

EVALUATION OF THE NEW SCORING SYSTEM FOR THE MANAGEMENT OF SUSPECTED FOREIGN BODY ASPIRATION IN CHILDREN

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Introduction

Foreign body aspiration (FBA) is encountered in many instances in the pediatric emergency department that could be life-threatening. FBA is considered the fifth cause of accidental death in children aged one to three years and the third cause of accidental death in children below one year. Diagnosis of FB aspiration is achieved by good history taking, clinical examination and chest radiography. In most cases, the witnessed event of aspiration is the most sensitive diagnostic tool. There is a wide range of clinical presentations in children with suspected FBA such as cough, dyspnea, wheezing, cyanosis and stridor. It also may be asymptomatic. FBA can lead to partial or complete air way obstruction, resulting in serious complications such as pneumonia, atelectasis, bronchiectasis, lung abscess , or even death. Bronchoscopy, whether rigid or flexible, is the standard procedure to ascertain and manage FBA. The use of flexible or rigid bronchoscopy has been a matter of debate for a few decades . In 2021, a retrospective cohort study was published to establish a management protocol for children with suspected FBA. Based on a simple algorithm, including history taking (witnessed choking, sudden cough and new-onset or recurrent wheezes), physical examination (unilateral decrease air entry, wheezy chest, respiratory distress) and radiological finding (unilateral hyperinflation). This approach may assist physicians to determine which cases require bronchoscopic interventions and which cases to follow up.

Aim of the work

The aims of this study were to : 1- Evaluate the previously published new scoring system in management of children with suspected foreign body aspiration .

2- Assess doing some modifications of the previous scoring system based on : new symptoms, signs or radiological findings not involved in the scoring system.

Patients and Methods

1-study design and setting: A retrospective study that included all children with suspected foreign body aspiration referred to Otorhinolaryngology and pediatric Departments, Faculty of Medicine, Alexandria University from August 2022 to August 2023.

2-Study population: All patients less than or equal 12 years with potential FBA .

3-Study measures and data collection : The medical records of all recruited children were analyzed. Data obtained were categorized according to age, sex, conditions on admission, physical examination findings, radiological features and bronchoscopic findings, nature and location of the FB, and management outcomes. Generally, any child attended to emergency department with a suspected foreign body aspiration was managed according to previously mentioned score by Fasseeh et al.

Table (1): Management according to score by Fasseeh et al.

Score	Management
1	Close follow up
2-3	Flexible bronchoscopy
4-5	Flexible or rigid bronchoscopy
5 or more	Rigid bronchoscopy

The score for all patients were calculated and the results were evaluated statistically. Some independent factors that validate the diagnosis of FBA that did not taken in consideration in the previous score were added based the univariate and multivariate regression analysis. A weighted risk score for each predictor was calculated by approximation of exponential beta to the nearest 0.5 and then multiplied by two to get whole numbers (to omit fractions). The total weighted risk score for each patient was further calculated by summing all the predictor’s scores. The diagnostic performance of the score in predicting positive FBA was performed using ROC curve analysis. Finally, a clinical algorithm was suggested based on the frequency of a proven FBA among different categories of the total weighted risk score. A p-value of < 0.05 was consideredstatistically significant.

Results

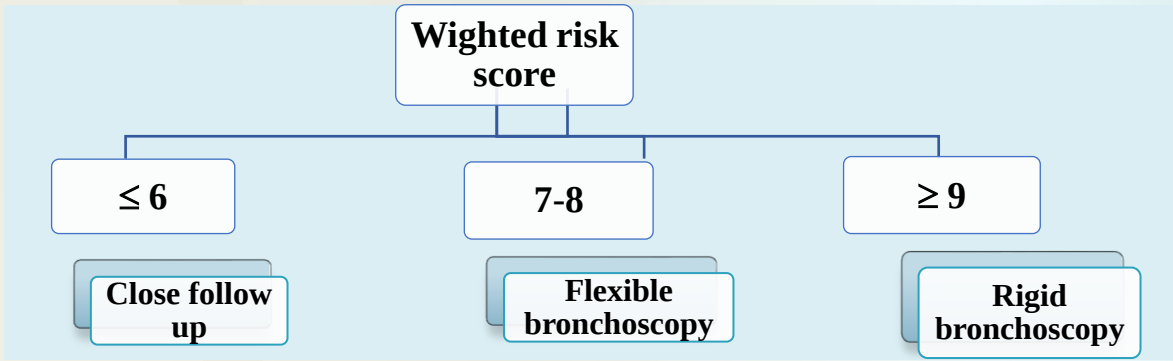
Medical records of 270 children who were admitted with a diagnosis of suspected FBA were investigated. The basic management among the studied cases is shown in **Table 2**. Among all cases, a correct decision was taken in 239 patients (88.5%), most of them (234 patients; 97.9%), underwent rigid bronchoscopy which revealed FB. And 5 patients (2.1%) were on medical treatment and follow up management and showed improvement.

