Foreign Bodies in Non-Life Threatening Locations: A Risk Analysis of Nose and Ears Foreign Bodies in European Children

Dario Gregori*1.§, Francesca Foltran1, Giselle Cuestas2, Hugo Rodriguez2.§, Desiderio Passali3 and Paola Berchialla4.§

1 Labs of Epidemiological Methods and Biostatistics, Department of Environmental Medicine and Public Health, University of Padova, Italy
2 Endoscopy, Hospital de Pediatría Juan P. Garrahan, Garrahan, Buenos Aires, Argentina Buenos Aires, Argentina
3 Ear, Nose, and Throat Clinic, Policlinico Le Scotte, University of Siena, Italy
4 Department of Public Health and Microbiology, University of Torino, Italy

Abstract: Children with a foreign body (FB) in either the ear or nose commonly present to the hospital. We present a retrospective series of 1186 European cases of FB in ears or nose in children younger 14 years old, classified following the International Classification of Disease (ICD931 and ICD932). Data were collected through a case report form (CRF) during three years (2000-2002) according to four main characteristics (socio-demographic, ergonomic, related to the hospital’s management and to the circumstance of the injury). Overall, 610 (53%) sampled children were males. In 704 (71%) of cases, FBs were inorganic and among them about 36% were balls, marbles or beads. The study investigates FBs features and injuries circumstances that are associated to prolonged hospitalization and complications. The most dangerous FBs resulted in objects with rigid or semi-rigid consistency.

Keywords: Foreign body (FB), children, choking, ears, nose.

INTRODUCTION

Foreign body (FB) insertion, ingestion, aspiration and inhalation is a common and serious problem among children in pediatric age. Unlike FB inhaled into the lower airway [1, 2] or ingested [3, 4], the presence of a foreign body in the ear or nose is not life-threatening, but it may result in significant morbidity [5-8].

Nasal foreign bodies (NFBs) are commonly observed in pediatric setting since boredom, curiosity, interests in exploring their bodies make children more prone to lodging foreign bodies (FB) in their nasal cavities [9].

In scientific literature a wide spectrum of foreign bodies has been documented and, most frequently, FBs are identified as toys, sweets, jewels, rocks, batteries, and magnets. The presence of a FB in the nose is not usually life threatening [10], however, it may result in long-term complications and it could be responsible even of fatal outcomes if the object is dislodged into the airway. Foreign body (FB) insertion in external auditory canal (EAC) is not an uncommon event in emergency medicine [7]. Several factors in fact may lead children to insert foreign bodies intentionally into the ears including curiosity, the wish to explore the orifices of the body, fun-making, irritation caused by otalgia and attraction to small, round-shaped objects [11, 12].

Although not life-threatening, the placement or presence of foreign bodies in the ear canal and their subsequent removal can be a source of significant morbidity. This is particularly true in children because of smaller anatomic dimensions and a variable level of cooperation [13].

Despite the frequency and potential morbidity circumstance there is very little literature based on large series of ear foreign bodies in children [11, 14].

Because of the risks associated with FB injuries, public health authorities must to devote great attention to this issue [10] and joint efforts, including the implementation of surveillance systems such as the Susy Safe Registry [15], have been made in several countries to better understand the injuries due to the FB insertion or inhalation and to identify shared prevention standards. Particularly, the integration of information coming from different clinical setting and cross-cultural comparisons constitute a cornerstone of a monitoring activity aiming to identify risky FB and hazardous behavior, in order to implement normative and educational preventive strategies.

Unfortunately, while in scientific literature several papers describe clinical management of FBs [11, 16-19], data on follow up of patients after the foreign body extraction and thus on long terms outcomes are almost absent [20].

Based on a database of foreign body injuries, which occurred in European children aged up to 14 years in 2000-
2003, this paper will focus on the cases regarding ICD codes 931 (FB inside the ears) and 932 (FB inside the nose) to evaluate the causes of prolonged hospitalization and complication.

