

Project: Ghana Emergency Medicine Collaborative

Document Title: Aspirated and Ingested Foreign Bodies

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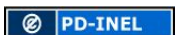
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Aspirated and Ingested Foreign Bodies Epidemiology

- **Possibly 1500 to 3000 deaths per year in U.S.**
- **80 % of cases are pediatric**
- **80 % of adult esophageal impactions have underlying esophageal disease**
- **< 10 % of pediatric cases have esophageal disease**
- **Male to female ratio in children is 2:1**
- **10 to 20 % require endoscopy**
- **1 % require surgery**

Effects of Aspirated Foreign Bodies

- **Complete upper airway obstruction : death**
- **Partial upper airway obstruction**
 - **wheezing**
 - **chest pain**
 - **mucosal injuries : bleeding**
- **Lower airway obstruction**
 - **atelectasis**
 - **pneumonia**
 - **decreased bre**

Objects Commonly Ingested or Aspirated by Children

- **hot dogs ; most common cause of fatal aspirations**
- **peanuts ; most common lower airway object**
- **coins**
- **bones**
- **balloons**
- **jacks**
- **buttons**
- **toys**
- **pins**
- **hair clips**
- **marbles**
- **beverage tops**
- **seeds, nuts**
- **screws**
- **nails**

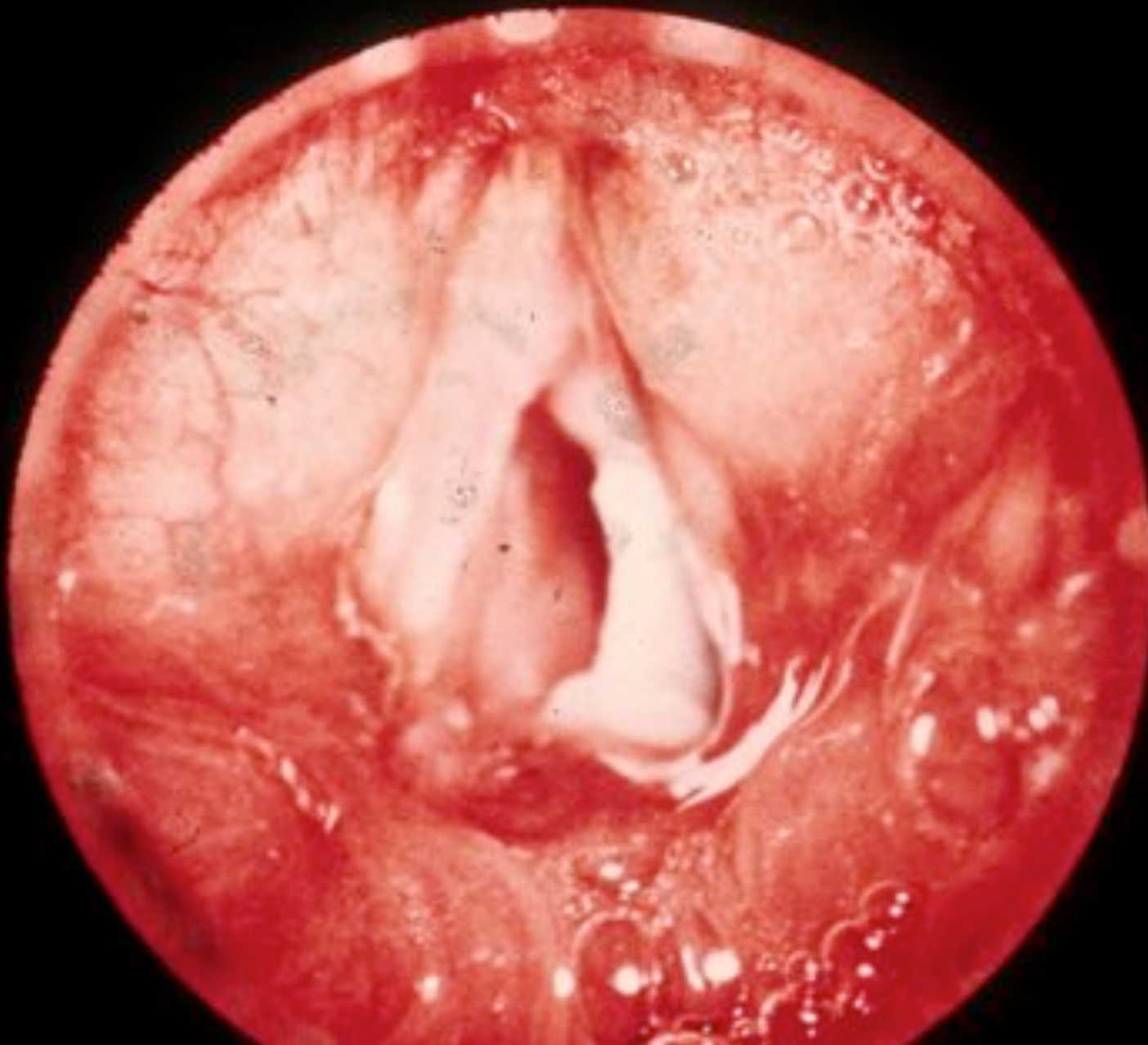




Fatal aspiration of an old Christmas bow button



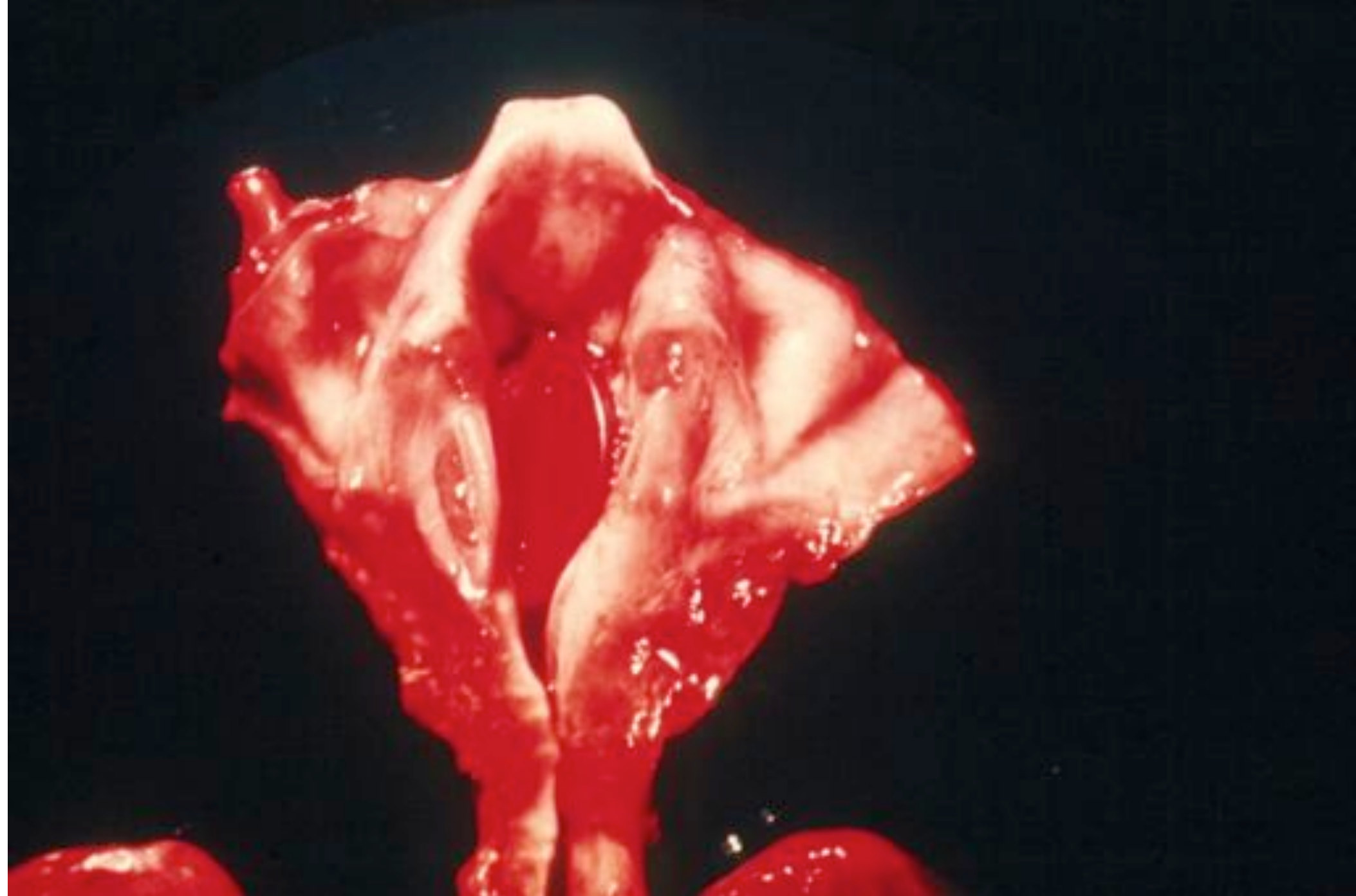
Redesigned Xmas bow buttons to prevent tracheal blockage if aspirated (also are made with barium so can be seen on X-ray)



Eggshell in larynx



Thistle in larynx



Fatal laryngeal obstruction from a coin

Emergency Treatment for Aspirated Foreign Bodies

- Heimlich maneuver
- Back blows
- Chest thrusts
 - *note : none of these should be applied if patient is able to speak or cough*
- Finger sweep / grasp
 - *should be done only if object is visible and will not be wedged deeper*





