

Initial Experience Using General Anesthesia For Preschool Children With Cystic Fibrosis Undergoing High Resolution Computed Tomography (HRCT) Scans

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Abstract

Background: Recent studies have shown that high resolution computed tomography (HRCT) is a more accurate method of evaluating early lung disease in cystic fibrosis (CF) than pulmonary function tests (PFTs) or chest x-rays. Since young children can not perform the breathing maneuvers required for high quality HRCT, lung volume control is necessary. Positive pressure facemask ventilation using chloral hydrate allows full inspiration and end exhalation images, but requires special expertise. Controlled ventilation can also be produced with general anesthesia (GA). GA has not been reported in children undergoing HRCT for CF research. The advantages of GA over sedation include rapid onset, faster recovery and reliability of scan completion. The undesirable effects of sedation are unpredictability and the higher failure rates. Additionally, failed sedation contributed significantly to parental dissatisfaction. (Malviya, et al., 2000). The primary outcome of our study was to examine the safety of using GA for HRCT scans and the quality of images obtained. A secondary outcome was parental satisfaction.

Methods: Participants were recruited from a larger NIH/CFFTI funded multi-site randomized clinical trial focusing on behavior and nutrition treatment to improve growth in preschoolers with CF. HRCT in subjects 2 to 5 years old (mean age 38 ± 10 months) was performed with GA. Parents accompanied the child during induction and left after the child was asleep prior to the intravenous (IV) being placed. After induction of anesthesia, LMA ProSeal™ specialized laryngeal mask airway (LMA), was placed which allowed ventilation with higher pressures and the ability to suction the stomach. Volumetric thin section CT scans were obtained. GA using inhalation (sevoflurane) and/or IV (propofol) agents was used and 6 out of 7 families who were eligible (85% recruitment rate) participated in the sub-study.

Results: The quality of the HRCT scans in all 6 subjects was optimal. There were no anesthetic complications upon emergence and none of the patients experienced any side effects after follow-up phone calls at 24 hours. Parents also expressed that the clinical interpretation of the HRCT scan provided beneficial information about their child's current lung disease status. The mean time from completion of scan to discharge was 38.8±15 minutes.

Conclusions: The use of GA in Radiology departments is becoming more common in pediatric centers. Our initial findings of this study demonstrate that GA can be safely administered for children with CF. In addition to very good quality scans being obtained, parental satisfaction was also noted. The use of the LMA ProSeal™ for HRCT may improve the image quality and aid in the diagnosis of early lung disease in preschoolers with CF.

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Malviya, et al. Pediatrics. 2000; 105; e42

Background

- High Resolution CT (HRCT) is an accurate method of evaluating of early lung disease
- Preschool children require sedation or general anesthesia (GA) and assisted ventilation to prevent patient motion and produce high quality HRCT images
- Our goal was to evaluate the use of GA and the laryngeal mask airway (LMA) ProSeal™ in children with CF undergoing HRCT

Methods

Figure 1.



1a. Induction of general anesthesia



1b. LMA ProSeal™ in place



1c. Closure of APL valve to generate 25 cm H₂O pressure



1d. Child after HRCT

Figure 2. Inspiration images of the lungs at 4 anatomic levels from a 3 year old boy with CF

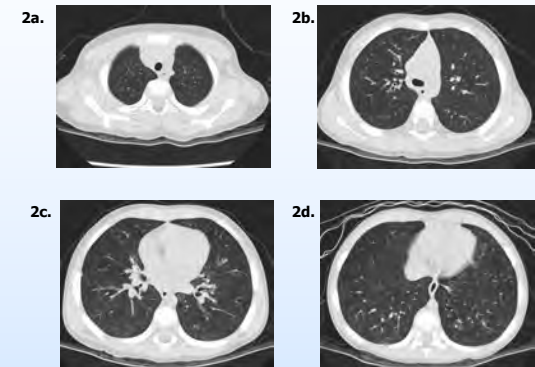
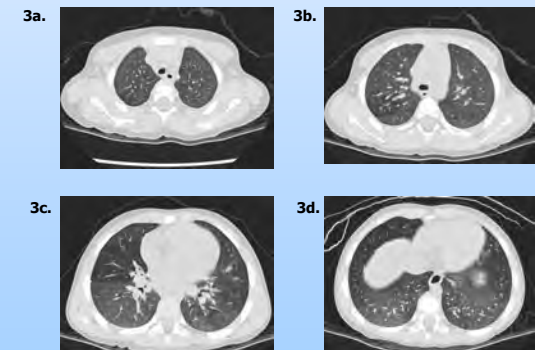


Figure 3. Expiration images of the lungs at 4 anatomic levels from a 3 year old boy with CF



Results

- High quality HRCT scans were obtained (see figures 2 and 3)
- There were no anesthetic complications
- Mean time from scan completion to discharge was less than 40 minutes and no subjects required further care

Conclusions

- The use of GA is becoming more common in Radiology departments in pediatric centers
- GA offers rapid onset and fast recovery without complications
- The use of the LMA ProSeal™ for HRCT may improve the evaluation of early lung disease in preschool children with CF