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**Case Report**

# When tracheotomy was the only resort in paediatric tracheo-bronchial foreign body: case report

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## ABSTRACT

The pediatric individual is likely to present with an aspirated foreign body that maybe oriented as such that it may necessitate often an alternate route for removal. Rigid bronchoscopy with jet ventilation is the intervention undertaken at the earliest. In wide caliber foreign bodies a different approach has to be adopted. Tracheotomy, thoracotomy, bronchotomy and pneumonectomy are the next level procedures. A cervical tracheostomy had to be undertaken in a child with a week old impacted conical tail cap of a ball point pen.

**Keywords:** Foreign body, Pen cap, Pediatric, Bronchoscopy, Sub-glottis, Tracheotomy

## INTRODUCTION

The conventional protocol in foreign bodies aspirated in the tracheo-bronchial tree is the jet ventilated assisted rigid bronchoscopy with grasping forceps of varied configurations. The latter required so to disimpact, hold and maneuver out the extraneous object. The vertically aligned right bronchus, followed by the left and the carina are the common sites of lodgment in individuals; with minimum symptoms and signs of respiratory tract obstruction. The 'bottle neck', sub glottis facilitates entry of conical foreign bodies but 'exit' of the same becomes a dilemma, consequent to a mismatch in the diameters of the both. Moreover the subglottic lumen gets further reduced due to traumatic edema i.e. during entry of the object and the repeated introduction of the sheath of the bronchoscope. Even the flanges of the grasper add to the width of the foreign body. The other site of concern are the vocal cords. Though they are reflected laterally with a cord hook or a dilator. Pen caps are easily inhaled while talking, laughing, coughing, or taking a deep breath.[1-3]

To circumvent the sub glottis in one such child a mid-level tracheotomy had to be undertaken to facilitate delivery of the non-negotiable pen cap foreign body.

## CASE REPORT

A 5 year old male child was referred with history of foreign body aspiration in the pediatric oto-rhino-laryngologist services of a tertiary health care facility of North India. On chest auscultation there was symmetrical bilateral ventilation at the base and apices of either lung fields. Moreover all vital parameters were within normal limits. A computed tomographic scan on coronal cut exhibited an inverted "U" silhouette of an extraneous object just above the carina (Figure 1). Since a precise sequel of events was narrated by the parents, i. e.; insertion of tail end of a pen in the oral cavity and later it was found to be untraceable

(Figure 2) and moreover it corroborated with the imaging study. Therefore, a flexible fieroptic diagnostic procedure was deferred and straight away the child was taken up for a therapeutic intervention

Rigid bronchoscopy was carried out under general anesthesia using the jet ventilation modality. A pediatric alligator forceps was inserted through the bronchoscope sheath of 3.5 mm diameter (Storz make) and was maneuvered through the glottis to grasp the leading edge of the pen cap. The latter thus was disimpacted from just proximal to the carina. Unfortunately, inspite of repeated attempts it could not be negotiated through the glottis chink. Therefore left with no alternative a cervical tracheotomy was embarked upon and a successful endoscopic retrieval of the pen cap was achieved, under video endoscopic visualization on a high definition '26 monitor'.

A post bronchoscopy I Mac laryngoscopy revealed slight vocal cord edema for which 3.5 mm tracheostomy tube was inserted in the tracheotomy. The pen cap was conical in shape, measured 10 mm in length and 8 mm in its widest diameter (Figure 3 and 4). The child was administered steroids intramuscularly initially and later orally. He was decannulated one day after the intervention and discharged.

**Figure 1: Coronal view of computed tomography of thorax showing foreign body at level of the carina.**

**Figure 2: Pen with separated and untraceable cap.**

**Figure 3: Pen cap measuring 10 mm in length after removal.**

**Figure 4: Pen cap measuring 8 mm at largest diameter after removal.**

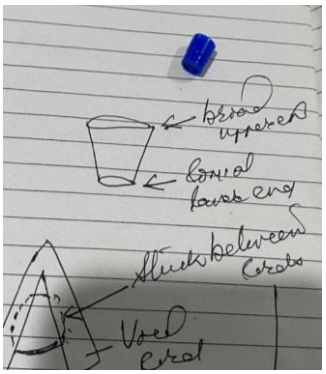


**Figure 5: Pen cap obstruction at the sub-glottis. Wide open end with threads with narrow closed end facing inferiorly.**

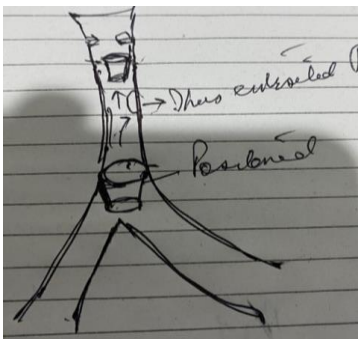

**Figure 6: Pen cap impacted at the carina with narrow closed end facing inferiorly and wide open end with threads, superiorly.**

## DISCUSSION

Pediatric airway foreign body aspiration is a life threatening clinical entity. Food items, especially peanuts, are the most common foreign bodies aspirated in infants and toddlers, whereas older children are more likely to aspirate non-food items such as pen caps, pins, and paper clips. This is the school going age group which is inquisitive and plays with school stationary.[4]

Tracheobronchial foreign bodies are often lodged in the right bronchial tree due to the anatomic angle, and the right main bronchus being shorter and wider, as the trachea extends.[5] The most common presenting symptoms are sudden cough and cyanosis, while some subjects are not symptomatic.[5] A strong history of insertion in presence of someone, followed by a choking event is the vital aspect that usually clinches the diagnosis at an early stage.

