

SINGLE USE BRONCHOSCOPY ΑΦΑΙΡΕΣΗ ΞΕΝΟΥ ΣΩΜΑΤΟΣ

ΒΑΣΙΛΕΙΟΣ ΤΣΑΟΥΣΗΣ
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INTRODUCTION

- Gustav Killian (the father of bronchoscopy) (1860-1921)
- In 1897 extracted a pork bone from the trachea of a German farmer using an esophagoscope



EPIDEMIOLOGY

Leading causes of unintentional-injury deaths, United States, 1998

Motor Vehicle	43,501
Falls	16,274
Poisoning*	10,255
Drowning	4,406
Choking	3,515

- Fifth most common cause of unintentional-injury mortality in the United States
- More common in children (80 % in pts < 15 yr)
- Uncommon in adults
- Increased risk of dying following FBA:
 - Children < 1 yr
 - Elderly > 75 yr

Examples of organic foreign bodies removed from children and adults



Courtesy of Charles Marquette, MD.

Examples of inorganic foreign bodies removed from children and adults



Courtesy of Charles Marquette, MD.

- The nature of the FB is highly variable
 - In children: nuts and other organic material
 - Young or middle-aged adults: nail or pin aspiration
- The most frequently aspirated food particles:
 - vegetable matters, bones, and watermelon seeds

Foreign body removal with direct visualization and Magill forceps



Central airway obstruction



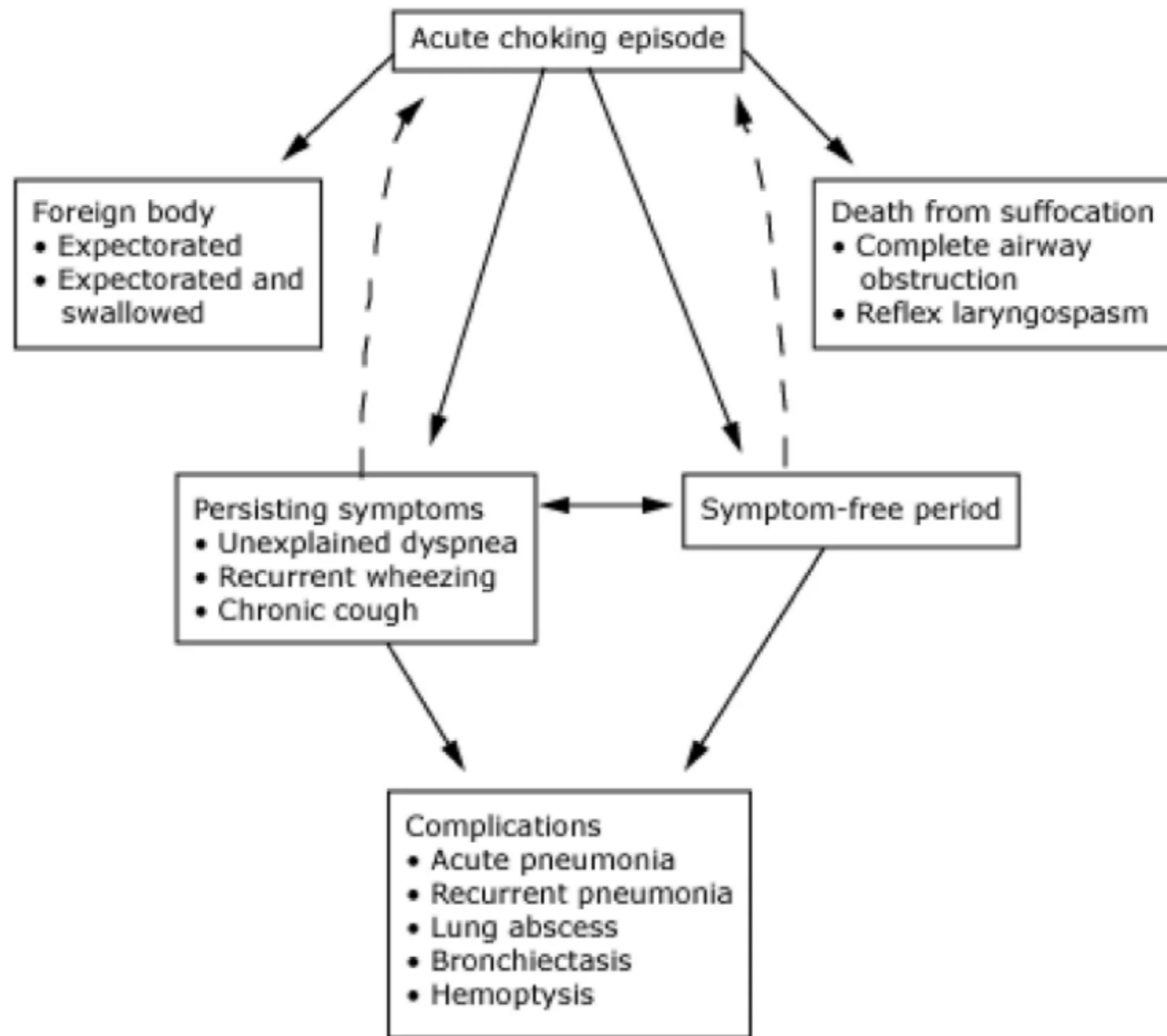
Caused by aspiration of a large piece of meat. Foreign body forceps are used for extraction.

Courtesy of Charles Marquette, MD.

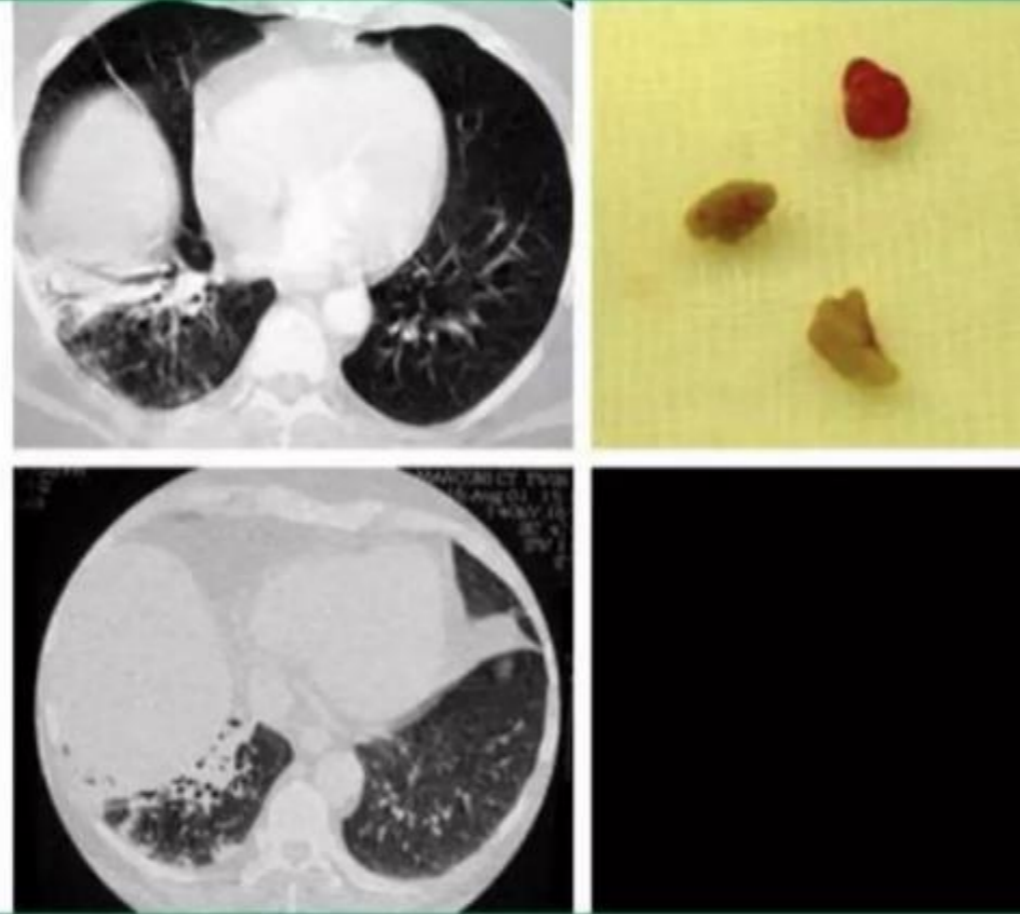
PRESENTATION AND DIAGNOSIS

- In adults acute presentation is rare
 - The FB usually is wedged distally in lower lobe bronchi
- Dyspnea (only 25 %)
- Coughing (80 %)
- Fever, hemoptysis, chest pain, or wheeze
- Adults do not always recall a history of choking
- The diagnosis is frequently overlooked

Natural course of foreign body aspiration



73-year-old woman with recurrent right lower lobe pneumonia and bronchiectasis



Bronchoscopy revealed a benign granulomatous tumor obstructing the right lower lobe bronchus. After resection of the "tumor" with a large forceps, two peanut fragments were found. The patient did not recall having eaten peanuts for 18 years.

