO₂ titrated to ORi™ values (6)

of prematurity, bronchopulmonary dysplasia and periventricular leucomalacia.^[3] On the other hand, due to lower reserve and increased oxygen consumption, they tend to desaturate rapidly especially during thoracic surgeries.^[4] Using the ORi™, we observed that initially though SpO₂ was 100% ORi™ remained 0, and rapid desaturation occurred after induction of anaesthesia correlating with the baby's low reserve. Perhaps use of apnoeic oxygenation techniques during laryngoscopy (such as high flow nasal cannula or deep pharyngeal insufflation) could have prevented this drop in saturation. As the surgery progressed, loss of ventilation through the tracheal rent compounded by the lateral position and frequent lung retraction led to multiple desaturation episodes correlating with the ORi™ value of 0. Repair of the rent and improvement in ventilation was visible with improvements in the SpO₂, decreased oxygen requirement and appearance of the ORi™ measurement. Titrating the FiO₂ to ORi™ values helped us avoid excessive oxygenation while maintaining a marginal reserve in anticipation of further possible desaturation episodes. The accuracy of ORi™ may be affected by vasoconstriction, hypothermia and poor perfusion states.^[5]

In conclusion, the ORi™ is a new monitoring tool, and further studies are needed to explore its utility in different clinical situations and elucidate the factors which may affect its value. Observing the trends in the ORi™ value would help to titrate oxygen therapy in vulnerable patients.

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Conflicts of interest

There are no conflicts of interest.

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