MATERIALS & METHODS

The European Survey of Foreign Bodies Injuries (ESFBI) is a retrospective study, aimed at collecting a great case database concerning FB injuries in the upper airways (the accidents referred to the International Classification of Disease, ICD-codes), as regards to European children, aged 0-14. The discharge records from 19 European hospitals were reviewed. Data were gathered in the capitals’ hospitals of 19 countries (Spain, United Kingdom, Germany, Switzerland, Austria, Italy, Belgium, Denmark, Finland, Sweden, Croatia, Slovenia, Greece, Slovakia, Czech Republic, Romania, Bulgaria, Turkey, Poland) and referred to the period starting from January, the 1st, 2000 and December, 31st, 2002 (whether available, also data from 2003 were considered).

Accidents, caused by the inhalation/ingestion/aspiration/insertion of FBs, were collected using a standardized Case Report Form (CRF).

The CRF encompassed four main aspects of the FB injuries: the characteristics of the children (age, gender), the characteristics of the object (shape, consistency and dimension), circumstances of injury (presence of parents, activity) and hospitalization details (length of stay in hospital, complications).

The coordinating centre received the data and made the quality case control in collaboration with the European Federation of Oto-Rhino-Laryngological Societies (EUFOS) board. Dedicated doctors checked for all cases that presented not sufficient integrity and accuracy, such as those records with discrepancies among the birth date of the injured child and the accident date or missed completion of mandatory fields [21].

Two outcomes were identified: (i) complications and (ii) prolonged hospitalization, which was defined on the basis of the length of stay (LOS) of 3 days, at least.

Descriptive statistics of the study sample were done using percentages and absolute numbers. Prolonged hospitalization and complications were analyzed using odds ratios and related 95% confidence intervals. Analyses were performed using R version 2.8 and Hmisc and Design libraries [22].

RESULTS

A total of 1186 European children had a foreign body injuries with the FB located in ears or nose. Among them, 51%...
were between 1-3 years old; 53% were males, according to previous studies [23, 24], which report a slightly higher incidence of FB injuries among males (Table 1).

Nineteen different objects were retrieved. Among them, 70% were inorganic, 55% had a spherical shape and 57% had a rigid consistency with volume ranging from 14 to 800 mm³.

Regarding the activity played by children immediately before the accident, playing is the most frequent (82%); also in the 64% of cases, adults were absent.

Among injured children, 86% did not require hospitalization; in the 34% of cases the foreign body was removed using endoscopy in Emergency Service.

Overall, 11% of the children experienced complications. The most frequent complication was inflammation of external meatus and perforation of tympanic membrane and infection of nasopharynx.

Surgery removal techniques showed anot significantly increased risk of complications than endoscopy (OR=1.17; 95% CI: 0.19-2.34); whereas 3D objects showed a significant increased risk of complicated injuries (with respect to spherical shaped foreign bodies) (O.R.=3.82, C.I. 2.39-6.10). Children older than three years old were at significantly greater risk of prolonged hospitalization (Table 1).

Inorganic foreign bodies were encountered more often in case of prolonged hospitalization (Table 1). Indeed they resulted associated with spherical and 3D shaped object and with rigid and semi-rigid consistency, which posed major risk of complicated injuries (Table 3).

A multivariable analysis for selecting predictors of prolonged hospitalization and complications was carried out. Shape and volume of the FB inserted its consistency along with organic/inorganic distinction, age and gender of the injured child, presence of complications (whether considering prolonged hospitalization as outcome) and the removal technique was considered as covariate for logistic regression model. After a backward selection procedure, age and shape of FBs were the only significant variable for predicting prolonged hospitalization and presence of complications (Table 3). In Fig. (1), probability of experiencing complications and having prolonged hospitalization is showed as function of age in the case of injuries due to 3D foreign bodies.

| Table 2. Foreign Bodies Features According to Inorganic/Organic Distinction |
|-----------------------------|-------------------|-------------------|-------------------|-------------------|
| N                           | Inorganic         | Organic           | Test Statistic    |
| N=825                       |                   |                   |                   |
| Shape : 2D                  |                   |                   |                   |
| 2D circle                   | 993               | 5% (36)           | 15% (41)          | P=0.001           |
| 3D                          |                   |                   |                   |
| other                       |                   |                   |                   |
| Spherical                   |                   |                   |                   |
| Consistency: Conforming     | 1034              | 11% (79)          | 39% (114)         | P=0.001           |
| Do not know                 |                   |                   |                   |
| Rigid                       |                   |                   |                   |
| Semi-rigid                  |                   |                   |                   |
| Volume                      | 453               | 33.49 113.04 267.95 | 54.0 82.0 189. | P=0.77           |

