

Foreign bodies in the pediatric age: the experience of an Italian tertiary care hospital

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Abstract. Foreign bodies in pediatric age represent an extremely frequent pathological condition and can undergo fearsome complications. Within the ENT area, foreign bodies in the pediatric age can be found in various districts such as external auditory canal, nasal passages, oral cavity, pharynx, larynx and trachea. They can be various and shape; generally, the main ones are buttons, beads, small parts of toys, caps of pens, pebbles, fragments of food bolus and others. As described in the literature, the main localizations are the external auditory canal and nasal cavities. Laryngeal and tracheal localization is infrequent but can be fatal. The aspiration of foreign bodies, mainly small parts of toys, occurs more frequently under three years age and mainly-especially in males. The experience of the ENT Department of the San Camillo-Forlanini Hospital in Rome, in the period between January 2007 and December 2018, consists a total of 1443 patients, aged between 0 and 14, who arrived in the emergency room with a foreign body diagnosis; of these, 613 (42.5%) were found with foreign body in the external auditory canal, 458 (31.7%) in nasal fossa, 298 (20.5%) in pharynx, 64 (4.4%) in oropharynx, and 10 (0.7%) in larynx and trachea. Treatment was in 1255 (87%) removal in the emergency room and home discharge, 79 (5.4%) with outpatient discharge, 40 (2.7%) need for hospitalization and surgery, 64 (4.4%) refusal of hospitalization and 1 case (0.07%) died in the emergency room. (www.actabiomedica.it)

Key words: foreign body, children, otorhinolaryngology

Introduction

Foreign bodies in pediatric age represent an extremely frequent pathological condition. Within the ENT area, foreign bodies in the pediatric age can be found in various districts such as external auditory canal, nasal passages, oral cavity, pharynx, larynx and trachea. Foreign bodies can be various and shape, the main ones being buttons, beads, small parts of toys, caps of pens, pebbles, fragments of food bolus, and others. The symptoms depend largely on the location and size of the foreign body. In particular, the most important complications are related to the characteristics of the foreign body to which particular attention must be paid for the therapeutic choice (1). Several authors report a mortality rate of 4% to 7% (2,3). Mechanical obstruction of the respiratory tract due to inhalation or aspiration of

foreign bodies is the primary source of fatal accidents in children under the age of one year and represents a major cause of death in children aged 1 to 4 years (4). It represents one of the main causes of sudden death.

Personal experience

The experience of the ENT Department of San Camillo-Forlanini Hospital in Rome, in the period between January 2007 and December 2018, consists of 1443 patients aged between 0-14 years, arrived in the emergency room with a foreign body diagnosis. Of these 613 (42.5%) with foreign body in the external auditory canal, 458 (31.7%) in nasal fossa, 298 (20.5%) in pharynx, 64 (4.4%) in oropharynx and 10 (0.7%) in larynx and trachea. The treatment adopted was 1255 (87%) removal in the emergency room and home dis-

charge, 79 (5.4%) with outpatient discharge, 40 (2.7%) need for hospitalization and surgery, 64 (4.4 %) refusal of hospitalization and 1 case (0.07%) died in the emergency room. In conclusion, we can affirm that in our casuistry, as well as in literature, the most documented incident is the foreign body in the external auditory canal, followed by those in nasal cavities.

