RISK FACTORS PREDICTING THE DEVELOPMENT OF COMPLICATIONS IN AN INGESTED FOREIGN BODY- A CASE-CONTROL STUDY IN A TERTIARY CARE CENTRE

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ABSTRACT

BACKGROUND

Foreign body (FB) ingestion is a common clinical problem seen in an Otorhinolaryngology Clinic in our day-to-day practice. The complications related to foreign body ingestion even though not common, can occur and the morbidity may be severe and life threatening. There is not much published data about the risk factors for complications. Hence, this study was conducted at Government Medical College, Thiruvananthapuram to detect the prevalence of complications in ingested foreign bodies and to identify any risk factors for the development of complications.

MATERIALS AND METHODS

The study was conducted on 112 patients with history of foreign body ingestion, admitted in the Department of Otorhinolaryngology, Government Medical College, Thiruvananthapuram during time period of April 2014 to March 2015, out of which 84 were controls and 28 cases.

RESULTS

The prevalence of complications was 25%. The most common complication was retropharyngeal abscess. The risk factors identified with the development of complications are delay in presentation and Diabetes Mellitus.

CONCLUSION

The most important factor, which came as significant in predicting complications, was duration of impaction or delay in presentation of more than 48 hours. Knowledge of the risk factors predicting the development of complications helps in early identification of the high risk group. Thus, it can prevent the development of complications or decrease the severity of morbidity.

KEYWORDS

Foreign Body Ingestion, Risk Factors, Complications.

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BACKGROUND

Foreign body ingestion is a common clinical problem. Majority of the swallowed objects pass through the digestive tract and are excreted spontaneously without any impaction in the hypopharynx or oesophagus. 10-20% of patients who have ingested foreign bodies will require non-operative intervention, and less than 1% will require a surgical procedure.^{1,2} The management of FB ingestion depends on many factors like type and size of the foreign body, its anatomical location and the duration of impaction. Complications related to foreign body ingestion are not so common; however, the associated morbidity may be severe and life threatening. Major complications include retropharyngeal abscess, migration of foreign body into deeper structures, oesophageal perforation and strictures.

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An understanding of the risk factors for complications associated with ingested foreign bodies might help to reduce patient morbidity. The purpose of this study was to determine the predictive risk factors associated with complications of ingested foreign bodies and discuss the optimal approach for prevention and management.

MATERIALS AND METHODS

Case Definition

Patients with ingested foreign body in throat with complications.

Following were considered as the Complications

- Retropharyngeal abscess.
- Parapharyngeal abscess.
- Mediastinitis/mediastinal abscess.
- Soft tissue cellulitis/lacerations.
- Oesophageal perforation/stricture/necrosis.
- Pneumothorax and/or pneumomediastinum.
- Tracheoesophageal fistula.
- Aorto-oesophageal fistulae or other mediastinal vascular injury.

Control Definition

Patients with ingested foreign body in throat without complications.

Subject Selection of Sample

Study Design- Case-Control study.

Study Setting- Inpatient section of Department of ENT, Government Medical College, Thiruvananthapuram.

Sample Size

Pilot study was done by retrospective chart review of patients admitted with ingested foreign bodies in the Department of ENT (Government Medical College, Trivandrum). That study showed that maximum foreign body related complications were due to dentures. Of patients with ingested denture, 62% cases were complicated and rest uncomplicated. Complicated cases due to other type of foreign bodies were 11% and uncomplicated cases were around 89%. By using this value sample size was calculated in Stat Calc software with 95% confidence level and power of 80%. It is calculated that 28 cases and 84 controls to be studied (1:3 case-control ratio as complicated cases are rare.). Study was conducted after obtaining ethical committee clearance.

Period of Study

12 months (April 2014 - March 2015).

Inclusion Criteria

- Patients with definite foreign body ingestion.
- Both sexes, all age groups.

Exclusion Criteria

- Patients not giving consent to be included in the study.

Data Collection

- Interview method.
- Lab investigations.
- Radiological investigations.

Tools

- Semi-structured questionnaire.
- Fasting blood sugar level.
- X-ray, soft tissue of neck (STN), lateral view.
- Chest X-ray (PA view).
- Erect X-ray, abdomen.
- CT Neck.
- Rigid hypopharyngoscopy.
- Rigid oesophagoscopy.
- Flexible Oesophagogastroduodenoscopy.

