www.jmscr.igmpublication.org
Impact Factor (SJIF): 6.379
Index Copernicus Value: 79.54
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossrefDOI: https://dx.doi.org/10.18535/jmscr/v6i12.38

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Research Article

Tracheo-bronchial foreign bodies-presentation, diagnosis and management in at rural setup

Authors
Dr Farha Manzoor Maloo, Dr Ashish Chandrashekhar Podey, Dr Aniket Ashok Lathi, Dr Sheetal Shelke

Abstract

Background: *Tracheo- bronchial foreign bodies have always posed a challenge to the ENT surgeon as they present with varied symptomatology ranging from a simple cough and fever to more grave respiratory distress. It requires a strong suspicion, early diagnosis and timely intervention to reduce the overall morbidity and mortality. This study was undertaken to highlight our experiences in handling cases of tracheo- bronchial foreign bodies (FB) at our setup.*

Methods: *The study involves 50 cases in age group of 1 to8yrs that underwent Rigid Bronchoscopy for suspected tracheo-bronchial FB over a period of one year (Oct. 2017-18) in the ENT Dept. of RMC, Loni.*

Results: *Most commonly affected were children between 1 to 8 years and mean age is 2.41 years. Chronic cough and wheeze & Respiratory Distress were the commonest presenting symptoms.*

Conclusions: *A good clinical acumen, team work, early diagnosis and timely intervention are all needed to reduce the overall mortality and morbidity associated with tracheo- bronchial foreign bodies.*

Keywords: *Foreign body, Bronchoscopy, Respiratory distress.*

Introduction

Gustav Killian reported the first case of bronchoscopic removal of foreign body from the trachea in 1897. Since then, Rigid Bronchoscopy under general anesthesia has remained the procedure of choice for Foreign body (FB) removal in the airways, failing which Thoracotomy and Bronchotomy is performed. Foreign body inhalation is an extremely serious and life-threatening condition in children and most common cause of accidental death among the children in the age group of one-three years. Prevention and early diagnosis can be lifesaving. Undiagnosed and unsuspected FBs still occur in the airway, causes severe complications and threat to life due to the delay in diagnosis.[1]

Tracheo-bronchial foreign bodies are an overall challenging scenario to the ENT surgeon most of which are encountered on an emergency basis. A well planned and timely intervention leads to management of the patient with a favorable outcome. Even with improved sophisticated instruments and management protocols, a simple case of foreign body removal from lower airway tract can prove fatal.[2] Foreign body aspiration has a wide array of presentation ranging from an

apparently symptomless child with a history of aspiration to more dangerous acute respiratory distress with no history of aspiration at all. The most common age of presentation is 1 to 3years, however any age can be affected.[3-4]

Only with strong suspicion, good clinical skills and appropriate imaging studies, a correct diagnosis of foreign body in lower respiratory tract can be made.[5,6] Rigid bronchoscopy is the treatment of choice for removal of tracheobronchial foreign body. It should be considered the definitive diagnostic and therapeutic intervention in all cases where history, examination and imaging are all suggestive or suspicious of an airway foreign body.

Materials and Methods

The study involves 50 cases in age group of 1to8yrs that underwent Rigid Bronchoscopy for suspected tracheo-bronchial FB over a period of one year (Oct. 2017-18) in the ENT Dept. of RMC, Loni.

Technique

a) Diagnosis

- Inspiratory and expiratory or decubitus films of the chest may be helpful in establishing the diagnosis of FBA. More than 50% of patients with early diagnosis (<24 hours) had normal chest X-rays. In Post-24hr period, the common radiographic finding in lower airway aspiration is air trapping. This occurs owing to the Ball valve mechanism, wherein, negative intra-thoracic pressure on inspiration causes dilatation of lumen around foreign body while positive pressure on expiration causes obstruction of lumen and resultant air trapping
- An early finding on radiographs is a hyperinflated lung contra lateral to the obstructed airway. Obstructive emphysema (45%), a contra lateral mediastinal shift (35%), atelectasis, consolidation are late findings on radiographs of the affected airway.

