

Chest X-Ray findings of foreign body aspiration and their relation with type and site of impaction

3.5 years experience at Hilla General Teaching Hospital

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المظاهر الشعاعية لمرضى حالات استنشاق الاجسام الغريبة وعلاقتها بنوع ومكان انحسار الجسم الغريب

الخلاصة:

الهدف استنشاق الاجسام الغريبة في القصبة الهوائية ما يزال واحدا من الحالات الطارئة التي نواجهها باستمرار في حياتنا العملية مع اعتمادية كبيرة لتشخيص هذا المرض على تاريخ الحالة المرضية و مظاهر اشعة الصدر السينية. الهدف من دراستنا هو تحديد الدور الذي تلعبه اشعة الصدر السينية في تشخيص هذا المرض وعلاجه بصورة عامة وصولا لتحديد المظاهر الاكثر شيوعا وكيفية تآثر المظاهر الشعاعية المختلفة بنوع الجسم الغريب ومكان استقراره في القصبات الهوائية

الطريقة دراسة استرجاعية وصفية اجريت لمرضى حالات استنشاق الاجسام الغريبة في مستشفى الحلة التعليمي العام. تم تحليل مظاهر اشعة الصدر السينية لثلاثة وخمسين مريضا كانت اصابتهم بهذه الحالة موجبة ومن خلال هذا التحليل تم التعرف على المظاهر الشائعة من الاقل شيوعا مع محاولة التعرف على تأثير نوع الاجسام الغريبة ومحل استقرارها في القصبات الهوائية على شيوع هذه المظاهر من عدمها.

النتائج الاجسام الغريبة العضوية شائعة الانحسار في القصبات اليمنى وتتمظهر شعاعيا على شكل مضاعفات الحالة المرضية بينما الاجسام الغريبة اللاعضوية (واغلبها اجسام معدنية معتمدة) تتحسر غالبا في القصبات اليسرى وتتمظهر شعاعيا على شكل اجسام غريبة بعينها مع ندرة في حصول مضاعفات للمرض وقت الاستشارة الطبية

الاستنتاجات المظاهر الشعاعية لأشعة الصدر السينية المجراة لمرضى استنشاق الاجسام الغريبة ستتأثر بنوع ومكان استقرار الاجسام الغريبة في القصبات الهوائية

Abstract

Objectives: Foreign body (FB) aspiration is still one of the most common emergencies in daily practice with great dependency of diagnosis on the history and radiological exam. Our work is to analyze the role of chest x-ray exam (CXR) in the management of FB aspiration trying to reach the most common radiological findings and how can such findings be affected by type and site of impaction of FB.

Methods: A retrospective study (descriptive study) of FB aspiration at Hilla General Teaching Hospital. CXR findings were analyzed in 53 positive cases, identifying the common patterns of such exam, then we tried to identify any possible effect of the type of FB and their site of impactions upon such CXR findings.

Results: Organic FB most commonly impacted at right bronchi and presented with complications specially emphysema, while inorganic metallic foreign bodies most commonly impacted at left bronchi, being radiopaque with no obvious radiological complications.

Conclusions: CXR findings will be affected by the type and site of impaction of FB.

Introduction

The first systematic or elaborate study of FB in the airway was attempted by Gross in 1854 [Gross SD 1854]. He emphasized the importance of clinical history, specially the first paroxysm, notably cough and a severe suffocation which occurred with the aspiration of foreign objects [Yadav S P S 2007].

Although there has been a decrease in childhood deaths from asphyxiation by ingested objects, the incidence of FB aspiration has not changed significantly [Laure D 1410]. Tracheobronchial FB is one of the most serious life threatening emergency, in USA, 90% of patients are less than four years, the maximum prevalence is between one and two years, it is the fourth leading cause of accidental death in children under five years of age, accounting for about 8% of such deaths [Mu L 1991, Steen KH 1990]. In the middle east, the prevalence of foreign body aspiration is high, and the puzzles involved in the diagnosis and the problems in their management are many [Abdulmajid OA 1976, Al-Ani MS 1978, Elhassani NB 1978, Thabet JH 1986].

Patients who have inhaled foreign bodies are typically asymptomatic at the time of initial exposure unless the particle is large enough to occlude the tracheobronchial tree, in such cases, as often seen in children, the diagnosis is made by history and confirmed by chest radiography and, if needed, diagnosed as well as treated via bronchoscopy [Suborto Paul 2005]. Bronchitis and pneumonic infiltration may develop after foreign body aspiration as a result of local irritation or possible post stenotic dystelectasis. Non radiopaque foreign bodies can often be recognized by indirect signs [Lars Kamper 2007].