Study Variables

- Sociodemographic variables.
- Presenting complaints.
- History of past illness.
- Family history.
- Treatment history.
- General examination.
- ENT examination.
- Systemic Examination.

Management Protocol

In our institution for a patient presenting with history of FB ingestion, chest X-ray, soft tissue of neck X-ray, lateral view and erect X-ray of abdomen are the baseline investigations. If there is radiological evidence of FB, we will proceed to rigid

hypopharyngoscopy/oesophagoscopy along with antibiotics.

If FB could not be retrieved by rigid endoscopy, then we usually proceed to CT scan of neck and thorax. If there is evidence of FB in CT, then depending on the site or whether it is intramural or extramural we will proceed to repeat endoscopy (Rigid oesophagoscopy/ hypopharyngoscopy or flexible oesophagoscopy) or open surgical exploration. In our institution, flexible oesophagoscopy is done in Medical Gastroenterology Department.

If there is no evidence of FB in X-ray and the patient is asymptomatic, we will proceed for better imaging like CT scan of neck and thorax. And if there is evidence of FB in CT scan, we will proceed to rigid oesophagoscopy or flexible endoscopy or open surgical exploration depending on whether it is intramural or extramural FB.

Data Analysis

Results were expressed as mean and Standard deviation. Chi square test and t-test were used for comparison, and p value less than 0.05 was taken as significant.

RESULTS

	N	%
Males	53	47.3
Females	59	52.7
Age group		
<10 years	2	1.7
10-60	85	76
>=60	25	22.3
Comorbidities		
Diabetes mellitus	24	21.42
Hypertension	25	22.3
Coronary artery disease	11	9.8
Seizure disorder	1	0.1
Bronchial asthma	9	8
Psychiatric disorder	0	0

Table 1. Basic Characteristics of Patients Studied. (n=112)

In our study, out of 112 patients, females constituted 52.7% and male to female ratio was 1:1.1. Most of the patients were in the age group between 10-60 years. Only 22.3% were 60 years or more. [Table 1].

Among the comorbidities present in our study population, most common was hypertension followed by diabetes mellitus. Only 1 had seizure disorder and there were no psychiatric comorbidities in any of the patients. [Figure 1].

	N	%
Foreign body sensation	92	82.1
Dysphagia	77	68.8
Neck swelling	11	9.8
Respiratory distress	3	2.7

Table 2. Symptoms of Patients with Ingested Foreign Body

Most of our patients who presented with foreign body ingestion had foreign body sensation. Dysphagia was present in 68.8% of patients. [Table 2].

	N	%
Fish bone	63	56.2
Chicken bone	30	26.8
Denture	3	2.7
Safety pin	1	0.9
Others	15	13.4

Table 3. Types of Foreign Bodies Ingested

Figure 1. Foreign Body Type

In our study, there were various kinds of foreign bodies. But the most common was fish bone 56.2% followed by chicken bone 26.8%. [Table 3].

Complication	N	%
Retropharyngeal abscess	16	57.1
Oesophageal perforation	2	7.2
Oesophageal stricture	0	
Mediastinal abscess	3	10.7
Mucosal lacerations/cellulitis	7	25

Table 4. Complications of Foreign Body Ingestion (n=28)

Out of 112 patients with foreign body ingestion, 28 had complications. 16 patients developed abscess and none developed oesophageal stricture. 2 of them had oesophageal perforation. 7 patients developed mucosal ulceration/oedema. [Table 4].

	No.	%
FB seen in X-ray of STN	47	42%
Prevertebral widening seen in X-ray of STN	18	16%
CT neck taken	9	8%
FB seen in CT	8	
Abscess seen in CT	6	
FB and abscess seen in CT	4	

Table 5. Investigations

In our study, X-ray showed foreign body in only 47 patients and prevertebral widening in 18 patients. CT neck was taken in 9 patients, out of which FB seen in 8 patients, abscess in 6 patients and both in 4 patients. [Table 5].

