Foreign body aspiration in children: Challenges, insights, and pathways forward

Foreign body aspiration (FBA) in children remains a problem worldwide, but with different challenges in developed and resource-poor settings. What gets aspirated, the length of time before medical advice is sought, expertise available and methods of removal vary across the world.

Most textbooks and articles refer to rigid bronchoscopy as the preferred method for foreign body (FB) extraction, but this practice has changed significantly over the past decade, with many FBs being removed using flexible bronchoscopy with the option of converting to rigid bronchoscopy if necessary. The latter is now possible owing to newer-generation bronchoscopes with larger working channels, as well as more advanced instruments. These include forceps, tripod forceps and baskets. Recently, cryotherapy has also been added as a possible treatment option.[1]

Moola *et al.*[2] report on FBA in the Johannesburg region of South Africa (SA). Many of their findings are similar to those reported previously, but they also highlight some important differences from articles published in other resource-poor settings. The rate of FBA was highest in an older age group, with the majority of children (42.6%) aged 7 - <10 years, which differs from previous studies. This is interesting, as one would not expect FBA to occur so commonly in this age group. The reasons for this finding are uncertain, but may in part reflect lack of supervision in a resource-poor setting where both parents are likely to be working, and after-school care may be lacking. Another reason may be neurological or developmental abnormalities, which were not evaluated in this study. Öztürk *et al.*[3] have reported that on screening, younger children with FB ingestion had a significantly higher prevalence of behavioural and emotional problems compared with controls. Hyperactivity was an important predictor for FB ingestion.[3]

Moola *et al.*[2] report that inorganic material, including plastic, was aspirated more commonly than organic material. This is also seen in other parts of SA, and the plastic material aspirated is commonly small plastic whistles found in inexpensive toys.[4]

Radiographic findings were only available in 34.0% of patients in this study (n=16), with 56.3% of radiographs reported as normal. This is an important point, as in many cases children present to a health facility with a history suggestive of FBA and then have a radiograph that is reported as normal, which can lead to missed or delayed diagnosis followed by complications. Furthermore, many radiographs will be read by junior doctors and not radiologists, which may result in subtle radiological changes being missed. It is debatable whether all children with FBA should be referred to a tertiary facility for review and bronchoscopy. Although FBA is taught in most curricula, it may be important to emphasise that the history overrules radiographic findings. There is also sometimes confusion about whether an FB was ingested rather than aspirated, as the history may be overlapping and confusing. Bronchoscopy will be negative in a number of these cases, but the risk/benefit ratio is much lower than that of a delayed diagnosis caused by failing to perform bronchoscopy. There is value in repeating radiographs within 24 hours if tertiary medical services are not easily accessible, as changes may be visible at follow-up with development of airway oedema and swelling, causing airway obstruction with an air-trapping effect.

New algorithms and scoring systems have been created to improve the diagnosis of FBA. A proposed new scoring system for prediction of FBA with the features new-onset, recurrent or persistent wheeze (93.3% specificity), noisy breathing/stridor/dysphonia (89% specificity), unilateral reduced air entry (81.5% specificity), abnormal findings on the chest radiograph (47.6% specificity) and a witnessed episode of choking (36% specificity) may be helpful, but the diagnosis still relies on clinical and radiological experience.[5,6]

The article by Moola *et al.*[2] has limitations such as small numbers, absent radiological findings in a large number of cases, and, probably the most important, the method of FB removal.

Task forces of the European Respiratory Society[7] and the American Thoracic Society[8] have recommended rigid bronchoscopy for FB removal in children; in contrast to these recommendations, there is an increasing number of publications reporting on, or even propagating, flexible bronchoscopy as the primary method for FB removal in children.

Schramm *et al.*[9] reported on a survey in Germany with a total of 259 participants. The majority of them were experienced doctors, with 65% working in the field of paediatric bronchoscopy at centres that performed ≥20 paediatric bronchoscopies per year. About 40% of the respondents indicated that they had been formally trained in a course in flexible bronchoscopy, 15% had been trained in rigid bronchoscopy, and 42% had never attended formal training. Seventy percent of the facilities treated ≤15 cases of paediatric FBA per year, and 30% treated >15 cases. Twenty percent primarily used flexible bronchoscopy as the method of choice for FB removal, 48% preferred rigid bronchoscopy, and 30% used a systematic combination of the flexible and rigid techniques. About a quarter of respondents reported that they had experienced situations requiring ICU admission.

Swanson *et al.*[10] retrospectively described a group of 40 children with FBA. Of the FBs, 60% were successfully removed with flexible bronchoscopy alone. In 35% of cases, the initial method was flexible bronchoscopy, but conversion to rigid bronchoscopy was required.

