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Review Article

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Peanut Aspiration A Pandemic Peril in Pediatric Population During COVID 19 Lockdown; Rigid Bronchoscopy A Ramrod for Grapple

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Abstract

Recent studies have shown that there is a strong correlation between covid-19 pandemic lockdown and surge in number of cases of Foreign body aspiration [FBA] especially Peanut in paediatric age group. It has been witnessed that foreign body aspiration is seen among children of low socioeconomic strata and migrant population because peanut is most common affordable snacks available during containment. Also it is seen among children of working parents and migrant labours,therefore it goes unwitnessed making diagnosis and treatment late. This review article out sketches the early and late manifestations, clinical evaluation and management of peanut aspirationin paediatric population during pandemic lockdown by timely role of paediatrician and itsretrieval by rigid bronchoscopy performed by otorhinolaryngologist.The best method for diagnosing and conveniently treating FBA is rigid bronchoscopy. In review of many cases of clinically diagnosed FBA, bronchoscopy resulted in a 99% success rate in removing identified foreign objects.

Keywords: Foreign body aspiration, Peanut, Rigid Bronchoscopy

Introduction

The global COVID-19 pandemic caused by SARS-CoV-2 is the largest ever since the Spanish flu in 1918, with almost more than 100 million people affected [1]. During covid 19 pandemic there were many hurdles faced by people in home and educational systems for children.Lockdown and school closure are the containment measure executed by every nation to control the rapid surge of covid 19 infection had caused disproportionate impacts on the most vulnerable paediatric populations. In developing and underdeveloping countries for example, containment measures led to the unavailability of normal food and a lack of nutrition supplementation, which in turn, affected the overall nutritional status of children.

Nutrition is supplemented by cheap available snacks and confectionaries where peanut is common ingredient. In general parents panicked by purchasing necessities due to containment and lockdown and emptied supermarket shelves to stockpile snacks, as seen since the onset of pandemic, lead to constant available of snacks to children.Among them one such critical situation is upsurge in number of children presenting with ingested foreign bodies especially peanut aspiration due to lack of parental supervision. This review article particularly focuses onthe need of accurate history for clinical diagnosis and the importance of intervention by diagnostic Rigid Bronchoscopy to provide effective solution because as mentioned earlier it is PANDEMIC PERIL.

Discussion

Properties and Nature of Peanut

Peanuts (*Arachis Hypogaea L*) belong to the legume family and its cultivation spread to other parts of the world, from South America. Peanut has been classified as Virginia, Runner, Spanish, and Valencia depending on the seed stagnation, branching pattern, the plant maturation period [2]. People consumed peanuts as raw, boiled, roasted (snack), in confectionary bars and candies.peanuts belong to the legume family,contain 32 different proteins in their composition, and 18 of these protein fractions can have an allergic effect. In addition, these allergenic proteins are resistant to proteolytic enzymes,and chemical denaturation. Most among all foreign bodies peanut aspiration is of a concern because it is a vegetative foreign body. Diameter of peanut is around 8.54mm. whereas diameter of

bronchus is 12. 6 mm approximately. But peanut incites inflammatory reaction leading to congestion and edema of bronchial wall and it absorbs moisture and swells up causing airway obstruction.

Clinical Approach

Foreign body aspiration in children either witnessed or unwitnessed is a dangerous life threatning condition, which may lead to serious complications of immediate hypoxia and cardiac arrest or may be asymptomatic episode with late manifestation of bronchopneumonia [3].

In children anatomical and physiological factors which contributehigh risk of foreign body aspiration include lack of molar teeth, highposition of larynx, dysfunctional epiglottis, delayed development of chewing habit and swallowing reflex, uncoordinated deglutition and breathing [4]. Additional risk factors in small children are hyper activity and insufficient guardianship access to inappropriate and unsupervised food intake for instance, confectionaries with nut fragments. Peanut aspiration is masquerade because it usually presents as wheeze and cough and most of time history of ingestion of peanut is unaware by the parents. This leads to delayed diagnosis and intervention. Signs of foreign body aspiration include cough, dyspnea, and choking [5].