Test used: Chi-square test for shape and consistency and Wilcoxon test for volume.

| Table 3. Multivariable Model for the Predictors of Complications and Prolonged Hospitalization |
|-----------------------------------------------|-----------------------------------------------|
| Factor            | Complications | Prolonger Hospitalization |
|                  | OR            | 95% CI | OR | 95% CI |
| Age               | 3.19          | 1.67 6.09 | 1.76 | 0.14    | 22.81 |
| Shape             |               |         |     |         |       |
| 2D:Spherical      | 2.34          | 1.12 4.92 | 0.01 | 0.3     | 1.07E+22 |
| 2D circle:Spherical | 1.83       | 0.83 4.01 | 3.58 | 0.3     | 43.52 |
| 3D:Spherical      | 4.17          | 2.57 6.75 | 1.49 | 0.27    | 8.25  |
| other:Spherical   | 0.15          | 0.02 1.13 | 0    | 0       | 4.31E+40 |
| Consistency       |               |         |     |         |       |
| Conforming: Rigid | 1.34          | 0.74 2.43 | -    | -       | -     |
| Semi-rigid:Rigid  | 1.01          | 0.59 1.71 | 0.50 | 0.05    | 5.32  |

Predictors were chosen with backward selection after entering all variables in the model.
DISCUSSION

Inhalation and aspiration of foreign bodies maintain their connotation of high prevalence cause of injury in children. Unfortunately, FB injuries are a neglected epidemic and there’s a lack of sensibility in terms of recognition and acknowledgement of the FB injury risk; the constant evolvement of the FB typology, as new products reach the market, makes the information on product specific hazard and symptoms scattered; moreover, in most of the cases the diagnosis is difficult since symptoms are absolutely a specific [25].

Particularly, foreign bodies in the nose and in the ears produce local inflammation which may result in a pressure necrosis and damage the surrounding structure [26]. Nasal symptoms are mainly caused by inflammation, mucosal damage and extension into adjacent structures and could include sneezing, epistaxis, nasal obstruction, nasal discharge, pain, and eventually rhinosinusitis. Similarly, a FB in the ear may result in significant morbidity because of the small anatomic size and delicate skin of EAC and the thinness of the tympanic membrane [27].

In our case series the most frequent symptoms was bleeding and infections of external ear and nasal mucosa constituted well documented complications.

As observed elsewhere, the first determinants of a damage requiring hospitalization are the age of the child and the shape of the object; on the opposite, differently from the most common findings, food and organic FB appear to be less dangerous than inorganic FB, whose relative inert nature is believed to imply a mild tissue inflammation and a relatively quick response of the patient upon removal [28]. However, inorganic FB more frequently than food have shape and consistency identified as risky in our analysis.

Adult presence is not sufficient to prevent hazardous situations: in our experiences almost 90% of injuries happen under adult supervision stressing the evidence that preventive strategies imposing a regulation of industrial production, even if fundamental, are not sufficient and need to be integrated with other preventive intervention, addressed to improve parents consciousness and attention toward a proper surveillance of children.

Consciousness toward foreign body injuries in children is needed also in order to address the problem from the public health perspective. In fact, the economic impact of hospitalization and complication of FB injuries on public health costs [29] confirms that FB injuries need a public health approach to be tackled effectively.

THE ESFBI STUDY GROUP

Coordinating Center

Prof. Roberto Corradetti, University of Torino, Italy
Prof. Dario Gregori, University of Padova, Italy
Prof. Desiderio Passali, University of Siena, Italy
Dr Silvia Snidero, University of Torino, Italy

Austria

Prof. Albegger Klaus, Head of the ENT-Department, Salzburg, Austria
Dr. Huttegger Isidor, Universitätsklinik für Kinder- und Jugendheilkunde, Salzburg, Austria
Foreign Bodies in Non-Life Threatening Locations

Dr. Schulz Gernot, Universitätsklinik für Kinder- und Jugendheilkunde, Salzburg, Austria
Dr. Bauer Jan, Universitätsklinik für Kinder- und Jugendheilkunde, Salzburg, Austria

