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Foreign bodies in the nose causing complications and requiring hospitalization in children 0-14 age: results from the European survey of foreign bodies injuries study*

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SUMMARY

Introduction: *The occurrence of foreign bodies (FB) in otorhinolaryngological practice is a common and serious problem among pediatric patients. The aim of this work is to characterize the risk of complications and prolonged hospitalization due to FBs in the nose in terms of the characteristics of the injured patients (age, gender), typology and features of the FBs, the circumstances of the accident and the hospitalization's details.*

Materials and methods: *A retrospective study of FB associated injuries, assessing the characteristics of the injured child and the FB, the circumstances of the accident and finally the hospitalization details took place on children aged 0-14 in major hospitals of 19 European countries.*

Results: *In total 688 cases were assessed. Complications and hospitalization occurred in 59 and 52 cases, respectively. Over 51% of patients were females. The median age of children who experienced a complication was four years. In the majority of cases FB removal was accomplished by means of a non-invasive technique (rhinoscopy with a nasal speculum or rigid fiberoptic endoscope. The majority of children were directly referred to the ENT department. The most common FBs associated with complications and hospitalization were nuts, seeds, berries, corn and beans, batteries and other inorganic objects such as broken parts of pens, paper clips and pearls. Over 38% of the injuries occurred under adults' supervision.*

Discussion: *FB injuries in the nose are commonly encountered in clinical practice. Even if the presence of a FB is not usually life threatening, it may result in long-term complications such as perforation of the septum. Because the risks associated with FB injuries, public education about this problem is recommended.*

Key words: foreign bodies, nose, case management, emergency care, child injuries

INTRODUCTION

The occurrence of foreign bodies (FB) in otorhinolaryngological practice is a common and serious problem among patients of pediatric age.

Unlike FBs inhaled into the lower airway, the presence of a FB in the ear or in the nose is usually not life threatening, but may result in significant morbidity [1,2].

In the nose, initial symptoms are sneezing, unilateral serous rhinorrhea and nasal obstruction that could eventually progress after few days to unilateral foul smelling purulent rhinorrhea [3]. Moreover the symptoms caused by FBs may progress to anterior or posterior epistaxis, septal perforation and rhinosinusitis [4]. Occasionally, patients may present with the complaint of foul breathing. According to their shape and consistency the FBs are usually found on the floor of the anterior or middle third of the nasal cavity if the foreign material was sniffed into the nose or coughed up into the posterior nasopharynx. The most commonly used techniques to remove them include mechanical dislodgement with a hooked probe or forceps, Fogarty or Foley balloon catheter or a suction catheter tip. Local injury and pain may occur during the FBs removal especially when the maneuvers are attempted without proper preparation or by untrained personnel [5,6].

In recent years, renewed attention has focused to the nasal FB

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epidemiology, emphasizing FB characteristics as well as case management [7-9].

The aim of this work is to assess the risk of complications and prolonged hospitalization due to FB in the nose in correlation with patients' characteristics (age, gender), typology and features of the FBs, the circumstances of the accident and the hospitalization details, as recorded in the ESFBI study.

MATERIALS AND METHODS

Sample

The European Survey on Foreign Bodies Injuries (ESFBI) Study collected data on FB injuries in the upper aero-digestive tract in children aged 0-14, from 19 European Hospitals (Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Finland, Germany, Greece, Italy, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, Swiss, Turkey and United Kingdom). Data on 2103 injuries that occurred in the years 2000-2002 were identified through International Classification of Diseases, Ninth Revision (ICD-9) codes listed on hospital discharge records. The current analysis was carried out on injuries in the nose (ICD932), for a total of 688 cases.

Case Report Form (CRF)

The CRF encompassed four main aspects of the FB injuries: the characteristics of the children (age, gender), the features of the object (shape, consistency, and dimension), the circumstances of injury (presence of parents, activity) and the hospitalization's details (lasting, complications and removal details).
Objects were characterized by size, shape and consistency, according to Rimell's classification [10]. With regard to size, when the dimensions (in mm) of the object were reported, the volume was calculated accordingly to the shape of the object. Such volume measures represent how much space the smallest geometrical figure containing the irregular-shaped FB occupies.
The CRF dedicated five questions on the associations of FBs with other objects, both at the time of the accident and when the product was purchased. These questions were recoded into a new variable for the purpose of highlighting the industrial problems of different product components.

