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Editorial

Endotracheal tube leakage in babies receiving mechanical ventilation: A bane or a boon?

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Leakage of gas around an endotracheal tube (ETT) is ubiquitous in babies receiving mechanical ventilation. This is because of the use of uncuffed tubes in newborns under the assumption that allowing some free movement (in contrast to snug fit of a cuffed tube, as used in pediatric and adult populations) will protect immature airways from mechanical compression injury. Although desirable, there is no convincing data to prove this and one is not sure if this practice offers any real advantage. Instead, the current studies suggest that the variable gas leak created around the uncuffed ETT may in fact be undesirable for a variety of reasons.

A number of physiological studies have confirmed adverse effects of ETT leaks on pulmonary mechanics including tidal volume, compliance, resistance and time constant [1,2]. The interpretation of such data may be somewhat difficult especially because of the variable nature of the leak depending on head position, movement and stages of respiratory cycle when the measurements are being made. Moreover, these physiologic studies only provide surrogate data, and we are not sure how this information can be extrapolated to our day to day practice. Nonetheless, observations made by these studies including the one published by Mahmoud et al. [3] in this issue of J Pediatr Intensive Care are very relevant, as they have significant implications to our clinical practice. In addition, clinicians dealing with a ventilated newborn should be aware of the pitfalls especially because online pulmonary graphic mechanic testing has now become an integral part of routine monitoring of infants receiving mechanical ventilation. What is even more important, as the authors have demonstrated, is that individual ventilators use different algorithms to produce reference data, which may not be correct, and if such erroneous data are going to be used as a reference for auto adjustment of ventilatory parameters, as in devices with dual control system, the patient can come to real harm because of inadvertent over expansion of lung units. This observation may be particularly relevant to modes of ventilation such as "Volume Guarantee Ventilation, Proportional Assist Ventilation" and "Pressure Regulated Volume Control", which are widely used in clinical practice.

What can we then do to deal with this paradox created by the use of uncuffed ETT in newborns? Although theoretically plausible, there is no convincing data to prove that a low pressure, newly designed cuffed tube, when used for a relatively short period of time, increases the incidence of subglottic stenosis. The incidence of upper airway complication in ventilated newborns has already reduced significantly and this can be attributed to a number of factors, including good nursing care. Perhaps this makes a good case for a well designed randomized controlled trial to compare the use of cuffed and uncuffed tube in small infants. Some clinicians, even today, remain oblivious

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of the presence of a variable leak around the ETT simply as they erroneously think that as peak pressure remains constant in pressure-limited ventilators, there is no leak around the tube. However, this thinking should now change because on-line monitoring has become an integral part of monitoring of a ventilated infant, and people have become more aware of the importance of optimizing tidal volume delivery. To achieve this, it is mandatory to pay full attention to the presence of large leaks around ETT (more than 20%) and realize that this may vary from one breath to another. Further research is needed in this area, preferably using clinically relevant outcome measures, which will help in improving our clinical practice and reduce the incidence of complication usually associated with neonatal ventilation.

References

[1] Main E, Castle R, Stocks J, James I, Hatch D. The influence of endotracheal tube leake on the assessment of respiratory function in ventilated children. Intensive Care Med 2001;27:1788–97.

[2] Mahmoud RA, Proquitte H, Fawzy N, Buhrer C, Schomalisch G. Tracheal tube leak in clinical practice and impact on tidal volume measurement in ventilated neonates. Pediatr Crit Care Med 2011;l12:197–202.

[3] Mahmoud RA, Proquitté H, Hadhood SE, Schmalisch G. Effect of endotracheal tube leakage on respiratory function monitoring: Comparison of three neonatal ventilators. J Pediatr Intensive Care 2011;1(2):61–69.