

Research Article

# Laryngo-Tracheo-Bronchial Foreign Bodies: Assessment of 10 Years of Activity at the Luxembourg Mother-Child University Hospital

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## Abstract

**Aim:** Study the epidemiological, clinical and therapeutic aspects of laryngo-tracheo-bronchial foreign bodies. **Materials and method:** This was a retrospective cross-sectional study which focused on 41 cases of laryngo-tracheo-bronchial foreign bodies collected at the Mother-Child University Hospital Center “Le Luxembourg”, from March 31, 2013 to March 31, 2023. **Results:** Forty-one cases of laryngo-tracheobronchial foreign bodies were collected. The male gender represented 65.9%. Children under 2 years old accounted for 56.1%. The reasons for consultation were dyspnea in 73.2% and cough in 26.8%. The consultation time was 51.2% in the first 48 hours with extremes of 6 hours to 11 months. The history revealed a penetration syndrome in 78% of cases. The complementary examination of first resort was the front and lateral chest radiography. He did not visualize a foreign body in 75.6% of cases. Endoscopy was performed in all cases except for one case who died during transfer to the emergency room. The location was the right main bronchus in 63.4% of cases. The foreign bodies were organic in nature in 70.7% and 21 cases of peanut seed was found (51.21%). The postoperative course was simple in all cases under antibiotic-corticotherapy treatment. **Conclusion:** Laryngo-tracheo-bronchial foreign bodies predominate in young children. The most suggestive sign is penetration syndrome. The extraction must take place in the best conditions with a team experienced in this exercise.

## Keywords

Foreign Bodies, Larynx, Bronchi, Child, Mali

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## 1. Introduction

Laryngo-tracheo-bronchial foreign bodies (FB) are common in children and rare in adults [1]. Their inhalation occurs accidentally. They constitute one of the causes of the most potentially fatal respiratory emergencies in pediatric ENT [2, 3]. Deaths can occur before or during endoscopic extraction maneuvers under general anesthesia. They are attributable to a permanent risk of airway obstruction. However, our countries suffer enormously from a lack of technical capacity capable of meeting the health problem challenges that concern us [4]. The care of a child with a foreign body (FB) of the lower respiratory tract in a tropical zone faces numerous constraints [1, 4]. The existence of nearby and/or accessible infrastructure adapted to the management of these domestic accidents constitutes the first challenge. The long consultation period, the lack of knowledge of the diagnosis and therefore of the care by parents and unqualified professionals constitute another handicap. Added to this is the availability of the operating room, the staff involved in the care as well as endoscopy and anesthesia-resuscitation equipment. The objective of this work was to report our experience in their care.

## 2. Materials and method

The study was carried out in the ENT and head and neck surgery department of the Mother-Child University Hospital Center "Le Luxembourg" in Bamako, Mali. This was a retrospective cross-sectional study carried out over 10 years (from March 31, 2013 to March 31, 2023). The inclusion criteria were any patient seen in medical consultation and in whom a laryngo-tracheo-bronchial foreign body had been diagnosed. Consent was obtained after a clear explanation to the parents for children and directly to the patient when it was adults. Complicated cases after extraction done in another department were not included as well as non-consenting patients. The variables studied were: sex, age, location of foreign bodies, reason for medical consultation, nature of foreign bodies and treatment.

## 3. Results

Children under 2 years old represented 56.1% (Table 1). The youngest of our patients was six months old and the oldest was 21 years old.

**Table 1.** Distribution of patients according to age group.

Age range	Effective	Frequency (%)
[0-28 Days[	0	0
[29 D-23 Month[	23	56.1%

Age range	Effective	Frequency (%)
[24 Months-59 Months[	9	22.0%
[6 Years-12 Years[	6	14.6%
[12-18 Years[	2	4.9%
Sup. at 18 years old	1	2.4%
Total	41	100.0%

NB: 0-28 Days: Newborn, 29 D-23 Months: Infants. 24 Months-59 Months: Early childhood. 6 Years-12 Years: Big child. 12-18 Years: Adolescence. Sup at 18: Adult.