Discussion

The site of greatest localization of foreign bodies in children is represented by the external auditory canal and the objects can be various, mainly inorganic. They may remain silent, if not referred to by the child, or manifest themselves instead with aurication, otorrhea, otorrhagia, and otodinia. The complications are represented by otitis externa, perforation of the tympanic *membrane* and dislocation of the ear chain. The diagnosis is based on otoscopy and otomicroscopy which allow to identify the type of foreign body, size, shape and to plan treatment. The extraction manoeuvres are based on the aid of chamfered hooks or pliers, in case of objects with irregular surfaces and prehensile edges. It is important to avoid gripping with unsuitable forceps, especially in case of rounded objects, due to the danger of pushing them deep, with the possibility of hesitating in complications. Sometimes the manoeuvre, based on the characteristics of the patient, is preferable to be performed in narcosis. The second most frequent location is represented in the nasal cavities. Also, in this case, they can remain silent if not reported by the child, in particular in case of objects with a smooth and non-irritating surface. Also, reflex phenomena can occur, including tearing, sneezing, serous rhinorrhea and headache, as well as pain in case of objects with sharp or pointed surfaces. Furthermore, whatever the nature or shape of the foreign body, unilateral nasal obstruction can occur with the possibility of mucopurulent rhinorrhea and blood streaks.

Diagnosis is based on anterior rhinoscopy and, eventually, rhinofibroscopy in case of posterior localization. The extraction manoeuvres are based on the aid of chamfered hooks or pliers, in case of objects with irregular surfaces and prehensile edges. It is essential to avoid gripping with unsuitable forceps, especially in

the case of round objects due to the danger of pushing them deeper with the possibility of inhaling or swallowing the foreign body.

Based on the location in the nasal fossa and on the patient's collaboration, it is possible to define the possibility of performing the procedure under local anaesthetic or in narcosis. The third most frequent location of foreign bodies in pediatric age is in the oropharynx, mainly represented by small objects, toys or food. They usually occur in moments of distraction during the game or while watching television and they must be removed immediately, as they can become complicated with ingestion or inhalation. In literature, it is reported that FB aspiration is observed mainly in children under 3 years of age and males (5,6). When the diagnosis of foreign body aspiration is delayed, the risk of complications and death is increased (7). In particular, a delay of more than 24 hours is associated with a risk of complication 2.5 times higher than an early diagnosis (8).

The location of arrest, the nature, and the degree of obstruction of the foreign body affect the children's clinical picture and the possible complications. Minor site of localization of foreign bodies is represented by the larynx, with extremely important and potentially fatal complications. Endoscopic surgery is often not possible due to lack of time.

The diagnosis and localization of the foreign body can be confirmed by radiography, in cases of radiopaque foreign bodies and by direct laryngoscopy with the diagnostic and therapeutic value being able to allow the removal of the foreign body. In cases where the foreign body is localized to the level of the bronchial tree, spontaneous attenuation or remission of the symptomatology can occur, with a free interval that can last months or years.

Late complications, in this case, are manifested by atelectasis, pulmonary abscesses, bronchiectasis that can occur even years later.

The unblocking manoeuvre is represented by the Heimlich manoeuvre. Possible therapeutic options are based on endoscopic removal with a flexible instrument, but more often with a rigid bronchoscope. Rigid bronchoscopy under general anaesthesia represents the best diagnostic and therapeutic method (5). It provides safe ventilation, better exposure to the foreign body and allows different sizes of pliers to be used. It must be

Our experience from 2007-2018

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LOCATION		HOME DISCHARGE	OUTPATIENT DISCHARGE	RECOVERY	REFUSES ADMISSION	TRANSFER TO ANOTHER STRUCTURE	DECEASED IN THE EMERGENCY ROOM
EAR	613 (42,5%)	521	62	14	16	0	0
NASAL CAVITIES	458 (31,7%)	398	10	15	35	0	0
PHARYNX	298 (20,5%)	271	7	4	12	4	0
LARYNX/ TRACHEA	10 (0,7%)	7	0	2	0	0	1
ORAL CAVITY	64 (4,4%)	58	0	5	1	0	0
TOTAL (N)	1443 (100%)	1255 (87%)	79 (5,4%)	40 (2,7%)	64 (4,4%)	4 (0,2%)	1 (0,07%)

Figure 1. Total number of foreign bodies at the ENT Department San Camillo-Forlanini, Rome, from 2007 to 2018