Site	N	%
Pyriform fossa	14	23%
Cricopharynx	26	42.6%
Upper oesophagus	21	34.4%

Table 6. Sites of FB Impaction

	N	%
Medical management alone	4	3.6
Rigid hypopharyngoscopy	106	94.6
Flexible oesophagoscopy	6	5.3
Open surgery	2	1.8
FB retrieved	62	55.4

Table 7. Interventions

Most of the patients underwent rigid hypopharyngoscopy/oesophagoscopy for foreign body visualisation/retrieval. Six of them underwent repeat endoscopy with flexible fibreoptic oesophagoscope. Two patients underwent open surgery. Some kind of foreign body was retrieved in 62 patients constituting 55.4% of the total study population.

Four patients received medical management alone. This was because in X-ray of chest and soft tissue of neck lateral view, there was no evidence of FB, and all these patients had symptomatic relief with intravenous antibiotics and intravenous steroids and analgesics. There was no need of further investigations or interventions. [Table 7].

	Control	Cases		Chi Squared	P value
No DM	74 (84.1%)	14 (15.9%)	88	18.10	<0.001
DM	10 (41.7%)	14 (58.3%)	24		
	84	28	112		

Table 8. Association of Comorbidities with Complication

Figure 2. Association of DM with Complications

We have analysed the association of DM with complications by Chi square test. Half of the cases had DM and there was significant statistical association between DM and development of complications. (p value<0.001). [Table 8].

	Control	Cases		Chi Squared	P value
No HTN	70 (80.5%)	17 (19.5%)	87	6.196	0.013
HTN	14 (56%)	11 (44%)	25		
	84	28	112		

Table 9. HTN and Complications

Figure 3. HTN and Complications

It was found that most of the controls were non-hypertensives and whereas a good amount of cases were hypertensives. Hypertension was also found to have significant association with development of complications. (p value=0.013) [Table 9].

	Controls	Cases	Total	P value
No CAD	81 (80.2%)	20 (19.8%)	101	0.0006*
CAD	3 (27.3%)	8 (72.7%)	11	
	84	28	112	

Table 10. Association between CAD and Development of Complication

*Fisher Exact test was used as 1 cell has expected count <5.

Majority (72.7%) of patients with CAD were cases and there was significant association between CAD and development of complications. [Table 10].

	Controls	Cases		Chi squared	P value
Fish bone	48 (76.2%)	15 (23.8%)	63	0.61	0.737
Chicken bone	21 (70%)	9 (30%)	30		
Others	15 (79%)	4 (21%)	19		
	84	28	112		

Table 11. Foreign Body Type and Development of Complication

Fish bone was the most common foreign body that got impacted followed by chicken bone. But there was no statistically significant association between type of foreign body and development of complication. [Table 11].

	Controls	Cases		Chi squared	P value
<24 hrs.	57 (91.9%)	5 (8.1%)	62	33.44	<0.001
24-48 hrs.	13 (86.7%)	2 (13.3%)	15		
>48 hrs.	14 (40%)	21 (60%)	35		
	84	28	112		

Table 12. Association with Delay in Presentation (Duration of Impaction)

Figure 4. Association of Duration after Ingestion and Complications

Most of the patients who later developed complications actually presented late. Delayed presentation >48 hours or prolonged duration of impaction were significantly high in cases than controls. (p value <0.001) [Table 12].

	Controls	Cases		P value
No FB sensation	2 (10%)	18 (90%)	20	<0.001
FB sensation	82 (89.1%)	10 (10.9%)	92	
	84	28	112	

Table 13. Association with Symptoms

Most common symptom at presentation was foreign body sensation which was found to have negative association with complications. [Table 13].

	Controls	Cases		P value
No dysphagia	34 (97.1%)	1 (2.9%)	35	<0.001
Dysphagia	50 (64.9%)	27 (35.1%)	77	
	84	28	112	

Table 14. Dysphagia

Dysphagia was significantly high in cases than controls and was found to be statistically significant (p value<0.01) [Table 14].

	Controls	Cases		P value
No respiratory difficulty	84 (77.1%)	25 (22.9%)	109	0.014
Respiratory difficulty	0 (0%)	3 (100%)	3	
	84	28	112	

Table 15. Respiratory Difficulty and Complications

Fisher's exact test*.