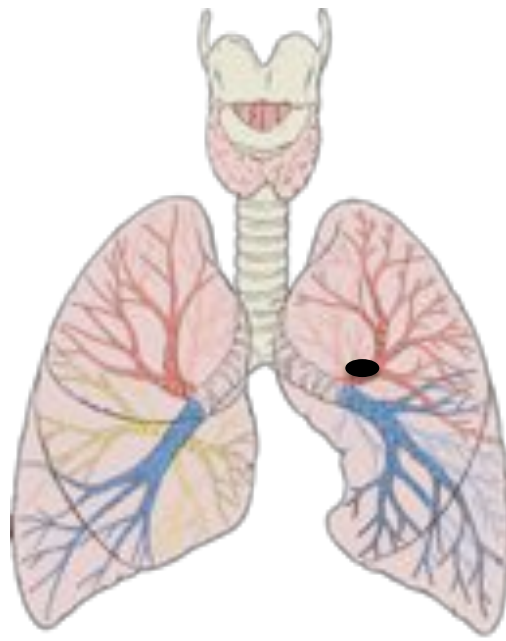
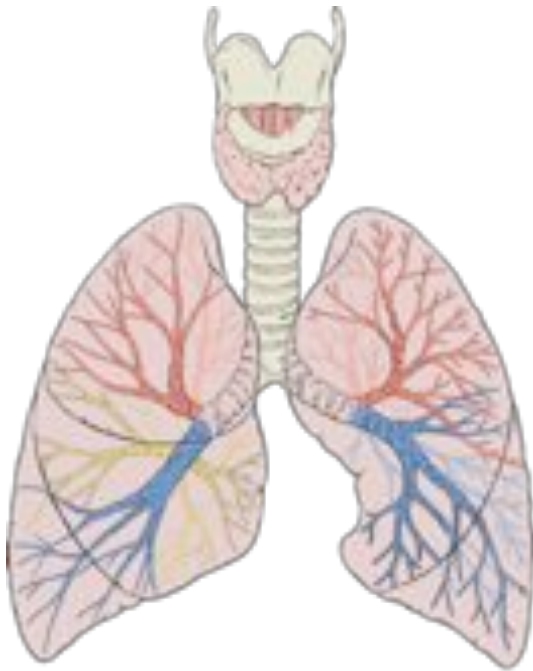
Image removed of
woman performing
chest thrusts on
choking infant

Symptoms of Foreign Body Aspiration into the Tracheobronchial Tree

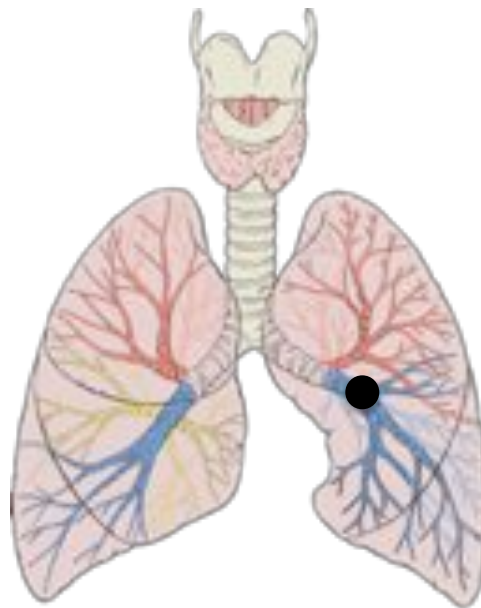
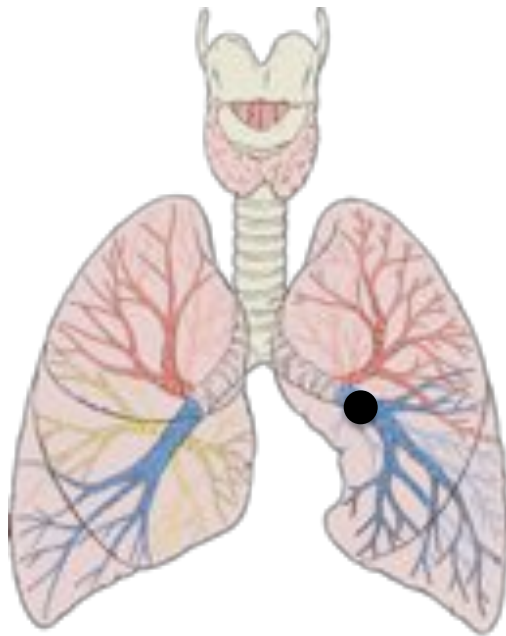
- **Respiratory arrest**
- **Stridor**
- **No symptoms (up to 40 %)**
- **Classic triad (in 40 %)**
 - **wheezing**
 - **coughing**
 - **dyspnea**

Types of Bronchial Obstruction

- **Bypass valve obstruction**
 - air passes in and out
 - no radiographic changes
 - may cause no symptoms
- **Check valve obstruction**
 - exhalation around object prevented
 - obstructive emphysema results
- **Stop valve obstruction**
 - both inspiration and expiration blocked
 - distal atelectasis results
 - pneumonitis may occur