FB can be classified as either inorganic or organic. Inorganic materials are typically plastic or metal, common examples include beads and small parts from toys. These materials are often asymptomatic and may be discovered incidentally. Organic foreign bodies, including food, rubber, wood, and sponge, tend to be more irritating to the nasal mucosa and thus may produce earlier symptoms [François M 1998].

The right main bronchus has a predilection for foreign body impaction because it is wider than the left, the carina is slightly to the left of the midline and the right main bronchus has more direct extension of the trachea than the left main bronchus [James B 1991].

Killian was the first person to remove a foreign body from an air passage in 1898, later on, Einhorn, Jackson, Ingels and Mashu improved the instrumentation and brought it to its present high state of perfection [Clerf LH 1952]. In children, suspected FB aspiration can be excluded with flexible fiberoptic bronchoscope, but it is recommended that foreign body extraction should be performed with the rigid bronchoscope, while in adults, flexible fiberoptic bronchoscope can be used in the removal of a foreign body but it is best done under general anesthesia, the rigid bronchoscope is preferred [Martinot A 1997, Richard Burr McElvein 1996].

Patients and Methods

During the period from 28/10/2008 to 25/5/2012, 53 cases, ages ranging from 8 months to 62 years, were proved to be with definitive FB aspiration after rigid bronchoscopic exam for a number of a suspected cases at Hilla General Teaching Hospital. CXR PA view was the main investigation to be requested prior to bronchoscopy. During bronchoscopy, we precisely document the site of impaction and types of foreign bodies extracted according to the well known two major categories which are organic and inorganic types. The CXR findings were

analyzed retrospectively (descriptive study) in relation with such different sites of impaction and types of FB trying to identify any effects on CXR findings.

Results

1. CXR finding: positive FB was the most common finding (fig.1) which occurred in 18 cases (33.96%), emphysema (fig.2) being next occurring in 16 (30.18%), other findings with less percentages, as in 9 cases (16.98%) there were infection, 4 cases (7.54%) with collapse (fig.3), 1 case (1.88%) with pneumothorax, and 5 cases (9.43%) were normal. Figure 4 summarizes these findings.