Belgium
Prof. Bertrand Bernard, Cliniques Universitaires UCL de Mont-Godinne, ENT Dept., Yvoir, Belgium

Bulgaria
Prof. Karchev Todor, University Hospital “Tzaritza Joanna”, Sofia, Bulgaria
Prof. Tzolov Tzolo, University Hospital “Tzaritza Joanna”, Sofia, Bulgaria

Croatia
Prof. Mladina Ranko, ORL Department, University Hospital Salata-KBC, Zagreb, Croatia
Dr. Kovac Lana, ORL Department, University Hospital Salata-KBC, Zagreb, Croatia

Czech Republic
Dr. Slapak Ivo, Pediatric ENT Department of Childrens University Hospital, Brno, Czech Republic

Denmark
Prof. Tos Mirko, Gentofte University Hospital of Copenhagen, Hellerup, Denmark
Prof. Per Caye-Thomasen, Gentofte University Hospital of Copenhagen, Hellerup, Denmark

Finland
Dr. Pitkäranta Anne, Helsinki University Central Hospital, Helsinki, Finland

Germany
Prof. Jahnke Volker, Charité Campus Virchow - Klinikum, Berlin, Germany
Dr. Göktas Önder, Charité Campus Virchow - Klinikum, Berlin, Germany

Greece
Prof. Nikola Simasko, Democritus University of Thrace, Ent Department, Alexandroupolis, Greece
Dr. Chroni Matilda, Agia Sophia Children Hospital, Ent Department, Athens, Greece
Dr. Dr Ioannis Christopoulos, Agia Sophia Children Hospital, Ent Department, Athens, Greece

Italy
Prof. Desiderio Passàli, Dept. of Otorhinolaryngology, University of Siena, Italy
Prof. Luisa Bellussi, Dept. of Otorhinolaryngology, University of Siena, Italy
Dr. Giulio Cesare Passàli, Dept. of Otorhinolaryngology, University of Siena, Italy

Poland
Prof. Chmielik Mieczysław, Department of Pediatric Otorhinolaryngology,
The Medical University of Warsaw, Poland

Romania
Prof. Sarafoleanu Dorin, Clinica ORL, Sfanta Maria Hospital, Bucharest, Romania
Dr. Sarafoleanu Codrut, Clinica ORL, “Sfanta Maria Hospital”, Bucharest, Romania
Dr. Dan Cristian Gheorghe, Clinica ORL, "Spitalul de Copii Marie Curie", Bucharest, Romania

Slovakia
Prof. Jakublicová Janka, Pediatric Otolaryngology Department of Medical Faculty of Comenius University, Bratislava, Slovakia

Slovenia
Prof. Žargi Miha, Department of Otorhinolaryngology and Cervicofacial Surgery, University Medical Centre, Ljubljana, Slovenia
Dr. Grošelj Aleš, Department of Otorhinolaryngology and Cervicofacial Surgery, University Medical Centre, Ljubljana, Slovenia
Dr. Matos Aleš, Department of Otorhinolaryngology and Cervicofacial Surgery, University Medical Centre, Ljubljana, Slovenia

Spain
Prof. Rubio Lorenzo, Jefe de la Unidad ORL - Hospital Ruber International, Madrid Spain
Dr. Cervera Javier, Hospital Niño Jesus, Madrid, Spain

Sweden
Prof. Stierna Pontus, Karolinska University Hospital Huttinge, Stockholm, Sweden

Switzerland
Prof. Pasche Philippe, Service ORL, Centre Hospitalier Universitaire Vaudois, Lausanne, Switzerland
Dr. Cherif Ahmed, Service ORL, Centre Hospitalier Universitaire Vaudois, Lausanne, Switzerland

Turkey
Prof. Önerci T. Metin, Hacettepe University, Dept. of Otorhinolaryngology, Ankara, Turkey
Dr. Çiftçi Arbay Özden, Hacettepe University, Faculty of Medicine, Dept of Pediatric Surgery, Ankara, Turkey
Dr. Doğan Riza, Hacettepe University, Faculty of Medicine, Dept of Cardiovascular Surgery, Ankara, Turkey
REFERENCES


