



Long-standing inhaled foreign bodies in children: Characteristics and outcome



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ABSTRACT

Objective: Aspirated foreign bodies in children present a potentially life-threatening condition and can be challenging to diagnose. This study aims to elucidate the characteristics and outcome of children with long-standing aspirated foreign bodies.

Methods: Retrospective case series of all cases of confirmed long-standing aspirated foreign bodies (LSAFB) between January 2003 to December 2015 in a single paediatric tertiary-level institution, defined as more than two weeks from choking episode or beginning of symptoms.

Results: Clinical files and operative records on 227 patients were screened and 35 children were confirmed to have been treated for LSAFB as per definition above. Median time to presentation was 4 weeks (mean 8.8 weeks). Eighty-six percent presented with cough and 51% with dyspnoea. Abnormal chest X-ray findings were found in 28 out of 31 patients (90%). Organic foreign bodies (22) were more common than inorganic (14). Intraoperative granulation tissue was demonstrated in 89% of patients and in 46% of patients this was regarded as *significant* (defined as obstructing more than 50% of the involved airway lumen). Mean length of stay was 2.5 days. Nine patients (26%) had 11 respiratory complications; there were no mortalities.

Conclusions: Paediatric LSAFB poses an uncommon diagnostic dilemma as there is often no witnessed history of aspiration event; and signs, symptoms and chest X-Ray findings are often non-specific. Laryngobronchoscopy is made more difficult by the presence of granulation tissue and the sequelae of prolonged non-treatment is a higher rate of chronic respiratory disease.

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1. Introduction

Paediatric aspirated foreign body (AFB) often presents with non-specific respiratory signs and symptoms, and in the absence of witnessed history of aspiration, diagnosis can be delayed with increased likelihood of chronic respiratory morbidity [1]. Children under 3 years of age are at increased risk due to their natural curiosity and developing independence along with lessening parental supervision. This age group was previously shown to be responsible for about 75% of AFB [2,3]. Positive suggestive history of aspiration is less likely in long standing cases and previously reported to range between 53 and 77% [4,5]. Short and long term respiratory complications due to long-standing aspirated foreign

bodies (LSAFB) were previously described in studies although with varying prevalence rates [1,6–8]. Despite the large body of literature addressing paediatric AFB, few studies have addressed the clinical characteristics of delayed presenters [6–8]. In particular, there is no universally agreed-upon definition of LSAFB with authors variously defining long-standing aspirated foreign body as >24 h, >3 days and 14 days delay [2,4–6]; we chose the latter definition in order to better differentiate this patient population from acute presenters. Further identified knowledge gaps in LSAFB include expected intra-operative findings and surgical outcome.

The limited extent of clinical information on the characteristics and outcome of children with LSAFB has led us to examine our data in order to improve the understanding and possibly the management of these children. The aim of this study was to describe the different presentation of LSAFB; evaluate common surgical

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findings; understand management challenges and delineate the outcome of this patient population.

2. Methods

Retrospective chart review of all laryngobronchoscopy-confirmed aspirated foreign bodies between January 2003 to December 2015 in a single paediatric tertiary-level institution in Auckland, New Zealand. All procedures coded as rigid laryngoscopy and/or bronchoscopy at Starship Children's Hospital (Auckland, New Zealand) were pooled and patients who underwent rigid laryngobronchoscopy using a ventilating age-appropriate bronchoscope for suspicion of foreign body aspiration were included. One of several senior paediatric otolaryngology consultants and senior paediatric anaesthetists were present in theatre in all cases. Image-documentation was used routinely.

Clinical files and operative records on 227 patients were found and examined. Inclusion Criteria: patients who presented ≥ 14 days from the witnessed time of foreign body aspiration or from time since onset of symptoms; Positive finding of an AFB; Children aged from 0 to 15 years were included (in line within the age limits of our institution). Exclusion Criteria: time to presentation < 14 days or not recorded.

We analysed patient's gender, age, ethnicity, clinical history, physical examination findings, pre-operative Chest X-ray findings, laryngobronchoscopic findings (surgical notes and clinical pictures were reviewed), clinical progression (length of stay, complications and follow up rigid laryngobronchoscopy procedures when performed). Length of stay was defined as time from laryngobronchoscopy to discharge and measured in days. Follow up laryngobronchoscopies were not routinely performed unless there was a suspected residual foreign body (FB) or significant intra-luminal granulation tissue. For suspected residual FB a second look was done after two days and for follow up of granulation tissue this was performed between 4 and 8 weeks after the first procedure. All chest X-rays were reviewed by senior radiology consultants.