Figure 1: CXR with metallic FB at left main bronchus

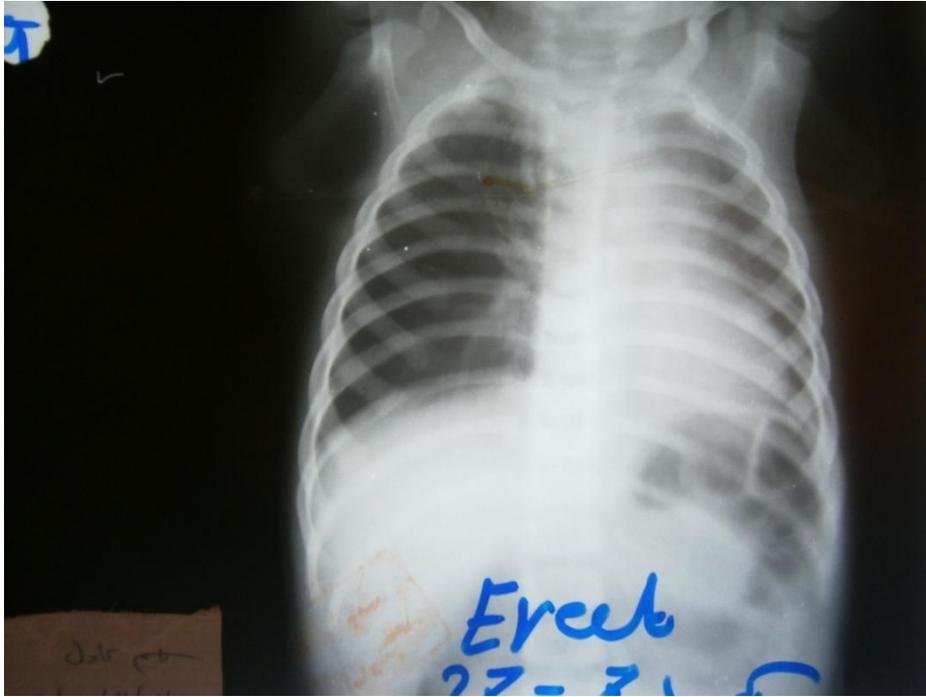


Figure 2: CXR with right sided emphysema



Figure 3: CXR with collapse

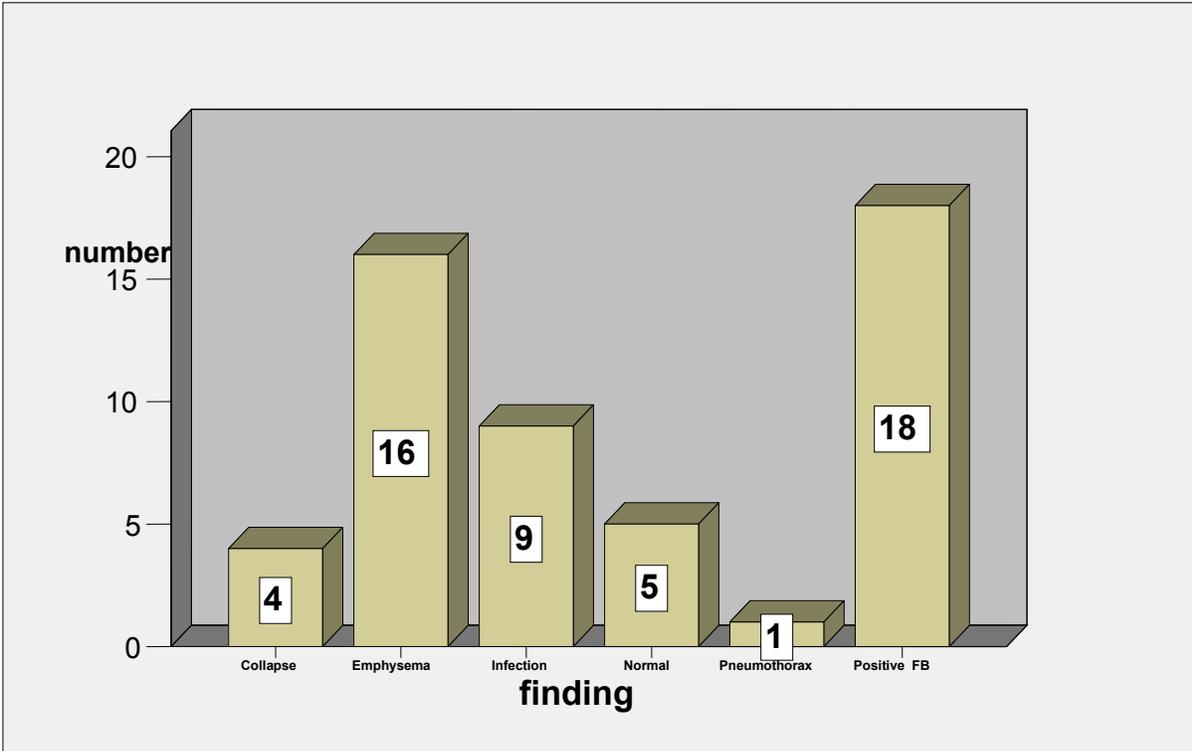


Figure 4: CXR findings

2. All the positive cases for FB were without other findings except one which was associated with Bronchiectasis wrongly treated for many years as TB infection as shown in figure 5.

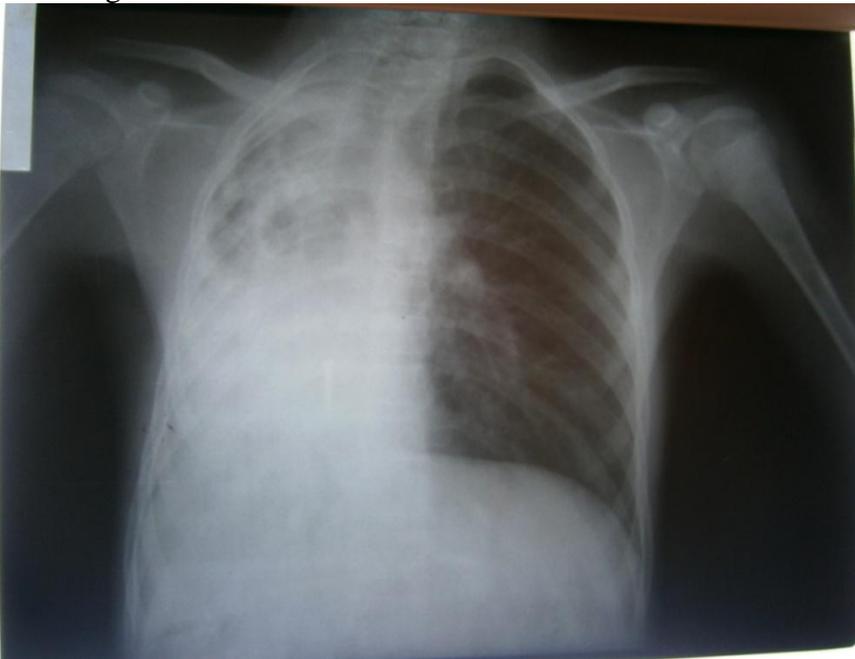


Figure 5: CXR with right lung bronchiectasis and metallic FB

3. Anatomical Sites of impaction: 23 cases (43.39%) in the right bronchi, 17 cases (32.07%) in the trachea, 12 cases (22.64%) in the left bronchi, while in 1case (1.88%) the foreign body was bilateral as it is summarized in figure 6.