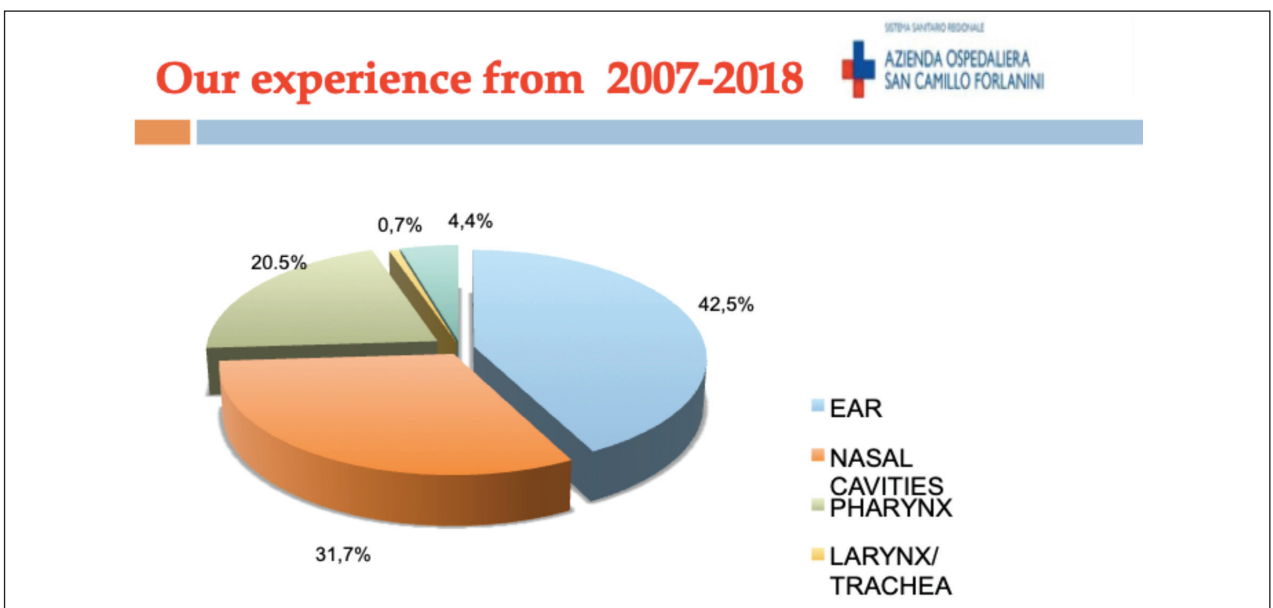


Figure 2. Percentage of foreign bodies at the ENT Department, San Camillo-Forlanini, Rome, from 2007 to 2018

performed without delay by qualified staff, appropriate tools and a period of fasting, except in emergencies (5,9). Due to the high risks and complications of this pathological condition, “The Susy Safe project” has

been created, which aims to establish a register of cases of foreign body injuries in children aged 0-14 (10).

Collect relevant, up-to-date, representative, accurate and systematic information relating to foreign

body injuries. This is a project co-funded by DG SANCO that collects data on foreign body injuries in all countries the EU and beyond and was established to create surveillance systems for choking injuries capable of providing a risk analysis profile for each of the products that cause the injury (11).

The main results showed: 16,878 foreign body injuries were recorded in children aged 0 to 14 in the SUSY SAFE databases; 8,046 cases were reported by countries outside the EU. Almost a quarter of cases involve very young children (less than one-year-old) with a foreign body located in the bronchial tract, which represented a serious threat to their health. In older children, the most common locations are ears and nose. The type of foreign body was specified in 10,564 cases. Food items represented 26% of cases, while non-food items were the remaining 74%. Among the food items, the most common were bones, nuts, and seeds, while for non-food items pearls, balls and marbles were more commonly observed (29%). The coins were involved in 15% of the non-food injuries and the toys accounted for 4% of the cases. In conclusion, this represents a data collection system that should be taken into account when calculating the risk of injury, to provide the European Commission with all relevant estimates of foreign body injuries (10).