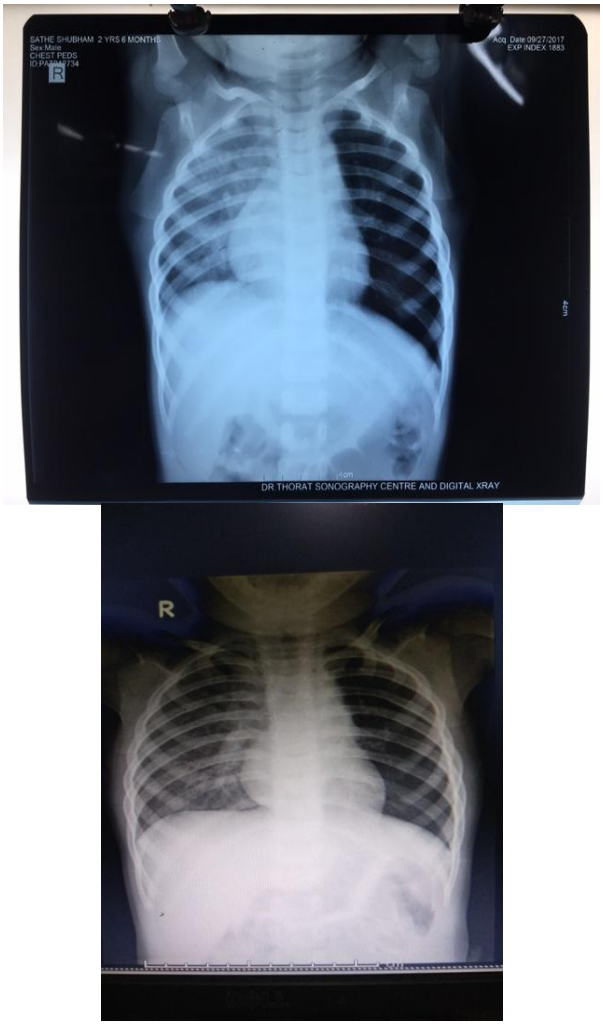


Fig.1: Pre-operative and Post-operative chest radiographs of 2.5yrs male patient who presented with history of tamarind ingestion and acute episode of choking.

- Computed tomography of the chest may have some additional benefit in acute aspirations, i.e. it can help define radiolucent foreign bodies such as fish bones. CT provides useful information (such as the location and size of the object, parenchymal changes, and the degree of granulation) before attempted extraction.
- A study by Behera et al indicated that virtual bronchoscopy using multidetector CT (MDCT) scanning is effective in diagnosing the presence of radiolucent vegetable foreign bodies in the tracheobronchial airway with a positive predictive value of 98.3%. [14]

b) Method

- Bronchoscopy is performed with General Anesthesia in the operating room for children, with inhalational induction Halothane and oxygen combination preferred at our setting. Skilled pediatric anesthesia is vital and close cooperation between anesthetist and bronchoscopist is essential to ensure the child's alveolar ventilation is maintained throughout the procedure.
- The use of ketamine, a short-acting dissociative anesthetic and analgesic, may be useful in this examination. Although the agent produces a dissociative state, the patient maintains respiratory and airway reflexes, while reducing bronchospasm. The drug is short acting, with an action duration of 15-30 minutes. The dose is 1-2 mg/kg IV. This in combination with Fentanyl(1-2 mg/kg), Glycopyrolate (0.004-0.008mg/kg) and Midazolam(0.04-0.06mg/kg).
- Rigid bronchoscopy was a valuable tool in tracheobronchial foreign body removal. The newer optical grabbing forceps available are integrated telescopes which can be passed through the most rigid ventilating bronchoscopes. Preferred bronchoscopes with a rod-lens telescope are the Doesel-Huzly bronchoscopes (Karl Storz). Age-appropriate sizes minimize laryngeal edema.

Fig. 2: Technique of Emergency Bronchoscopy using Ventilating Bronchoscope with a side-port which allows standard anesthetic oxygen tubing to be attached.

