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Analysis of related factors for the retention time of tracheobronchial foreign bodies in pediatrics

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ABSTRACT

Background: This study aims to investigate the related factors for the retention time of tracheobronchial foreign bodies in infants and children, to provide help for the assessment of the disease, surgical risk, and prognosis.

Materials and methods: The clinical data of 1060 patients with tracheobronchial foreign bodies from January 2015 to December 2015 were retrospectively studied, and the correlation of the retention time of foreign bodies with age, gender, preoperative complications, granulation formation, operation time, and hospital stay was analyzed.

Results: The retention time of foreign bodies was not correlated with age ($r = 0.041$, $P = 0.194$) and gender ($r = 0.039$, $P = 0.214$) but was correlated with preoperative complications ($r = 0.072$, $P = 0.023$), granulation formation ($r = 0.134$, $P < 0.001$), operation time ($r = 0.112$, $P < 0.001$), and hospital stay ($r = 0.189$, $P < 0.001$).

Conclusions: The retention time of foreign bodies was closely correlated with granulation formation, preoperative complications, operation time, and hospital stay.

Introduction

Tracheobronchial foreign bodies are one of the most common life-threatening emergency diseases in pediatric otolaryngology and are also a worldwide health problem.[1] Because of factors such as anatomy, physiology, dietary habits, and infantile curiosity, approximately 80% of tracheobronchial foreign bodies occur in 1-3 y-old infants and young children, the severity of its harm mostly depends on the nature and location of the foreign bodies, the degree of obstruction caused by the foreign bodies, and the short-term and long-term respiratory complications caused by foreign body retention.[2-6] The common complications include recurrent pneumonia, emphysema, atelectasis, bronchiectasis, or even death.[7,8] Timely and accurate diagnosis and treatment are particularly important for preventing complications and accidents. Although the knowledge education about the harm of tracheobronchial foreign bodies has been constantly popularized, the number of children with tracheobronchial foreign bodies has not decreased. Therefore, tracheobronchial foreign bodies remain an urgent emergency that clinicians must focus on. Various studies have been conducted on tracheobronchial foreign bodies,[9-11] but the analysis of related factors for foreign body retention time has not been reported. The present study analyzes the related factors for the retention time of foreign bodies.

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Data and methods

Clinical data

The clinical data of 1060 children, who were diagnosed with tracheobronchial foreign bodies and underwent rigid bronchoscopy in Nanjing Children's Hospital Affiliated to Nanjing Medical University from January 2015 to December 2015, were collected. Inclusion criteria: (1) children with or without a clear history of foreign body cough; (2) children with clinical manifestations of cough, asthma, fever, dyspnea, and so on; (3) children with weakened respiratory sound, heavy double lung breath sounds, wheezing sound, and dry and moist rales, as revealed by lung auscultation; (4) children with emphysema, atelectasis, and pneumonia, as revealed by chest computed tomography (CT); (5) children with an obstruction shadow of the foreign body in the airway, as revealed by the three-dimensional image reconstruction of the trachea and bronchus. Exclusion criteria: (1) patients with foreign bodies ejected by cough after admission to hospital; (2) patients with a history of asthma and acute upper respiratory tract infection; (3) patients in whom the foreign body could not be taken by rigid bronchoscopy and needs to be transferred to other departments. The correlation of foreign body retention time with age, gender, granulation formation, preoperative complications, operation time, and hospitalization stay was analyzed. This study was conducted in accordance with the declaration of Helsinki. This study was conducted with approval from the Ethics Committee of Children's Hospital of Nanjing Medical University (Approval No.201601001-1). Written informed consent was obtained from all participants.

Therapeutic methods

Patients were treated with bronchoscopy and foreign body removal under general anesthesia within 24 h after admission. Anesthesia was induced by the sequential intravenous injection of 0.1 mg/kg of midazolam (batch number: 20130480; Jiangsu Nhwa Pharmaceutical), 0.3 mg/kg of dexamethasone (batch number: 1208176412; Shandong Cisen Pharmaceutical Co, Ltd), and 2 mg/kg of propofol (batch number: KA500; AstraZeneca, Italy). After 30 s, a slow intravenous injection of 3 μg/kg of fentanyl (batch number: 2121130; Yichang Renfu Pharmaceutical Co. Ltd, Hubei, China; finished in 60 s, retained spontaneous breathing) was given, and 100 $\mu g/kg^{-1}$ min^{-1} of propofol was given for maintenance. After 4-6 min, the epiglottis was picked up by an anesthetic laryngoscope, and 1% lidocaine (batch number: 7A99J1; China Otsuka Pharmaceutical Co. Ltd) was sprayed into the trachea while breathing to fully anesthetize the trachea. After 8 min, the operation began. Surgical procedures: A rigid bronchoscope (KARL STORZ, Germany), which was chosen according to the age of the patient, was inserted through the larynx. The bronchoscope entered the trachea and bronchus to remove foreign body. Granulation was also removed if found. If the mucous membrane was bleeding or the foreign body was broken, 2 mL of 1% hydrochloric lidocaine solution containing adrenalin hydrochloride (1:100,000, batch number: 1606161; Suicheng Pharmaceutical Co, Ltd) was given for alveolar lavage. After 30 s, the lavage fluid was sucked using 50-70 mmHg of negative pressure, and the trachea and bronchus were repeatedly flushed until the tracheobronchial lumen was completely unobstructed. Electrocardiogram and blood oxygen saturation were monitored during the operation. Intravenous administration and atomization inhalation of antibiotics and hormones were given after the operation. Chest fluoroscopy was performed at the third day after the operation. If no obvious abnormality was found, the patient was discharged from the hospital.

Statistics analysis

Data were statistically analyzed using statistical software SPSS 19.0. The rank correlation coefficient was used to describe the correlation between two quantitative variables or between quantitative variables and classified variables in non-normal distribution. For the correlation analysis of two classified variables with at least one unordered categorical variable, the independence of two attributes was first evaluated using χ^2 test, according to the contingency tables with cross-classified data. Then, the correlation coefficient was calculated. The inspection level for the present study was set at $P = 0.05$.

Results

Age distribution

Among these 1060 infants and children, the youngest infant was 6 mo old, and the oldest child was 9 y and 11 mo old. Furthermore, 96 infants were ≤1 y old, accounting for 9.1%; 734 children were >1 y old and ≤2 y old, accounting for 69.2%; 151 children were >2 y old and ≤3 y old; accounting for 14.2%; and 79 children were >3 y old, accounting for 7.5% (Table 1).

Gender distribution

Among these 1060 infants and children, most of the infants and children were male. That is, 682 infants and children were male, accounting for 64.3%, whereas 378 patients were female, accounting for 35.7% (Table 2).

Distribution of retention time of tracheobronchial foreign bodies

Among these 1060 infants and children, the retention time of foreign bodies was ≤1 d in 328 patients, accounting for 30.9%; the retention time of foreign bodies was >1 and ≤3 d in 398 patients, accounting for 37.5%; the retention time of foreign

Table 1 – Age distribution of children with tracheobronchial foreign body.

Age	Frequency	Valid percent	Cumulative percentage
≤1	96	9.1	9.1
>1～≤2	734	69.2	78.3
>2～≤3	151	14.2	92.5
>3	79	7.5	100.0
Total	1060	100.0	