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INTRODUCTION:Thoracoscopy is a minimally invasive technique for surgical repair of congenital diaphragmatic hernia (CDH) and tracheoesophageal fistula(TEF)/esophageal atresia(EA)in neonates.Reported advantages include enhanced surgical visualization, avoidance of a thoracotomy, shorter duration of mechanical ventilation, decreased opioid requirements and quicker return to oral feeds.In the neonate, concerns regarding oxygenation, ventilation and hypercarbia associated with CO₂ insufflation may be more pronounced. High-frequency oscillatory ventilation (HFOV) maintains mean airway pressure and optimal lung volume while limiting peak inflating pressures and lung over-distension.

METHODS:IRB approval was obtained for prospective data collection of neonatal patients undergoing thoracoscopic surgery using HFOV. HR, BP, transcutaneous CO₂(TC-CO₂),PaCO₂, PaO₂, HFOV ventilation settings and insufflation pressures were recorded at baseline and subsequent intervals during the case. Patient demographic data and postoperative recovery characteristics of tracheal extubation, time to oral feeds, opioid consumption and time to discharge were recorded.

RESULTS:Thoracoscopic repair of CDH and TEF/EA was successfully performed in all patients except for a 36 week, 2.2 kg neonate with TEF/EA. Thoracoscopy was aborted secondary to respiratory instability; however, HFOV was used for the open thoracotomy. Surgery occurred at gestational ages of 36-39 weeks and weights from 2.2-3.3 kg. Patients were transitioned to HFOV from conventional ventilation prior to the surgical procedure.Adjustment in HFOV settings were guided by TC-CO₂ which correlated with PaCO₂ values prior to and during thoracic insufflation (TC to PaCO₂ gradient of 2-8 mmHg) in 4 of 5 patients. The differences between PaCO₂ and TC-CO₂ were greatest in a 36 week TEF/EA patient. Adequate ventilation, oxygenation, surgical visualization and CO₂ elimination were obtained in all cases.

CONCLUSIONS:Intraoperative use of HFOV for thoracoscopic neonatal surgery provided adequate oxygenation, ventilation,surgical visualization and effective CO₂ elimination allowing for minimal interruptions during surgical repair of both congenital diaphragmatic hernia and trachea-esophageal fistula in 4 of 5 neonates. Ventilatory management of the HFOV was guided by transcutaneous CO₂ monitoring that correlated well with PaCO₂ values. Postoperative recovery characteristics included rapid extubation, minimal use of opioids, and a rapid transition to enteral feeds in 2 of 3 patients with CDH. In one patient, thoracoscopy was not well tolerated secondary to respiratory issues. Overall, we conclude that intraoperative HFOV can be an effective and easily adaptable ventilatory strategy in neonates undergoing thoracoscopic repair of CDH and TEF/EA.

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