Eur Respir J 2000; 15: 424–425
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European Respiratory Journal
ISSN 0903-1936

CASE STUDY

A method for bronchoscopic evaluation of salivary aspiration in a disabled child

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A method for bronchoscopic evaluation of salivary aspiration in a disabled child. N.J. Zurick, A.J.W. Henderson, S.C. Langton-Hewer. ©ERS Journals Ltd 2000.

ABSTRACT: Chronic aspiration is a cause of life-threatening respiratory complications and repeated hospital admissions, particularly in children with neurological disabilities. Determining the source of aspiration is important for optimizing treatment.

This report describes a simple technique to demonstrate salivary aspiration during fibreoptic bronchoscopy. A child with a history of recurrent pneumonia was given methylene blue orally 2 h prior to fibreoptic bronchoscopy. Bronchoscopy was carried out through a laryngeal mask airway under inhalational anaesthesia. The stained saliva was seen to be pooling in the valleculae and then running down the trachea into the bronchi, confirming salivary aspiration.

Eur Respir J 2000; 15: 424–425.

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Keywords: Aspiration, bronchoscopy, methylene blue, pneumonia, saliva

Received: February 25 1999
Accepted after revision May 15 1999

Chronic aspiration, particularly in children with neurological disabilities, may be responsible for life-threatening respiratory complications as well as much disruption to family life by frequent hospital admissions. An appropriate management strategy requires that the source of the aspiration must be determined. Recurrent pneumonia, despite control of gastro-oesophageal reflux and the avoidance of oral feeds may point to chronic salivary aspiration.

Various techniques have been described to control salivary aspiration [1, 2]. Medical options primarily involve the use of antimuscarinic agents to reduce saliva production. The surgical options available include bilateral submandibular gland excision and parotid duel ligation, tracheostomy with or without stent insertion, and laryngotracheal separation procedures [3, 4]. The most effective procedure to prevent salivary aspiration is laryngotracheal separation, which involves forming an end tracheostomy and connecting the oesophagus to the proximal trachea, thus producing total isolation of the airway [5, 6].

A bronchoscopy will be required in most children being investigated for recurrent pneumoniae and in whom surgical procedures to prevent aspiration would be considered. This report describes a simple addition to bronchoscopy to demonstrate salivary aspiration using methylene blue given orally prior to bronchoscopy. The saliva is thereby stained so that it can easily be seen if it enters the lower respiratory tract.

Case report

Clinical history

A 2-yr-old child was referred to the respiratory team for investigation of recurrent pneumonia. The child had partial trisomy 13 with resultant severe developmental delay. She had a history of recurrent pneumonia from an early age, often with right middle lobe changes on chest radiography and often associated with *Pseudomonas aeruginosa* in oropharyngeal aspirates. She had a percutaneous endoscopic gastrostomy inserted at 10 months of age because of feeding difficulties, in particular choking on feeds. Video fluoroscopy at 11 months of age showed pooling of contrast in the posterior pharynx before a swallow was triggered; by which time there was contrast in the airways. She subsequently received all her feeds *via* her gastrostomy with no oral intake. A pH study and milk scan demonstrated gastro-oesophageal reflux and delayed gastric emptying. Treatment with prokinetics and antacids did not result in clinical improvement and she had a Nissen fundoplication at the age of 17 months. A pH study after this procedure demonstrated no evidence of continuing reflux.

Despite these measures she continued to have frequent episodes of pneumonia. She was noted to continuously drool large quantities of saliva, and it was considered that chronic salivary aspiration could be contributing to her respiratory problems. She was treated with transcutaneous hyoscine and enteral glycopyrrolate with little observed change in saliva production. We elected to perform a fibreoptic bronchoscopy to investigate her recurrent pneumonia. To demonstrate salivary aspiration we gave methylene blue orally to stain the saliva so that it could be detected readily if it reached the lower respiratory tract.

Procedure and findings

Two hours prior to bronchoscopy whilst fully awake, the child was given 1 mL of methylene blue orally by dripping it onto the tongue. Sevoflurane induction was used to produce anaesthesia and laryngeal mask airway (LMA)

was inserted to limit contamination of the airways with material for the mouth during the procedure. The LMA is inserted into the hypopharynx such that when its cuff is inflated it forms a low pressure seal around the entrance to the larynx, protecting the trachea from pharyngeal secretions. The child was breathing spontaneously and topical anaesthesia was not used. Fibreoptic bronchoscopy using a 3.5 mm bronchoscope (Pentax, Slough, Berkshire, UK) introduced through the LMA, demonstrated paradoxical motion of the anterior vocal cords. The tracheo-bronchial anatomy was normal. The stained saliva was seen pooling in the valleculae and running down the trachea into the right and left main bronchi.