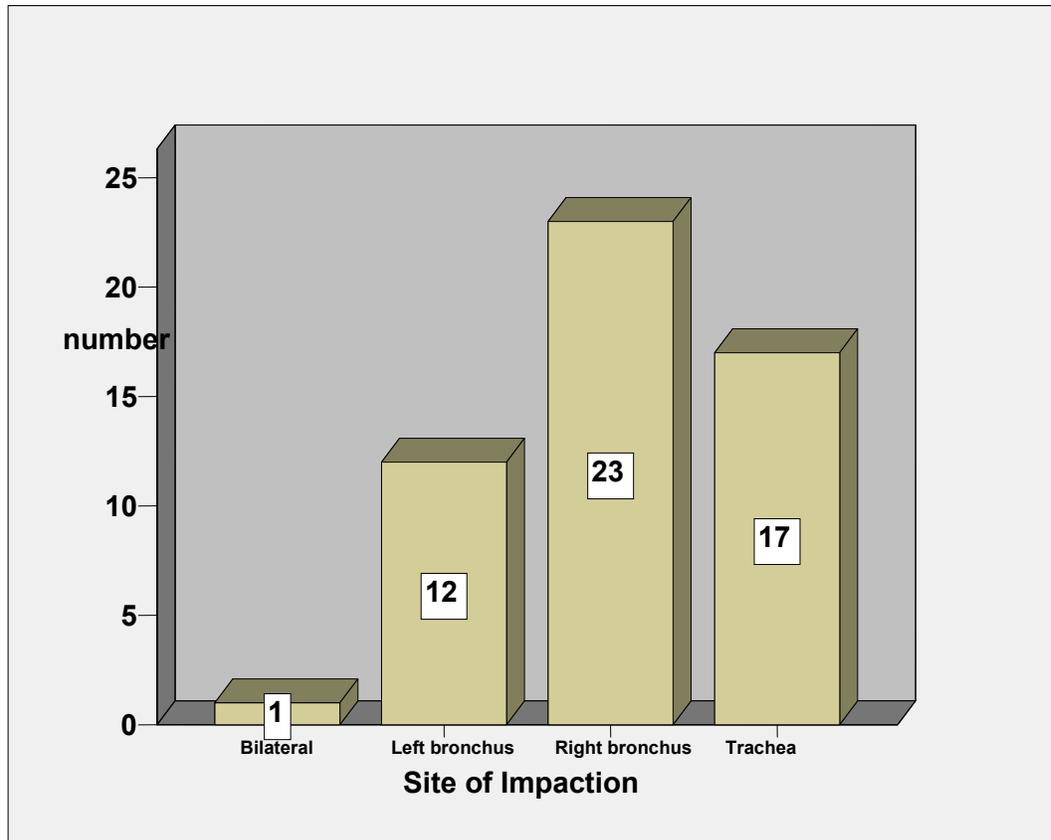


Figure 6: site of impaction

4. Types and sites of impaction of foreign bodies: Organic FB are more common (32/53), and these are mainly non radiopaque (31/32), but can be radiopaque (1/32) with predilection for right bronchial impaction (15/32), while inorganic FB are less common (21/53), being mainly radiopaque (17/21), and can be non radiopaque (4/21) with predilection for left bronchial impaction of the radiopaque (metallic) types (8/17). Table 1 presents these findings.

Table. 1: Types and sites of impaction of FB

Type of foreign bodies	No.	%	subtypes	Site of impaction							
				Right bronchi		Left bronchi		Trachea		Bilateral	
				No.	%	No.	%	No.	%	n o.	%
organic	32	60.37	opaque		65.23		33.33	1	70.58		100
			nonopaque	15		4		11		1	
inorganic	21	39.62	opaque	4	34.78	8	66.66	5	29.41		
			nonopaque	4							
Total	53	100%		23	100%	12	100%	17	100%	1	100%

5. CXR findings according to site of impaction: emphysema was the most common finding of the total and right bronchial FB comprising 16/53 (30.18%), and 9/23 (39.13%) respectively, while positive FB was the most common finding in left bronchial and tracheal FB comprising 8/12 (66.66%), and 6/17 (35.29%) respectively. Table 2 presents these findings.