	Controls	Cases		Chi Squared	P value
No FB in X-ray	47 (72.3%)	18 (23.7%)	65	0.599	0.439
FB in X-ray	37 (78.7%)	10 (21.3%)	47		
	84	28	112		

Table 16. X-ray FB and Complication

Majority of patients with presence of FB in X-rays were in controls and there was no significant association between X-ray positivity and complications. [Table 16].

	Controls	Cases		P value*
No IL pooling	49(100%)	0(0%)	49	<0.001
IL pooling	35(55.6%)	28(44.4%)	63	
	84	28	112	

Table 17. Association of IL Pooling and Complications

*Fishers exact test

IL pooling was significantly higher in cases than controls and was also statistically significant (p value<0.001).

	Controls	Cases		Chi Squared	P value
No impaction	39 (76%)	12 (24%)	51	0.01	0.920
Impaction	45 (74%)	16 (26%)	61		
	84	28	112		

Table 18. Association of FB Impaction and Complications

There is no significant association between impaction of FB and development of complications [Table 18].

	Controls	Cases		Chi squared	P value
Pyriform fossa	13 (92.9%)	1 (7.11%)	14	8.26	0.016
Cricopharynx	21 (80.8%)	5 (19.2%)	26		
Upper oesophagus	11 (52.4%)	10 (47.6%)	21		
	45	16	61		

Table 19. Site of Impaction and Complications (n=61)

There is a significant association between site of impaction and development of complications. About half of

Independent Variables	Regression Coefficient	S.E.	P value	OR	95% CI
DM	1.852	1.033	.073	6.375	0.841- 48.316
Duration of impaction	1.301	.459	.005	3.674	1.495 - 9.032
Constant	-22.415	5209.565			

Multivariate Analysis

r² value of the model was 0.779 i.e. 77.9% variability in the occurrence of complication can be explained by using these factors.

In multivariate analysis, only delay in presentation or duration of foreign body impaction is statistically significant as an independent predictor of development of complications. (p value -0.001).

Diabetes as a comorbidity is having a tendency towards significance in multivariate analysis (p value-0.07).

DISCUSSION

This study aims at detection of prevalence of complications in an ingested foreign body and to look for any relation between age, sex, type of FB, duration after FB ingestion and associated comorbidities with the development of complications.

patients (52.4%) with impaction in the upper oesophagus developed some complication and this is found to be statistically significant. [Table 19].

Figure 5. Site of Impaction and Complications (n=61)

Univariate Analysis

Among the comorbidities, DM, HTN and CAD were found to have significant association with development of complications (p<0.05).

Among the symptoms, foreign body sensation, respiratory distress and dysphagia had significant association with development of complications. (p<0.05). Also, there was statistically significant association between complications and presence of fever and evidence of pooling of secretions in indirect laryngoscopy. Delay in presentation more than 48 hrs. was found to have significant association with development of complication.

	Controls	Cases		P value*
No fever	84 (83.2%)	17 (16.8%)	101	<0.0001
Fever	0 (0%)	11 (100%)	11	
	84	18	112	

Table 20. Fever and Complications

*Fisher's exact test

In our study, we have analysed all patients admitted with foreign body ingestion in our department over a time period of 1 year. Total of 112 patients were studied during the time period. Controls were 84 and those with complications (cases) were 28 in number.

Females were slightly more in our study population. This was similar to previous study by Lai et al which also had a slightly higher female incidence.³ But there was no statistically significant association between sex and the development of complications. There were patients of all age groups and 22.3% of total patients were in the older age group>60 years. We could not include most of the paediatric age group patients with foreign body ingestion as they were managed by paediatric surgeons. There was no association between development of complications and the older age group.

But in previous study by Lai et al, age > 60 years was a significant risk factor for development of complications.³ This could be due to the difference in proportion of the age groups studied and regional variations.

Most common FB identified in our study was fish bone which is similar to previous studies.³ Recent Korean study also showed fish bone as the most common foreign body.⁴

There was no significant difference in the type of foreign body between cases and controls. In other words, foreign body type was not found to have a role in predicting the complications.