We considered 5 different categories where objects were: (i) not an industrial component, (ii) a piece of an object: the FB was a broken part of the product (e.g. a broken part of a pen, the wheel of a toy car, etc.), (iii) present simultaneously with another object: when the objects were sold together (like the cap with the pen, the marble with a board game, etc.), (iv) a package or a part of a product package (e.g. the tinfoil containing a chocolate, a polystyrene ball, a piece of cardboard, etc.), (v) the inedible part of a FPCI (food product containing inedibles: stickers in crisps, toys in chocolate eggs, etc.). Where the association was not specified, we considered the non-food product as a single object and not an industrial component.

Outcomes

Two outcomes were identified: (i) complications and (ii) hospitalization.
Complications depend on the consequences of the FB injuries, including those arising during the attempt of FB's removal.
Hospitalization has been defined as more than one day of hospital stay. Hospitalization was generally required when general anesthesia was used in order to proceed with the extraction of the FB or in the case of uncooperative patients.

Statistical methods

Absolute and relative number of cases for categorical variables and interquartile range for continuous variables such as hospitalization and complications were correlated with patient's age and gender, hospitalization and length of stay, departments which admitted and discharged the injured child, removal methods and cost. The association between outcomes and FB types, dimensions and characteristics, co-presence, activity during the injury and the presence of adults was also assessed using unweighted odds ratios and 95% confidence intervals.
Analyses were performed using Design and Hmisc libraries from R version 2.4 [11].

RESULTS

Complications

Complications resulting from FB injuries were seen in 59 patients (Table 1). The median age of children who were subject to complications was four years whereas the median age of children who did not experience complications was three years. The children of three years or older had the highest incidence of complications (76%).
Threehundredtwentyone out of 612 children who had no complications, were referred directly to the ENT service, while 52 children were initially referred to the Emergency Department who subsequently referred them to ENT without attempting to remove the FB. Onehundredfour out of 608 children, who were not hospitalized, were successfully managed in the Emergency Department. Finally, 8 out of 59 cases with complications required hospitalization (Table 1).
FB extraction from the nose was mostly performed using nasal endoscopy through a nasal speculum or rigid fiberoptic endoscope, after decongestion of mucosa obtained with a topical vasoconstrictor-anesthetic, the instruments used during the removal maneuver were alligator or bayonet forceps, hooked probes, suction tubes, while sometimes sedation and/or general anesthesia was used.
Moreover, seven cases required already extraction in the ambulance, whereas three children discharged the FB spontaneously.
The most common complications were: purulent secretion and obstruction (27 cases), rhinitis (5), bleeding (7), pain on pressure of the nose (5), and infection of nasal mucosa (5). Two children experienced septal perforation.

Table 1. Distribution of the overall sample and according to the presence of complications and the hospitalization (for at least one day). Data are I quartile, median III quartile for continuous variables and percentages (absolute numbers). P-values are based on a F-test for continuous variables and on a Chi-square test for categorical variables.