Table. 2: radiological findings according to site of impaction

finding	total		Right bronchi		Left bronchi		trachea		bilateral	
	No.	%	no	%	No.	%	No.	%	No.	%
emphysema	16	30.18	9	39.13	2	16.66	5	29.41	-	-
normal	5	9.43	4	17.39	-	-	-	-	1	100
infection	9	16.98	3	13.04	1	8.33	5	29.41	-	-
positive	18	33.96	4	17.39	8	66.66	6	35.29	-	-
collapse	4	7.54	2	8.69	1	8.33	1	5.88	-	-
pneumothorax	1	1.88	1	4.34	-	-	-	-	-	-
total	53	100%	23	100%	12	100%	17	100%	1	100%

Discussion

Radiologically, it is well known that radiopaque foreign bodies will be found in the tracheobronchial tree directly, while radiolucent foreign bodies will be found by indirect signs where in 75% of cases they cause emphysema, in 15% obstructive atelectasis, and in 10% the CXR might be normal [Lars Kamper 2007], so whether to find a foreign body directly or indirectly will be greatly affected by the incidence of both radiopaque or radiolucent foreign bodies, and hence the incidence of non organic and organic foreign bodies because needless to say that radiopaque foreign bodies are mainly belong to the group of non organic foreign bodies, while radiolucent foreign bodies are mainly organic [Salcedo L1998], although we found that there are 1/32 (3.12%) of organic foreign bodies can be radiopaque and 4/21 (19.04%) of non organic FB can be radiolucent.

The majority of aspirated objects are organic in nature, with the aspirated radiopaque foreign bodies being less than 20% [Midulla F 2005, Raos M 2000, Tsolov Ts 1999, Emir H, 2001], or even less as we see in the great work of Nazar B. Elhassani where a radiopaque FB was found in only 63/1800 (3.50%) of cases [Nazar B. Elhassani 1988]. In our work, the aspirated organic foreign bodies are still the majority but occupying only 32/53 (65.23%) with increasing percentage of non organic FB to be 21/53 (34.78%) and specially the radiopaque objects to be 17/53 (32.07%), this is definitely due to increase incidence of (pins) aspiration due to changing cultural and social factors in the community at the last years and increasing number and decreasing age of veiled females who were used to hold pins at their mouth while wearing their shawl and talking or laughing with sisters or friends.

The single case with bilateral foreign body and that presented with pneumothorax clearly reveal the importance to anticipate whatever possible in FB aspiration cases, and honestly I found no mention to such occurrence in the available data specially the great and important work of Nazar B. Elhassani which can be regarded, proudly, one of the most important regarding the problem in the world [Nazar B. Elhassani 1988]. also The single case with Bronchiectasis clearly demonstrate the high morbidity of such problem on long term, although the screw was obvious upon presentation to us, but it was hard (but not impossible) to be observed Radiologically some months earlier. This child received a full anti TB course without benefit, which clearly reveal that keeping high index of suspicion is the only way to precisely diagnose and manage this common problem.

There is great discrepancy among literatures regarding the most common site of impaction [Rashid D 1999, Farooqi T 1999, Black RE 1994, Yeh LC 1998], although they are realizing that there are two main presentation with the right bronchus is the most common and the left one is the second, or the reverse status is the most common. At our study, we found that the tracheal FB are second to the expected most common right sided FB leaving the left bronchial FB last. this distribution will carry no effect on the radiological findings if the types of foreign bodies were evenly distributed among anatomical sites, but we found that the more the metallic and sharp the FB, the more chance to be lodged in the left bronchi or trachea (table 1), that's why emphysema and other signs of non radiopaque FB were very common with right sided FB 9/23 (40.90%), then tracheal FB 5/17 (27.77%), and last left sided FB 2/12 (9.09%) because of more organic FB to be lodged in the right bronchial tree 15/23, and the reverse is true since positive FB were more common finding in left sided 8/12 (72.72%) and tracheal foreign bodies 6/17 (33.33%) when the type of foreign body was nonorganic in nature 8/12. These findings point to the importance of history taking in the way that CXR findings will, and better to be, anticipated and related with the type of possibly aspirated FB.

Conclusions

CXR findings will be affected by the type and site of impaction of foreign body in the way that The more the organic the FB, the more the right sided impaction and the more the radiological complications, while the more the metallic the FB, the more the left sided impaction and the less the radiological complications.

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