Courtesy of Charles Marquette, MD.

**68-year-old woman with recently diagnosed asthma
unresponsive to therapy**



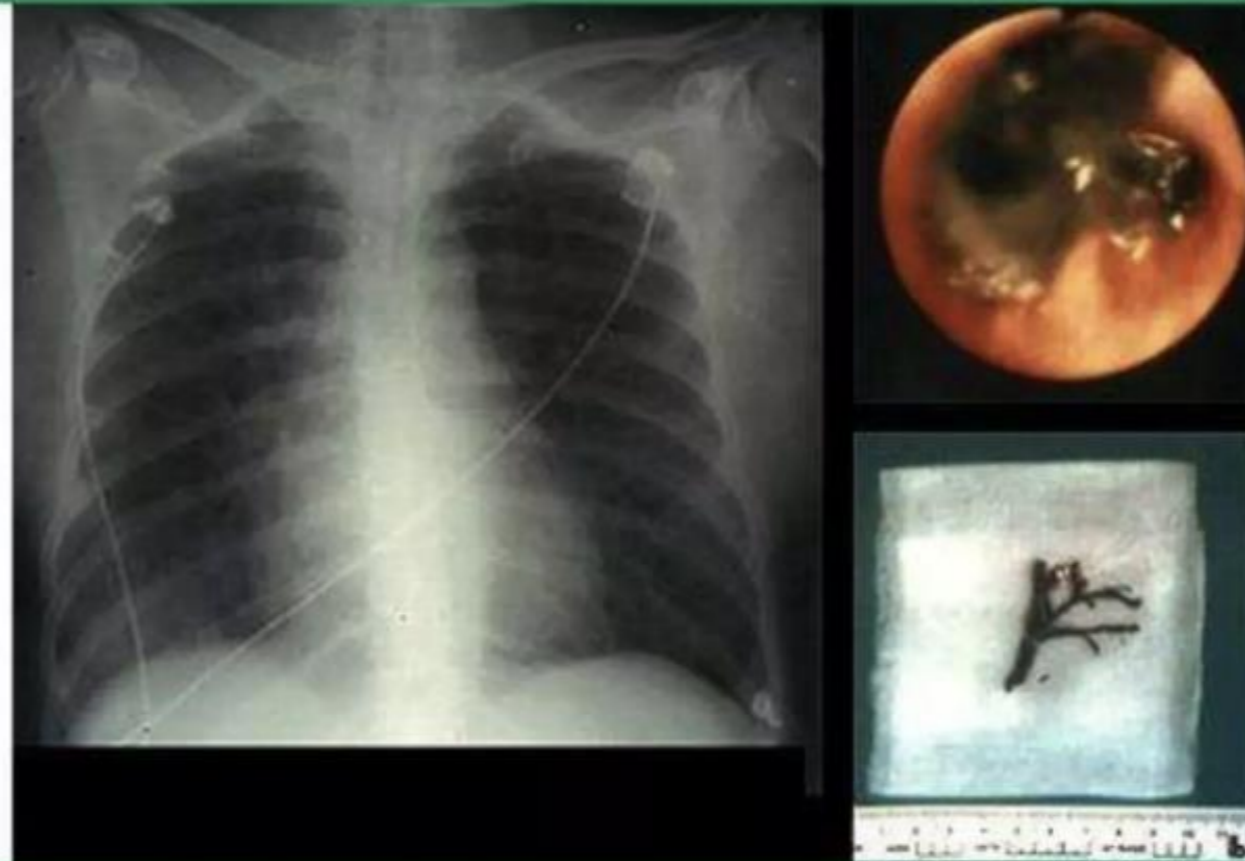
Endoscopic view shows an oyster shell fragment impacted in the right lower lobe bronchus.

Courtesy of Charles Marquette, MD.

FBs THAT CAN BE REMOVED EASILY USING SIMPLE SUCTION

- Soft beans
- Bronchial soot plugs

Severe airway burns complicated by hypoxemic respiratory failure

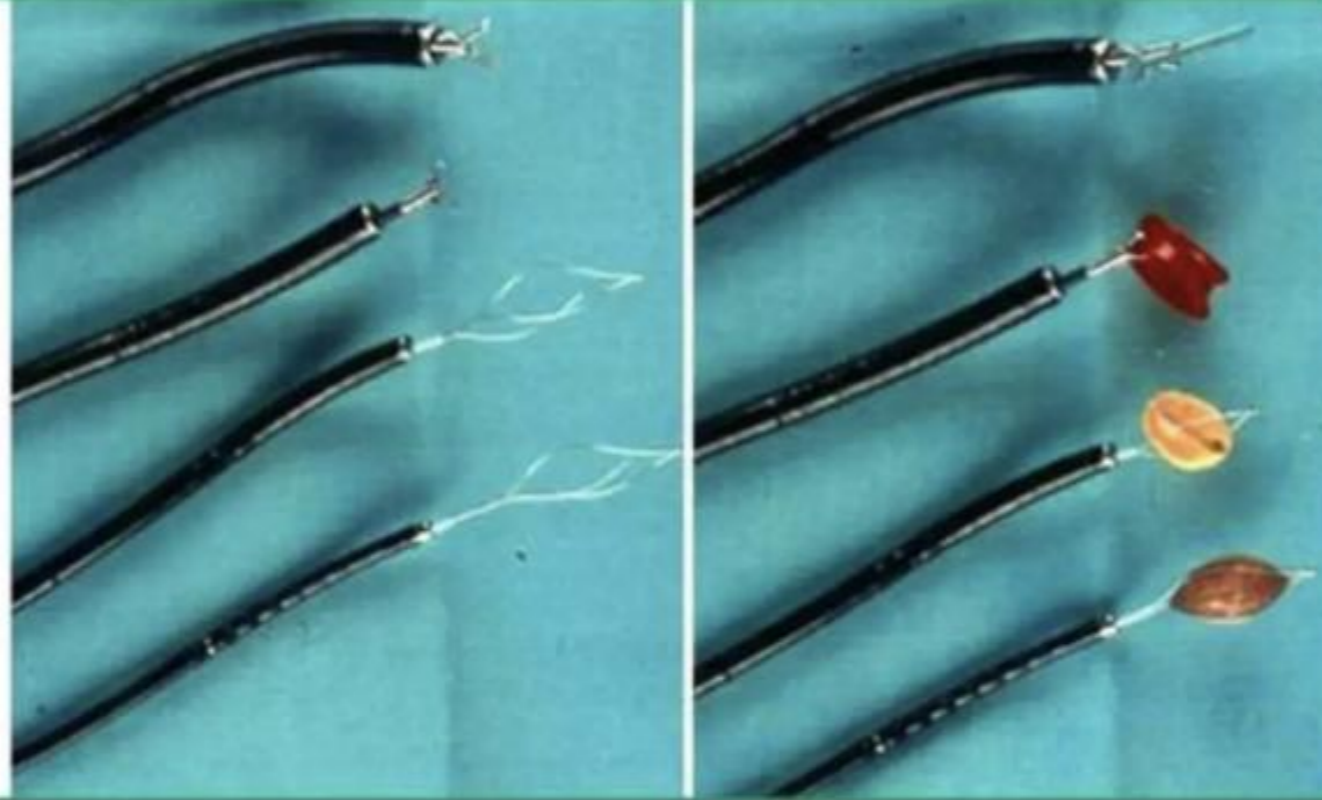


Chest X-ray demonstrates lung hyperinflation (left). Endoscopic view showing proximally impacted soot plugs (top right). Large soot plugs molding the right upper lobe were removed simply by suctioning with a flexible bronchoscope (bottom right).