Common presentation are refractory paroxysmal cough (70%), dyspnea(65%), wheeze(60%). Physical signs are decreased breath sounds (72%), fever(22%), cyanosis(18%).Not uncommonly, foreign bodies are aspirated in the absence of parental attention, which adds an additional hurdle to establishing a proper diagnosis. Children present with acute respiratory distress or choking. Some individuals, however, do not have symptoms during the acute phase but eventually present with paroxysmal cough or wheezing that is sometimes misdiagnosed as an asthmatic attack. Some children may not even have any respiratory symptoms but present with a delayed onset fever due to pneumonia or lung abscess. Clinicians should always bear this diagnosis in mind when encountering similar complaints.

Investigations

Similar to clinical manifestations, radiological findings are also variable. The chest X-ray is usually the first investigation ordered and occasionally the foreign body can be seen on the film. The majority, the aspirated foreign bodies are radiolucent and not revealed on the X-ray, but lobar pneumonia and atelectasis due to airway obstruction are two common radiological findings. Sometimes, the foreign body can act as a 'check-valve' and results in hyperinflation of the ipsilateral lung with mediastinal shift to the contralateral side. This may easily be misinterpreted as obstruction to an airway of the contralateral normal lung, in which collapse is due to compression. Though X ray stands first choice of investigation in foreign body aspiration,whenever there is negative Xray but strong suspicion of foreign body is there, higher modalities like low dose MDCT and VIRTUAL BRONCHOSCOPY is the cardinal diagnostic tool [6].

Computed tomography (CT) is an excellent modality for the diagnosis and may reveal the impacted foreign body directly as a hyperdensity in the lumen of airway. It is also possible to differentiate low density foreign bodies from the mucous plug by determining the Hounsfield value. Ancillary findings such as post obstructive emphysema, collapse, consolidation and bronchiectasis are also well demonstrated. Advent of Multi-detector Computed Tomography (MDCT) has made it possible to obtain isotropic high resolution images in any desired plane. Thus, it is possible to see and evaluate even a subtle abnormality. Multiplanar reconstructions, minimal intensity projection of the airway and virtual bronchoscopy provide an excellent roadmap to Otolaryngologist for planning the endoscopic removal. With MDCT, we can able to detect, localize and assess the crucial parameters of the foreign bodies in all cases planned for endoscopic removal.

Multidisciplinary Approach

Paediatric physicians are the first point of contact for clinical evaluation. Accuratehistory and timely clinical diagnosis for proper referral to higher equipped centre for Otolaryngologist intervention play a major role. Otorhinolaryngologist play a major role because they are one who picks up unwitnessned foreign body by clinical features and provide timely relief by doing intervention rigid bronchoscopy. Rigid bronchoscopy is technically challenging because the bronchoscopist and anesthesiologist must simultaneously perform in a narrow airway [7]. This is especially difficult in pediatric patients. In order to ensure patient safety, Otolaryngologist must have adequate opportunities to attain the necessary experience in decision making, knowledge, and technical skill to perform rigid bronchoscopy. Proceduralist must have Primordial knowledge in endoscopic anatomy of tracheobronchial tree and proficiency in laryngoscopy, rigid bronchoscopy for safe navigation of procedure.