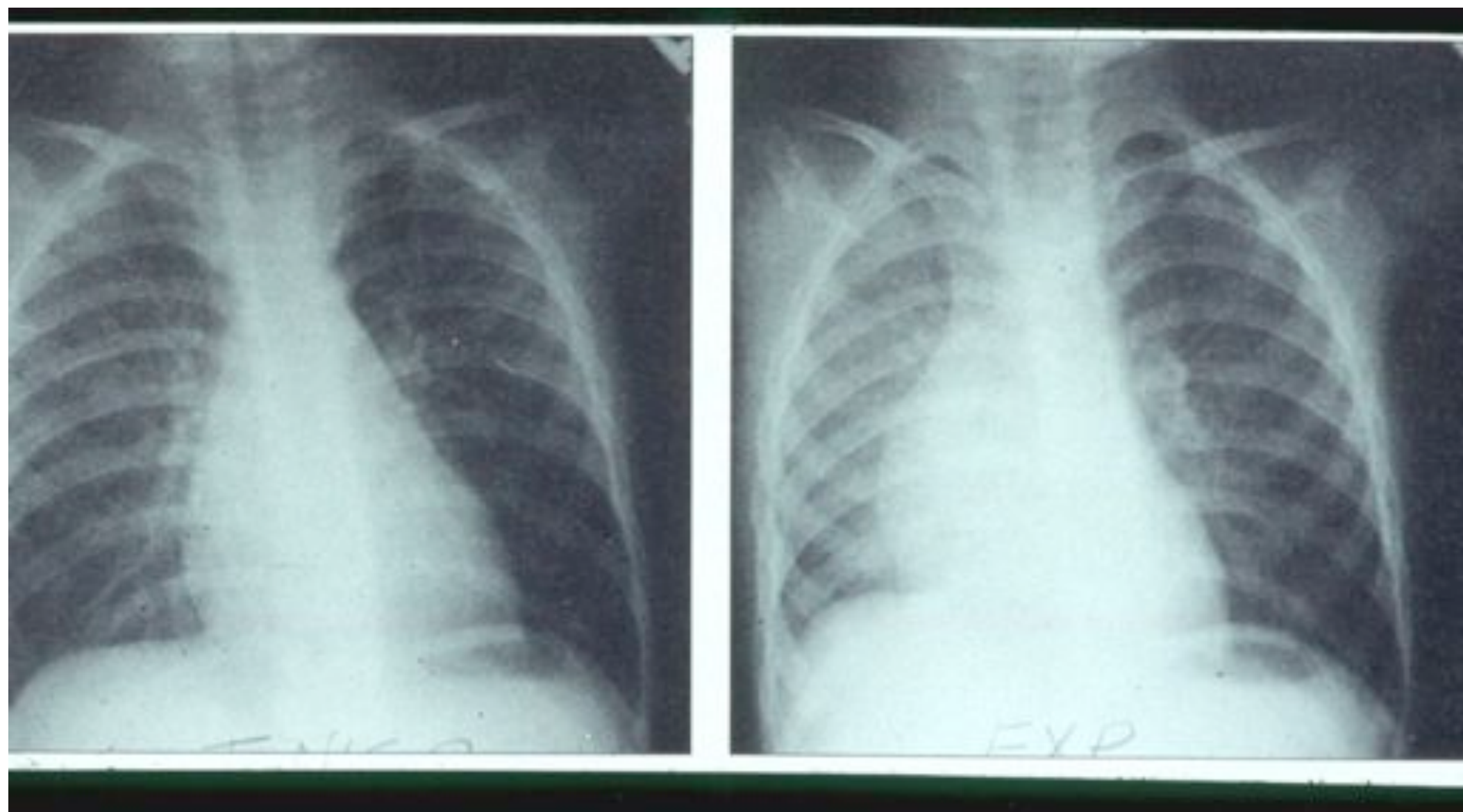
Check valve obstruction



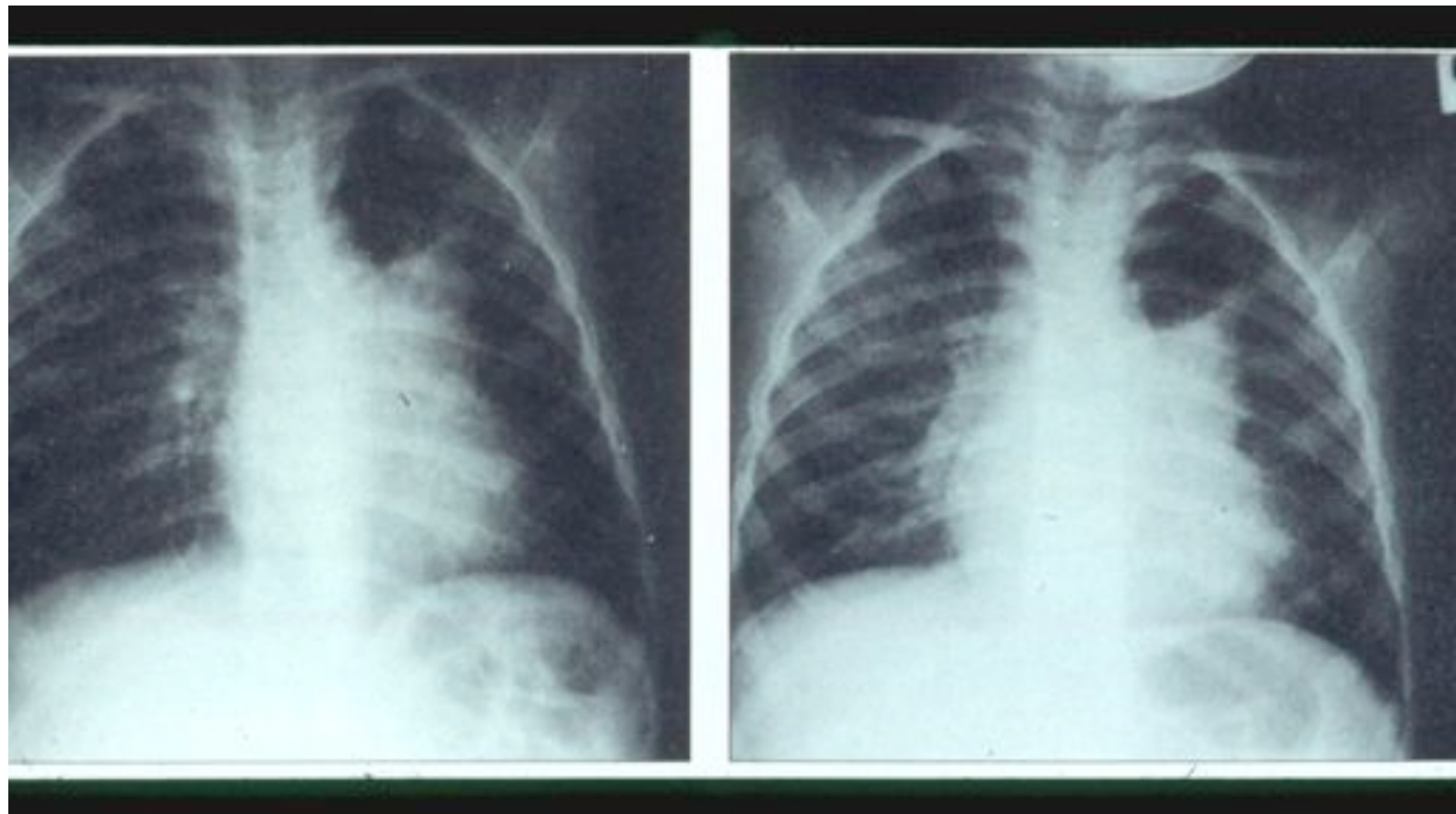
Stop valve obstruction

Chest X-ray for Aspirated Foreign Bodies

- **Foreign object radiopaque in 6 to 20 %**
- **CXR normal in 18 to 33 %**
- **CXR findings:**
 - **obstructive emphysema**
 - **atelectasis**
 - **pneumonia**
- **Expiratory film enhances CXR yield**



Inspiratory film on left, expiratory film on right ; Foreign body in left main stem bronchus



Inspiratory film on left, expiratory film on right ; Stop valve obstruction in left main stem bronchus

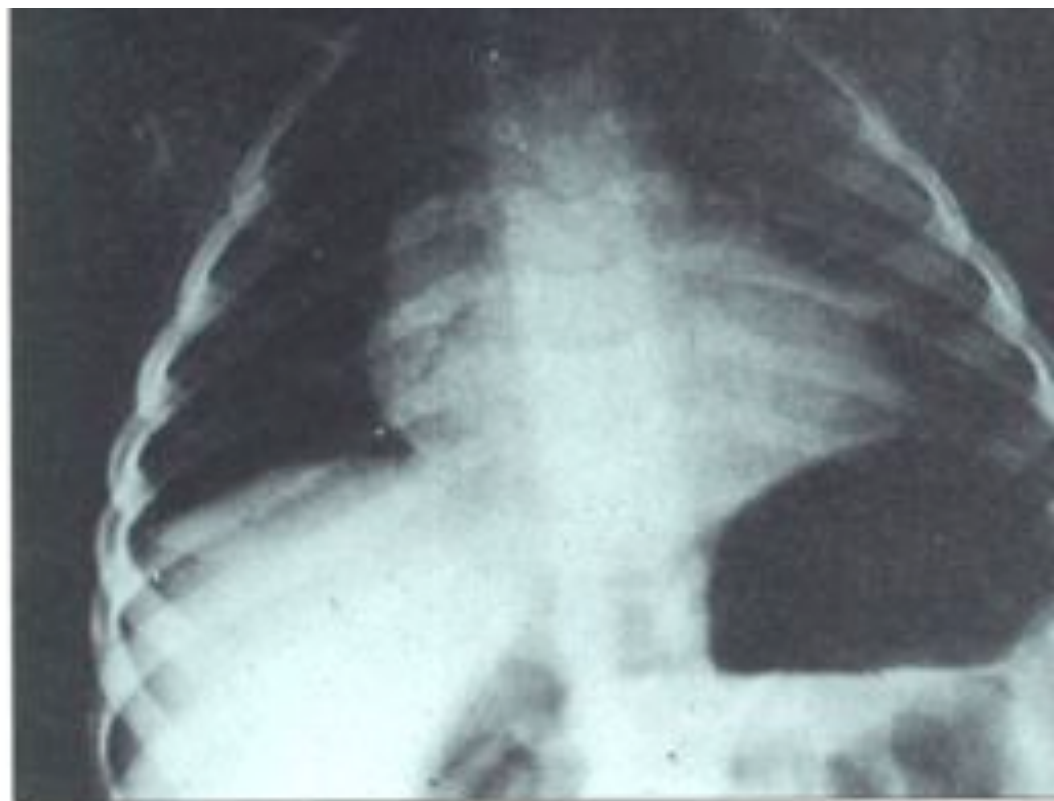
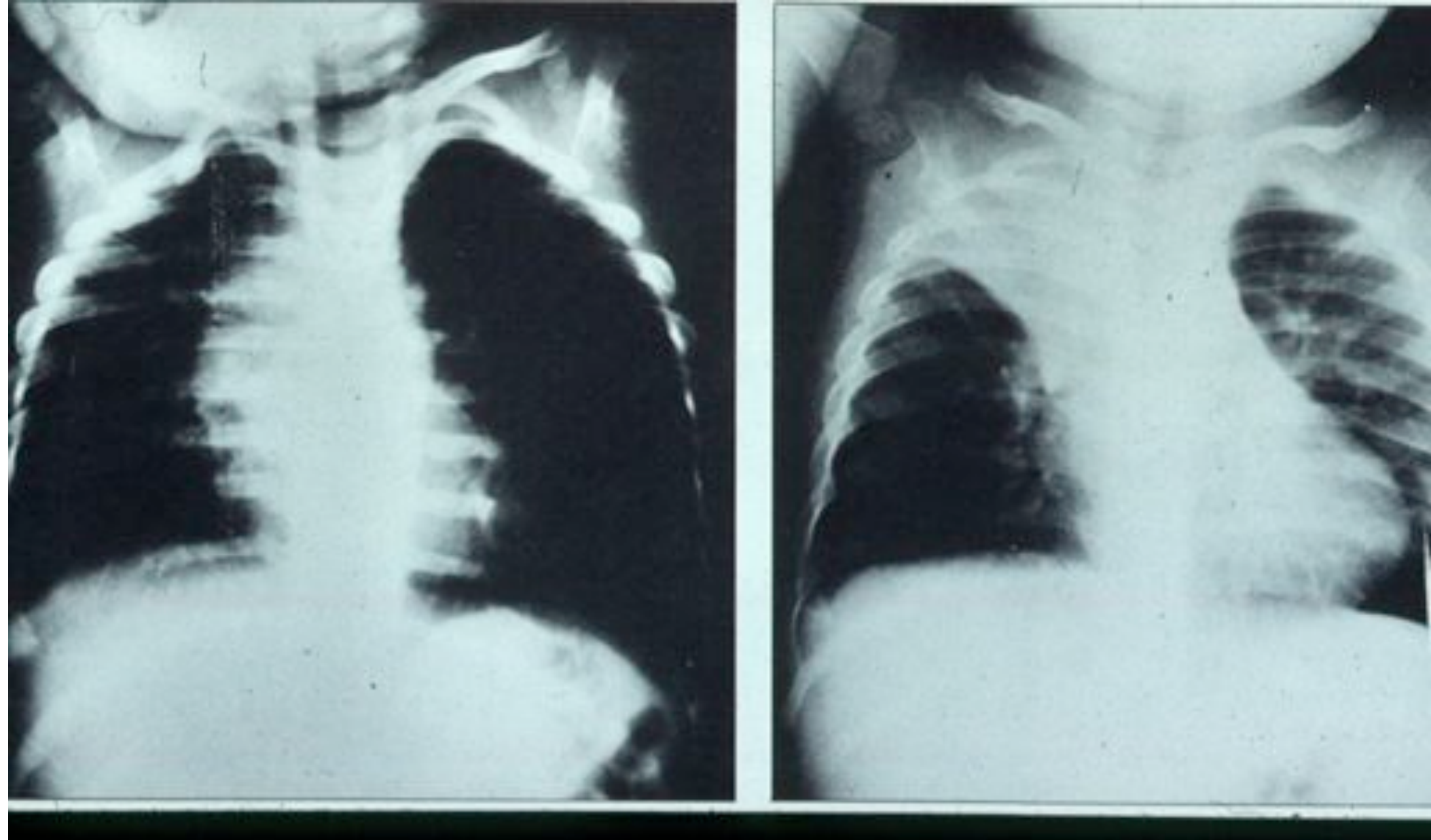
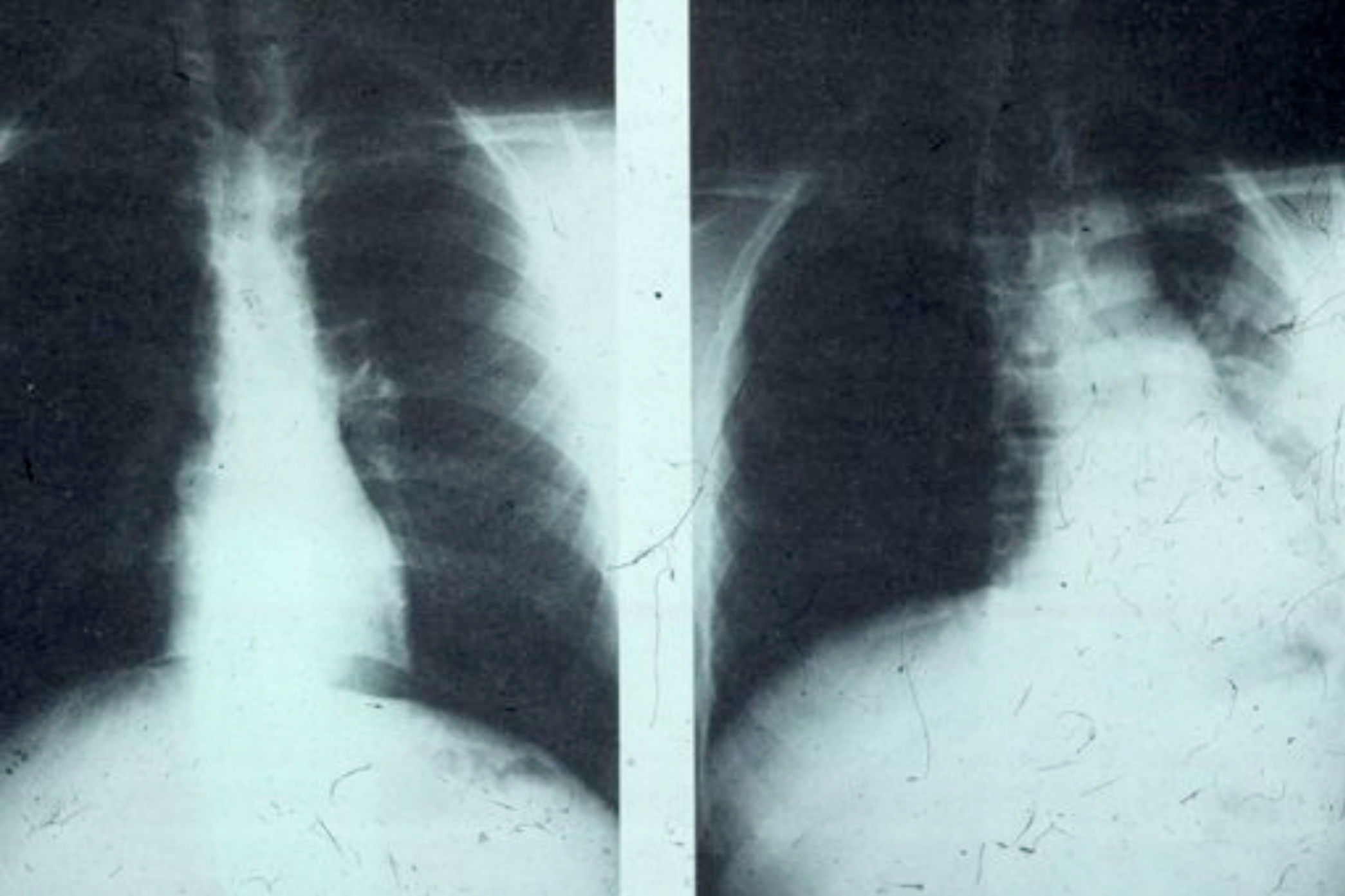


