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ORIGINAL ARTICLE

Foreign body inhalation in the pediatric population: Lessons learned from 106 cases

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Aspiration;
Foreign body;
Rigid bronchoscopy;
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Diagnostic delay

Summary
Objectives: To review the cases encountered in a tertiary care center so as to assess the incidence of foreign body aspiration in the pediatric population and to draw on our experience to improve prevention and early diagnosis.
Patients and methods: Retrospective study of 106 children under the age of 15 years, admitted to the Hôtel-Dieu de France hospital for flexible and/or rigid bronchoscopy between November 1998 and January 2010, for suspected foreign body aspiration (FBA).
Results: Among the children, 56.6% were aged between one and three years. Peanuts or pistachios were found in 48% of cases. In 73% of cases, the FB was bronchial, and slightly more frequently on the right side (60%); 17.8% of cases presented in emergency immediately after inhalation; 12% presented with life-threatening symptoms; 29% presented within 24 hours and 49% were seen later than 72 hours. In 81% of subjects, a typical penetration syndrome was found on interviewing the parents. Physical pulmonary examination was normal in 21% of patients and chest X-ray in 21.8%. Rigid bronchoscopy was preceded by flexible bronchoscopy in 12% of cases. Parental underestimation of the gravity of the situation was a significant factor in delayed diagnosis. Among the patients, 64% examined 24 hours after inhalation were initially treated for another pathology. Delay in diagnosis and organic vs inorganic FB did not significantly correlate with duration of bronchoscopy. The rate of complications did not significantly increase after a 24-hour diagnostic delay threshold.
Conclusion: FB aspiration is a serious problem. A high index of suspicion is required in health care providers (ENT, pediatricians and family physicians). Physician and especially parental education are the main guarantors of significantly reduced morbidity and mortality in this pathology.

Introduction

Foreign body aspiration (FBA) remains a significant issue. Worldwide, eight persons die every hour from FBA; most are children [1]. Progress in interventional techniques has improved prognosis in diagnosed FBA [2]. The penetration

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syndrome, however, may be overlooked by parents, and is often followed by an asymptomatic phase which delays diagnosis. Delay in diagnosis, and hence in treatment, may have serious consequences; the index of suspicion should be high.

The present study analyzed our experience in the Hôtel-Dieu de France tertiary care center over the last 12 years. The aim was to identify the spectrum of clinical and radiological manifestations of FBA, to determine the causes of diagnostic delay and thereby improve management. Results were compared with those of a study performed in our center in 1997, to study the evolution of FBA in the Lebanese population [1,3].

Patients and methods

A retrospective study included 106 files of patients aged less than 15 years admitted to the Hôtel-Dieu de France university hospital (Beirut, Lebanon) between 1998 and 2010 for flexible and/or rigid bronchoscopy for suspected FBA.

Data collection

For each of the 106 records, 42 parameters, divided into seven sections, were studied:

- demographic data;
- description of foreign body;
- diagnosis: symptoms, clinical signs, radiological signs;
- treatment: bronchoscopy type, date and duration; any difficulties, and their causes;
- intervention: anesthesiological and operator (ENT or pneumologist) factors;
- postoperative course: postoperative chest X-ray and results, FB-related complications, bronchoscopy-related complications, duration of hospital stay, sequelae, antibiotic and corticosteroid regimes, need for control endoscopy;
- parent education - prevention: circumstances of accident, reasons for delay if consultation later than 24 hours.

Statistics

A dedicated data-base was constructed under Microsoft Access 2003®. Qualitative variables were analyzed by χ^2 test and χ^2 test for trend, Kruskal-Wallis test for non-parametric multiple comparison, Fisher exact test for small-sample comparison, and Student t test for quantitative variables. All tests were two-tailed. The significance threshold was set at $p < 0.05$. Analysis used Epi Info™, Version 3.3.2, software.

Results

Thirty-eight of the 106 patients admitted for suspected FBA were girls, and 68 boys: sex-ratio, 1.8. Patients were divided into three age groups: 56.6% were in the one to three-years group; 22.6% of bronchoscopies were negative; 73% of FB locations were bronchial, with 60% right-side incidence; six were tracheal and three subglottic.

Fig. 1 shows time to admission in the Emergency Department. 17.8% of patients presented with superacute

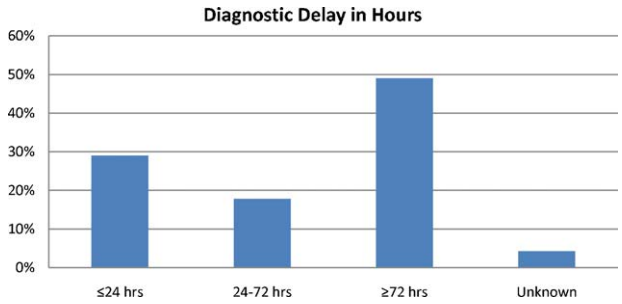

Figure 1 Diagnostic delay after presumed aspiration syndrome.

penetration syndrome. Penetration syndrome was identified on parent interview in 81% of cases. Table 1 shows presenting symptoms and clinical signs.

Chest X-ray was normal in 21.8% of cases, showed ipsilateral obstructive emphysema in 46%, and ipsilateral atelectasia with or without compensatory contralateral hyperinflation in 13.3%. Five of the retrieved FBs were radio-opaque (two pins, one needle, one thumbtack, and one apricot stone).

Among the children, 23.5% showed an aspect of lower airway infection, 56% of which were within seven days of the presumed aspiration.

All patients admitted with suspected FBA underwent rigid bronchoscopy under spontaneous ventilation, performed by pediatric airway specialists (ENT or pneumology); 15% required switchover to assisted ventilation due to peroperative complications such as bradycardia or desaturation.

One 3-year-old who presented two hours after inhaling a snail developed non-lesional edema requiring four days' mechanical ventilation, leading to sequela-free recovery. Otherwise, there were no major postoperative complications except for eight cases of spontaneously resolving subglottic edema due to difficult and prolonged intervention (multiple FB fragments). In 12% of cases, rigid bronchoscopy was preceded by flexible bronchoscopy, due to low initial suspicion. Thirteen of the negative rigid bronchoscopies had been preceded by flexible bronchoscopy; in five of these, no FB had actually been found but uncertainty remained in view of secretion.

Intervention was judged to be difficult in 39.5% of cases; granuloma was implicated in 64% of these. 58% of patients received postoperative antibiotic or corticosteroid treatment, continued after discharge home. 85% of patients had same-day discharge.

Control chest X-ray followed bronchoscopy in 86% of patients; 84% showed no further radiological signs such as pneumothorax or pneumomediastinum, 13% showed signs such as pulmonary or peribronchial edema.

Cases in which significant inflammation was observed peroperatively were re-examined by flexible bronchoscopy at three weeks to rule out bronchial stenosis.

Two main reasons for more than 24-hours' delay in diagnosis were found:

- misdiagnosis: 64% of patients seen more than 24 hours after aspiration were initially treated according to another diagnosis. In most such cases, penetration syn-