Figure 1: Karl Storz Rigid Bronchoscopy

S.NO		SIZE	Age of patient
1	RIGID BRONCHOSCOPE	3	Term newborn [Birth- 3 months]
2	RIGID BRONCHOSCOPE	3.5	6 months [3 months to 18 months]
3	RIGID BRONCHOSCOPE	4	3 years [1 1/2 years to 5 years]
4	RIGID BRONCHOSCOPE	5	5 years [3 years to 10 years]

History of Rigid Bronchoscopy

Tracing back to history in 1876, bronchoscopy was first performed by Gustav Killian a German Laryngologist using modified oesophagoscope to remove pork bone from farmer's airway. A direct ocular mechanism consisting of an illumination and suction tubing attached to a rigid bronchoscope was developed by a Philadelphia based American laryngologist Chevalier Jackson in 1904 [8]. This is considered to be the precursor of the modern-day rigid bronchoscopes.Edwin Broyles who developed an optical telescope with distal viewing augmented the innovation. Storz and Wolf became the two pivotal companies that introduced newer technologies and newer versions of the rigid bronchoscope. In England in 1954, Hopkins developed a rod-lens telescope 2.7mm and 1.3mm that improved the illumination and imaging, improving further clear access to the airways. This technology was adopted by Karl Storz as a cold light illumination source forrigid bronchoscopes in 1963. The three main components of the rigid bronchoscope include the barrel, the multifunction head, and the optics illumination by light source.

The Barrel

Ventilating Rigid bronchoscopes are longer permitting access to the right and left main bronchi and have sidefenestrations for ventilation and light source along with axis of portal for telescope and instrumentation.

The rigid barrel is a hollow metallic tube with a bevelled distal tip have fenestrations to allow ventilation of contralateral airway while the tube tip is navigated into either the right or left main stem bronchus. The proximal end of the scope connects to the multifunction head permitting ventilation and instrument access. The light source attaches to the proximal end of the scope or to the telescope lens directly depending on the make. The bronchoscope can be used with direct visualization down the tube, directly through a telescope, or the telescope can be connected to a camera head to provide visualization on a monitor. Multiple accessory instruments can be used through a rigid bronchoscope. They include large optical grasping forceps and suction catheter.

The Multifunction Head

The multifunction head attaches to the proximal portion of the barrel. The multifunction head has ports to accommodate ventilation and procedural instruments or suction simultaneously. The ventilation port can be attached to either volume ventilation or jet ventilation depending on one's preference. The rigid bronchoscope is uncuffed, therefore a significant air leak may occur and the tidal volumes delivered will not reflect alveolar tidal volume. Furthermore, it may be difficult to assess end tidal CO_2. Jet ventilation allows the operator to maintain an open circuit and freely introduce and remove instruments. Volume ventilation requires a fenestrated cap which must remain closed to ensure adequate ventilation.

Optics and Light Source

For intubation, the endoscopist can either use a telescope and camera to direct the rigid scope or direct visualization down the barrel with the naked eye using the light source built into the barrel. Once the airway is secured, the bronchoscopist can deploy a telescope coupled to a camera, passoptical forceps which combine the telescopic camera and specialized graspers for visualization. Some endoscopists site directly down the barrel with the naked eye for instrument deployment. Only bronchoscopes with a built-in light source allow the endoscopist direct sight through the lumen of the scope