The average age was 40 months and 27 days. Boys represented 65.9% and girls 34.1%. Patients were referred to us in 65.7%. The reasons for consultation were dyspnea in 73.2% and cough in 26.8%. The consultation time was 51.2% in the first 48 hours with extremes of 6 hours to 11 months (Table 2).

**Table 2.** Distribution of patients according to the duration of progression of the disease.

Evolution duration	Effective	Frequency (%)
0-2 Days	21	51.2%
2-4 Days	6	14.6%
4-7 Days	5	12.2%
7-21 Days	4	9.8%
21-90	1	2.4%
3-6 Months	1	2.4%
6M- 1 year	1	2.4%
Total	41	100%

The notion of penetration syndrome was found in 78% of patients. The complementary examination of first resort was the chest X-ray in front and in profile. He did not visualize a foreign body in 75.6% of cases. Endoscopy was performed in all cases except for one case who died during transfer to the emergency room. All our patients benefited from antibiotic-corticosteroid therapy. The location was the right main bronchus in 63.4% of cases. Other locations in the left main bronchus, trachea and larynx represented 17.1%, 17.1% and 2.4% respectively. Foreign bodies were of organic nature (Table 3) in 70.7% and 21 cases of peanut seeds (Table 4) were found (51.21%).

**Table 3.** Distribution according to the nature of foreign bodies.

Nature of the FB	Effective	Frequency (%)
Organic	29	70.7
Metallic	3	7.3
Plastic	4	9.8
Others	5	12.2
Total	41	100

Others = balloon deflator (2 cases), thumbtack (2 cases), piece of glass (1 case).

**Table 4.** Distribution according to the type of foreign body.

Type of FB	Effective	Frequency (%)
Peanut seed	21	51.2
Pearl	3	7.3
Point	2	4.9
Thumbtack	2	4.9
Peanut shell	2	4.9
Fish bone	2	4.9
Balloon deflator	2	4.9
Corn	1	2.4
Grain of rice	1	2.4
Piece of sweet pea	1	2.4
T piece of plastic	1	2.4
Piece of glass	1	2.4
Wild vine thorn	1	2.4
Whistle	1	2.4
Total	41	100

The postoperative course was simple in all cases under antibiotic-corticotherapy treatment.

## 4. Discussion

Laryngo-tracheo-bronchial foreign bodies usually penetrate through natural pathways, either by inhalation or exceptionally by transverse migration, after ingestion [5]. The frequency of laryngo-tracheo-bronchial FB is relatively low in this study (41 cases in 10 years). Ouoba K in Burkina Faso had collected 96 and Diop in Senegal 95 in 10 years [6, 7]. However, it should be noted that the actual frequency of these accidents remains difficult to specify in Mali where health