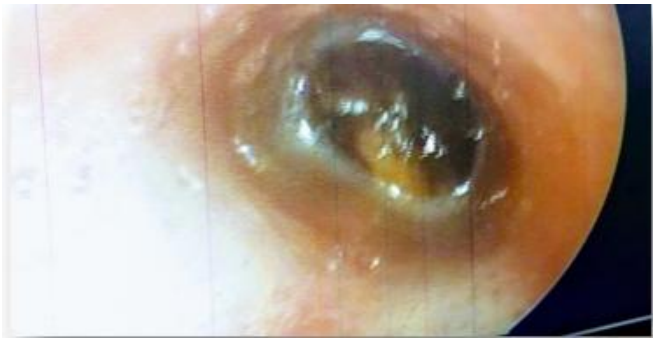


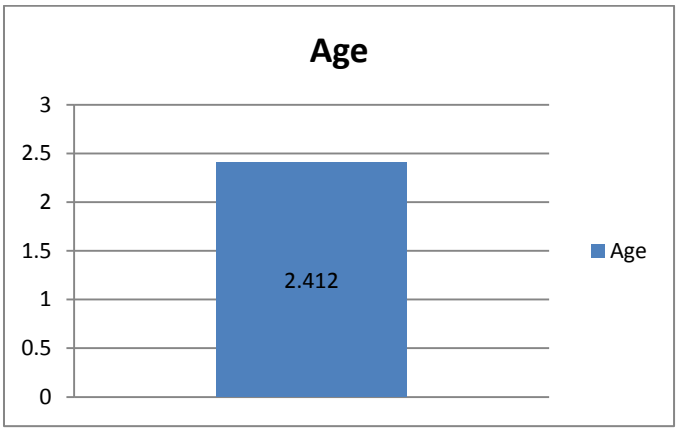
Fig. 3: Endoscopic view of Foreign body obscuring the carina.

Observations and Results

A total of 50 cases were reviewed within the age range from 1 to 8yrs in one year. The observations pertaining to commonest age of presentation with tracheo-bronchial foreign bodies, most common sex, most significant symptoms and signs of presentation, frequently presenting chest radiograph findings, correlation between history, chest radiography and CT bronchogram findings with the Rigid Bronchoscopy findings, most common foreign bodies removed and their commonest location in the tracheo-bronchial tree are all summarized below:-

Table 1: Age Incidence

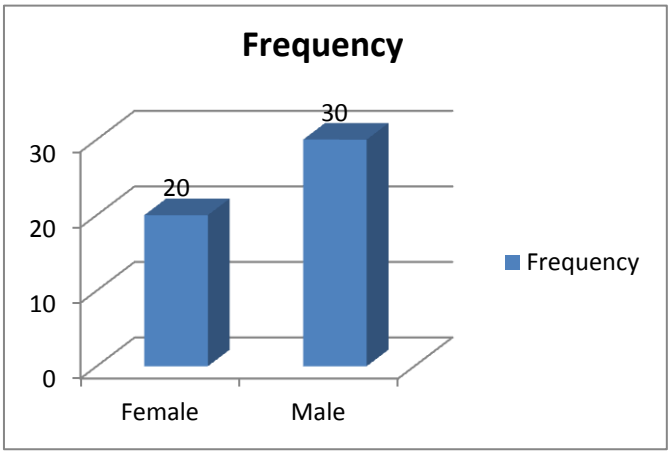
Minimum Age(in yrs)	Maximum age(in yrs)	Mean Age(in yrs)	Std. Deviation
1.00	8.00	2.4120	1.43863



The mean age of patients presenting with foreign body aspiration at our set up is 2.4 yrs.

Table 2: Sex Distribution

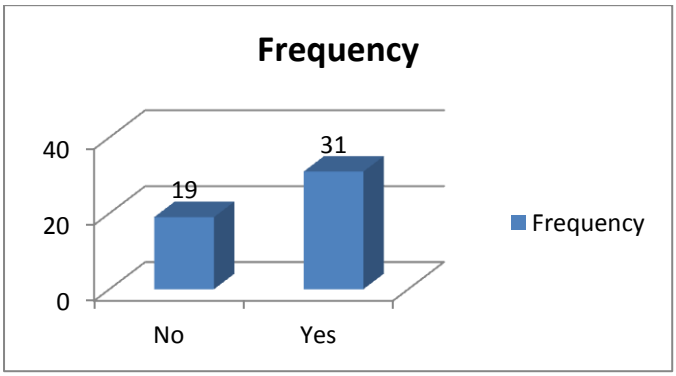
	Frequency	Percentage
FEMALE	20	40.0
MALE	30	60.0
Total	50	100.0



Males present with foreign body aspiration more frequently as compared to females.

Table 3: Historyof FB Inhalation

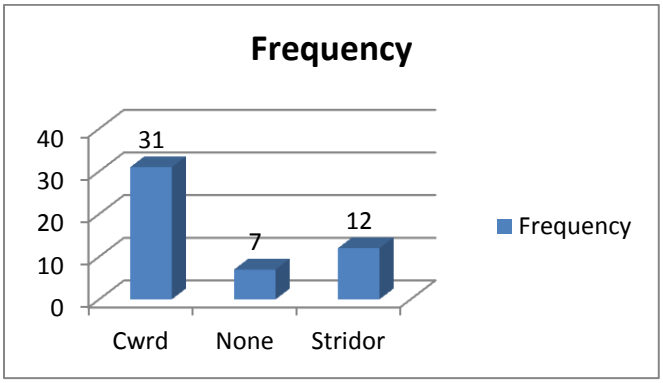
	Frequency	Percentage
No	19	38
Yes	31	62
Total	50	100.0



In 62% cases, there was definite history of foreign body ingestion observed by parents or relatives.

