Innovative surgical technique for removal of Light Emitting Diode from segmental bronchus in a child: After the failure of endoscopic retrieval

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A B S T R A C T
A five years boy aspirated Light-emitting diode (LED) of a toy while playing. Initially, he had a cough which later on settled. Chest physician at the local hospital tried to retrieve foreign bodies endoscopically, but he failed. He was referred to our tertiary care hospital. Chest physician and pediatric ear, nose and throat surgeon (ENT) were unable to remove it endoscopically as the (LED) migrated further into posterior basal segmental bronchus with manipulation. We removed this foreign body with our innovative lung paracymal sparing surgical technique without compromising the airway integrity.

Post-operative follow up showed full lung expansion. The child was discharged home safely and follow up chest X-ray was unremarkable.

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1. Introduction

Aspiration of foreign by children accounts for significant morbidity and mortality. In the United States incidence of death rate about 1.4/100000 has been reported in children due to foreign body aspiration [1]. Accidental aspiration of foreign body in children is common due to multiple factors, as they tend to put objects into their mouth. They don’t have molar teeth to chew food and also have immature swallowing coordination. They are also no aware of purpose in their mouth when they cry, shout, or play [2]. As the children have symmetric bronchial angle until the age of 15 years, a foreign body can go to any side of the bronchial tree, unlike the adults who tend to the right side. The incidence of foreign body aspiration is higher in 1–2 years old age group, children > 5 years of age aspiration rate are less than 15% [3].

This case has been reported in line with SCARE criteria [4].

2. Presentation of case

A 5 year old boy while he was playing, accidentally aspirated the (LED) of a toy. He had an initially dry cough, no choking or severe respiratory distress. Parents noticed LED missing, so he was taken to a local hospital. Chest x-ray showed a foreign body in the right lower lobe bronchus Fig. 1A. Basic blood tests were within the normal range. Pulmonologist endoscopically tried to retrieve but he failed. The child was referred to our tertiary care hospital for further management. The pediatric era nose and the surgeon also was unable to retrieve with flexible and rigid Bronchoscopes. Probably due to multiple attempts foreign body migrated more distally. Computed tomographic scan of the chest showed that a foreign body was lodged in the posterior basal segmental bronchus. Fig. 1(B,C,D)

With our lung sparing innovative surgical technique, we removed the foreign body Fig. 1(E). Airway anatomy (Fig. 2) and location of LED is shown in Fig. 1.

Informed consent was taken from parents for a surgical procedure under general anesthesia. After induction of anesthesia size, 4.5 single-lumen endotracheal tube was positioned into the trachea and then guided with the fiber optic scope into the Right main bronchus to achieve Lt Lung isolation for the procedure. Thoracic epidural, right-sided radial arterial line and large intravenous access were inserted. The left lung was approached through a left posterolateral thoracotomy. Image intensifier was used to locate the foreign body in lower lobe posterior basal segmental bronchus. We put a bulldog clamp on segmental bronchus proximally. Distal to the foreign body we injected 3 mL/ml of normal saline using 0.4 mm X 13 mm needle on five ml syringe which dilated the segmental bronchus to make a precise incision on further flush with 5 ml of normal saline foreign dislodged and was removed with ease, in addition to that pus and secretion were also washed off. Bronchus was repaired with 5/0 proline suture, Fig. 3 (Illustrative drawing of...
Fig. 1. (A) Pre-operative chest X-ray showing foreign body in the lower lobe of the left lung. (B) Non enhanced Magnified image CT image of thorax, round radiopaque structure seen within the left lower lobe posterior basal segment. (C) Non contrast CT scan of thorax axial view (E) Coronal reformatted image shows the foreign bodies in the basal segment bronchi of left lower lobe. (D) Foreign body, light emitting diode (LED). (F) Post-operative chest X-ray.