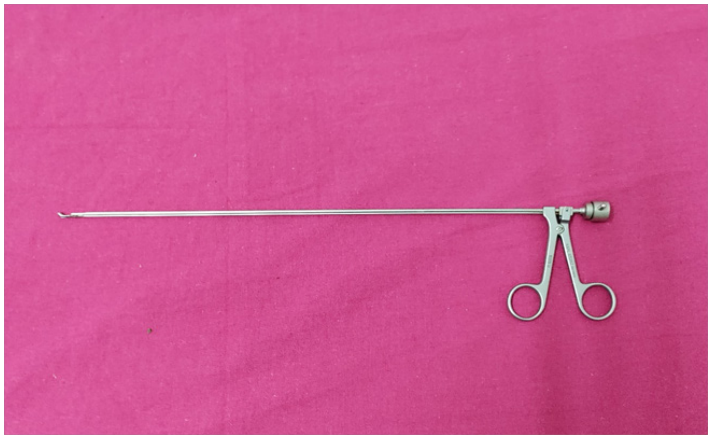

Figure 2: OPTICAL FORCEPS peanut grasper

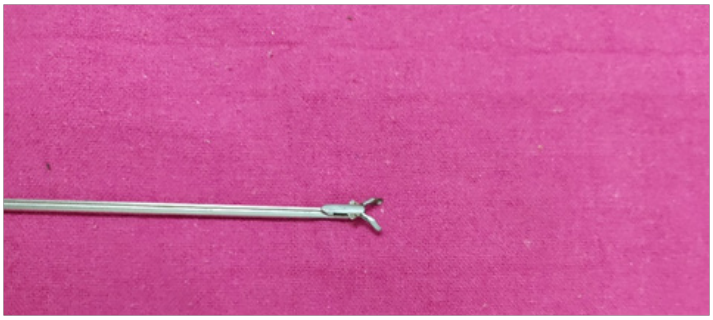

Figure 3: OPTICAL FORCEPS Killian peanut jaw

Tools and Accessories

Instruments have been designed to pass through the main working lumen or barrel of the bronchoscope. Principle accessories include suction catheters, graspers, biopsy forceps, dilators, cau-

tery, stents, and other implements. The common feature of instruments designed for the rigid bronchoscope is that they are larger and stiffer than those built for the working channel of the flexible bronchoscope. Various types of forceps to grasp foreign bodies include alligator jaw, killian bean jaw and 2 teeth jaw or shark tooth forceps

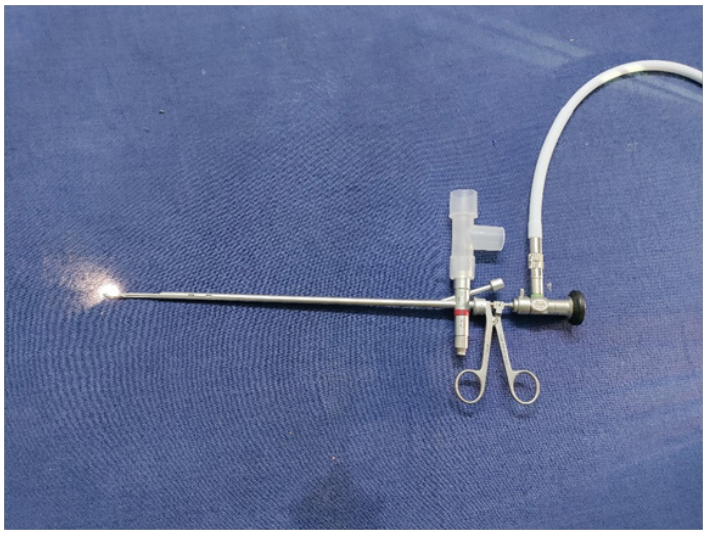

Figure 4: Storz ventilating rigid bronchoscope with multifunctional head for ventilation, illumination and instrumentation

Conclusion

Global covid 19 pandemic is a conundrum for parents and health care professionals. Peanut considered as "Lockdown legume" consumed more during pandemic lockdown had more incidence of peanut aspiration."An ounce of prevention is worth a pound of cure." Parents should devoid children, especially those under the age of 3 years, from consumption of peanut fragmented snacks. Food safety regulation should emphasis for labelling the peanut confectionaries with caution and warning logo for choking with aspiration in children. When presentation is delayed, aspirated fragments are more difficult to be retrieved and more likely to cause life threatening complications. There should be no delay in seeking appropriate medical advice for children with suspected foreign body aspiration. For attending clinicians, this differential diagnosis should always be included in children who present with history of choking, wheezing, or chronic cough. An accurate history of foreign body ingestion is not always available and requires a high index of suspicion. Once the diagnosis is made, the patient should be referred to a tertiary centre for multidisciplinary approach by paediatrician,otolaryngologist and anaesthesiologist expertiseto perform rigid bronchoscopy for safe and successful retrieval.

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