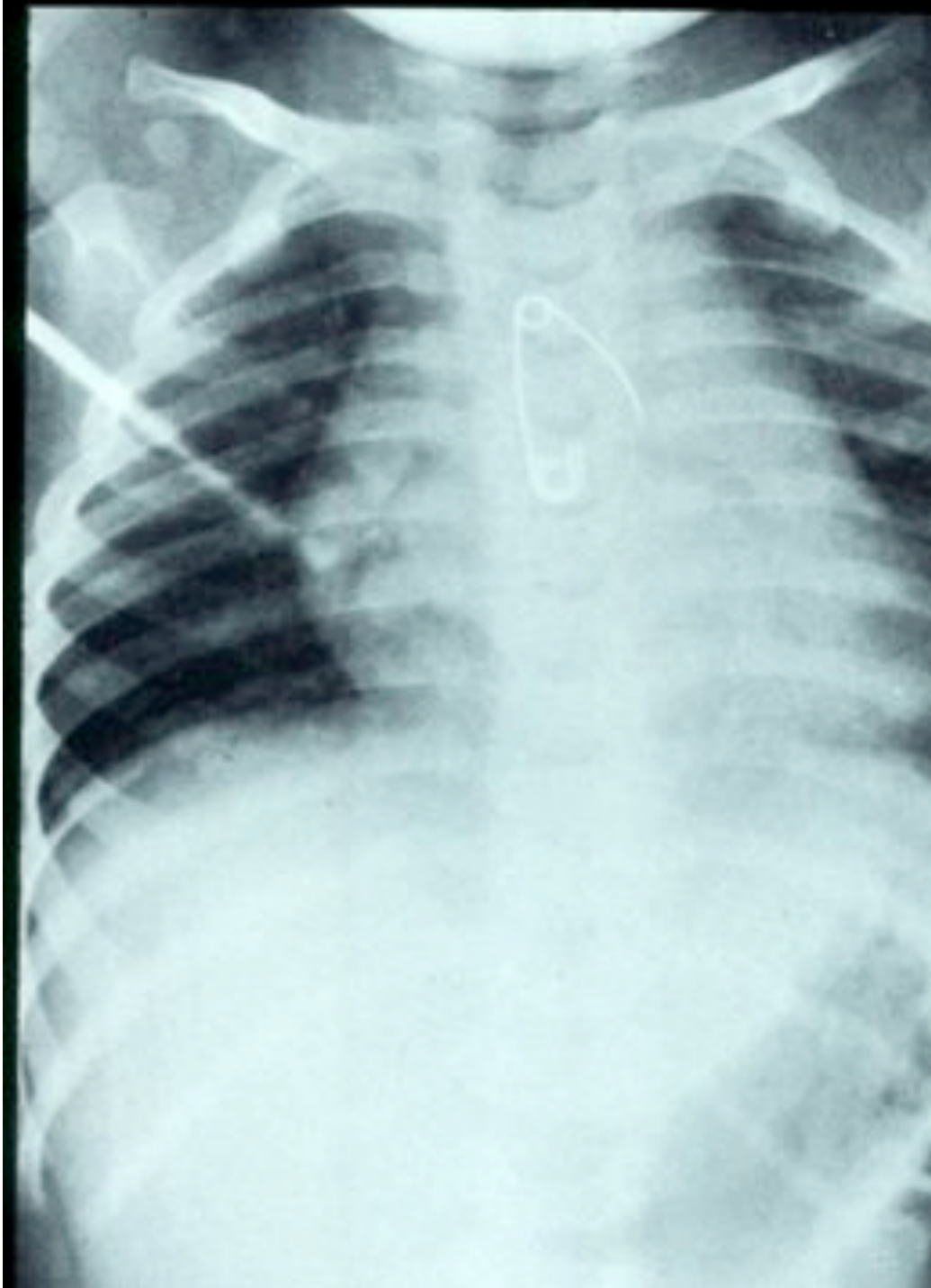
FIGURE 4. A child about 24 hours after aspiration of a foreign object has complete obstruction and collapse of the left lung (left), caused by the lodging of the foreign body in the left main-stem bronchus. Shortly after removal of the object, the lung is re-expanded (right).



Left X-ray shows air trapping ; right X-ray (different patient) shows atelectasis



Inspiratory film on left ; expiratory film on right ; foreign body in right bronchus



14 month old who presented with 4 day history of dysphagia and fever ; 4 months later was found to have an aortic pseudoaneurysm on chest X-ray

Other Studies to Consider to Demonstrate Aspirated Foreign Bodies

- **Fluoroscopy : may enhance yield to 76 %**
- **Xerotomography**
- **Computed tomography**
- **Contrast bronchography : usually not useful**

Management After Diagnosis of Aspirated Foreign Body

- **Bronchoscopy : 99 % success rate**
 - **rigid : often preferred in kids**
 - **flexible**
 - **ventilation more difficult**
 - **can extract more distal objects**
- **Patient should be observed 12 to 24 hours post procedure (till CXR normal)**

Differential Diagnosis of Partial Airway Obstruction in Children

- **Foreign bodies**
- **Iatrogenic**
 - laryngeal nerve paralysis
 - tracheal ulceration or granuloma
 - vocal cord granuloma
- **Infections**
 - croup/epiglottitis
 - diphtheria
 - retropharyngeal or peritonsillar abscess
- **Neoplasms**
 - hemangiomas
 - angiofibromas
 - teratomas
 - lymphangiomas
 - recurrent respiratory papillomatosis
- **Other**
 - Lingual thyroid
 - Congenital craniofacial anomalies
 - allergic edema

Precautions in Partial Airway Obstruction in Children

- **Don't do chest physical therapy**
 - **may dislodge object higher in airway**
- **General anesthesia required for safe object removal**
- **May be more than one object aspirated**

Foreign Body Ingestions : Risk Factors

- **Developmental immaturity**
- **Psychiatric illness**
- **Altered level of consciousness**
- **Structural dental abnormalities**
- **Abnormal deglutition**
- **Illicit concealment (drugs)**
- **High risk foods**
 - **Chicken bones**
 - **Fish bones**