			Presence of Complications			**Hospitalization**		
VARIABLE	*CATEGORY*	*N*	*No*	*Yes*	*Test*	*No*	*Yes*	*Test*
			(n = 551)	*(n = 59)*		*(n = 549)*	*(n = 52)*	
Gender	Female	681	51% (278)	49% (29)	p = 0.776	51% (279)	46% (23)	p = 0.474
Age		682	2/3/4	2.5/4/6	p < 0.001	2/3/4	2/3/4	p = 0.593
Age -class	≥ 3 years	677	55% (300)	76% (44)	p = 0.00268	57% (307)	61% (30)	p = 0.544
Foreign Body removal	Endoscopy	611	68% (373)	37% (22)	p < 0.001	70% (382)	17% (9)	p < 0.001
	Surgery		8% (42)	5% (3)		1% (7)	71% (37)	
	Other		24% (134)	58% (34)		29% (158)	12% (6)	
Hospitalization	Yes	601	8% (44)	14% (8)	p = 0.163			
Lasting class	1 day	49	92% (37)	86% (6)				
	2 days		5% (2)	0% (0)				
	3 days		2% (1)	14% (1)				
	more than 3 days		0% (0)	0% (0)				
Regime of hospitalization	Ordinary	279	5% (13)	50% (4)	p < 0.001			
	Day Hospital		12% (31)	25% (2)				
	Emergency Service		84% (225)	25% (2)				
First accident	Yes	607	98% (536)	93% (54)	p = 0.014	98% (531)	96% (50)	p = 0.181
How many accident	1	10	67% (5)	75% (2)	p = 0.778	78% (7)	0% (0)	p = 0.107
	2		33% (2)	25% (1)		22% (2)	100% (1)	
Type of transport for reach the hospital	In ambulance	598	2% (9)	2% (1)		1% (6)	10% (5)	
	By taxi or in a private car		62% (334)	79% (45)		62% (331)	79% (41)	
	By public transport		36% (194)	18% (10)		37% (195)	10% (5)	
	Walking		0% (2)	2% (1)		0% (2)	2% (1)	
	Other		0% (0)	0% (0)		0% (0)	0% (0)	
Department that look first after the child	ENT Dept	612	58% (321)	73% (43)		62% (339)	42% (22)	
	Paediatrics		14% (75)	22% (13)		15% (83)	6% (3)	
	Reanimation		0% (0)	0% (0)		0% (0)	0% (0)	
	Accident Emergency		28% (154)	5% (3)		23% (12 6)	52% (27)	
	Other		0% (0)	0% (0)		0% (0)	0% (0)	
Department that discharged the child	ENT Dept	608	80% (440)	98% (57)		81% (439)	98% (51)	
	Paediatrics		0% (2)	0% (0)		0% (1)	2% (1)	
	Reanimation		0% (1)	0% (0)		0% (0)	0% (0)	
	Accident Emergency		19% (104)	2% (1)		19% (103)	0% (0)	
	Other		0% (0)	0% (0)		0% (0)	0% (0)	
Cost		51	370.3/370.3/370.3	370.3/370.3/370.3	p = 0.447	370.3/370.3/370.3	1798.82/1798.82/1798.82	p < 0.001

Table 2. Distribution of the overall sample and according to the presence of complications and the hospitalization (for at least one day) with respect to the characteristics of the foreign body and the circumstances of the accident. Data are I quartile, median, III quartile for continuous variables and percentages (absolute numbers). Odds Ratio of complications and of hospitalization with the 95% confidence intervals are presented. P-values are also presented.