Among the comorbidities analysed, DM, HTN and CAD had statistically significant association with development of complications. But in multivariate analysis, DM was found to have tendency towards significance and hence can be considered as comorbidity which clinically predicts development of complications.

Only DM can be considered as an independent predictor of complications among comorbidities. This association can be explained by the possible immunocompromised state due to diabetes per se.

Patients with foreign body ingestion were presented with various symptoms of which foreign body sensation was the commonest. It was found that there was association between foreign body sensation and complications. As majority of patients had foreign body sensation and majority were controls, it can be a just negative association. Other symptoms like dysphagia, fever and respiratory difficulty were more in cases than controls and were statistically significant.

Clinical and radiological examination findings were studied for looking into their role in predicting complications. Only less than half of our patients showed X-ray evidence of foreign body and hence prediction of foreign body and its complication using X-ray alone is not easy. In a prospective study on fish bone ingestion, it was found that prediction of the presence of fish bones by symptoms and radiograph was poor.⁵ Indirect laryngoscopy finding of pooling of secretion was found to have an association with complications in univariate analysis. But X-ray evidence of FB was not found to have statistically significant association with complications. But previous study by Lai et al found X-ray presence of FB having significant association.³ This difference could be due to the radiopaque nature of the foreign bodies and the difference in the percentage of foreign bodies that spontaneously expelled without impaction.

Some kind of foreign body was retrieved in 55% of the total study population meaning rest 45% might have passed spontaneously. But as per literature, 80% of FB pass spontaneously without any complications.^{6,7} The probable reason may be that such patients might not have reported in our otorhinolaryngology clinic or might have managed in outpatient department of ENT which were not included in our study. (only patients in inpatient department included in our study).

Endoscopic intervention (Rigid hypopharyngoscopy/flexible oesophagoscopy) was done in 94.6%. Most of our patients underwent rigid hypopharyngoscopy/oesophagoscopy and had good outcome. Those who failed rigid endoscopy were taken up for flexible endoscopy. Complications due to endoscopic procedure is almost nil which is similar with Mosca et al study on endoscopic management of upper gastrointestinal foreign bodies.⁸

Surgical intervention via external approach for foreign body retrieval and management of complications was done in 1.8% of study population and this is less compared to previous studies. This might be because most of our FBs were in upper oesophagus and hence we were able to retrieve with rigid hypopharyngoscopy or rigid oesophagoscopy.

Foreign body impaction was found in 61 of the total 112 patients studied. There was no association between foreign body impaction and development of complication. Among the site of foreign body impaction, most common site was cricopharynx followed by upper oesophagus. In oesophagus, upper oesophagus was the most common site of impaction found in the recent Korean study.⁴ There was statistically significant association between the site of FB impaction and complications.

Complications occurred in 28 out of 112 patients which come to 25%. Most common complication was retropharyngeal abscess. As we have included cellulitis and laceration in complications, it is reflecting in the higher rate of complications in our study.

In multivariate analysis, only factor which came as significant in predicting complications was duration of impaction or delay in presentation of more than 48 hours. This was in similarity with previous study by Lai et al who also found the delay in presentation to be significant.³ The question of whether impaction time is a risk factor for complications has been controversial. As in the ASGE guidelines, Loh et al suggested that if the foreign body had been impacted for more than 1 day, there was a 14-fold greater risk of a major complication versus impaction of less than 1 day.⁹ Jung et al reported a "long" duration of impaction without mentioning a particular time as a predictive factor for complications after foreign body ingestion. However, Park et al reported no correlation of impaction time (> 24 hours) with risk of complication.¹⁰

CONCLUSION

This study was done with the aim of finding the factors predicting the development of complications in foreign body ingestion. Most common foreign body identified in our study was fish bone and most common site of foreign body impaction was cricopharynx followed by upper oesophagus. Most common complication in our study was retropharyngeal abscess. In multivariate analysis, only duration after FB ingestion was found to be an independent predictor of outcome in the form of morbidity. But diabetes mellitus was found to have a tendency towards significance and hence can be considered as a comorbidity, which clinically predicts development of complications. Identification of risk factors like diabetes mellitus, and aggressive management in such cases may help to reduce complications and thereby morbidity associated with it.

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