A phase minus any symptoms is not uncommon following aspiration and thereby there is undue delay in diagnosis of more than one week in 12% to 26% of patients. In the meantime bronchial inflammation, obstruction, and pneumonia recalcitrant to treatment enhances the morbidity.[4] The most important element in diagnosis is a detailed and reliable history, confirmed on physical and X-ray examinations.

A chest X-ray is recommended in all patients with suspected tracheobronchial foreign body, while negative finding does not invalidate the diagnosis, CT thorax is useful in cases where history and clinical examination is doubtful or not conclusive.[5]

Aspirated foreign body in child is an issue that necessitates intervention at the earliest lest it may prove fatal. A conventional endoscopic extraction usually suffices but often the size, site shape and orientation of the extraneous object dictate otherwise. A tracheotomy, tracheostomy, thoracotomy and bronchotomy and/or pulmonary resection may have to be undertaken. A tracheotomy or tracheostomy is usually the rule in objects lodged in the sub glottis for a long duration, and those with piercing edges in sub glottis and also those that cannot be negotiated through the pediatric glottic chink.[6] Thus, a supplementary procedure i. e. a tracheotomy has to be resorted to for an 'open' extraction removal of the foreign object. Cervical tracheotomy is undertaken and via the tracheostome a rigid bronchoscope is maneuvered to extract the foreign body.

The trachea post tracheotomy is sutured after the foreign body removal either at the termination of the intervention or later, subject to laryngoscopic or radiological resolution of subglottic and glottis edema.[7] Swensson et al emphasized that tracheostomy with bronchoscopy i. e. a 'simultaneous approach' and undertaken electively markedly reduces the morbidity and mortality in large tracheo bronchial foreign bodies.[8] A peculiar situation is when after a successful extraction from the either bronchi or the carina the now tracheal foreign body become moreover in the sub glottis region thereby obstructing the airway, and repeated attempts to bring it out are unsuccessful. Here an on table 'emergency tracheotomy 'approach is carried out. Moreover there is another group of patients where sometimes to secure the airway in impending subglottic or glottic edema undertaken multiple laryngo-tracheal bronchoscopic passes have been to facilitate the foreign body removal. In our patient's, CT thorax was earlier taken at the referring hospital and foreign body was seen at carina level. This further validated the diagnosis of foreign body aspiration besides reliable history.

Ulkü et al series of 24 bronchoscopies in 8-15 years, localized, pen caps in the right bronchial tree in 74% children, which could be extracted by conventional forceps bronchoscopy in 9 patients. In 5, bronchoscopies with tracheostomy in 5, thoracotomy and bronchotomy series had to be performed.[3] Jiaqiang et al series 34 children of pen cap inhalation had predominance in 6-14 years old boys (64.7%) and in right main stem bronchus (76.4%). Of the 34 children with pen cap inhalation, 22 (64.7%) were boys and 12 (35.3%) were girls. Children with pen caps were frequently found in the history of an episode of foreign body inhalation (34 cases, 100%) and acute cough (28 cases, 82.3%) was the most common presenting findings. They could extract all inhaled pen caps by reverse grasping forceps during rigid bronchoscopy. Tracheotomy, thoracotomy, and bronchotomy was not required.[1]

Chen et al 44 pediatric pen cap series utilized a reverse grasping forceps in 62% and the ordinary forceps in 38% of the cases. In 2 cases, the pen caps were coughed up. In 2 kids a tracheotomy and in 1 thoracotomy was the solution.[9] A Fogarty catheter threaded through the 'pen cap hole' and then inflated and withdrawn to bring out the cap, too has been an indigenous modality adopted by some.[10] There may be concerns about variable pen cap shapes and sizes and applicability of this technique in all cases.

Mahakam et al advocated a technique of 90 degree rotational movement of the grasping forceps to align the pen cap with the vocal cords and to facilitate extraction. The technique, overcomes the misalignment with the vocal cords, which they emphasized is the most important bottleneck in the removal of aspirated pen caps.[11,12] Orientation and dimensions of the pen cap in our 5 years old pediatric patient made it difficult to negotiate the pen cap through the glottic chink. Inspite of repeated attempts the pen cap got obstructed at the subglottis as it had a broad open end facing upwards and a narrow closed end facing inferiorly (Figure 5 and 6). Compression as well as rotational realignment too was unsuccessful, Therefore rather being adamant and damage the vocal cords and thus the voice by 'forceful extraction' took resort to a transcervical tracheal window approach. Here a wide

working space for instrumentation and removal was obtained and the cap easily retrieved.

On vis a vis, the Ulkü et al statement ever holds true, "even in the hands of experienced endoscopists, there may be occasions when an endoscopic approach to airway foreign bodies should be abandoned in favor of an open surgical procedure".[3] Ulkü et al and Hui et al series reported the necessity of open surgical intervention ranged from 0.3% to 4%.[3,13]

Marks et al review of 6,693 airway foreign body series concluded 2.5% needed thoracotomy and 2.0% tracheostomy. The Marks et al criteria for tracheostomy for tracheobronchial foreign bodies is threefold (a) acute airway obstruction from a subglottic foreign body; (b) foreign body too large to be removed through the glottis without risking dislodgement and sudden distal obstruction; (c) to avoid laceration and potentially permanent injury to the vocal cords and sub glottis in sharp impacted foreign bodies.[14]

## CONCLUSION

In trachea-bronchial foreign bodies one should not be dogmatic rather resort to a tracheotomy or a tracheostomy to achieve a favourable outcome. To retrieve a foreign body or post retrieval when one anticipates glottis or subglottic edema, a timely tracheal window is the best option.

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