Table 4: Symptoms Distribution

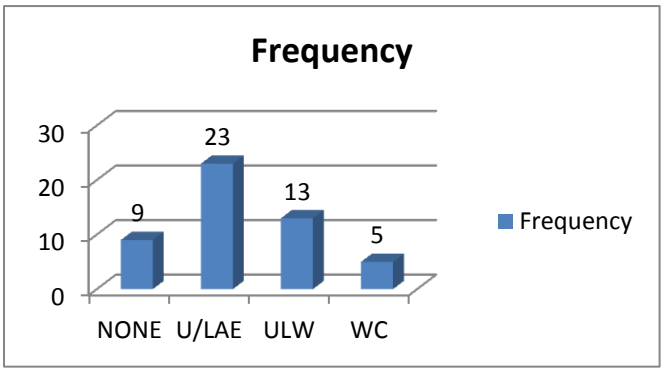
	Frequency	Percentage
Cough, Wheeze & Respiratory Distress	31	62.0
No Symptoms	7	14.0
Stridor	12	24.0
Total	50	100.0



62% cases presented with acute respiratory distress characterized by cough, wheeze, grunting and chest retractions. 24% patients presented with inspiratory stridor. Remaining 14% patients presented without obvious symptoms.

Table 5: Signs of FB Inhalation

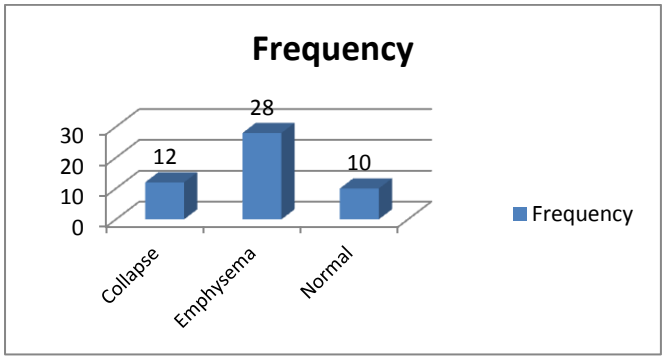
	Frequency	Percent
No Signs	9	18.0
Unilateral reduced Air Entry	23	46.0
Unilateral Wheeze	13	26.0
Whistling and Clicking sounds	5	10.0
Total	50	100.0



46% patients presented with unilateral decreased air entry and 26% patients presented with unilateral wheeze. About 10% patients presented had whistling and clicking sounds on auscultation and 12% had no obvious signs of foreign body aspiration.

Table 6: Chest X- Ray Findings

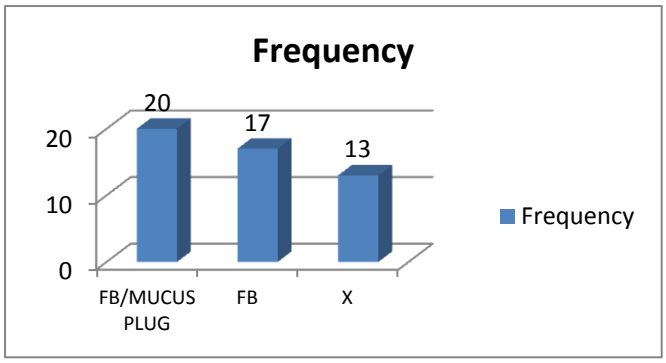
	Frequency	Percentage
Ipsilateral Collapse	12	24.0
Ipsilateral Emphysema	28	56.0
Normal	10	20.0
Total	50	100.0



56% had ipsilateral emphysema on Chest radiogram and 24% had ipsilateral lung collapse on chest radiogram. 10% patients had normal chest radiograms.