structures and qualified personnel are insufficient. The technical platform is often deficient. Road infrastructure is unsatisfactory and patients' financial access to care is difficult. Added to this is the lack of awareness of the signs and the seriousness of this accident. The corollary is the frequency of complications from the first consultation due to delay in treatment [6, 8, 9]. However, progress is being made with the assignment of specialist doctors to <sup>2nd level</sup> Health Centers in Bamako. However, the rest of the country is waiting to be strengthened. Laryngo-tracheo-bronchial FB constitutes a pathology of young children with a maximum between 1 and 5 years of age with a very clear peak between 1-2 years of age. In our study 56.1% were less than 2 years old. These data agree with those of the majority of authors. [6, 9-12]. Several theories are proposed to explain these figures. During breastfeeding or breast feeding, newborns can breathe simultaneously thanks to the particular arrangement of their larynxes; this being located in a high position in relation to the esophageal mouth. While liquid food travels down the esophagus via the pyriform sinuses located on either side of the larynx, air inspired through the nose goes straight to the trachea [8]. When the child's diet becomes more solid, the level of the larynx goes down. When swallowing, the uvula tenses and obstructs the cavum. At the same time, the epiglottis descends and closes the laryngeal vestibule. After this maturation period, it is very difficult to swallow and breathe at the same time. During this transitional phase (6-18 months), when reflex systems are not functioning properly, FB inhalation occurs more frequently. It is also at this age that the child has the bad habit of putting everything he finds in his mouth without chewing it. The frequency of inhaled FB increases from the age of 5 months when manual grasping is possible at the same time as supervision by the mother or nurse is relaxed [6, 8]. Some authors put forward the hypothesis that the absence of molars in children is a contributing factor due to less good chewing of food. This also explains the rarity of Laryngo-tracheo-bronchial FB before 6 months. Our young patient was 6 months old. Male predominance is also classic [6, 8, 9, 11]. It is commonly explained by the livelier temperament of boys and the hypothesis of a slower maturation of the pharyngo-laryngeal junction in boys is put forward [6, 8]. The nature of the FB is an important factor to consider. There is a predominance of ECs of an organic nature, generally plant and often food. In France, 90% of organic FB are peanuts, hazelnuts or almonds [8]. In Tunisia, sunflower seeds are the most incriminated [11]. In our country, as in Burkina Faso, peanuts are more often the cause [6]. However, we know the more pejorative nature of this type of FB. These oleaginous FB can be responsible for bronchial inflammation, called peanut bronchitis, causing edema and parietal ulcerations. These inflammatory lesions can increase the entrapment of the EC and make extraction more difficult [13]. In the literature, the time taken to treat inhaled FB in industrialized countries varies from a few minutes to 8 weeks. A third to half of patients are treated within the first 24 hours. Less than a

third is seen beyond 3 days [8]. In our study, this delay was relatively long. The patients who were lucky enough to be seen by an ENT specialist within the first 48 hours were 51.2%. The maximum delay was 11 months. The key element in the diagnosis of inhaled FB is the concept of penetration syndrome. Common to all locations, it corresponds to the activation of respiratory defense reflexes which are the laryngeal spasm and the expulsion cough, reactions to FB [8]. This bout of coughing and choking resolves within a few seconds and then the symptoms resume within a variable period of time [4, 13]. When it is found in the history, the diagnosis is easy. It was found in 78% of cases in our series, 77% for K. Ouoba, 61% for F. Hamouda and 70% for A. Viot [6, 8, 11]. But it is not always obvious, and the first person to consult does not always think about it so that the delay in diagnosis is significant [6, 8, 9]. The only objective sign of Laryngo-tracheo-bronchial FB may be auscultatory asymmetry [4]. The location of the CE depends on the specific characteristics of the FB, but also on the position of the subject during inhalation and the age of the patient. It varies with size, shape, consistency, its rough surface or not and its stinging power. The smaller the FB, the greater the risk that it will remain unknown. In children, small ECs predominate in the right bronchus because of its larger diameter, its almost vertical axis and the greater volume of air going into the right bronchus during inspiration [8, 11]. This preferential location also results from childhood life. Children lie more on their sides. This position favors the migration of FB to the right. In comparison, in adults, the entrapment of the FB depends on the position of the shoulders at the time of the accident: the CE falls into the bronchus opposite the uppermost shoulder [8]. Tracheal and laryngeal locations are rarer [8, 11]. We found it at 17.1% and 2.4% respectively. Cervico-thoracic X-ray can help in the diagnosis of laryngo-tracheo-bronchial CE. The majority of authors recommend it except when the clinical state of the subject does not allow it [8]. If the FB is radiopaque, it is visualized directly on cervicothoracic radiographs [8]. However, a normal radiograph does not exclude the presence of FB. This normality is due to the radiolucency of food foreign bodies [1]. Radiological images of bronchopneumopathy, atelectasis or bronchus dilation constitute suggestive indirect signs [4, 14]. They often testify to a prolonged stay of the FB [14]. Radiography can also show localized obstructive emphysema, mediastinal deviation or, more rarely, pneumothorax, pneumomediastinum and subcutaneous emphysema [15]. Our Radios were normal in 75.6%. In Ouoba K's study, the radiograph was normal in 56.2% [6]. Virtual endoscopy using a spiral scanner is an excellent tool for diagnosing foreign bodies [15]. Some authors currently recommend suspending systematic bronchial endoscopy when virtual bronchoscopy by spiral scanner is normal [16]. The main limitations of this examination are the cost and the clinical condition of the child. Indeed, performing a virtual endoscopy during a spiral scanner can only be considered in a perfectly stable and cooperating patient. This