TECHNICAL ASPECTS

- Fiberoptic Bronchoscopy:
 - Allows precise identification and localization of FBs
 - Facilitates the choice of rigid bronchoscope and type of forceps
 - Shorten the duration of the rigid bronchoscopy procedure

Flexible bronchoscopes

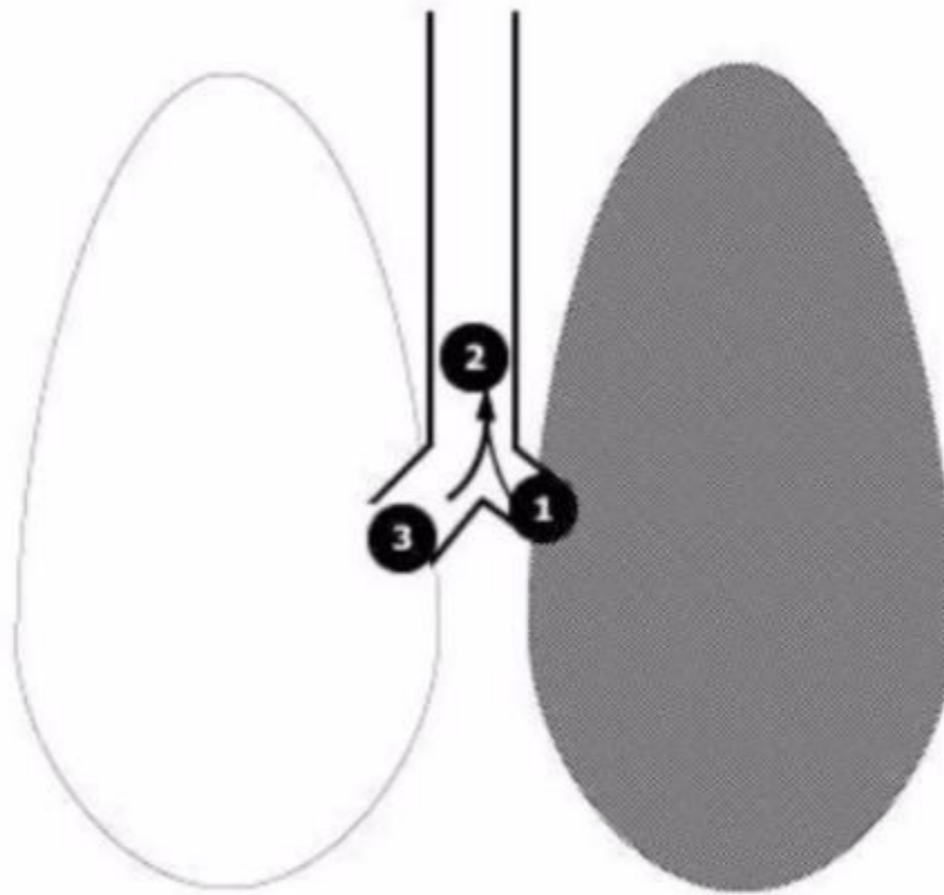


From top to bottom: 6 mm outer diameter (OD) bronchoscope with a 2.8 mm diameter working channel (WC); 4.9 mm OD bronchoscope with a 2.2 mm diameter WC; 3.5 mm OD bronchoscope with a 1.2 mm diameter WC and 2.7 mm OD bronchoscope with a 1.2 mm diameter WC (Olympus prototype). A large variety of ancillary equipment, including forceps, grasping claws and baskets, can be passed through these bronchoscopes to grip various foreign bodies.

POTENTIAL COMPLICATIONS OF FB EXTRACTION

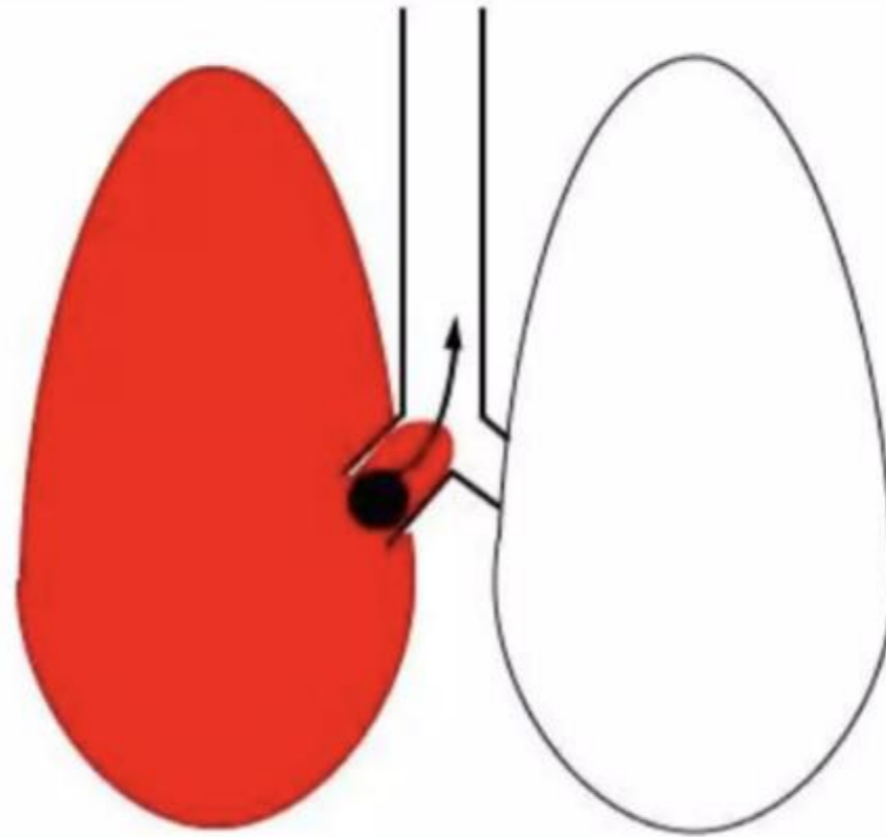
- FB becomes wedged distally: postobstructive atelectasis
- Loss of the foreign body:
 - Obstruction of the contralateral mainstem bronchus
 - Obstruction of the central airway, potentially causing asphyxia
- Hemorrhage: FB is completely encased in bulky and bleeding granulation tissue

Potential complications of foreign body extraction



1. Foreign body becomes wedged distally, leading to postobstructive atelectasis 2. Loss of the foreign body complicated by 3. Obstruction of the contralateral mainstem bronchus or central airway, potentially causing asphyxia.

Potential complications of foreign body extraction



Hemorrhage complicating the extraction of a foreign body encased in bulky and friable inflammatory tissue.

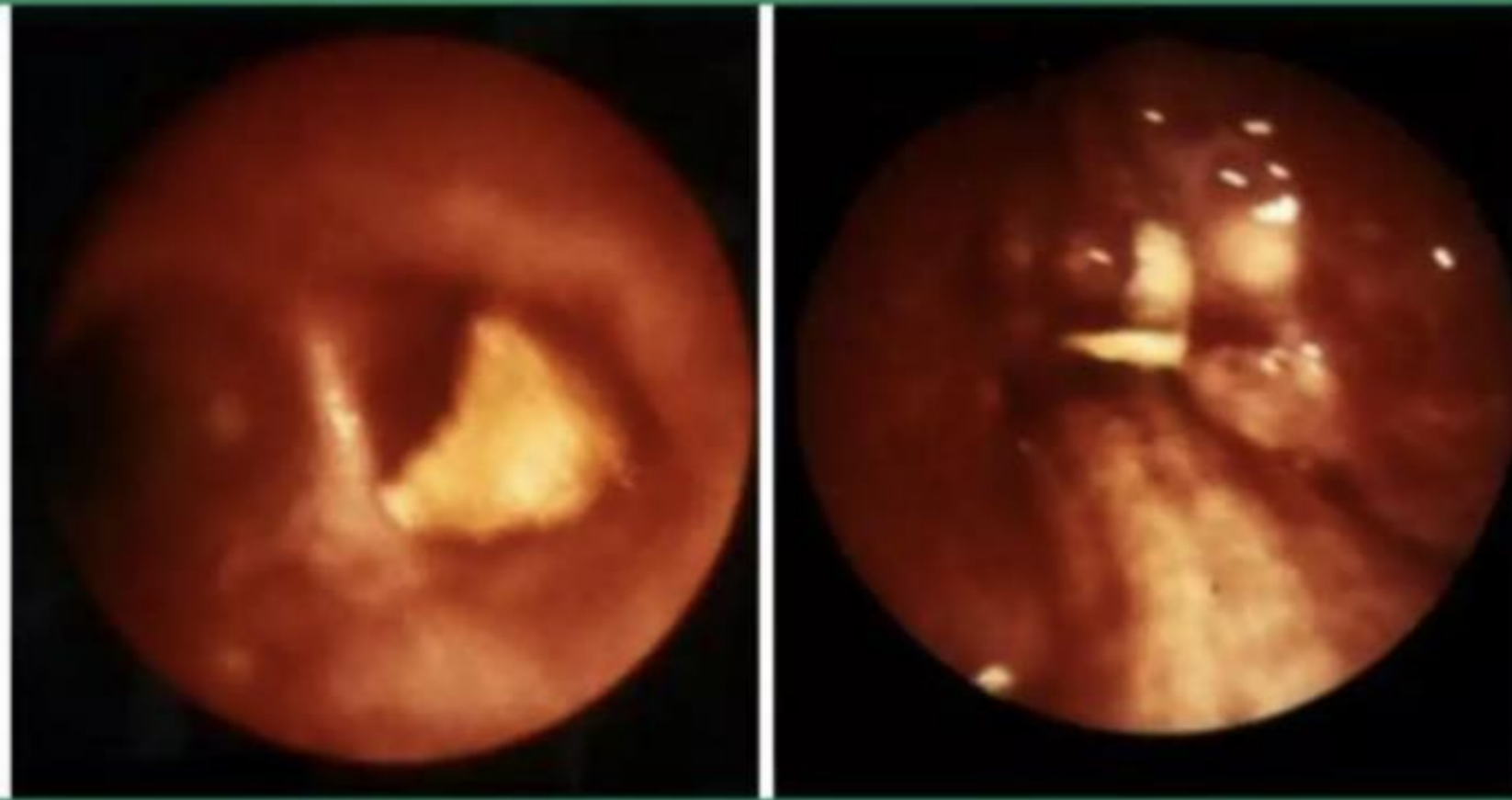
FOREIGN BODY REMOVAL

- Once the diagnosis is established, extraction must be performed without delay.
 - Do not postpone foreign body extraction (FBE) in pts with an acute post-obstructive pneumonia

GRANULATION

- Mucosal inflammation and accumulation of bulky granulation tissue
 - Within few hours
 - Organic FBs (peanuts, high oil content)
 - Within few weeks/months
 - Chronically impacted sharp or rusty FBs
 - Iron or nortriptyline pills aspiration

Foreign body in an infant



Left: Peanut impacted in the right mainstem bronchus of a 13-month old child for four hours. Right: After 28 hours, the oily peanut has caused severe mucosal inflammation with bulky granulation tissue.