Table 7: CT bronchogram Findings

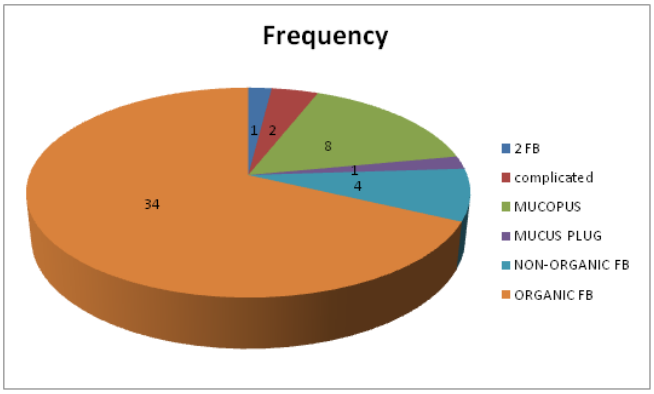
	Frequency	Percentage
?FB/Mucus Plug	20	40.0
FB	17	34.0
Not Done	13	26.0
Total	50	100.0



CT Bronchogram of 40% patients suggested foreign body/mucus plug while 34% patients were reported of having foreign body in their tracheo-bronchial tree. CT Bronchogram was not done for 26% cases as they had obvious history, symptoms or signs of foreign body aspiration.

Table 8: Rigid Bronchoscopy Findings

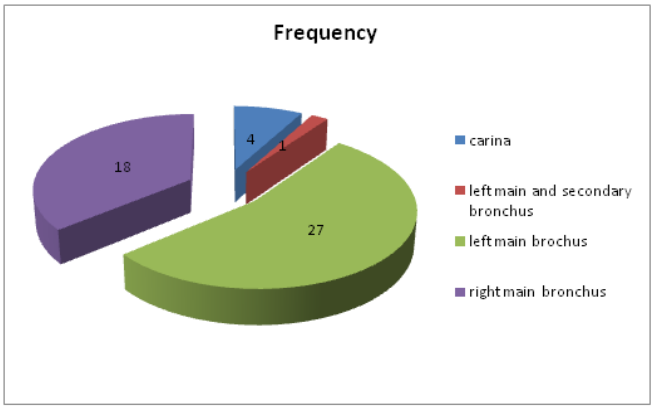
	Frequency	Percentage
2 FB	1	2.0
Complicated	2	4.0
Mucopus	8	16.0
Mucus Plug	1	2.0
Non-organic FB	4	8.0
Organic FB	34	68.0
Total	50	100.0



On Rigid Bronchoscopy, organic foreign bodies especially groundnut was removed in 68% patients. Mucus plug was removed by suctioning in 16% patients. Non-organic foreign bodies like pen cap, metal screw and stones were removed in 8% of the patients. In one patient, there were two stones at the level of left main bronchus and left secondary bronchus. In two patients, rigid bronchoscopy was attempted but procedure was abandoned as patient was unable to maintain saturation due to low hemoglobin levels.

Table 9: Location of FB

	Frequency	Percent
Carina	4	8.0
Left Main and Secondary Bronchus	1	2.0
Left Main Bronchus	27	54.0
Right Main Bronchus	18	36.0
Total	50	100.0

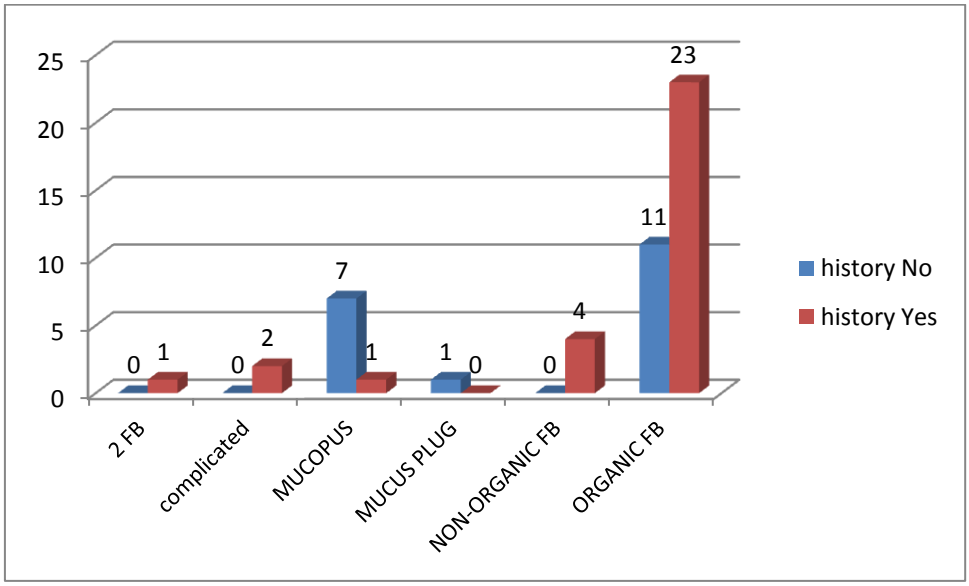


In 54% cases, foreign bodies were removed from left main bronchus and in 36% cases, they were removed from right main bronchus. In 8% cases, foreign body was located in carina while in one patient, two foreign bodies were found the level of the left main and secondary bronchus.