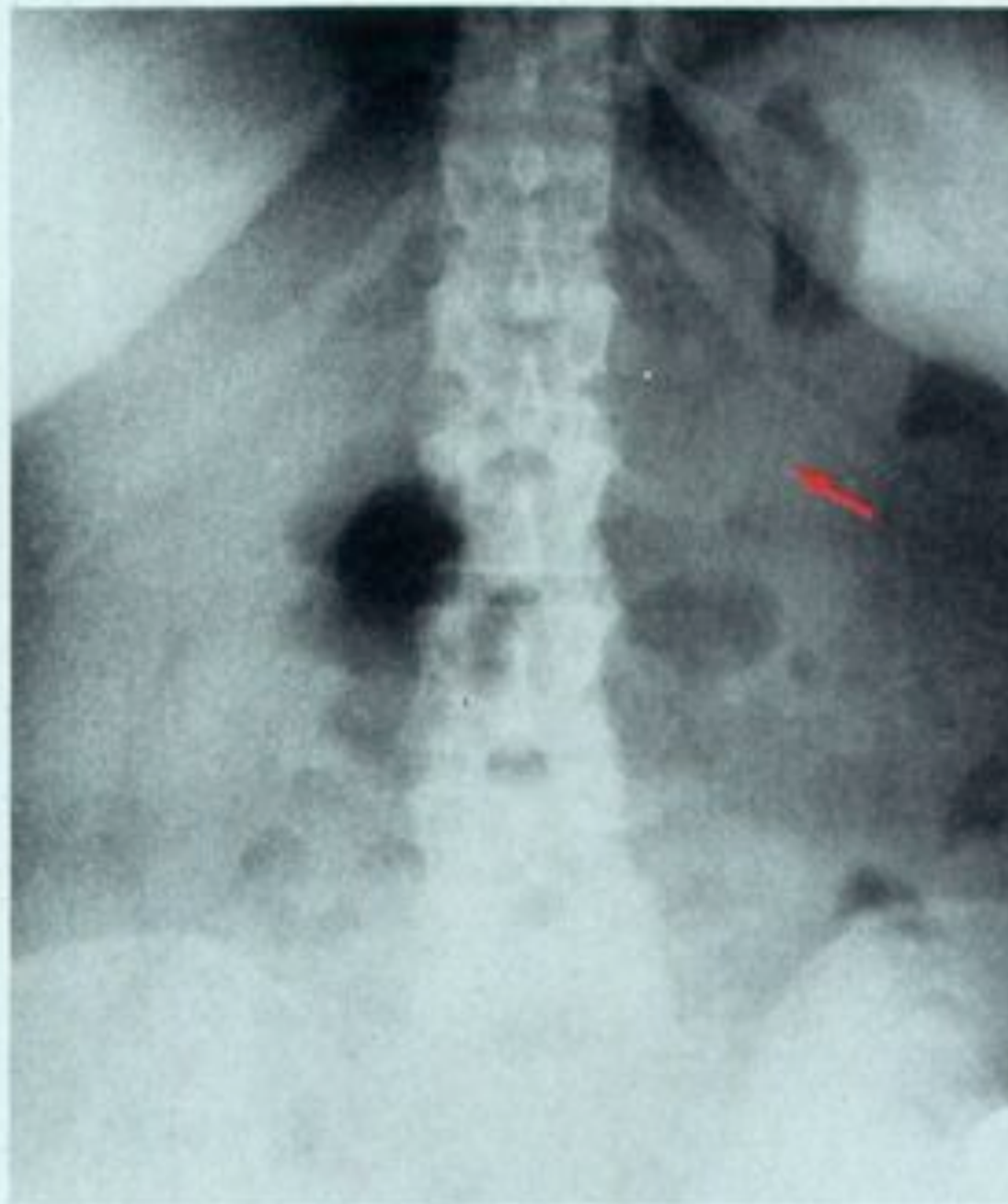


Figure 2. Routine abdominal radiograph of 50-year-old schizophrenic patient showing sharpened wooden pencil (arrow). Endoscopic removal was safely accomplished.



Figure 3. Lateral chest radiograph showing swallowed dental prosthesis in esophagus at level of aortic arch in patient who had a major motor seizure. Because of sharp hooks on prosthesis, rigid esophagoscopy with general anesthesia was necessary to remove it.



Swallowed denture

Foreign Body Ingestions : Most Common Types

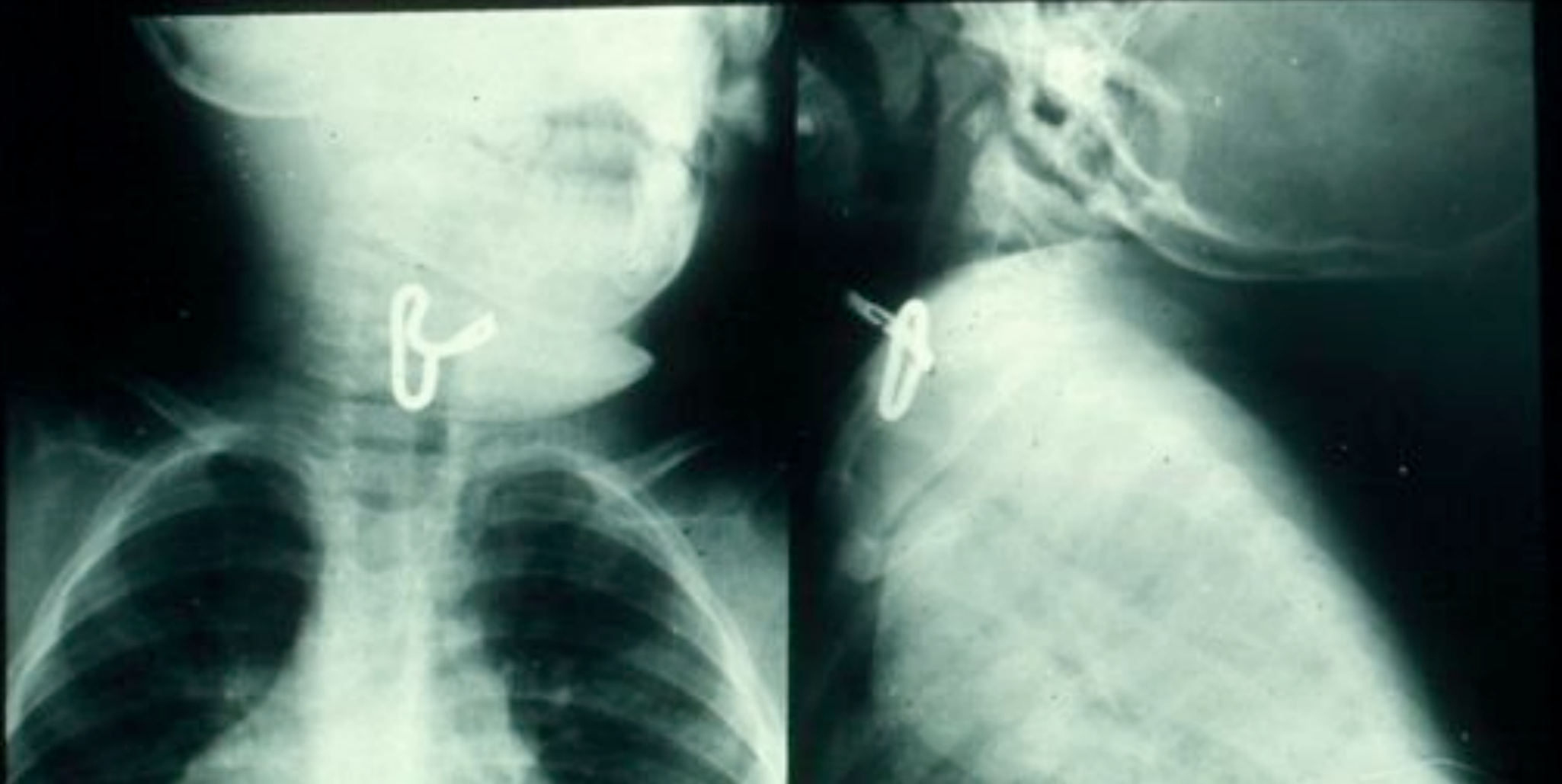
- **Meat : most common in adults**
- **Chicken bones : most common cause of perforation**
- **Sewing needles**
- **Safety pins**
- **Pills**
 - **Doxycycline & AZT can cause esophageal ulcers if impacted**
- **Other objects listed on slide # 4**