Courtesy of Charles Marquette, MD.

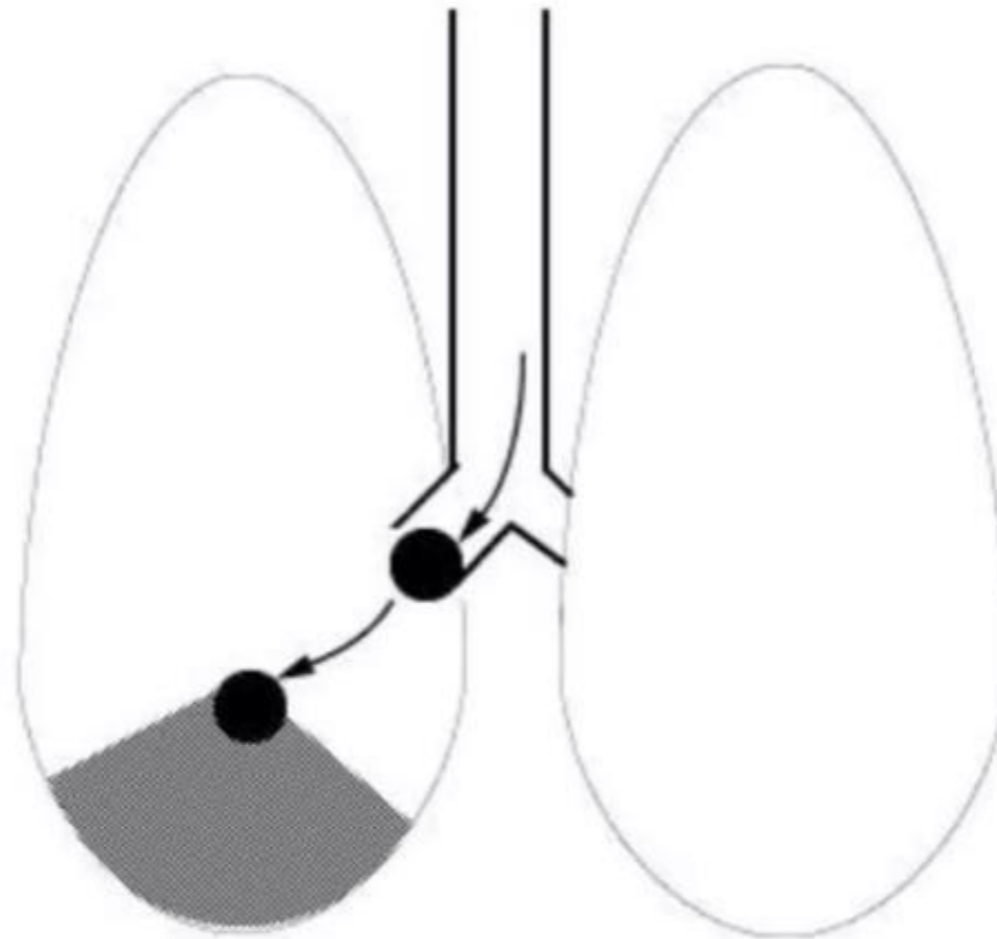
ROLE OF CORTICOSTEROIDS

- No prospective trials
- Indication
 - FB is completely encased in bulky and bleeding granulation
- Short course (12 to 24 hours) of IV corticosteroid (1-2 mg/kg prednisolone or equivalent)
 - Cleveland Clinic Experience
- May result in dislodgement of the FB
 - These pts should remain under observation until the extraction procedure

ROLE OF CORTICOSTEROIDS

- Prophylactic use of corticosteroids to decrease the incidence of post-operative subglottic edema. *is not recommended and it should be avoided*
- Post-operative subglottic edema:
 - Parenteral corticosteroids
 - Aerosolized epinephrine
 - Helium-oxygen therapy (heliox)

Potential complications of foreign body extraction

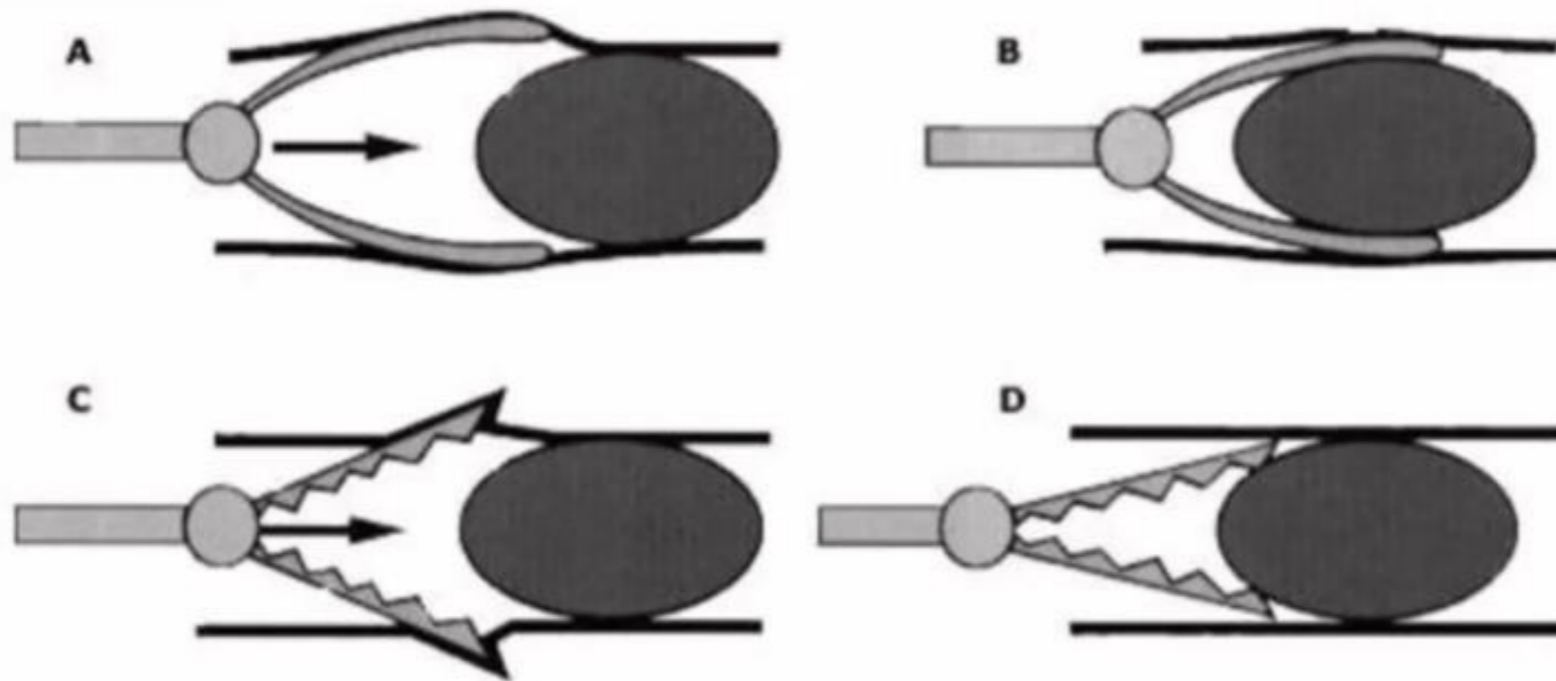


Accidental wedging of the foreign body into a distal position.

PROPER GRASPING TECHNIQUE

- Smooth and rounded FBs
 - Foreign body forceps (smooth) are preferred
- Sharp or irregular FBs
 - Alligator forceps are preferred

Proper grasping technique



Firm and atraumatic grasping of a smooth and rounded foreign body with a foreign body forceps (A & B). Traumatic and unsecured grasping with an alligator forceps (C & D).