Statistical analysis employed the *student's t-test* for continuous data and the *chi-squared test* for binomial data.

Institutional review board approval was obtained for this study (Auckland District Health Board Research Review Committee. Study reference details A+7096.)

3. Results

3.1. Demographics

Thirty-five children were found to have been treated for LSAFB within the study time-frame, comprising 15% of all aspirated foreign body presentations. Approximately 2/3 were boys and the most common age group was 1–3 year olds (See Table 1 for demographic details and Fig. 1 for age and gender distribution).

Median time to presentation was 4 weeks overall (mean 8.8 weeks); range 2–52 weeks. Median time for boys was 5.5 weeks (mean 11.4 weeks) and girls 4 weeks (mean 8.8 weeks) with boys presenting later ($p < 0.05$). There were no differences in time to

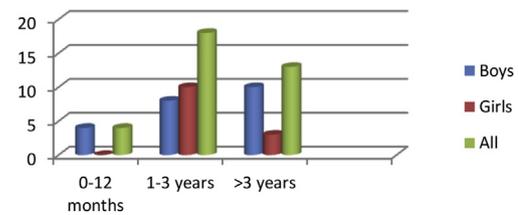


Fig. 1. Age and gender distribution.

presentation between ethnic groups; there was a non-significant trend of > 3 year olds presenting later than 0–1 year olds ($p = 0.0621$). In only 6 cases (17%) was a clear reason for delayed presentation found with 3 of these having previously had negative laryngobronchoscopy, and 3 cases having delayed laryngobronchoscopy despite high pre-test probability of FB (with 2–3 positive items out of history for aspiration, abnormal physical examination findings and abnormal Chest X-ray findings) [3].

3.2. Clinical presentation

See Table 2 for information regarding history and physical examination. Non-productive cough (86%) and dyspnoea (51%) were the most common presenting symptoms. There was a history of noisy breathing with dysphonia in 2 individuals – in both cases the foreign body was located in the larynx; one laryngeal FB was a wire brush spindle that migrated to the soft tissue anterior to the hyoid bone and needed an open approach for removal (4 weeks following aspiration) while the second laryngeal FB was a metal pin which was lodged in the vocal cord ventricular region on one side and extracted using a trans-oral endoscopic approach two weeks after aspiration. The remaining three patients with noisy breathing all had foreign bodies in the distal airways. Two of them had small plastic FB and one aspirated a nut. Two patients were found to have clubbing of the fingers, one in combination with pectus excavatum. The latter patient had a witnessed aspiration of barley seeds 11.5 months earlier which was complicated by a bronchopleural fistula requiring thoracotomy 2 months later (surgery performed at another institution). The patient did not undergo laryngobronchoscopy at the time of thoracotomy.

The second patient who presented with clubbing had five weeks duration of symptoms and no history of witnessed aspiration. A nut fragment was removed in this case.

3.3. Chest X-Ray findings

Thirty-one out of 35 patients underwent pre-operative chest X-ray; two patients had a pre-operative CT scan demonstrating foreign body prior to international transfer from Samoa; two further patients had no imaging. Apart from international transfers, all imaging was performed within 24 h before rigid laryngobronchoscopy. Abnormal chest X-ray findings were seen in 28 out of 31 patients (90%); radio-opaque foreign body was demonstrated in 13 patients (42%), lung hyperinflation demonstrated in 11 patients (35%), collapse/consolidation in 11 patients (35%).

3.4. Laryngobronchoscopic findings

Thirty-six foreign bodies were retrieved in 35 patients. Eighty-nine percent had intra-luminal granulation tissue and 46% of all patients were recorded to have granulation tissue obstructing more than 50% of the involved airway lumen which we define as significant. There were no statistically significant differences in the

Table 1
Demographic details.

Ethnicity	Our study (n = 35)	Auckland area (0–14)
European	14 (40%)	57.1%
Maori	5 (14%)	10.7%
Pacific Islands	10 (29%)	14%
Asian	5 (14%)	16.7%
Other	1	1.4%

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