Fig. 2. Anatomical picture of the airway showing the location of foreign body.
procedure). A chest drain was removed after 24 hour as his chest x-ray was satisfactory. He was followed up in an outpatient clinic for six months; a surveillance chest x-ray showed a normal lung fields

3. Discussion

Foreign body aspiration in children is not only the most common emergency but also is the leading cause of death too. The commonly aspirated foreign bodies can be classified into two categories [5,6]. Organic (peanuts, beans, popcorn, seeds, vegetable, meat, bone pieces) nonorganic (toy parts, caps, crayons pins, tacks, and screws metal pieces nails, metal foil) [6,7]. Failure of endoscopic or surgical retrieval of these foreign bodies can lead to atelectasis, chronic pneumonia bronchiectasis, and granulation tissue formation in the airway leading to chronic infection [8]. The aspirated foreign body may be lodged in glottis inlet, trachea or one of the bronchus. Small objects can migrate to distal bronchi. Patients with foreign body obstruction of the glottis commonly present with acute respiratory distress, stridor hoarseness. Complete glottis obstruction if not treated urgently can lead to asphyxia, death, and hypoxic encephalopathy 45% and 30% respectively [9]. Therefore lifesaving maneuvers are essential at the site or in an emergency room. Often the child had initial symptoms like respiratory distress, cough, shortness of breath, fever, cyanosis, hoarseness after aspiration. Sometimes after an initial episode child condition improves as the small size foreign body migrates to the right or left main bronchus.

Whatever the imaging modality we use for diagnosis, a careful history and physical examination are essential. It has been reported in the medical literature that 73.8%–93.2% of parents had evidence that the child had aspirated a foreign body [10,11]. Chest x-ray and computed tomographic scan can be very useful if the foreign body is radiopaque. The primary diagnostic and therapeutic tool is bronchoscopy flexible/rigid. Endoscopic retrieval is the primary and gold standard treatment, surgical procedures, tracheotomy Bronchotomy, lobectomy, segmentectomy are reserved only if endoscopic retrieval is unsuccessful [12]. The chest is entered through 6th, intercostal space, and the foreign body is palpated and stay sutures are applied to the bronchus. A foreign body is removed through Bronchotomy and the primary closure of bronchus achieved with absorbable sutures. Lobectomy or segmentectomy is indicated only if the lobe is damaged due to bronchiectasis or foreign has migrated to segmental bronchi and cannot be removed by Bronchotomy. In case if there is no life-threatening airway compromise, a surgical procedure in children should be delayed after the failure of repeated rigid endoscopic retrieval because this can cause laryngeal edema. The submucosal

Fig. 3. (A) Location of the foreign body (B) incision site over the foreign body. (C) Proximal bulldog on the posterior basal bronchus and injection of normal saline. (D) Repair of posterior basal segmental bronchi after retrieval of the LED.
tissues are lost in children and are more prone to develop edema, which can lead to asphyxia [13]. Sometimes small foreign bodies like LED can migrate further into segmental and subsegmental bronchi after multiple endoscopic manipulations. In such cases, surgical removal is the only choice either by lobectomy or segmentectomy. We developed a technique for the removal of foreign bodies lodged in segmental bronchi after the failure of bronchoscopic retrieval. An image intensifier was used to locate the foreign body; bulldog clamp was placed proximally on segmental bronchus. Five milliliters (ml) normal saline was injected into segmental bronchus that dilated the airway which helped us for precise incision; once segmental bronchus was opened we injected an other 5 ml of normal saline to clear the pus and necrotic material, LED was removed with ease incision was closed with 5/0 prolene two interrupted stitches.

4. Conclusion

For removal of foreign bodies in segmental bronchi, our technique in addition to benefits of lung volume sparing has other several advantages.

As the saline injection dilates segmental bronchus that allows the removal of foreign body easily without any manipulation which minimizes the mucosal damage. This technique facilitates the precise incision and closure of segmental bronchi without compromising the intraluminal diameter, and there is minimal chance of stricture formation. As previously it is known to proceed with segmental resection or lobectomies for foreign bodies after failure in bronchoscopic removal. In our opinion this is an instrumental technique for surgical removal of the foreign body impacted in segmental bronchi after the failure of endoscopic retrieval to avoid lung volume loss.