Alligator forceps removal of a metallic FB

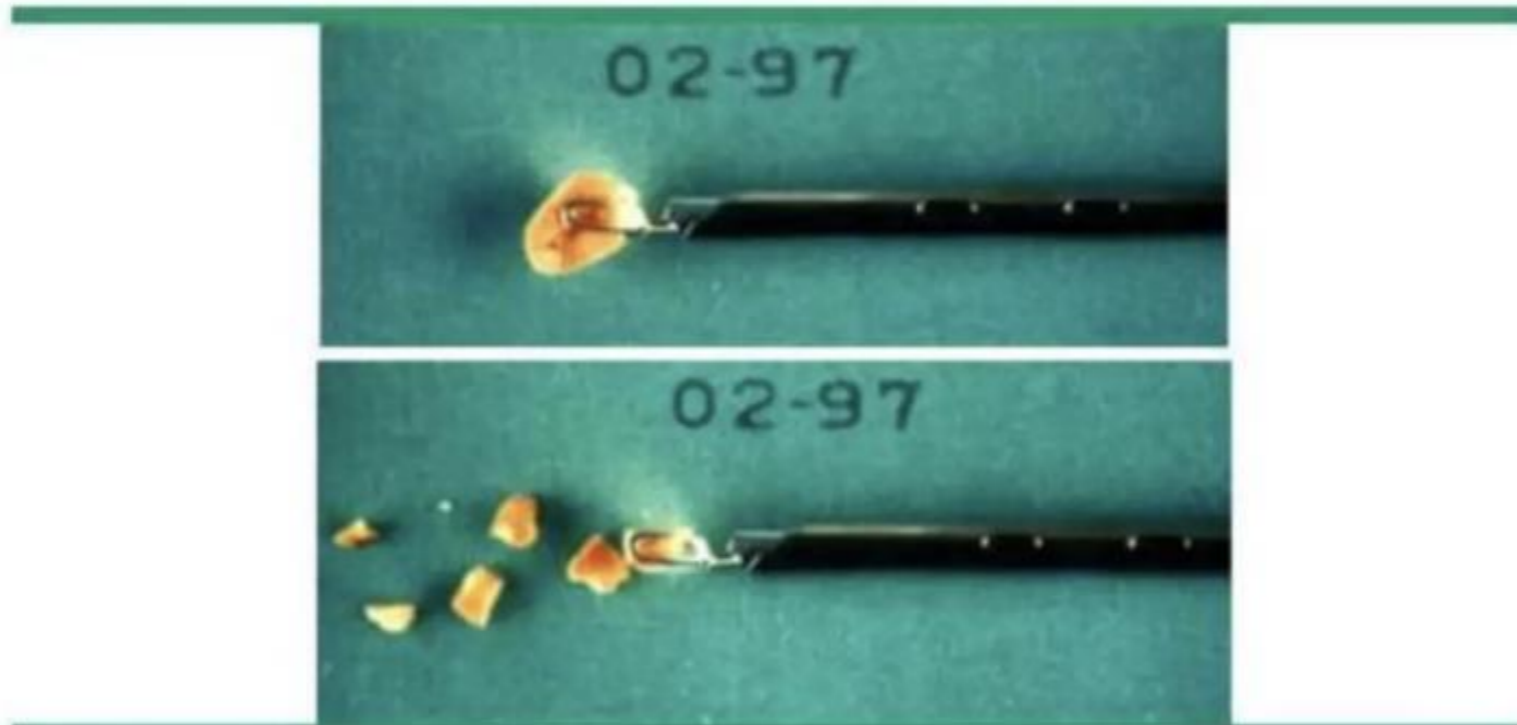


Courtesy of Charles Marquette, MD.

PROPER GRASPING TECHNIQUE

- Large and hard FBs (pistachio shells)
 - Breaking the FB into two or three fragments may help extraction
- Friable FBs (peanuts)
 - Vigorous grasping should be avoided
 - May result in maceration and distal wedging of small fragments

Potential complication of foreign body extraction

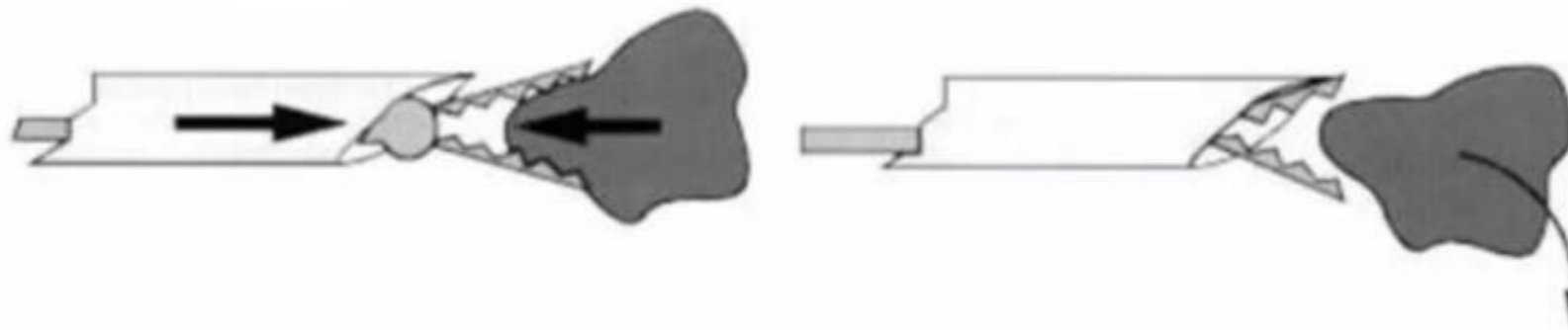


Half peanut grasped and fragmented by an optical forceps.

COAXIAL MOVEMENT

- Both the instruments (the bronchoscope and the forceps) and FB are withdrawn en masse from the trachea
- The FB can be lost accidentally
 - Blocked in the narrow glottic area
 - Inappropriate coaxial movement between the bronchoscope and the forceps, causing the tip of the bronchoscope to push the FB out of the forceps' cups or jaws

Inappropriate coaxial movement

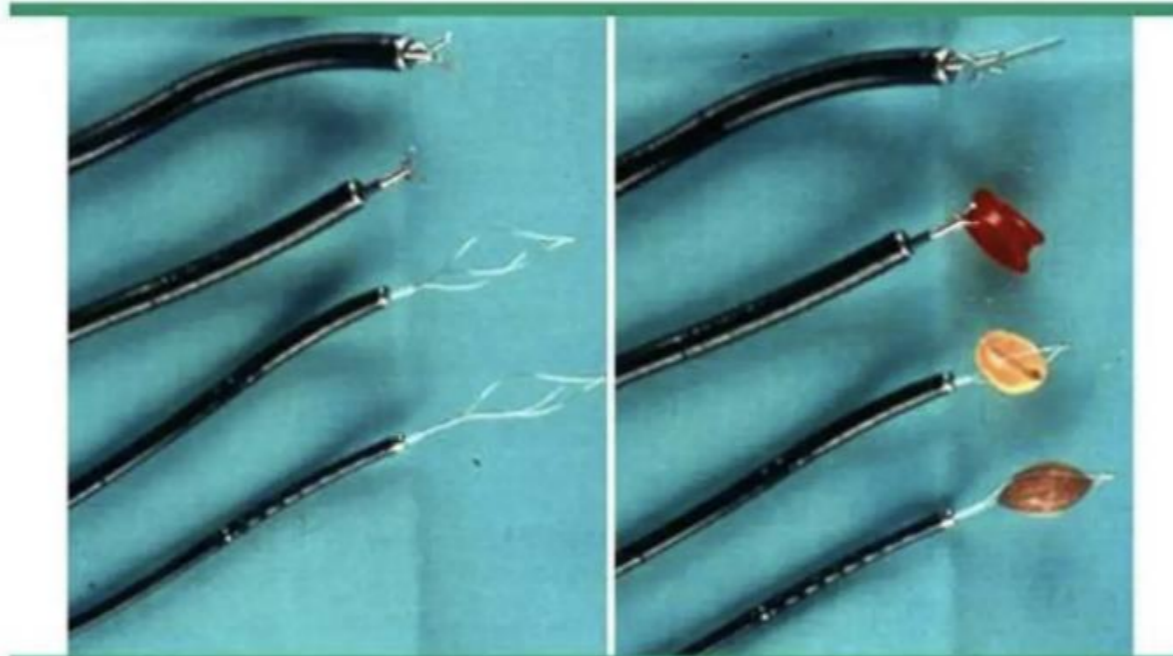


Inappropriate coaxial movement between the bronchoscope and the forceps can push the foreign body out of the forceps cups or jaws, leading to loss of the object.

