

## PNEUMOPERITONEUM SECONDARY TO PNEUMOTHORAX IN A VENTILATED CHILD

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### Abstract

Bronchoscopic removal of airway foreign body in children is a common emergency. With advancements in bronchoscopes and optics, removal of airway foreign body has become a safe procedure. Occasionally, due to poor visibility, lack of experience and faulty techniques complications like pneumothorax and pneumomediastinum can occur. Here we report a case of pneumoperitoneum following rigid bronchoscopy, which was managed non-operatively.

**Key Words:** Bronchoscopy, pneumothorax, pneumomediastinum, pneumoperitoneum, Conservative management.

### INTRODUCTION

#### Presentation of case

A 10 month old male boy was admitted to paediatric ward with history of fever and cough - 2days, breathlessness since 1 day. With suspicion of foreign body aspiration, emergency rigid bronchoscopy, was done and cooked noodles from carina and both main bronchi was extracted. Baby was shifted to ICU with Endotracheal tube in-situ and ambu assisted ventilation and connected to ventilator, once in ICU.

Immediately, baby desaturated and developed Surgical emphysema with abdominal distension. X-ray of chest and abdomen revealed, bilateral pneumothorax, pneumomediastinum with surgical emphysema of chest and neck and gross pneumoperitoneum. Bilateral tube thoracostomy was done for bilateral pneumothorax. Child was managed conservatively and discharged in good condition, after 2 weeks.



Pre-operative X-rays of thorax and abdomen ( Fig-1&2)



X-ray of chest and abdomen (post bronchoscopy), showing pneumothorax, pneumomediastinum, subcutaneous emphysema and pneumoperitoneum with typical 'Foot Ball sign' and Rigler's sign ( Fig-3 )

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X-ray chest , prior to discharge ( Fig-5 )

## DISCUSSION

Pneumoperitoneum in children is a relatively uncommon emergency and is usually due to perforation of a hollow intra-abdominal viscus, necessitating surgical exploration. However pneumoperitoneum in children has also been reported as a complication of bronchoscopy<sup>2</sup> and positive pressure ventilation.<sup>2-5</sup> It has been demonstrated, that air can escape from a ruptured alveolus into the interstitial tissues of the lung and enter the mediastinum via the perivascular and peribronchial connective tissue sheaths.<sup>6</sup> Dissection into the pleural space then produces a pneumothorax while downward extension of the air reaches retroperitoneum via esophageal, aortic and caval hiatuses<sup>6</sup>, from where it ruptures into the peritoneal cavity causing pneumoperitoneum.

The mediastinum also communicates with several anatomic structures including the submandibular space,<sup>6</sup> retropharyngeal space, and vascular sheaths in the neck.<sup>7</sup> A tissue plane extends anteriorly from the mediastinum to the retroperitoneal space through the sternocostal attachment of the diaphragm.<sup>8</sup> This space is continuous with the flank and extends to the pelvis.<sup>9</sup> The mediastinum also communicates directly with the retroperitoneum by way of the periaortic and periesophageal fascial planes.<sup>6,7</sup>

Pneumoperitoneum, in the children secondary to a respiratory cause has been increasingly recognized in recent years<sup>1-5</sup> especially with the widespread use of positive-pressure ventilation in the management of critically ill infants. It is important to differentiate medical from surgical pneumoperitoneum in order to avoid an unnecessary exploratory laparotomy in infants, who are frequently too ill to withstand major surgery.

Although differentiation of medical from surgical pneumoperitoneum is sometimes possible on clinical grounds alone, several other features may aid this differentiation:

1. Absence of an intra-abdominal air-fluid level favors the diagnosis of medical pneumoperitoneum, as an abdominal air-fluid level is found in more than 90% of neonates with gastric perforation.<sup>10</sup> However the absence of an air-fluid level does not necessarily exclude a gastrointestinal perforation.<sup>2</sup>
2. Presence of extra-alveolar air on a chest roentgenogram in the form of a retrocardiac pneumomediastinum or a pneumothorax<sup>3</sup> strongly favors a medical cause for the pneumoperitoneum.
3. In ventilated infants, an average peak inspiratory pressure of more than 35cm water has been



X-ray chest (Post ICTD), showing radiological improvement (Fig-4)



correlated with increased risk of producing medical pneumoperitoneum.<sup>4</sup>

4. A large pneumoperitoneum, favors a medical cause while a small pneumoperitoneum is more likely to be due to a surgical cause.<sup>3</sup>
5. The presence of bacteria and debris on peritoneal lavage strongly favors a surgical cause for the pneumoperitoneum.<sup>4,11</sup>

## CONCLUSION

This case is particularly notable because of unusual presentation of pneumoperitoneum, following rigid bronchoscopy, which was recognized in time and treated conservatively, with good result.

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## Author's contribution

All authors contributed to the paper.

## References

1. Leininger B J, Barkcr WI, Langston HT. Tension pneumoperitoneum and pneumothorax in the newborn. *Ann Thorac Surg* 1970; 9 : 359-363.
2. Holloway GA. Pneumoperitoneum in the neonate. *SAfrMedJ* 1980; 57 : 1083-1086.
3. Knight P J, Abdenour G. Pneumoperitoneum in the ventilated neonate: Respiratory or gastrointestinal origin. *J Pediatr* 1981; 98 : 972-974.
4. Steves M, Rickctts RR. Pneumoperitoneum in the newborn infant. *Am Surgeon* 1987; 53 : 226-230.
5. Vanhaesebrouck P, Iccroy JG, De Praetor C et al. Simple test to distinguish between surgical and non-surgical pneumoperitoneum in ventilated neonates. *Awh Dis Child* 1989; 64 : 48-49.
6. Sandler CM, Libshitz HI, Marks G. Pneumoperitoneum, pneumomediastinum and pneumopericardium following dental extraction. *Radiology*. 1975; 115:539-540.
7. Marchand P. The anatomy and applied anatomy of the mediastinal fascia. *Thorax*. 1951; 6:359-65.
8. Cyslak D, Milne EN, Imray TJ. Pneumomediastinum: a diagnostic problem. *Crit Rev Diagn Imaging*. 1984; 23:75-117.
9. Ieinman PK, Brill PW, Whalen JP. Anterior pathway for transdiaphragmatic extension of pneumomediastinum. *AJR Am J Roengenol*. 1978; 131: 271-257.
10. Pochaczcvsky R, Bryk D. New roentgenographic signs of neonatal gastric perforation. *Radiology* 1972; 102 : 145-147.
11. Chang JHT, Hernandez J. Ventilator induced pneumoperitoneum-A rapid diagnosis, *l'ediaoics* 1980; 66 : 135-136.

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