The child was followed up in an outpatient for six months with a surveillance chest x-ray, which revealed no abnormality.

Declaration of Competing Interest

There is no conflict of interest in this paper.

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Ethical Approval

Institutional review board (IRB) approval achieved.

Consent

A written was obtained from the patient parent for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-chief of this journal on request.

Author contribution

Ikram Ulhaq Chaudhry.

Operating surgeon drafting the article, Critical revision and final approval of the article. (Corresponding author).

Hazam Alleid Ear nose and throat surgeon, tried endoscopic retrieval written abstract.

Ahsan Cheema, References.

Aqeel Chaudhry searched literature.

Suha Albadar Radiologist.

Mohiudin G Ali Anaesthetist.

Registration of research studies

1. Name of the registry: research registry.
2. Unique identifying number or registration ID: 5783.
3. Hyperlink to your specific registration (must be publicly accessible and will be checked):

Guarantor

The corresponding author Dr Ikram Chaudhry is the guarantor.

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References

[1] R. Altokorn, X. Chen, S. Milkovich, et al., Fatal and non-fatal food injuries among children (aged 0-14 years), Int. J. Pediatr. Otorhinolaryngol. 72 (2008) 1041–1046.
[2] D. Joshua, M.D. Rovin, M. Bradley, M.D. Rogers, Pediatric foreign body aspiration, Pediatr. Rev. 21 (March 3) (2000) 86–90.
[3] F. Brikic, S. Umihanic, Tracheobronchial foreign bodies in children. Experience at ORL clinic Tuzia1954–2004, Int. Pediatr. Otorhinolaryngol. 71 (2007) 909–915.
[4] R.A. Agha, M.R. Borelli, R. Farwana, K. Koshy, A. Fowler, D.P. Orgill, For the SCARE Group, The SCARE 2018 statement: updating consensus Surgical Case Report (SCARE) guidelines, Int. J. Surg. 60 (2018) 132–136.
[5] R. Samarei, Survey of foreign body aspiration in airways and lung, Glob. J. Health (2014) 130–135.
[6] H.K. Tan, K. Brown, T. Mc Gill, M.A. Kenna, D.P. Lund, G.B. Healy, Airway Foreign bodies: a 10-years review, Int. Pediatr. Otorhinolaryngol. 56 (2000) 91–99.
[7] C.A. Hughes, F.M. Broody, B.R. Marsh, Pediatrics tracheobronchial foreign bodies: a historical review from John Hopkins Hospital, Ann. Otol. Rhinolaryngol. 105 (7) (1996) 555–561.
[8] C.L. Daines, R.E. Wood, R.P. Boesch, Foreign body aspiration an important etiology of respiratory symptoms in children, J. Allergy Clin. Immunol. 121 (2008) 1297–1298.
[9] J.A. Lima, Laryngeal foreign bodies in children a persistent life-threatening problem. Laryngoscope 99 (1989) 415–420.
[10] A. Sahin, F. Meteroglu, S. Eren, Y. Celik, Inhalation of foreign body in children: experience 22 years, J. Trauma Acute Care 54 (2013) 532–535.
[11] W. Kornacki, K. Korecka, J. Dzieliicki, Foreign body aspiration in children: diagnostic and therapeutic role of bronchoscopy, Pediatr. Surg. Int. 27 (2011) 833–837.
[12] S.C. Mark, B.R. Marsh, D.L. Dudgeon, Indications of open surgical removal of foreign bodies, Ann. Otol. Rhinol. 102 (1993) 690–694.
[13] Chuan-Shan Zang, Jian Sun, Hai-Tao, Yan Sun, Jie Que, Yan Jiang, Li Na, Inhaled foreign bodies in pediatric patients a review and analysis of 3028 cases, Int. J. Clin. Exp. Pathal. 10 (1) (2017) 97–104.

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