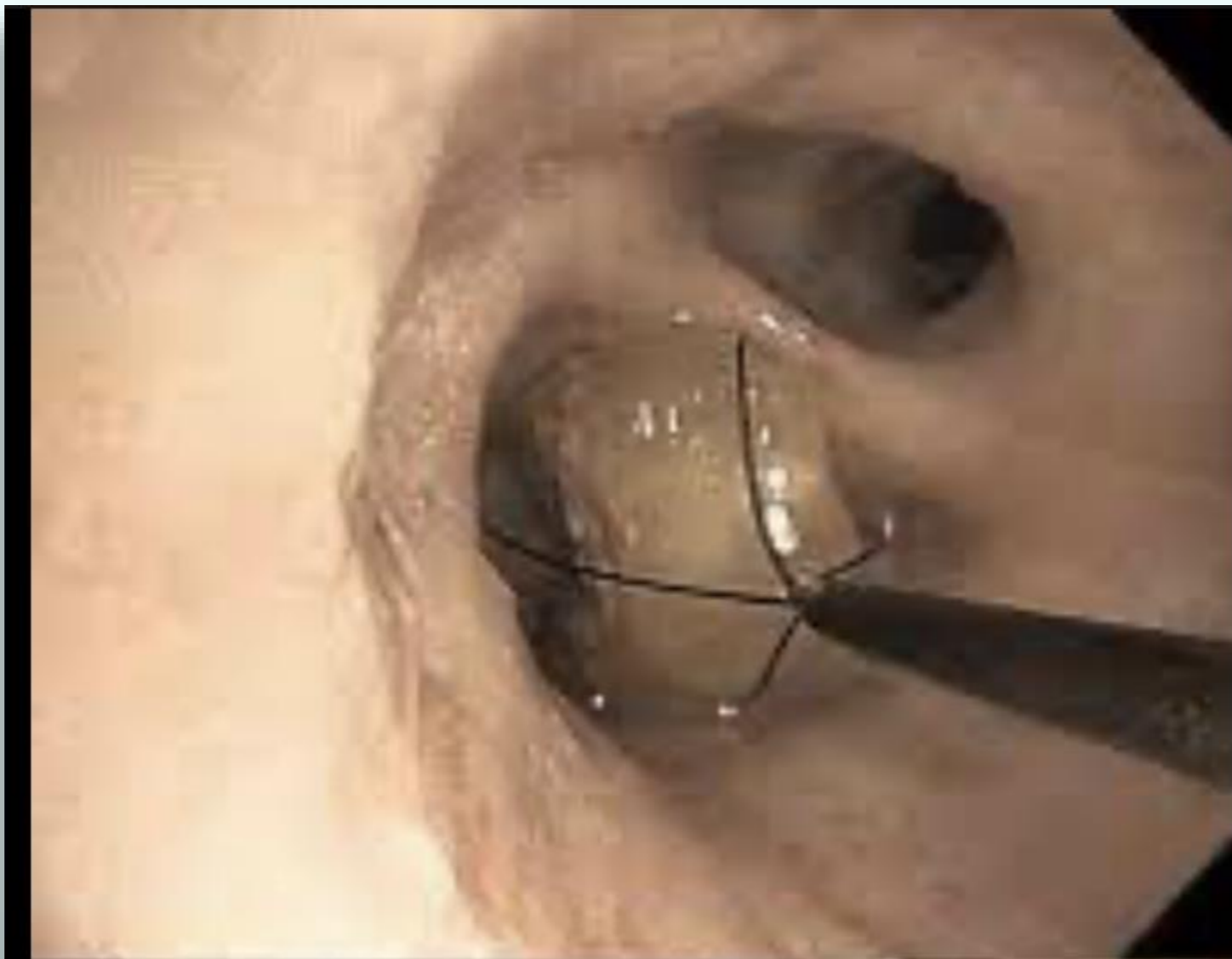
FLEXIBLE BRONCHOSCOPY

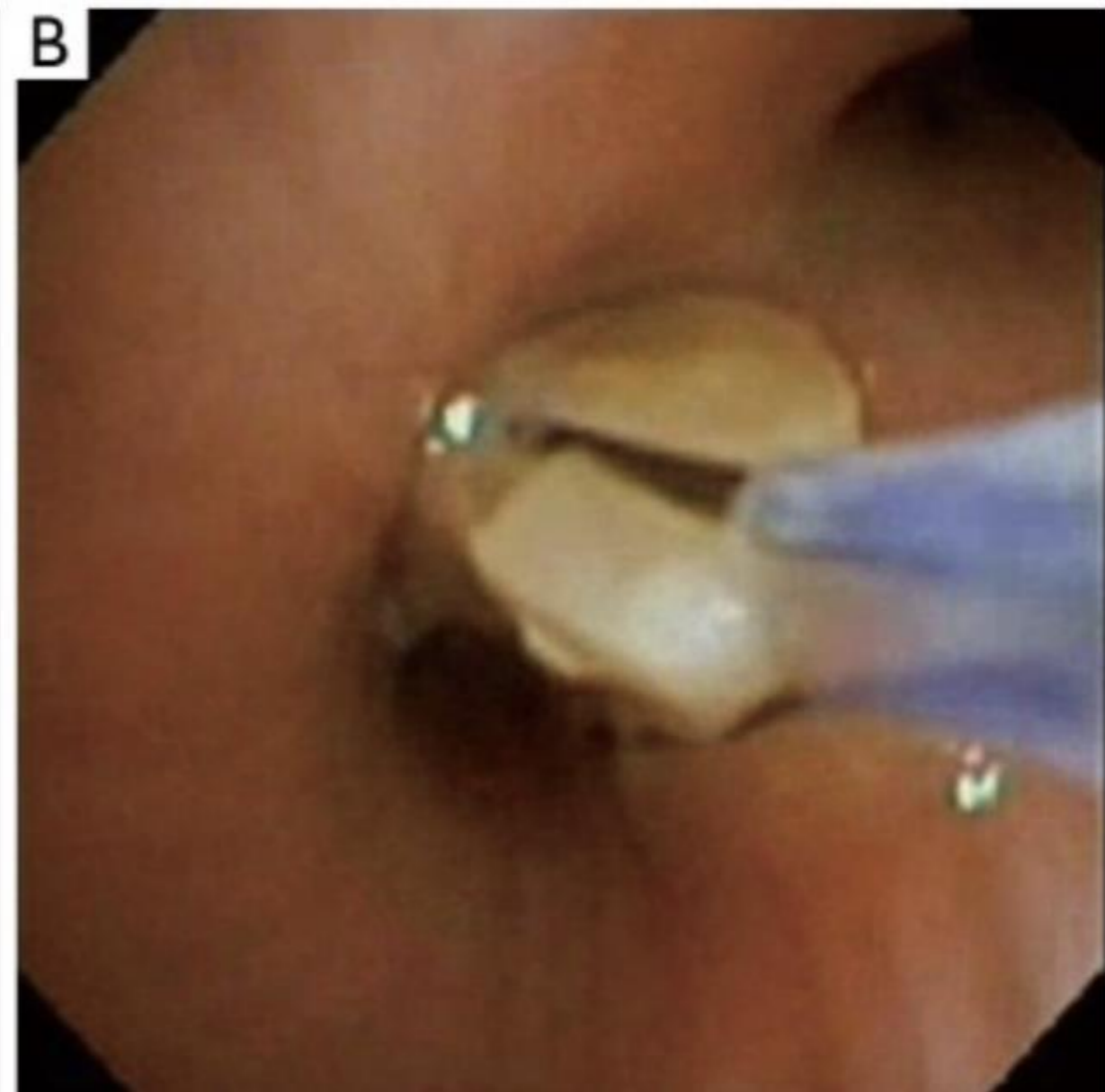
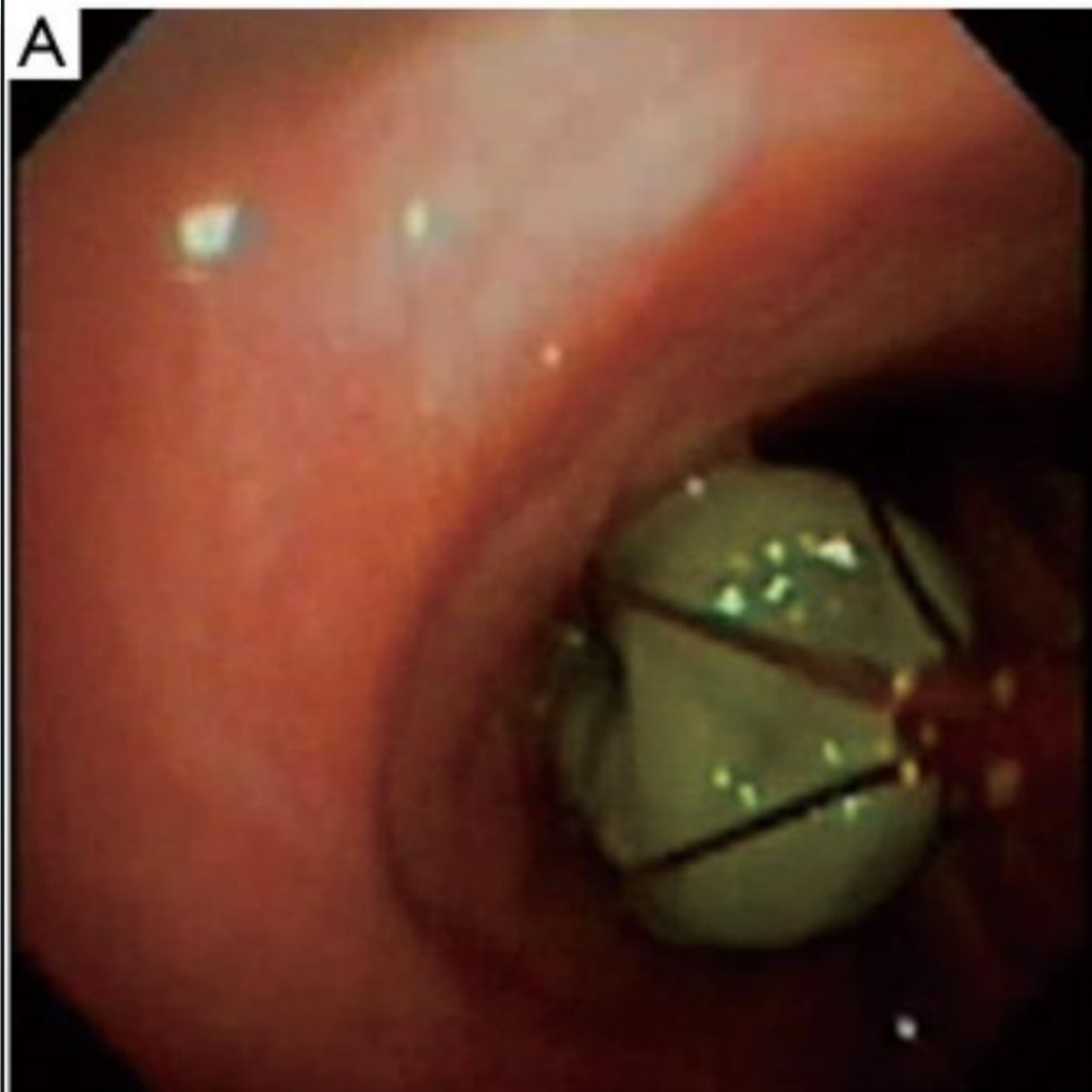
- Equipments for FBs removal
 - FB forceps (smooth)
 - Alligator forceps
 - Grasping claws
 - Snares
 - Balloon-tipped catheters
 - Magnets
 - New "zero tip" baskets