			Presence of complications				**Hospitalization**			
		n	*No* (*n* = 551)	*Yes* (*n* = 59)	*OR*	*p-value*	*No* (*n* = 549)	*Yes* (*n* = 52)	*OR*	*p-value*
Shape	Spherical	578	53% (277)	27% (13)	Ref		51% (266)	35% (17)	Ref	
	3D		20% (105)	52% (25)	5.07 (2.5-10.29)	< 0.001	21% (111)	35% (17)	0.42 (0.21-0.85)	0.0155
	2D		8% (40)	8% (4)	2.13 (0.66-6.86)	0.205	8% (39)	10% (5)	0.5 (0.17-1.43)	0.1947
	2D circle		9% (46)	12% (6)	2.78 (1.01-7.68)	0.0487	9% (47)	15% (7)	0.43 (0.17-1.09)	0.0756
	other		11% (59)	0% (0)	-	0.767	11% (55)	4% (2)	1.76 (0.39-7.83)	0.4593
First dimension		296	5/7/10	5/6/8	0.52 (0.3-0.89)	0.018	5/8/10	3/5/8	1.92 (1.04-3.54)	0.0381
Second dimension		103	3/5/8	3/4/5	0.44 (0.18-1.09)	0.0751	4/5/7	2/3/3	3.6 (0.92-14.07)	0.0659
Third dimension		87	3/4/6	2/3/4	0.4 (0.18-0.85)	0.0178	3/4/6	2/3/3	8.46 (1.83-39.03)	0.0062
Consistency	Rigid	576	56% (288)	27% (15)	Ref		54% (277)	62% (30)	Ref	
	Conforming		20% (102)	46% (26)	1.63 (0.83-3.2)	0.1562	20% (105)	25% (12)	0.95 (0.47-1.92)	0.8814
	Semi-rigid		25% (128)	27% (15)	1.3 (0.67-2.53)	0.44	26% (134)	12% (6)	2.42 (0.98-5.95)	0.0557
Copresence	No	680	85% (461)	74% (43)	Ref		84% (458)	80% (40)	Ref	
	Part of another object		10% (57)	19% (11)	2.07 (1.01-4.24)	0.0469	11% (60)	10% (5)	1.05 (0.4-2.76)	0.924
	Package		1% (5)	0% (0)	-	-	1% (3)	4% (2)	0.13 (0.02-0.81)	0.028
	Different objects		3% (19)	5% (3)	1.69 (0.48-5.95)	0.411	3% (19)	6% (3)	0.55 (0.16-1.95)	0.357
	FPCI		0% (2)	2% (1)	5.36 (0.48-60.33)	0.174	1% (3)	0% (0)	-	-
Volume		241	65.42/179.50/523.33	34.12/96/160	0.69 (0.42-1.13)	0.144	65.42/180/523.33	14.13/33.49/49.5	98.71 (5.05-1929)	0.0025
Adult presence	Yes	541	37% (181)	47% (25)	1.51 (0.85-2.67)	0.157	37% (179)	50% (22)	0.58 (0.31-1.09)	0.0896
Activity before	Playing	591	84% (451)	85% (46)	Ref		84% (452)	84% (37)	Ref	
accident	Eating		12% (63)	9% (5)	0.78 (0.3-2.03)	0.609	12% (63)	9% (4)	1.29 (0.44-3.74)	0.64
	Other		4% (21)	6% (3)	1.4 (0.4-4.87)	0.596	4% (20)	7% (3)	0.55 (0.15-1.92)	0.341
FB organic	Yes	684	32% (175)	31% (18)	0.96 (0.53-1.72)	0.888	32% (173)	29% (15)	1.11 (0.59-2.09)	0.7383
FB.Type	balls, marbles and beads	684	22% (112)	9% (5)	Ref		23% (128)	18% (9)	Ref	
	batteries		2% (9)	5% (3)	8.93 (1.84-43.5)	0.0067	1% (5)	12% (6)	0.06 (0.01-0.23)	<0.001
	buttons		2% (13)	2% (1)	2.06 (0.22-19)	0.5232	2% (13)	2% (1)	0.91 (0.11-7.79	0.9345
	coins		0% (2)	0% (0)	-	0.9375	0% (2)	2% (1)	0.14 (0.012-1.7)	0.1231
	foils and cellophane		1% (5)	0% (0)	-	0.9013	1% (4)	0% (0)	-	-
	food		6% (33)	2% (1)	0.81 (0.09-7.19)	0.8516	6% (32)	4% (2)	1.12 (0.231-1.698)	0.8839
	jewellery		1% (8)	2% (1)	3.35 (0.35-32.18)	0.2949	1% (8)	2% (1)	0.563 (0.0632-1.61)	0.6059
	nuts, seeds, berries, peas, corns and beans		15% (81)	19% (11)	3.64 (1.22-10.08)	0.0205	16% (85)	10% (5)	1.19 (0.387-1.3)	0.7564
	other inorganics		7% (39)	17% (10)	6.87 (2.22-21.3)	<0.001	7% (36)	24% (12)	0.21 (0.0823-0.54)	0.0012
	other organics		6% (35)	7% (4)	3.06 (0.78-12.01)	0.1084	5% (30)	12% (6)	0.35 (0.116-1.063)	0.0642
	paper		5% (26)	3% (2)	2.06(0.38-11.02)	0.4022	5% (26)	4% (2)	0.91(0.187-4.47)	0.9118
	pearls		4% (21)	0% (0)	-	0.7994	3% (19)	0% (0)	1.65 (0.52-5.22)	0.8707
	pebbles, stones and grit		9% (47)	7% (4)	2.28 (0.59-8.85)	0.2334	9% (51)	0% (0)	-	-
	pins, screws, needles and nails		1% (4)	2% (1)	6.7 (0.63-71.4)	0.1151	1% (4)	2% (1)	0.281 (0.0283-2.78)	0.2783
	plastic		5% (28)	12% (7)	6.7(1.98-22.64)	0.0022	6% (34)	4% (2)	1.19 (0.246-5.792)	0.8246
	stationery		1% (8)	7% (4)	13.4 (3-59.8)	<0.001	2% (12)	0% (0)	-	-
	toys		10% (53)	5% (3)	1.52 (0.35-6.57)	0.5775	10% (54)	6% (3)	1.26 (0.3298-4.85)	0.7314