Table 10: Comparison between History and Bronchoscopy Findings

		History		Total
		NO	YES	
Bronchoscopy findings	2 FB	0	1	1
	complicated	0	2	2
	MUCOPUS	7	1	8
	MUCUS PLUG	1	0	1
	NON-ORGANIC FB	0	4	4
	ORGANIC FB	11	23	34
Total		19	31	50

P value=0.01 (S)

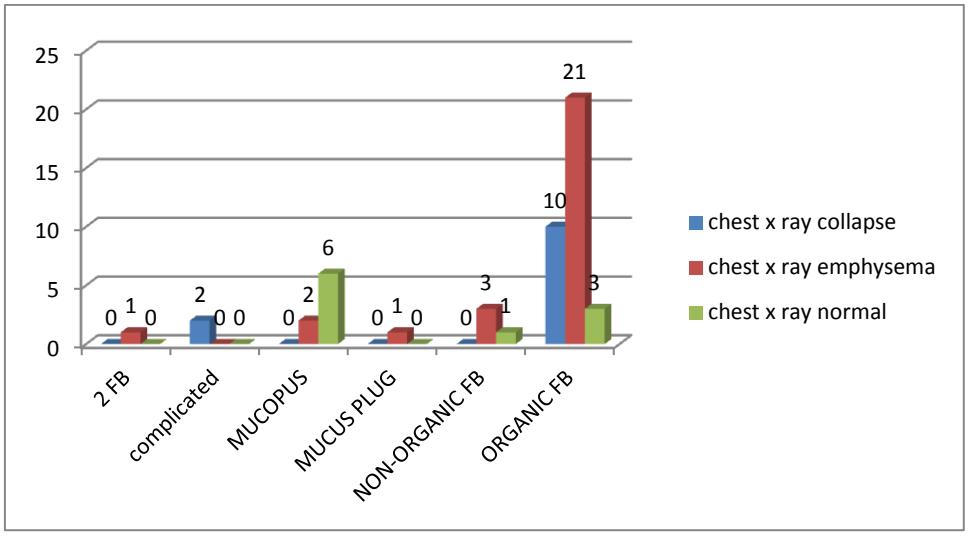


In 31 cases out of 50, history given by parents/guardians of patients is relatable to the Rigid Bronchoscopy findings. This is proved by using the independent t test (for quantitative data within two groups)l level of significance was set at P=0.5.

Table 11: Comparison between Chest X-Ray and Bronchoscopy Findings

		CHEST XRAY			Total
		Collapse	Emphysema	Normal	
Bronchoscopy findings	2 FB	0	1	0	1
	Complicated	2	0	0	2
	Mucopus	0	2	6	8
	Mucus Plug	0	1	0	1
	Non-organic FB	0	3	1	4
	Organic FB	10	21	3	34
Total		12	28	10	50

P value=0.002 (S)

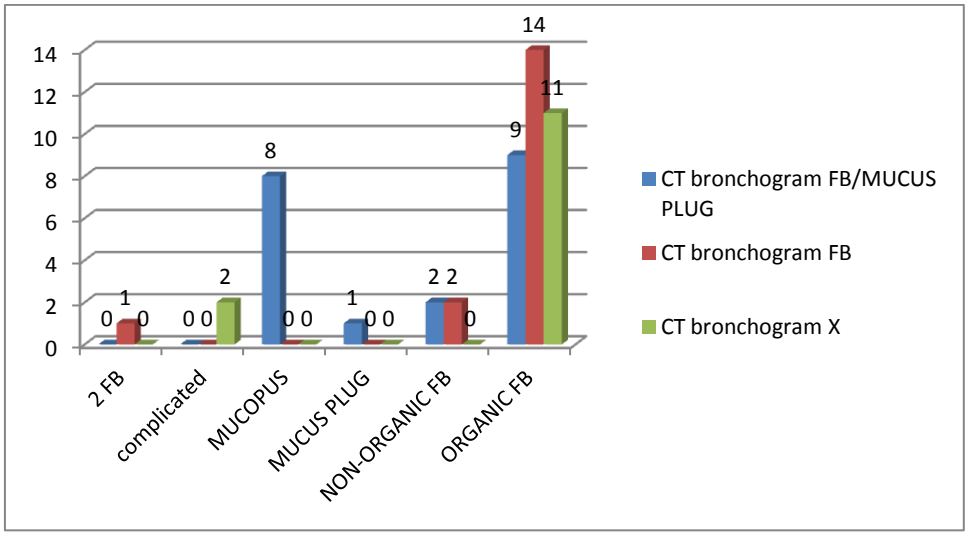


On comparing the correlation between the Chest radiogram and Rigid Bronchoscopy findings, we found that out of 50 cases, total 40 cases showed relevance between the two and P value is less than 0.5.