Table (2):Comparison between the 2 studied groups regarding management (basic)						
management [Basic]	FBA (n = 245)		No FBA (n = 25)		Total (n = 270)	
	No.	%	No.	%	No.	%
Correct decision	234	97.9	5	2.1	239	88.5
Wrong decision	11	35.5	20	64.5	31	11.5

Table 3 shows a multivariate logistic regression analysis for the predictors of FBA among studied patients. Children with persistent cough were more than nine times at higher probability of having FBA (OR=9.63), similarly,those with decreased air entry were more than eight times at higher probability to have FBA(OR=8.164). Moreover, children with history of choking were more than six times at higher probability to have FBA (OR=6.32).

Table (3): Multivariable logistic regression model and weighted risk score for prediction of FBA					
	B	Weighted risk score	Weighted risk score ×2	p	OR (LL – UL 95%C.I)
Event [Witnessed]	1.844	2	4	0.002*	6.320 (1.955 – 20.427)
Presence of Persistent cough	2.265	2.5	5	0.037*	9.630 (1.147 – 80.889)
Presence of Witnessed cyanosis	0.942	1	2	0.208	2.564 (0.593 – 11.094)
Presence of Stridor	0.923	1	2	0.312	2.517 (0.420 – 15.084)
Presence of Retraction	0.441	0.5	1	0.645	1.555 (0.238 – 10.139)
Presence of Hoarsy cry	1.238	1	2	0.333	3.449 (0.281 – 42.342)
Air entry [Dec unilateral/bilateral]	2.100	2	4	<0.001*	8.164 (2.783 – 23.955)
Signs of laterality on x-ray [White lung/ Hyperinflation]	1.298	1.5	3	0.084	3.662 (0.838 – 15.995)

Based on the results of logistic regression and ROC curve analysis, a modified decision plan was suggested as shown in **Figure 1**



Figure(1) :Clinical algorithm for bronchoscopy decision in children with suspected FBA

The modified management among the studied cases is shown in **Table 4**. Among all cases, a correct decision was taken in 248 patients (91.9%), most of them (243 patients; 98.0%), underwent rigid bronchoscopy which revealed FB. And 5 patients (2.0%) were on medical treatment and follow up management and showed improvement

Table (4):Comparison between the 2 studied groups regarding management (modified)

Management [Modified]	FBA (n = 245)		No FBA (n = 25)		Total (n = 270)	
	No.	%	No.	%	No.	%
Correct decision	243	98.0	5	2.0	248	91.9
Wrong decision	2	9.1	20	90.9	22	8.1

Conclusion

Our modified model is based on several noteworthy findings, including the history of witnesses, persistent cough, witnessed cyanosis, stridor, chest retraction, hoarsy cry, decreased air entry on physical examination, and the signs of laterality on chest X-ray. Using a multivariate analysis the most significant predictors factors of FBA in children are as follows: the history of witnesses, persistent cough, and decreased air entry on physical examination. Our modified model is useful in determining the type and need of bronchoscopy for children presented with suspected FBA. At a cut-off value ≥ 9 , the score showed a satisfactory diagnostic performance with a sensitivity higher than the previously published score (88.16% vs. 79.9%) but, a lower specificity of (68% vs. 84.9%).