The most common FBs associated with complications were nuts, seeds, berries, peas, corns and beans along with inorganic objects such as batteries, part of pen and paper clip. Most frequently, injury occurred during playing or eating (Table 2).

Hospitalization

Hospitalization occurred in 52 (8.7%) children, 23 of whom were females; 61% of the children who experienced a hospitalization were older than three year (Table1). In the 92% (45) of the cases the LOS was one day; moreover nobody was hospitalized for more than three days. Thirtytwo hospitalized children were treated in day hospital settings while 11 children in standard wards. Batteries and other inorganic objects like chewing gum, magnets and foam rubber were the most common FBs associated with hospitalization (Table 2).

DISCUSSION

Clinical findings

The majority of patients presenting with a nasal FBs were between 2 and 6 years old. In the 11% of cases nasal FBs have been described during oral ingestion. In this case, the FB migrates toward the upper respiratory tract after experiencing respiratory distress and/or a cough attack. Even an intense search aimed at the digestive and lower respiratory tract might miss the object and lead to the conclusion that the FB had disappeared. Consequently, the diagnosis can be delayed.

Only in the 38% of the ESFBI's reported cases the injury occurred in the presence of an adult. Children do not always inform their parents of a FB ingestion, which is subsequently diagnosed when complications occur, such as purulent rhinorrhea, bleeding, sneezing or obstruction [1,12].

Volumes of FB that were associated with hospitalization were significantly lower, mostly as a result of difficulties with object removal. However, lower FB volumes were not associated with an increased incidence of complications. In general, two-dimensional objects tended to be associated with a higher risk of hospitalization as compared to three-dimensional FBs. Taking as reference the spherically shaped objects, representing the most common category of FB observed, batteries, nuts, corn and other seeds in general pose a higher risk of complications, although this is not associated, for the latter, with a prolonged hospitalization. Twelve injuries were caused by batteries insertion. They were directly referred to ENT Department. Five cases were treated by endoscopy and other five cases required operation. The batteries were removed but there was a residual septal perforation in two cases. It is therefore recommended that batteries should be removed immediately to prevent long-term complications [13].

Consumer protection

Miniature batteries can be found in many electronic devices and toys, both easily available to children. These batteries pose a hazard to children. Since they are small, despite improvement in the safety standards, children are able to remove them without difficulties and to insert them into the nose. Broken parts of industrial objects were associated with a significantly higher risk of complications and a higher risk (although not strictly significant) of hospitalization. This suggests that industry needs to adopt design techniques and materials less prone to breaks.

As already highlighted [14], there is a need of public education on the danger of FBs insertion in the nose, which could result in long-term complications such as a septal perforation. Primary care physicians should educate parents about this hazard as part of the routine guidelines for childproofing the home.

Final remarks

We investigated 688 cases of injuries due to insertion of FBs in the nose (ICD932) in children aged 0-14. Occasions for the injury were mostly playing and eating in the absence of parents or adult supervision. Even if the presence of a FB is usually not life-threatening, it may result in long-term complications such as perforation of the septum. Because of its hazardous nature, public education about this problem is recommended.

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