Table 12: Comparison between CT Bronchogram and Bronchoscopy Findings

		CT Bronchogram			Total
		?FB/MUCUS PLUG	FB	X	
Bronchoscopy finding	2 FB	0	1	0	1
	Complicated	0	0	2	2
	Mucopus	8	0	0	8
	Mucus Plug	1	0	0	1
	Non-organic FB	2	2	0	4
	Organic FB	9	14	11	34
Total		20	17	13	50

P value=0.005 (S)



CT Bronchogram was found to be more reliable as compared to Chest Radiogram as it has 100% sensitivity 37 out of 37 suspected foreign body aspiration cases undergoing CT Bronchogram came positive for presence of foreign body/mucus but 92%specificity which is seen in 17 cases out of 37 in which CT Bronchogram reported confirmed foreign body in tracheo-bronchial tree.

Discussion

Most common season when the cases of foreign body aspiration present are the harvesting season- between July to September and between October to March. As the parents are busy in the fields, there is no one to supervise the children who tend to ingest or inhale various food/non-food materials in and around the home. Most commonly in children between 1 and 8 years of age. Boys are more affected than girls. This is similar to other studies.[7-11]

Predisposing factors include smaller diameter of their airway, lack of molar teeth necessary for proper grinding of food, minimal controlled coordination of swallowing and immaturity in laryngeal elevation with glottis closure, the tendency to introduce objects into the mouth, activity while eating, and having older siblings.

Food (eg., peanuts, seeds, nuts,corn) is the most commonly aspirated by infants and toddlers. Nonfood items (eg., coins, batteries, paper clips, toy parts, pen caps) are more commonly aspirated by older children. These organic F.B can swell and cause local edema and inflammatory reactions.[12-14] Most objects aspirated by children are radioluscent, whereas only 18% to 20% of aspirated foreign bodies are radio-opaque.

Patients with acute symptoms tend to volunteer an aspiration history (100%) while those with chronic history do not attempt. A history of the clinical triad of choking, wheezing, and coughing is important to illicit, especially in context of other acute clinical signs and symptoms. There are three clinical phases of foreign body aspiration. The initial phase consists of choking, gagging and paroxysms of coughing or airway obstruction that occurs at the moment of aspiration. [15-18]

Parents give a definitive history of this phase only if witnessed. History is confirmatory of foreign body aspiration. The coughing and protective mechanisms eventually became fatigued and asymptomatic latent phase ensures which can last hours to weeks. Complications occur in the third phase when obstruction, erosion or infection causes hemoptysis, pneumonia, atelectasis, abscess or fever.

Compared to bronchial foreign bodies, laryngotracheal foreign bodies tend to present more acutely. Between 80% and 90% of airway foreign bodies are found in the bronchi because their size and configuration allow passage through the larynx and trachea. Tracheal foreign bodies accounts for only 4% of aspirated foreign bodies.[19-22] In children presenting with complete airway obstruction, dislodgement using back blows and chest compressions in infants, or the Heimlich maneuver in older children, should be attempted.“Blind” sweeping of the mouth should not be performed.

Conclusion

The most serious complication of FBA is complete obstruction of the airway, atelectasis, pneumothorax, perforation, bronchopulmonary fistula, bronchiectasis. Inhalation of a FB is a potentially lethal event. The importance of early diagnosis and rarity of tracheal FB are stressed here. In pediatric patient careful history, meticulous examination and imaging are essential for early diagnosis for airway foreign body.