examination is therefore mainly useful in clinical situations where the diagnosis of FB is delayed. It then allows a more precise injury assessment to be carried out [15]. The treatment is medico-endoscopic. Medical treatment is based on corticosteroids and antibiotics as needed [4]. Endoscopy occupies a crucial place. Its goal is to extract the FB by natural means while avoiding complications [6, 8-12, 17]. Outside of a life-threatening emergency, the patient must be referred to a specialized environment [15]. It involves a correct technical platform including fountains of cold light, rigid endoscopes of different calibers adapted to the age of the child, magnifying optics, good suction and forceps and basket probes of different types chosen according to the nature, form and layout of the FB. This expensive and fragile equipment requires rigorous maintenance and regular renewal [9]. This endoscopy also requires close collaboration between a trained endoscopist and a child anesthetist, especially since several passages of the tube may be necessary if the FB which is too large must be fragmented: usual case of the peanut seed [1, 6]. General anesthesia in endoscopy represents a real challenge for the anesthetist who must guarantee correct oxygenation and ventilation in a child who presents with mechanical obstruction of the airways, while maintaining sufficient depth of anesthesia in order to prevent the occurrence of laryngospasm, bronchospasm or direct trauma secondary to endoscopic maneuvers [15]. Technical defects cause serious complications. The risks of endoscopy are currently estimated at 1% [6]. The majority of deaths during this endoscopy result from hypoxic cardiorespiratory arrest. In the other cases, they are secondary to bronchial rupture, severe bronchospasm or an infectious complication [18]. Tracheotomy is frequently performed, most often as an emergency in the face of paroxysmal laryngeal dyspnea in a child who has been struggling for several hours already [6]. For rare authors [8, 11], the flexible fiberoptic is of interest for the management of foreign bodies located in the periphery. But it exposes you to difficulties of varying severity; a displacement of the FB in a bad position making its extraction more difficult, insufficient control of the gesture, bronchial trauma. Surgical extraction is reserved for enclosed intrabronchial foreign bodies [11, 19]. Cases of unexpected, surprising and life-saving spontaneous expulsion have been described during coughing. This is a rare and exceptional event [20].

## 5. Conclusion

Laryngo-tracheo-bronchial foreign bodies predominate in young children, especially in their 2<sup>nd</sup> and 3<sup>rd</sup> years of life. The most suggestive sign is penetration syndrome depending on the age of the accident, the clinical picture takes on two different aspects. Chest radiography is a diagnostic aid with sensitivity that increases over time. However, its implementation must be careful not to put the patient's life at risk, by leading to dangerous mobilization of the FB or by delaying the life-saving procedure. The extraction of inhaled FB must

be carried out in the best possible conditions with a team experienced in this exercise. Prevention and education measures for patients and doctors are desirable in order to reduce the frequency of these potentially fatal accidents and also to reduce treatment times.

## Abbreviations

ENT: Ear Nose and Throat

FB: Foreign Body

## Author Contributions

**Youssef Sidibé** Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing

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**Mohamed Amadou Keita:** Validation, Writing - original draft

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## Conflicts of Interest

The authors declare no conflicts of interest.

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