Bronchoalveolar lavage was performed, using 20 mL aliquots of sterile 0.9% saline solution. Culture of the bronchoalveolar lavage fluid grew *P. aeruginosa*, but no fat laden macrophages were detected.

After discussion with the family the child was referred for consideration for surgery to reduce saliva production or to prevent aspiration.

Discussion

This report describes a simple technique to demonstrate salivary aspiration at fibreoptic bronchoscopy. This is an important condition to diagnose because it is the cause of much morbidity and mortality. Accurate assessment is vital, particularly when considering surgical interventions with their attendant risks and potential adverse effects. The salivagram has been used in some centres to investigate recurrent pneumonia with some reported success [7]. However, as most of those being investigated will require flexible fibreoptic bronchoscopy, it is useful to have a means of demonstrating salivary aspiration as part of this procedure. There have been reports that α-amylase concentrations are raised in tracheobronchial secretions in salivary aspiration. However, these observations were made in ventilated patients with tracheostomies and not from bronchoscopy [8, 9]. To the authors′ knowledge there are no data in children.

Methylene blue was chosen as it could be given orally in a small volume, and it has been used safely during bronchoscopy to demonstrate tracheo-oesophageal fistula and to calculate the dilution of bronchoalveolar lavage fluid [10, 11]. Precautions were taken to minimize the possibility of the stain contaminating the lower airways as a result of the procedure. A laryngeal mask airway was used to minimize oral secretions entering the airway after induction of anaesthesia. The dye was given slowly whilst the child was fully awake, and during the procedure the child was breathing spontaneously without local anaesthesia being used on the vocal cords. This technique clearly demonstrated salivary aspiration. It would appear to be a simple addition to flexible fibreoptic bronchoscopy when the source of recurrent pneumonia is being investigated.

References

1. Blitzer A. Evaluation and management of chronic aspiration. *N Y State J Med* 1987; 87: 154–160.
2. Murray LN, Guarisco JL. Chronic aspiration in children. *J LA State Med Soc* 1997; 149: 462–467.
3. Gerber ME, Gaugler MD, Myer CM, Collon RT. Chronic aspiration in children. When are bilateral submandibular gland excision and parotid duct ligation indicated? *Arch Otolaryngol Head Neck Surg* 1996; 122: 1368–1371.
4. Weisberger EC. Treatment of intractable aspiration using a laryngeal stent or obturator. *Ann Otol Rhinol Laryngol* 1991; 100: 101–107.
5. Snyderman CH, Johnson JT. Laryngotracheal separation for intractable aspiration. *Ann Otol Rhino Laryngol* 1988; 97: 466–470.
6. De Vito MA, Wetmore RF, Pransky SM. Laryngeal diversion in the treatment of chronic aspiration in children. *Int J Pediatr Otorhinolaryngol* 1989; 18: 139–145.
7. Cook SP, Lawless S, Mandell GA, Reilly JS. The use of the salivagram in the evaluation of severe and chronic aspiration. *Int J Pediatr Otorhinolaryngol* 1997; 41: 353–361.
8. Nandapalan V, McIlwain JC, Hamilton J. A study of alpha-amylase activity in the tracheobronchial secretions of seriously ill patients with tracheotomies. *J Laryngol Otol* 1995; 109: 640–643.
9. Nandapalan V, McIlwain JC, England J. Amylase activity in tracheobronchial secretions of laryngectomised patients. *J Laryngol Otol* 1995; 109: 637–639.
10. Baughman RP, Bosken CH, Loudon RG, Hurtubise P, Wesseler T. Quantitation of bronchoalveolar lavage with methylene blue. *Am Rev Respir Dis* 1983; 128: 266–270.
11. Karnak I, Senocak ME, Hicsonmez A, Buyukpamukcu N. The diagnosis and treatment of H-type tracheoesophageal fistula. *J Pediatr Surg* 1997; 32: 1670–1674.