Flexible bronchoscopes



From top to bottom: 6 mm outer diameter (OD) bronchoscope with a 2.8 mm diameter working channel (WC); 4.9 mm OD bronchoscope with a 2.2 mm diameter WC; 3.5 mm OD bronchoscope with a 1.2 mm diameter WC and 2.7 mm OD bronchoscope with a 1.2 mm diameter WC (Olympus prototype). A large variety of ancillary equipment, including forceps, grasping claws and baskets, can be passed through these bronchoscopes to grip various foreign bodies.

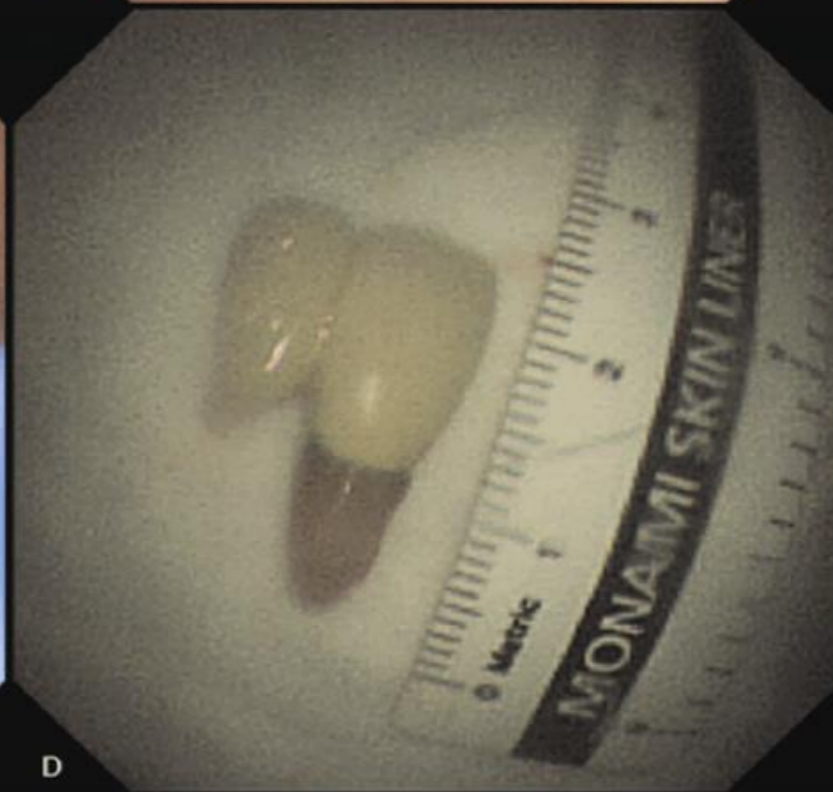
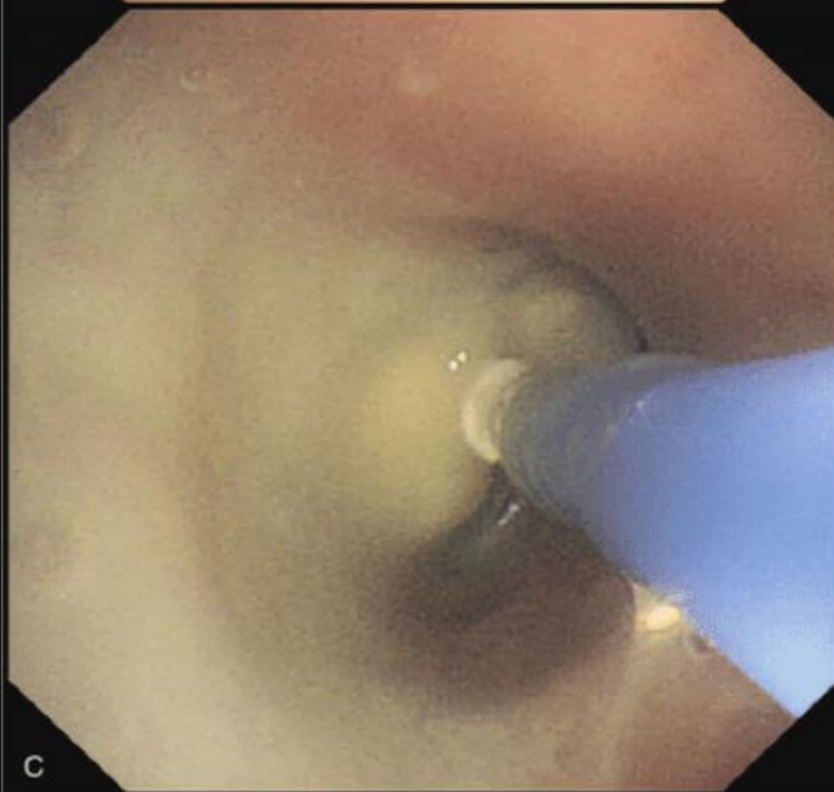
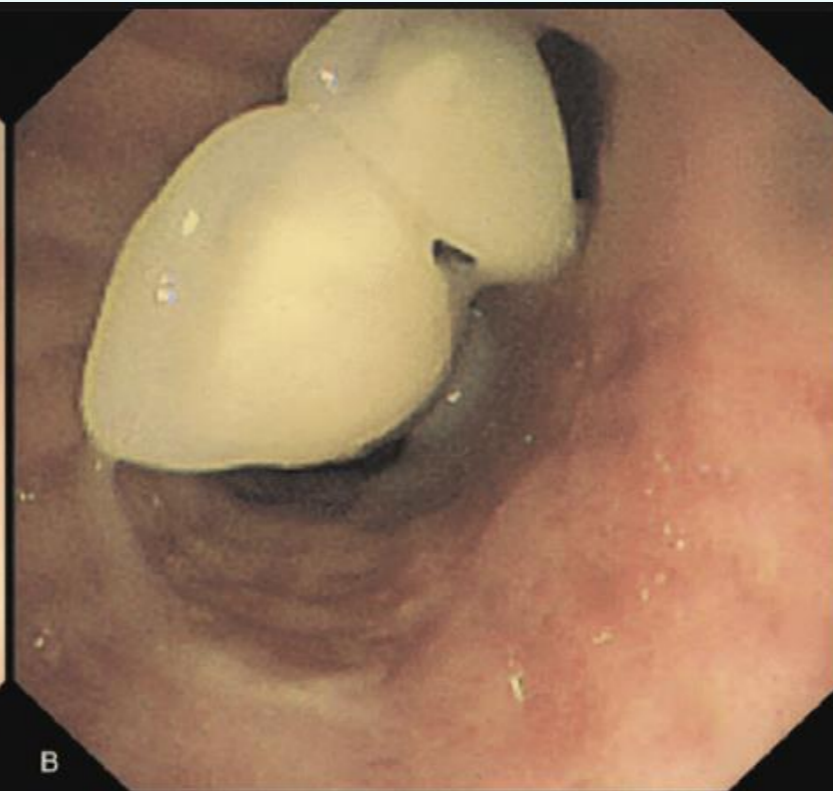
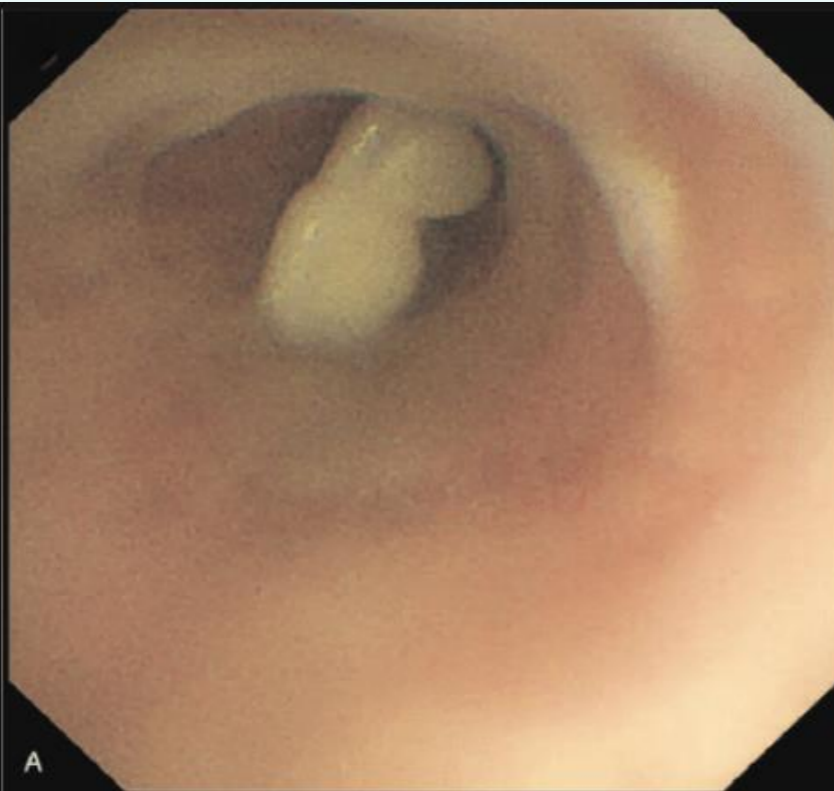