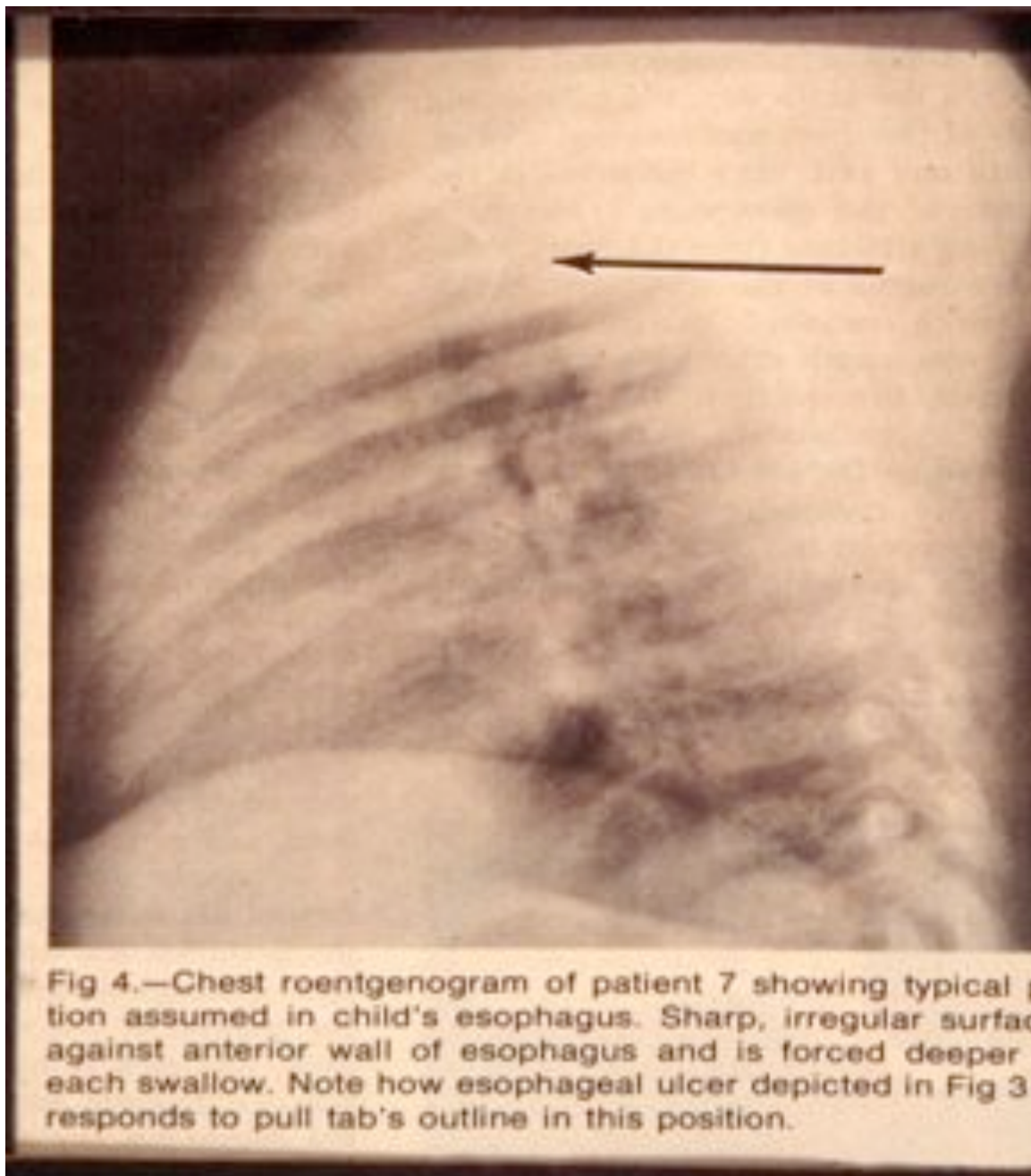
**Barium swallow
showing complete
esophageal
obstruction from a
meat bolus**



Esophageal obstruction from a meat bolus



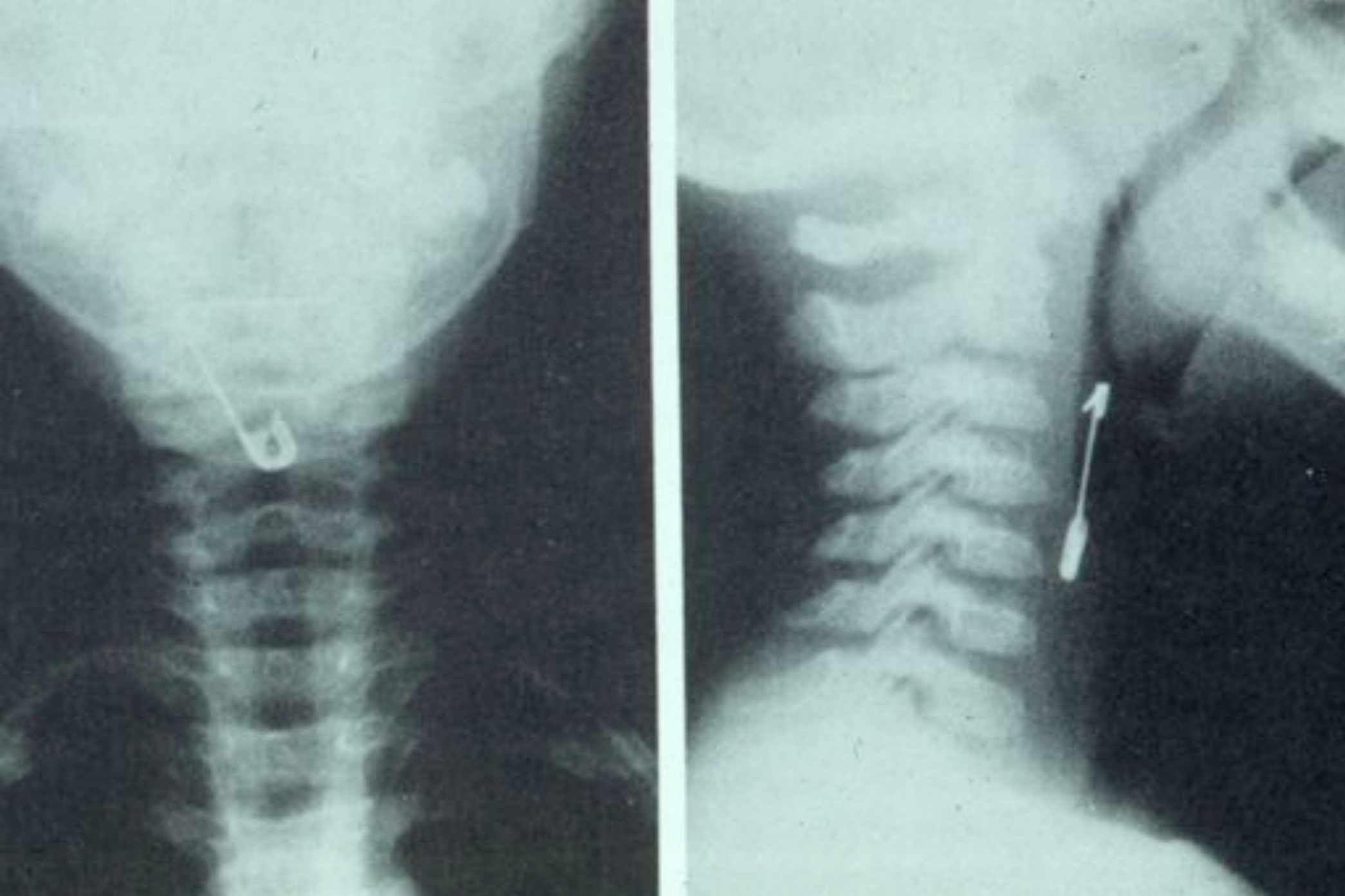
Can opener in the cervical esophagus



**Aluminum pull-top can
opener in the
esophagus**



Safety pin in the cervical esophagus



2 year old with safety pin in the cervical esophagus



Pork bone stuck in cervical esophagus



**Accidentally ingested
piece of glass from a
casserole dish**

Fish bones Causing Dysphagia

- **Only 20 to 35 % of patients with dysphagia after eating fish prove to have a fish bone**
- **Most of these are in the posterior pharynx and retrievable with Magill forceps**
- **For persistent symptoms, endoscopy is necessary since only 33 to 50 % of fish bones show on X-ray**



**Fishbone in cervical
esophagus**



**Another fishbone in
the cervical
esophagus**



**Calcified arytenoid
cartilages (normal
variant) mimicking
ingested fishbone**

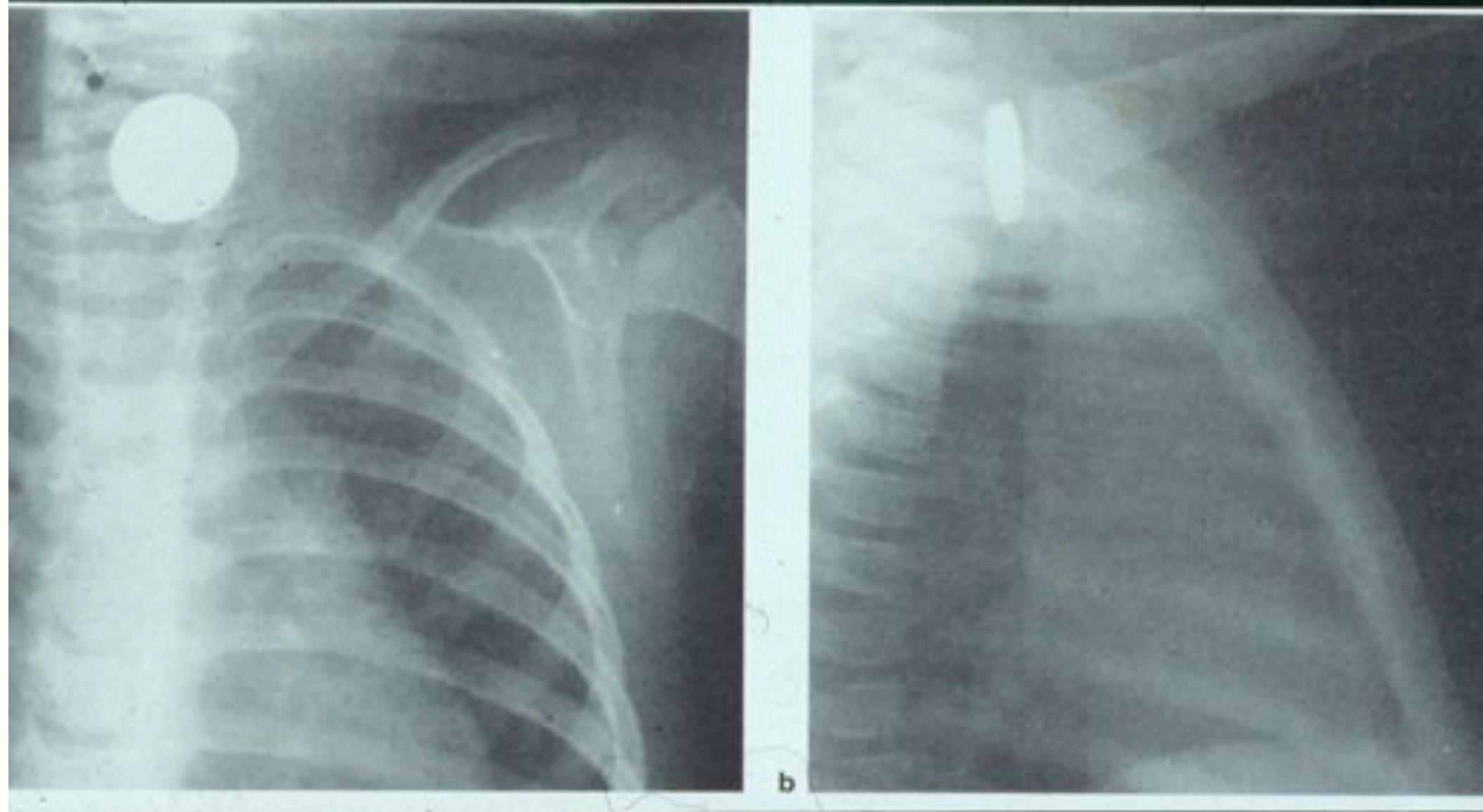
Esophageal Foreign Bodies :