References

1. Kaur K, Sonkhya N, Bapna AS. Foreign bodies in the tracheobronchial tree: a prospective study of 50 cases. Indian J Otolaryngol Head Neck Surg. 2002;54(2):30-4.
2. Darrow DH, Holinger LD. Foreign bodies of the larynx, trachea and bronchi. In: Bluestone CD, Stool SE, Apler CM, Arjmand EM, Casselbrant ML, Dohar JE et al (eds). Paediatric otolaryngology, 4th edn. WB Saunders Company, Philadelphia; 2002:1543-1557.
3. Naragund AI, Mudhol RS, Harugop AS, Patil PH, Hajare PS, Metgudmath VV. Tracheo-bronchial foreign body aspiration in children: a one year descriptive study. Indian J

Otolaryngol Head Neck Surg. 2014;66(Suppl 1):180-5.
4. Haddadi S, Marzban S, Nemati S, Ranjbar Kiakelayeh S, Parvizi A, Heidarzadeh A. Tracheobronchial Foreign-Bodies in Children; A 7 Year Retrospective Study. Iran J Otorhinolaryngol. 2015;27(82):377-85.
5. Jaswal A, Jana U, Maiti PK. Tracheo-bronchial foreign bodies: a retrospective study and review of literature. Indian J Otolaryngol Head Neck Surg. 2014;66(Suppl 1):156-60.
6. Karakoç F, Karadağ B, Akbenlioğlu C, et al. Foreign body aspiration: what is the outcome? *Pediatr Pulmonol*. 2002;34(1):30-36.
7. Sersar SI, Rizk WH, Bilal M, et al. Inhaled foreign bodies: presentation, management and value of history and plain chest radiography in delayed presentation. *Otolaryngol Head Neck Surg*. 2006;134(1):92-99.
8. Srivastava G. Airway foreign bodies in children. *Clin Pediatr Emerg Med*. 2010;11(2):67-72.
9. Assefa D, Amin N, Stringel G, Dozor AJ. Use of decubitus radiographs in the diagnosis of foreign body aspiration in young children. *PediatrEmerg Care*. 2007;23(3):154-157.
10. Rudman DT, Elmaraghy CA, Shiels WE, Wiet GJ. The role of airway fluoroscopy in the evaluation of stridor in children. *Arch Otolaryngol Head Neck Surg*. 2003;129(3):305-309.
11. Hui H, Na L, Zhijun C, et al. Therapeutic experience from 1428 patients with pediatric tracheobronchial foreign body [published correction appears in *J Pediatr Surg*. 2009;44(3):662.
12. Ramírez-Figueroa JL, Gochicoa-Rangel LG, Ramírez-San Juan DH, Vargas MH. Foreign body removal by flexible fiberoptic bronchoscopy in infants and children. *Pediatr Pulmonol*. 2005;40(5):392-397.
13. Soysal O, Kuzucu A, Ulutas H. Tracheobronchial foreign body aspiration: a continuing challenge. *Otolaryngol Head Neck Surg*. 2006;135(2):223-226.
14. Behera G, Tripathy N, Maru YK, et al. Role of virtual bronchoscopy in children with a vegetable foreign body in the tracheobronchial tree. *J Laryngol Otol*. 2014 Dec. 128(12):1078-83.
15. Abdollahi Fakhim SH, Badbarin D, GoljananTabrizi A. Studying delay causes in the diagnosis of patients with airway foreign body aspiration. J Iran University Med Sci. 2008;15(59):119-24.
16. Barretto RL, Holinger LD. Foreign bodies of the airway and oesophagus. In: Cummings CW, Fredrickson JM, Harker LA, Krause CJ, Schuller DE (eds). Otolaryngology head and neck surgery, 4th edn. Mosby: Philadelphia; 2005:4343-4353.
17. Weissberg D, Schwartz L. Foreign bodies in the tracheobronchial tree. Chest. 1987;91:730-3.
18. Zaytoun GM, Rouadi PW, Baki DH. Endoscopic management of foreign bodies in the tracheobronchial tree: predictive factors for complications. Otolaryngol Head Neck Surg. 2000;123:311-6.
19. McGuirt WF, Holmes KD, Feehs R, Browne JD. Tracheobronchial foreign bodies. Laryngoscope. 1988;98:615-8.
20. Mallick MS, Khan AR, Al-Bassam A. Late presentation of tracheobronchial foreign bodyaspiration in children. J Trop Pediatr. 2005;51(3):145-8.
21. Jose A, Cataneo M, Cataneo DC, Ruiz Jr RL. Management of tracheobronchial foreign body in children. Pediatr Surg Int. 2008;24(2):151-6.
22. Vijaykumar T, Kalyanappagol NH, Kulkarni LH. Management of tracheobronchial foreign body aspirations in pediatric age group: a 10-yearsretrospective analysis. Indian J Anaesth. 2007;51(1):20-3.