Inhalation from foreign bodies as described represents an extremely frequent and formidable condition, which is why numerous studies are present in the literature on the risks and complications related to the introduction of foreign bodies in pediatric age in the upper aerodigestive tracts. A study conducted by the European Study group on Foreign Body Injuries (ES-FBI), conducted in the main pediatric hospitals of 19 European countries, aims to evaluate the characteristics of the foreign body (shape, volume, consistency), age and sex, location, details of hospitalization and onset of complications.

Between 2000 and 2003, a total of 2,094 foreign body injuries were recorded in children aged 0 to 14 years. Of these, 121 (5.8%) were due to toys (mainly toy parts) and 95 (4.5%) occurred in the aero-digestive tract; 58 children needed hospitalization. It has been assessed that the first determining factor of the damage that requires hospitalization is the rigidity of the object (11).

A further study, conducted by the same working group reports data from the Siriraj hospital, in Thailand, from June 2006 to 2010, compared with four other countries, such as Finland, Slovenia, Sweden, and Turkey. The results of this study: 172 cases were collected from the Siriraj hospital in Bangkok (Thailand) compared to the other centres, respectively Finland, Sweden, Slovenia, and Turkey, with a sample size of 307, 235, 104, and 196 cases respectively. All countries showed a higher male than female prevalence and lesions occurred more frequently in children younger than 3 years. The most frequent place of recovery was the digestive system (oesophagus) in Thailand (97 cases, 56.40% of the cases), while the European cases most frequently concerned the nose in Slovenia (58.65%), Finland (37.79 % of cases), and Sweden (54.47%). In the Turkish case series, the highest prevalence of cases involved the airways. In the Thai and Finnish case series, the main types of foreign bodies were bones (66 cases, 38.37%, and 48 cases, 15.64% respectively), while pearls, beads, and marble were the most frequent foreign bodies both in Slovenia (16.35%) and Sweden (35.32%). The case series in Turkey had nuts, seeds, and cereals as prevalent foreign matter (29%). In conclusion, it can be said that the nature of foreign bodies varies from country to country and depends on different cultural, social, religious and economic factors that include parental attitudes, eating habits, availability and types of potentially dangerous objects and prevention strategies (12).

Furthermore, an evaluation conducted by the same group assessed the impact in terms of direct costs of injuries in children caused by foreign bodies in the upper air and digestive tract. 2105 cases were collected from 2000 to 2002 in 16 European hospitals, one hospital for each participating country and referred to children aged 0 to 14 years with a foreign body diagnosis. The costs were based on the procedure of extraction of the foreign body and the duration of the hospitalization, based on the DRG. It has been found that the major cost of treating foreign body injuries is covered by ENT departments, which are usually the first choice of reference, directly by patients. The children had an average duration of stay (LOS) of 2.13 days (95% of C.I. 1.99-2.29). The treatment of the foreign body was associated with an average cost of 1017.37

euros (95% C.I. 963.27-1073.51). In the multivariate analysis, the highest costs are related to the method of arrival at the hospital on foot, the site of the lesion (ICD-933, ICD-934, ICD-935 in particular) and the use of surgery in the removal of the foreign body.

The results obtained show that lesions from foreign bodies represent a great threat not only about the clinical aspects but also from public health because their treatment is associated with high costs, in particular when surgery is required (13).

Conclusions

Our experience and literature show that most foreign bodies are of an inorganic nature and the risk of complications is highly related to the type of foreign body, such as rigid or semi-rigid objects or with sharp edges; they present a greater risk of perforation and laceration of the aerodigestive pathways, while small round-shaped objects increase the likelihood of inhalation. Most choking episodes occur during meal or play and generally occur under adult supervision (76.8%) (5).