Symptoms

- **Stridor**
- **Choking**
- **Gagging**
- **Coughing**
- **Drooling / spitting**
- **Refusal to eat**
- **Vomiting**
- **Chest or neck pain**
 - **The person can often point to the level of the obstruction**
- **Dysphagia**
- **Odynophagia**

Coin Ingestions

- **Quarters are 24 mm. in diameter**
- **Esophagus is 17 x 23 mm. in size**
- **Before 1982 pennies were 95 % copper & 5 % zinc**
- **Since 1982 pennies are 97.6 % zinc**
 - **Zinc is more corrosive than copper**
- **Coins tend to lodge in frontal (coronal) plane in esophagus (sagittal if in trachea)**
- **Up to 30 % of children with coins lodged in the esophagus may be asymptomatic**



Coin in upper esophagus

Diagnosis of Esophageal Foreign Bodies

- **CXR / neck films always indicated**
 - **Should get in 2 planes in case more than one coin ingested**
- **Consider dilute barium or gastrografin swallow for radiolucent foreign bodies like food**
- **May order as "alimentary tract" film for kids**

"Conservative" Initial Treatment for Impacted Food in the Esophagus

- **Glucagon 0.5 to 2.0 mg (usually 1.0 mg) IV or IM**
 - **Success rate 20 to 50 %**
- **Nifedipine 10 mg SL**
- **Nitroglycerin 0.4 mg SL**
- **Diazepam 5 to 10 mg IV**
- **Atropine 0.5 to 1.0 mg IV or IM**

"Invasive" Removal of Esophageal Foreign Bodies

- **Flexible fiber optic endoscopy**
 - **Usually method of choice**
 - **General anesthesia may be required in children**
 - **If food impaction, may be pushed into stomach rather than removed**
- **Foley catheter extraction**
 - **Patient must be in head - down position**
 - **Only suitable for upper esophageal impactions**
- **Nasogastric suction or magnet (needs fluoroscopy)**
 - **Rare earth cobalt magnet useful for button batteries**

Unsafe Methods for Esophageal Food Impaction Removal

- **Meat tenderizer (papain)**
 - **Has caused esophagitis & deaths from esophageal perforations**
- **Gas - forming agents**
 - **Sodium bicarbonate & tartaric acid**
 - **"EZ Gas" (sodium bicarbonate & citric acid & simethicone)**
 - **Can rupture esophagus from gas buildup**
- **Syrup of ipecac**

Indications to Emergently Remove Objects from the Esophagus

- **Sharp object (e.g. : open safety pin)**
- **Button battery**
- **Penny (younger than 1982)**
- **Bone fragment**
- **High complete obstruction (risk of aspiration)**
- **Any potentially corrosive agent**
- **Any sign of esophageal perforation**

Follow up of Patients After Endoscopic Removal of Esophageal Foreign Body

- **Observe in E.D. until sedatives wear off (at least 4 hours)**
- **Reinsert endoscope after object removal (to rule out perforation)**
- **Do follow up barium swallow in adults**
 - **Not necessary in children unless esophagitis present and risk of stricture**

X-ray Signs of Possible Perforation of the Esophagus

- **Air in :**
 - **Cervical soft tissues**
 - **Subcutaneous**
 - **Supraclavicular**
 - **Mediastinum**
- **Pneumothorax**
- **Pleural effusion**
- **Retropharyngeal swelling**



Prevertebral air from hypopharyngeal perforation

Most Likely Sites of Esophageal Foreign Body Impaction

- **Sites of esophageal narrowing :**
 - **Cricopharyngeus (15 to 17 cm. from incisors)**
 - **Aortic arch (22 to 24 cm. from the incisors)**
 - **Left main stem bronchus (28 to 30 cm. from incisors)**
 - **Gastro-esophageal sphincter (40 cm. from incisors)**
- **Pathologic narrowing of esophagus**
 - **Intrinsic : tumors, strictures**
 - **Extrinsic : tumors, vascular lesions**

Button Battery Ingestions

- **Probably > 2000 reported cases per year in U.S.**
- **Button batteries are 6 to 23 mm. in diameter**
- **Used in calculators, cameras, electronic games, hearing aids, watches, etc.**
- **Types :**
 - **Mercuric oxide**
 - **Manganese dioxide**
 - **Zinc-air**

Dangers of Button Battery Ingestions

- **Esophageal impaction**
 - **Corrosion & esophageal perforation**
 - **Some deaths reported**
- **Dissolution & heavy metal poisoning**
 - **No confirmed cases yet - probably because any released mercury is converted to elemental mercury**
 - **Lethal dose of mercuric oxide is 0.5 to 1.0 grams, & there is 1.0 to 21 g. mercuric oxide in a battery**

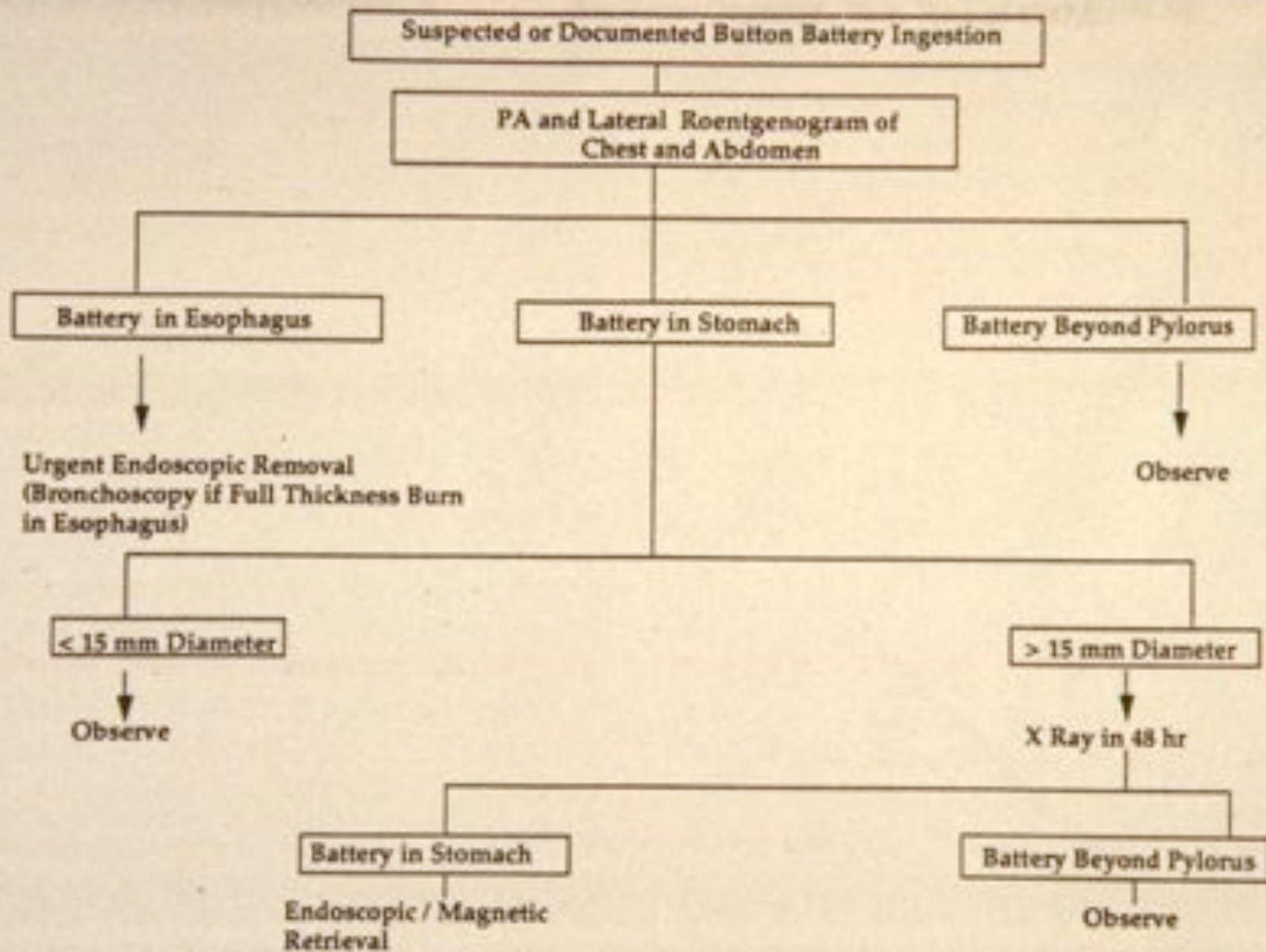


FIG. 3. Flow diagram of suggested management of button battery ingestions in children.

