

# Tracheobronchial Foreign Body in Children with an Insidious Medical History

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## ABSTRACT

This study explored the clinical features of tracheobronchial foreign bodies (TFB) in children lacking both a foreign body aspiration history and bronchial cut-off signs on imaging. This study was conducted between 2011 and 2021, including 45 children without a choking history or tracheal interruption on CT scans. Common symptoms were cough and wheezing (91.1%, 41 cases), followed by decreased breath sounds (55.6%, 25 cases), rales (48.9%, 22 cases), and wheezing (42.2%, 19 cases). Prior to TFB confirmation, bronchopneumonia was the prevalent diagnosis (88.9%, 40 cases). Vegetable matter was the most frequent foreign body type (75.6%, 34 cases), primarily located in the right main bronchus (31.1%) and left lower lobe bronchus (22.2%). TFB in children with obscure medical histories presents non-specifically, highlighting bronchoscopy's pivotal role in diagnosis and treatment.

**Key Words:** Bronchoscope, Paediatrics, Tracheobronchial foreign body, Diagnosis.

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Tracheobronchial foreign bodies (TFB) are a common emergency in paediatrics, with imaging detection rates varying from 73.9 to 99.8%. Imaging is the preferred method for children with known or suspected foreign body aspiration.<sup>1</sup> However, some cases, termed occult tracheobronchial foreign bodies (OTFB), are diagnosed only after bronchoscopy, despite no reported aspiration history or bronchial cut-off signs in imaging. The exact definition of OTFB remains unclear. So, this study aimed to provide descriptive statistics on such cases for future researches.

This retrospective observational study was conducted at Nanjing Children's Hospital, from September 2011 to December 2021. Since the study reviewed the past cases, it did not require IRB approval or patients' parents informed consent. The study included children who denied any history of foreign body choking and showed no tracheal interruption signs on CT scans.

The cases were selected based on medical records indicating no history of foreign body aspiration. Cases with visible foreign bodies or bronchial cut-off signs in CT scans were excluded. Age, history duration, main complaints, physical exam findings, imaging outcomes, and complications in these children were quantified and expressed as counts and percentages, undergoing descriptive statistical analysis.<sup>2</sup> Statistical analyses were performed using SPSS software version 20.

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This study included 45 children (28 males, 17 females), between the ages of 8 months to 12 years, with a median age of 28 months. Common symptoms were cough (41 cases, 91.1%), wheezing (41 cases, 91.1%), expectoration (22 cases, 48.9%), and hoarseness (3 cases, 6.7%). Physical examination findings included wheezing (19 cases, 42.2%), decreased breath sounds (25 cases, 55.6%), rales (22 cases, 48.9%), and normal findings (4 cases, 8.9%). Before OTFB diagnosis, bronchopneumonia (41 cases, 91.1%) was the most frequent initial diagnosis, followed by bronchial asthma (2 cases, 4.4%), acute laryngitis (1 case, 2.2%), and pulmonary tuberculosis (1 case, 2.2%). The disease duration varied from 7 days to 2 years, with a median of 2.2 months. Common CT findings included pulmonary consolidation (29 cases, 64.4%) and emphysema (26 cases, 57.8%), along with atelectasis (6 cases, 13.3%) and no abnormalities (3 cases, 6.7%). Foreign body removal time ranged from 15 minutes to 2 hours, averaging 55 minutes. The right main bronchus (31.1%) and left lower lobe bronchus (22.2%) were the most frequent foreign body locations, with a lower incidence in the upper lobe bronchi (4.4%). Table I lists the common foreign body locations. The predominant shapes of the foreign bodies were clumps (31 cases, 68.9%), flakes (12 cases, 26.7%), and hollow columns (2 cases, 4.4%). Plant-based foreign bodies were most common (37 cases, 82.2%), followed by mineral and synthetic materials (8 cases, 17.8%). Among these patients, 77.7% (35 cases) developed bronchial complications, including granulation hyperplasia (22 cases, 48.9%), mucosal hyperplasia (12 cases, 26.7%), and bronchiectasis (1 case, 2.2%).

Tracheobronchial foreign bodies (TFBs) are prevalent in paediatric otorhinolaryngology, constituting 7.9-18.1% of accidental injuries in children aged 0-14 years. Recent advancements in imaging techniques and increased parental awareness have significantly enhanced TFB diagnosis.<sup>3</sup> Yet, TFBs with subtle

presentations, termed 'occult tracheobronchial foreign bodies' (OTFB), remain challenging. OTFBs are characterised by a lack of reported aspiration history and the absence of bronchial cut-off signs on imaging studies.<sup>4</sup> Between 2011 and 2021, the hospital treated 1,023 children with TFBs, of which 45 (4.4%) met the criteria for OTFBs, highlighting their rarity.

**Table I: The common sites of OTFB.**

Location	Number of cases	Percent
Main trachea	2	4.4%
Left main bronchus	5	11.1%
Left upper lobe bronchus	2	4.4%
Left lower lobe bronchus	10	22.2%
Right main bronchus	14	31.1%
Right upper lobe bronchus	2	4.4%
Right lower lobe bronchus	6	13.3%
Right middle lobe bronchus	4	8.9%

This raises a question: Why do children with OTFBs often lack typical signs of tracheal interruption on CT scans? There may be many reasons including disease duration, airway anatomy, composition of foreign body, and technical reasons.<sup>5,6</sup> In prolonged cases, severe tracheal inflammation, wall swelling, and increased secretions, combined with foreign body decay, can obscure opacities. The smaller, more elastic tracheas in children, which change significantly with breathing, result in poorer image quality than adults. Especially, foreign bodies in the narrow subglottic area are more likely to be missed. Movement artefacts from coughing and breathlessness in uncooperative or inadequately sedated children can overlap with foreign body opacities, leading to missed diagnoses. Improper parameter settings can impede accurate three-dimensional reconstruction, hiding foreign bodies. Thin, flaky (melon seed shells, longan shells, shrimp skins) or hollow objects (whistles, dried peppers) minimally impact ventilation and show no significant signs of bronchial obstruction. Low-density materials like plastic films are hard to distinguish from secretions on CT.

Common CT findings in this study were pulmonary consolidation, emphysema, and atelectasis, in some children (6.7%) showing no abnormalities. In cases of long-term pneumonia with symptoms such as cough, wheezing, or dyspnoea, bronchoscopy is recommended to rule out TFBs.

OTFBs, often lacking a clear medical history, can lead to serious complications if the illness is prolonged, posing a significant risk to paediatric health. Therefore, heightened awareness among physicians about TFBs is crucial. In cases of recurrent bronchial pneumonia, cough, and wheezing in children, even without bronchial cut-off signs on imaging, prompt bronchoscopic examination is recommended. This approach not only identifies the

underlying cause but also mitigates the risk of long-term complications.

#### **PATIENTS' CONSENT:**

The consent has been obtained from the guardians of all paediatric patients involved in the study. The guardians have been fully informed about the nature of the research and the potential publication of the findings. They have provided their written consent for the inclusion of the children's medical data in this study and for the publication of the related clinical information.

#### **COMPETING INTEREST:**

The authors declared no conflict of interest.

#### **AUTHORS' CONTRIBUTION:**

XZ: Proposed the idea and wrote the manuscript.

QS: Reviewed the article and revised the manuscript.

Both authors approved the final version of the manuscript to be published.

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