The high presence of adults during the aspiration of foreign bodies shows that primary prevention plays a fundamental role. The need to develop primary prevention strategies is crucial, implementing educational programs aimed at parents and school collaborators, to emphasize the importance of children eating food and playing with toys that are suitable for their age (14).

Furthermore, primary prevention must also be extended to producers and consumer associations, to provide rigorous regulation on the production, packaging, quality control and marketing of dangerous objects.

Conflict of interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article

References

1. Passali D, Gregori D, Lorenzoni G, Cocca S, Loglisci M, Passali FM, Bellussi L. Foreign body injuries in children: a review. *ACTA Otorhinolaryngol Italica* 2015;35:265-271.
2. Foltran F, Ballali S, Rodriguez H, van As AB, Passali D, Gulati A, et al. Inhaled foreign bodies in children: a global perspective on their epidemiological, clinical, and preventive aspects. *Pediatr Pulmonol.* 2013;48:344-51.
3. Esteban Ibarz JA, Sáinz Samitier A, Delgado Alvira R, Burgués V, Prades P, González Martínez-Pardo N, Elías Pollina J. Aspiración de cuerpos extraños en la infancia. *Cir Pediatr.* 2007;20:25-8.
4. Reilly J, Thompson, MacArthur C, Pransky S, Beste D, Smith M, et al., Pediatric aerodigestive foreign body injuries are complications related to timeliness of diagnosis. *Laryngoscope* 1997;107:17-20.
5. Rodríguez H, Cuestas G, Botto H, Nieto M, Cocciaglia A, Passali D, et al. Demora en el diagnóstico de un cuerpo extraño en la vía aérea en niños. *Arch Argent Pediatr.* 2013;111:e69-73.
6. Sidell DR, Kim IA, Coker TR, Moreno C, Shapiro NL. Foodchoking hazards in children. *Int J Ped Otorhinolaryngol* 2013;77:1940-6.
7. Barrios JE, Gutiérrez C, Hernández E, Ayuso L, Roca A, García-Kuhn R. Consecuencias del retraso diagnóstico de la aspiración de cuerpo extraño. *Acta Pediatr Esp.* 2006;64:57-60.
8. Iversen RH, Klug TE. Need for more clear parental recommendations regarding foreign body aspiration in children. *Dan Med J.* 2012;59:A4498.
9. Gregori D. The Susy Safe Project. A web-based registry of foreign bodies injuries in children. *Int. J. Pediatr. Otorhinolaryngol.* 2006;70:1663-4.
10. The Susy Safe Working Group. *Int J Ped Otorhinolaryngol* 2012;76 (Suppl): S3-S11
11. Foltran F, Gregori D, Passali D, Bellussi L, Caruso G, Passali FM, Passali GC; ESFBI Study Group. Toys in the upper aerodigestive tract: evidence on their risk as emerging from the ESFBI study. *Auris Nasus Larynx.* 2011;38:612-7.
12. Chotigavanich C, Ballali S, Foltran F, Passali D, Bellussi L, Gregori D; ESFBI Study Group. Foreign bodies injuries in children: analysis of Thailand data. *Int J Ped Otorhinolaryngol.* 2012;76 (Suppl): S80-3.
13. Gregori D, Scarinzi C, Berchiolla P, Snidero S, Rahim Y, Stancu A, et al; ESFBI Study Group. The cost of foreign body injuries in the upper aerodigestive tract: the need for a change from a clinical to a public health perspective? *Int J Ped Otorhinolaryngol.* 2007;71:1391-8.
14. Foltran F, Passali FM, Berchiolla P, Gregori D, Pitkaranta D, Slapak I, et al. Toys in the upper aerodigestive tract: New evidence on their risk as emerging from the Susy Safe Study. *Int J Ped Otorhinolaryngol* 2012;76 (Suppl): S61-S66

Received: 9 October 2019

Accepted: 1 February 2020

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