Stomach and Intestinal Foreign Bodies

- **Only 1 % of objects that reach the stomach will require surgical removal**
- **Only 2 to 7 % of high risk objects (pins, nails, toothpicks) will need surgery**
- **Somewhat higher risk for ingested Christmas ball ornaments (have thinner, sharper glass)**
- **90 % of foreign bodies will pass in less than 7 days**



Abdominal film of a 41 year old psychiatric patient with abdominal pain



Surgical exploration of the same patient revealed a 2 by 3 cm lesser curve gastric ulcer and an interesting variety of swallowed objects

Indications for Surgical Removal of A Stomach or Intestinal Foreign Body

- **Signs of obstruction**
 - **Persistent vomiting**
 - **Progressive abdominal distention**
- **Abdominal pain / peritonitis**
- **Gastrointestinal bleeding**
- **Failure to move distally for > 2 weeks (?)**

Indications to Admit a Patient with a Foreign Body in the Stomach or Intestine

- **High risk object**
 - **Sharp point(s)**
 - **Cocaine packets**
 - **> 6.5 cm. in length**
 - **Potential toxin**
- **Multiple objects (?)**
- **Preexistent GI disease (?)**

Endoscopic Techniques for Removal of Sharp Foreign Bodies

- **Alligator forceps**
- **Wire snare**
- **Magnet**
- **Suction**
- **Preplace protective tube over endoscope to protect esophagus during withdrawal of sharp object**
- **Can manipulate open safety pins to close them**

Management of Cocaine Packet Ingestion

- **X-ray to locate & count bags**
- **If symptoms of bag rupture :**
 - **Pretreat with labetalol or phentolamine**
 - **Emergent surgical removal**
- **If asymptomatic :**
 - **Sorbitol or osmotic cathartic**
 - **Do follow up X-rays to document clearance**
 - **Save passed bags for police**

Nasal Foreign Bodies

- **May present in children as :**
 - **Extremely bad body odor**
 - **Unilateral rhinorrhea**
 - **Epistaxis**
 - **Sinusitis**
- **Use decongestant first for exam**
- **May require general anesthesia for removal**
- **Sometimes removable with suction, alligator forceps, or inflatable balloon catheter**
- **May need antibiotics post-removal**

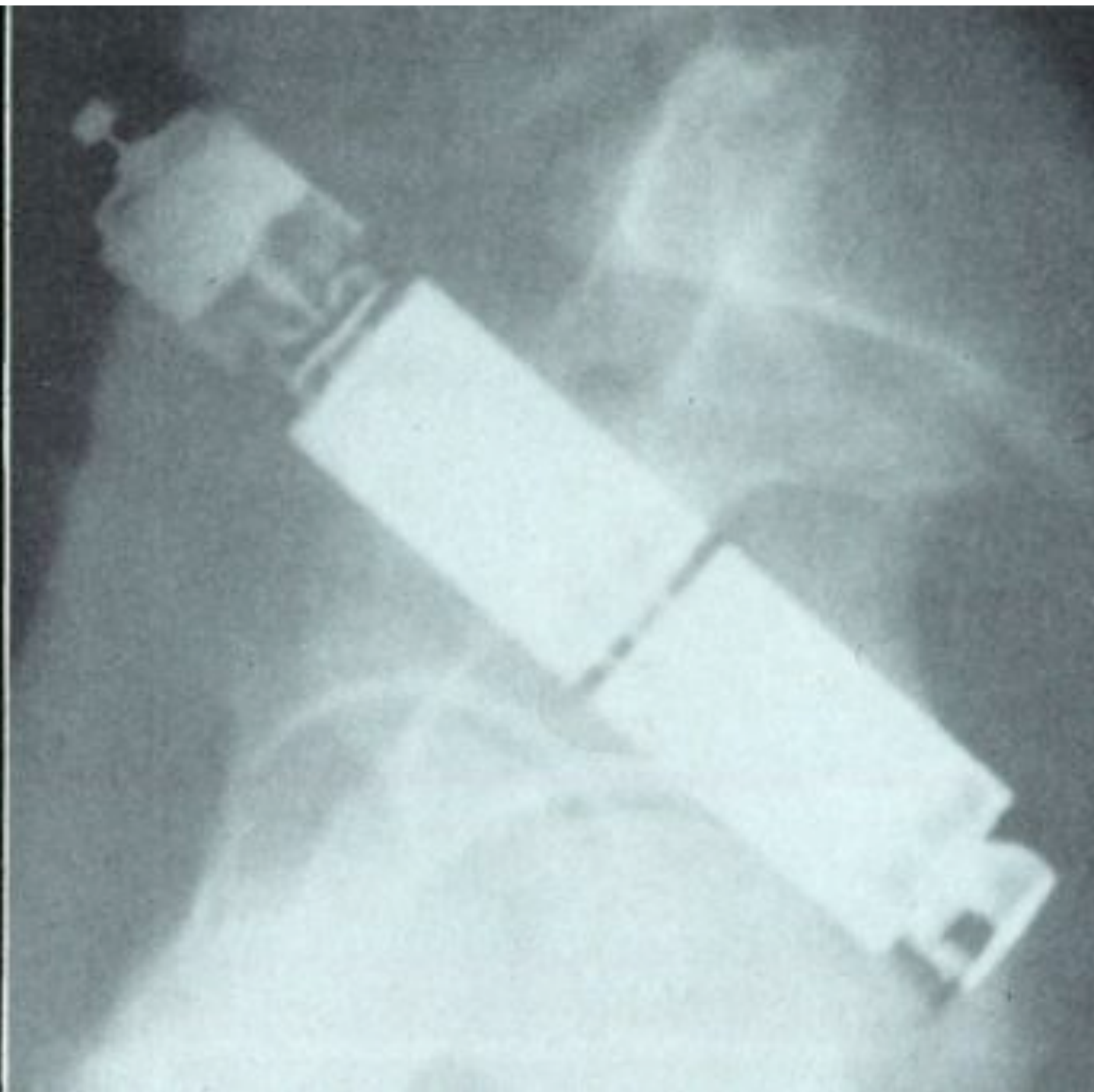


Ear Canal Foreign Bodies

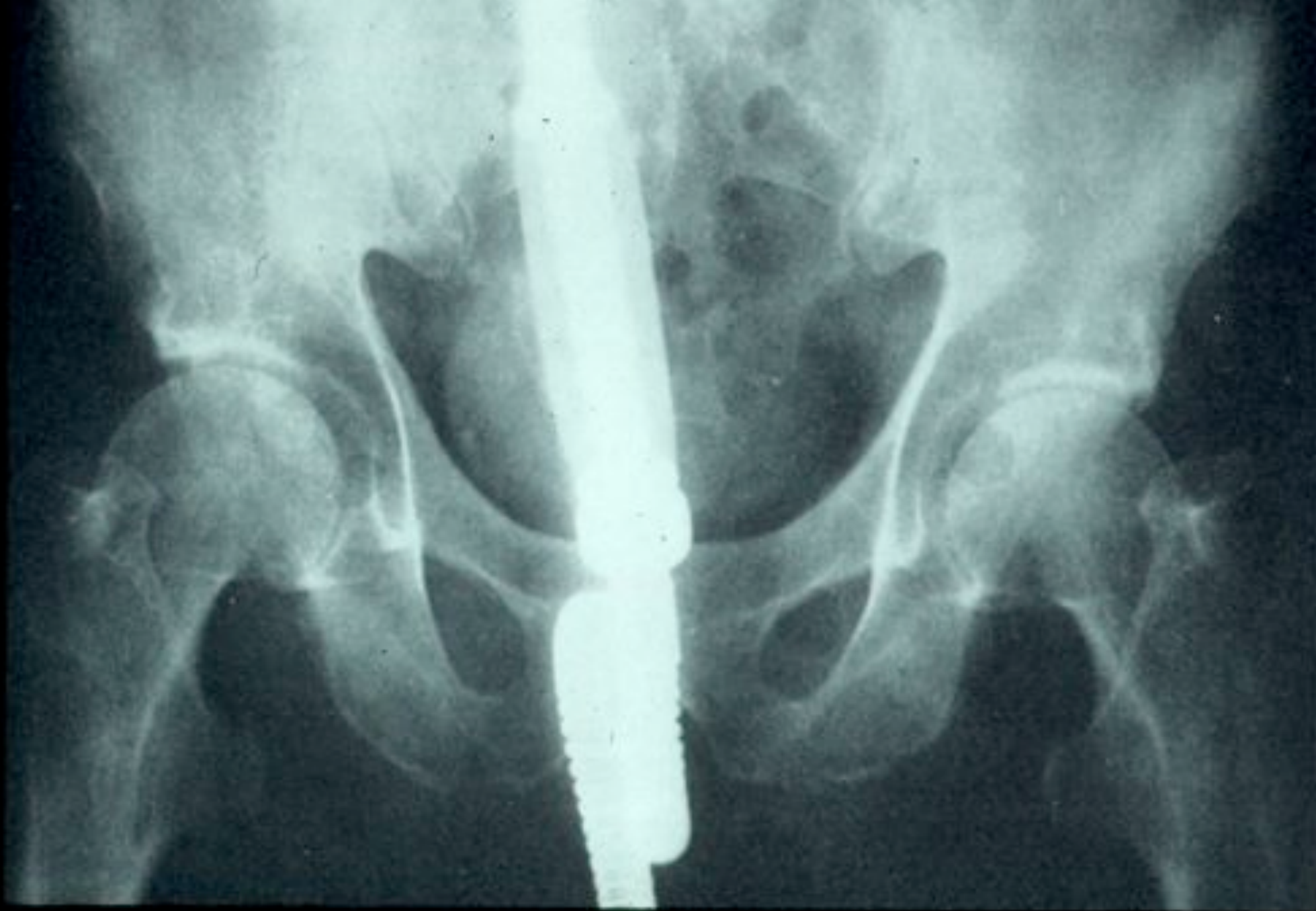
- **Insects (cockroaches) are most common**
- **Patients have been misdiagnosed as psychiatric**
- **Can fill ear canal with 2 % lidocaine to cause bug to seize & jump out**
- **May require general anesthesia for removal**
- **May need otic antibiotic drops afterward if canal wall injured**

Rectal Foreign Bodies

- **Should get pelvic / abdominal X-rays first**
- **Emergent surgery indicated if any sign of perforation**
- **May require perianal block or general anesthesia for removal**
- **Can insert Foley beyond object & inflate balloon to assist removal**
- **After removal do sigmoidoscopy to look for mucosal injury or perforation**



X-ray of vibrator lost in the rectum



X-ray of hand shower misplaced in the rectum