T-Piece Resuscitator and Better Arterial CO₂ Levels: An Optimistic Future

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Positive pressure ventilation (PPV) is an essential step during surfactant administration by INSURE technique in preterm infants with respiratory distress syndrome. Identifying optimal device for administration of PPV is an area of critical research. Out of the three commonly available devices for PPV [Self-inflating bag (SIB), flow-inflating bag and T-piece resuscitators (TPR)], SIB and TPR are most commonly used in neonates during neonatal resuscitation as well as surfactant administration [1]. By providing stable targeted peak inspiratory pressure (PIP) and positive end expiratory pressure (PEEP), TPR attains functional residual capacity rapidly, improves compliance, oxygenation and thus results in decreased incidence of lung injury [2]. Due to stable tidal volumes, TPR has theoretical advantages of lesser fluctuations in CO₂ levels with reduced incidence of periventricular leukomalacia, intraventricular hemorrhage and bronchopulmonary dysplasia [3]. However, not much of literature is available to support this hypothesis.

In this issue of the journal, Jeevan et al. [4] have compared effect of SIB with TPR in fluctuation of arterial CO₂ (PaCO₂) levels at 1 h and 6 h of surfactant administration in preterm neonates with respiratory distress syndrome (RDS). In this open labelled RCT, the authors have randomly assigned 80 preterm neonates meeting the criteria for surfactant administration via INSURE technique (RDS with FiO₂ requirements of >35% and

PEEP ≥ 6 cm H₂O) to receive PPV either by SIB or TPR and compared the mean change in PaCO₂ levels 1 h (primary outcome) and 6 h after the intervention. The study showed that infants in TPR arm had significantly lesser drop in PaCO₂ at 1 h post intervention as compared to infants in SIB arm [SIB: 8.96 ± 9.06 mmHg vs. TPR: 1.37 ± 9.06 mmHg, mean difference 7.58 mmHg, (95% CI: 3.78–11.4), *p* < 0.01]. Though difference remained significant in subgroup of infants requiring non-invasive mechanical ventilation (NIMV) but the difference was insignificant at 6 h of life. There was no difference in other secondary outcomes as well as other clinical outcomes among the groups.

While clinicians are already aware of the benefit (in form of lesser duration of PPV and lesser intubation rates) of TPR in neonatal resuscitation [5], its role in surfactant administration has not yet been studied in detail. Although, the study provides evidence in favour of use of TPR in surfactant administration, routine use of TPR in resource-limited setting has several hurdles like financial crunches, inadequate availability and absence of prior training. Like any other biomedical equipment, the wider incorporation of TPR in Indian neonatal critical units requires bulk production of standard quality TPR of reasonably low price by local entrepreneurs, wider availability in NICU by involvement of policy makers in both public as well as private sectors and last but not the least, regular training for NICU professionals for use and maintenance of TPR. As the current study has focused on short term in-hospital outcomes, future RCTs with adequate sample size addressing long term neurodevelopmental outcome in follow up are needed before the findings of study can be translated in to clinical practice.

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Compliance with Ethical Standards

Conflict of Interest None.

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