Wiemers *et al.*[11] reported on complication rates of rigid and flexible bronchoscopy in FB removal. The overall rate of complications was similar in rigid v. flexible bronchoscopy (19.1% v. 24.2%; p=0.232), but respiratory complications occurred significantly less frequently during rigid bronchoscopy (9.2% v. 16.3%; p=0.025).

The situation in SA is less clear with regard to the method used, and this varies from institution to institution, depending on who is responsible for the management of children with suspected FBA. It seems that at many institutions rigid bronchoscopy is still the preferred choice, as removal is mostly done by cardiothoracic or ear, nose and thoat surgeons. However, in an increasing number of cases, flexible bronchoscopy is used by paediatric pulmonologists.

FBA can be complicated by many factors, including location of the FB, length of delay in diagnosis, parenchymal and pleural complications, and the degree of airway obstruction.

FBA can have a significant mortality rate, both before hospital admission and during attempted removal. The real risk of removal is mostly unknown, as negative outcomes are typically not reported. Delayed diagnosis with

complete bronchus obstruction may have a high risk of complications due to suppurative lung disease, which can lead to pus formation and release once the FB is removed or moved.

Many countries in Africa, including certain areas of SA, have a shortage of bronchoscopy services, especially for paediatric patients. This shortage results in delays in the resolution of obstructions and can lead to long-term complications. It is important that pulmonology societies develop a plan to improve this situation, or at least create pathways of referral to centralised units.

In conclusion, the management of FBA is influenced by a variety of factors including technological advancements, resource availability, healthcare provider expertise and regional differences. Addressing these challenges requires a multifaceted approach involving medical education, resource allocation, and collaboration among healthcare providers and organisations.

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1. Schramm D, Freitag N, Kötz K, et al. Cryotherapy in the paediatric airway: Indications, success and safety. Respirology 2022;27(11):966-974. https://doi.org/10.1111/resp.14353
2. Moola A, Verwey C, Mabaso T, et al. Tracheobronchial foreign body aspiration in children in Soweto, South Africa: A retrospective descriptive study. Afr J Thoracic Crit Care Med 2024;30(2):e1145. https://doi.org/10.7196/AJTCCM.2024.v30i2.1145
3. Öztürk B, Güngör A, Yoldaþ TÇ, et al. Social, emotional and behavioral problems in children with foreign body ingestion: A case control study. Indian Pediatr 2024;61(5):447-451 (epub 26 February 2024).
4. Webster I, Goussard P, Gie R, Janson J, Rossouw G. The indications and role of paediatric bronchoscopy in a developing country, with high prevalence of pulmonary tuberculosis and HIV. Expert Rev Respir Med 2017;11(2):159-165. https://doi.org/10.1080/17476348.2017.1280397
5. Janahi IA, Khan S, Chandra P, et al. A new clinical algorithm scoring for management of suspected foreign body aspiration in children. BMC Pulm Med 2017;17(1):61. https://doi.org/10.1186/s12890-017-0406-6
6. Pozailov S, Goldbart A, Aviram M, et al. Foreign body aspiration score (FOBAS) – a prospectively validated algorithm for the management and prediction of foreign body aspiration in children. Eur J Pediatr 2024;183(2):815-825. https://doi.org/10.1007/s00431-023-05347-9
7. Eber E, Antón-Pacheco JL, de Blic J, et al. ERS statement: Interventional bronchoscopy in children. Eur Respir J 2017;50(6):1700901. https://doi.org/10.1183/13993003.00901-2017
8. Faro A, Wood RE, Schechter MS, et al.; American Thoracic Society Ad Hoc Committee on Flexible Airway Endoscopy in Children. Official American Thoracic Society technical standards: Flexible airway endoscopy in children. Am J Respir Crit Care Med 2015;191(9):1066-1080. https://doi.org/10.1164/rccm.201503-0474ST
9. Schramm D, Ling K, Schuster A, Nicolai T. Foreign body removal in children: Recommendations versus real life – a survey of current clinical management in Germany. Pediatr Pulmonol 2017;52(5):656-661. https://doi.org/10.1002/ppul.23609
10. Swanson KL, Prakash UB, Midthun DE, et al. Flexible bronchoscopic management of airway foreign bodies in children. Chest 2002;121(5):1695-700. https://doi.org/10.1378/chest.121.5.1695
11. Wiemers A, Vossen C, Lücke T, et al. Complication rates in rigid vs. flexible endoscopic foreign body removal in children. Int J Pediatr Otorhinolaryngol 2023;166:111474. https://doi.org/10.1016/j.ijporl.2023.111474

Afr J Thoracic Crit Care Med 2024;30(2):e2380. https://doi.org/10.7196/AJTCCM.2024.v30i2.2380