Flexible bronchoscope with cryoprobe and the adhered foreign body (Meat). | [Download Scientific Diagram](#)





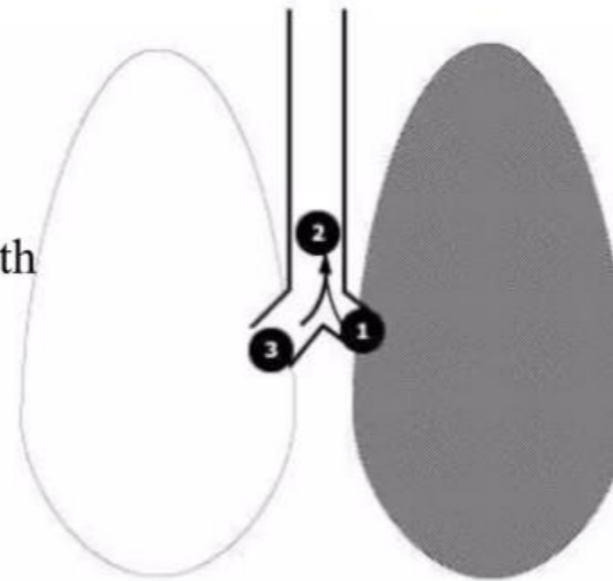
FLEXIBLE BRONCHOSCOPY

- May be used as an alternative to rigid bronchoscopy for extraction
- Success rates in adults range from 60 to 90 %
- Can be cumbersome

RISKS ASSOCIATED WITH FIBEROPTIC EXTRACTION

Potential complications of foreign body extraction

- Accidental migration of the FB into the contralateral lung
 - Due to insufficient grasping with the fiberoptic forceps
 - Less likely to occur with rigid forceps used for rigid bronchoscopy

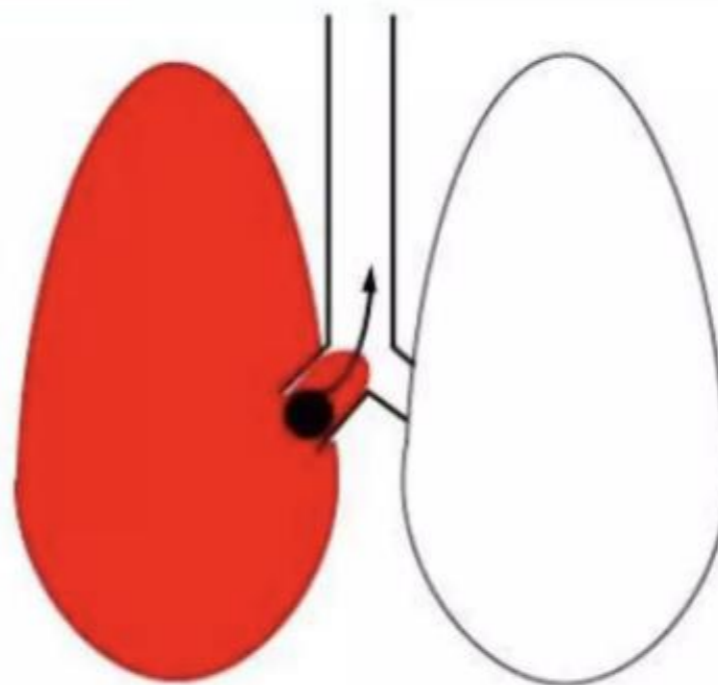


1. Foreign body becomes wedged distally, leading to postobstructive atelectasis 2. Loss of the foreign body complicated by 3. Obstruction of the contralateral mainstem bronchus or central airway, potentially causing asphyxia.

RISKS ASSOCIATED WITH FIBEROPTIC EXTRACTION

Potential complications of foreign body extraction

- Impossible simultaneous FB manipulation and suctioning with flexible bronchoscope
 - FB is completely encased in bulky, friable and bleeding granulation tissue

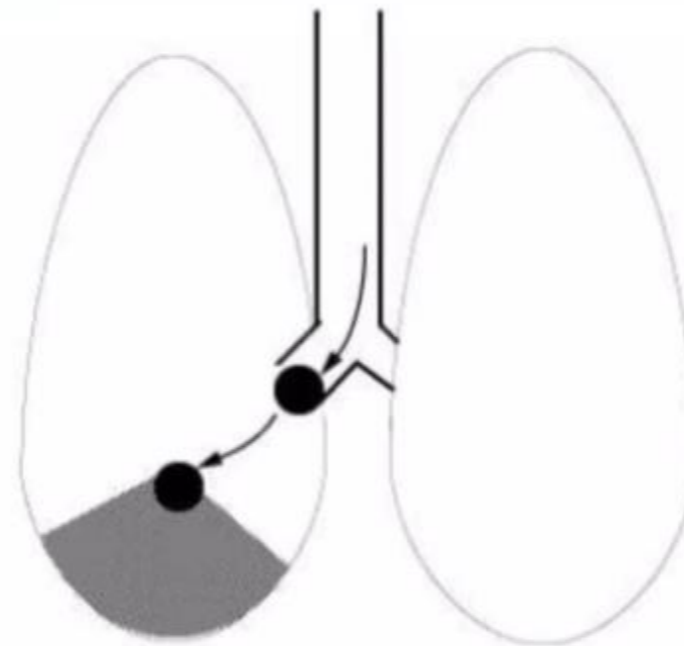


Hemorrhage complicating the extraction of a foreign body encased in bulky and friable inflammatory tissue.

RISKS ASSOCIATED WITH FIBEROPTIC EXTRACTION

Potential complications of foreign body extraction

- Unsuccessful attempts may push the FB distally into a wedged position



Accidental wedging of the foreign body into a distal position.

ADVANTAGES OF FIBROPTIC BRONCHOSCOPY

- Fiberoptic is superior to rigid bronchoscopy in the setting of
 - Distally wedged FB
 - Mechanically ventilated patients
 - The presence of spine, craniofacial, or skull fractures
- The use of a laryngeal mask airway (LMA) allows ventilation and easy access to the central airways under general anesthesia

Laryngeal mask airway



The device allows flexible bronchoscopy and ventilation under general anesthesia.

Courtesy of Charles Marquette, MD.

SECOND LOOK INSPECTION

- Once the FB is removed
 - Reintubate the trachea with the bronchoscope
 - The airways are carefully reexamined
 - Rule out another FB or residual fragments
 - If doubt persists, a repeat fiberoptic bronchoscopic examination a few days later should be considered

