

Foreign Body Aspiration/Ingestion in Dentistry: A Review

Dr. Nirmala Kumari^{1*}, Dr. Sunil Dutt Christopher², Dr. K.V. Umashankara³

¹Reader, Department of Prosthodontics, College of Dental Sciences, Davangere Karnataka India

²Professor & Head, CODS Academy of Implantology, College of Dental Sciences, Davangere Karnataka India

³Professor, Department of Oral & Maxillofacial Surgery, College of Dental Sciences, Davangere Karnataka India

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*Corresponding author: Dr. Nirmala Kumari

Abstract

Review Article

Foreign body aspiration/ingestion is one of the vexing complications during any dental treatment procedures. This may be attributed to the small size of the instruments or prosthesis and treating the patient in supine or semi – recumbent position. Aspiration/ ingestion of foreign bodies is a life-threatening incident. Hence, it is always better to follow the golden rule “prevention is better than cure”. But if such an incident occurs, proper management is crucial to prevent morbidity and mortality. The objective of this paper is to draw attention to the risk factors, symptoms, various preventive measures to be taken during dental treatment procedures, serious consequences of foreign body aspiration / ingestion, and management of such accidents.

Key words: Foreign body, aspiration, ingestion, KUB.

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INTRODUCTION

Foreign body aspiration can be a life threatening emergency. According to National Safety Statistics in 1995, mechanical suffocation accounted for 5% of all unintentional death among children in United States younger than 4 years of age[1].

Foreign body aspiration is often a serious medical condition demanding timely recognition and prompt action. Delayed diagnosis and subsequent delayed treatment is associated with serious and sometimes fatal complications.

Dental items have been reported as the second most commonly aspirated foreign object in adults[2]. Aspiration/ ingestion of files, reamers, burs, impression

materials, inlays, onlays, crowns, posts & cores, rubber dam clamps, removable prosthesis, orthodontic retainers, bands & wires, implant components, teeth or root and even parts of intra-oral tracing apparatus may also occur.

The handling of dental objects require particular care, especially where the patient is treated in supine and semi-recumbent position. Dentist must be able to manage situation in which patients accidentally swallow dental instruments or materials during treatment procedures.

Relevant anatomy

Esophagus

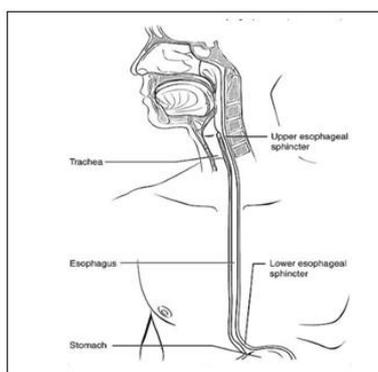


Fig-1: Relevant anatomy Esophagus

Esophagus is a part of the alimentary canal. It begins at lower border of cricoid cartilage, posterior to the trachea and connects the throat to the stomach. It conduits food and liquids swallowed into the pharynx to reach the stomach. The length of the esophagus is around 25 cm. Opening is protected by two sphincters (Fig 1)[3]. The upper esophageal sphincter closes the upper esophageal opening and the lower esophageal sphincter prevents the backward movement of food in the stomach to the esophagus⁴. Esophagus is most contracted at commencement and at level of diaphragm.

It is composed of three parts: cervical part, thoracic part, and abdominal part. The trachea connects to the pharynx through the larynx. The esophagus is directly connected to the pharynx. The main difference between trachea and esophagus is the type of materials passed by each tube in the body[3].

Trachea

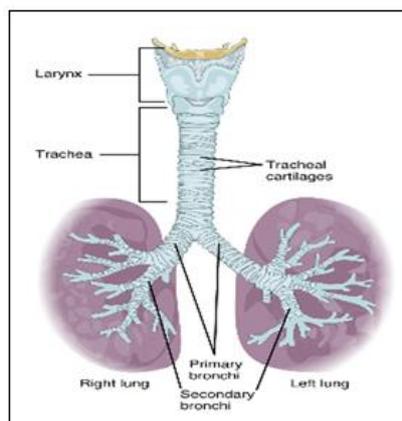


Fig-2: Relevant anatomy Trachea

Trachea is the main windpipe of the respiratory system. Trachea is a large membranous tube extending from the inferior part of the larynx to the bronchial tubes and is strengthened by the cartilage rings (Fig 2)[3]. It is about 11 cm in length. The opening is protected by epiglottis.

It is composed of two parts: cervical part and thoracic part. It divides into right and left mainstem bronchi at the carina. Right mainstem is more vertically oriented and wider in caliber compared to left [5].

Common sites of impaction and obstruction [2]

Airway Foreign Body

- Larynx (least frequent) (6%)
- Tracheal (rarely) (4%)
- Bronchial (most common)
 - Right (58%)
 - Left (42%)

Esophageal Foreign Body

- Upper esophagus at Thoracic Inlet
- Carnia and Aortic Arch
- Distal Esophagus

Signs and Symptoms of Airway Foreign Body

Larynx(least frequent):	Complete airway obstruction <ul style="list-style-type: none"> ○ Emergency Partial <ul style="list-style-type: none"> ○ Stridor ○ Hoarseness ○ Aphonia ○ Croup – like cough ○ Odynophagia ○ Hemoptysis ○ Wheezing ○ Dyspnea
Tracheal rarely	<ul style="list-style-type: none"> ○ Obstruction ○ Stridor ○ Wheezing ○ Dyspnea

	<ul style="list-style-type: none"> ○ Complications 4-5 times greater
Bronchial most common	<ul style="list-style-type: none"> ○ Coughing ○ Wheezing ○ Hemoptysis ○ Dyspnea ○ May shift between Right and Left Bronchus ○ Obstructive emphysema/ball valve ○ Atelectasis ○ Pneumonia ○ Lung abscess ○ Empyema(bacterial overgrowth)

Renewed Symptomatic Period

Airway	Esophagus
Airway inflammation	Dysphagia
Infection	Drooling
Cough	Vomiting
Fever	Gagging perforation
Wheezing	Abscess
URI	Tracheoesophageal fistula (rare complication)
Pneumonia	Aortoesophageal fistula(rare complication)

Differential diagnosis

Airway	Esophageal
Reactive Airway Disease	Achalasia
Pneumonia	Strictures of the esophagus
Croup	

Consequences

The foreign body may get wedged anywhere either in the GI or respiratory tract. 90% of an ingested object normally passes through GIT in a harmless way in 2-12 days. About 60% enter stomach without lodging in the esophagus. The foreign object may become stuck anywhere in the GI or pulmonary tracts [6-8].

Aspiration cases are usually more critical and less common than ingestion. If central airway is the site of complete or partial obstruction, respiratory distress or arrest, or both may ensue.

Preventive precautions during dental treatment procedures to Prevent Aspiration/ Ingestion

Related to patient[9]

- Prior instructions should be given to the patients that if an object falls on the tongue, patient should try to suppress the swallowing reflex and to turn their head to the side.
- Identify high-risk patients.
 - Consider (i) Treatment with patient under general anesthesia or (ii) Alternative treatment options.

- Use gauze screen to protect oropharynx in sedated or conscious patient.
- Treat patient with swallowing or coughing problem in upright position.
- High speed evacuators should always be kept handy to retrieve articles.

Related to specific dental treatment

Endodontics and operative dentistry [9]

- Use rubber dam for root canal treatment and post-cementation, and during removal of amalgam fillings, for adhesive cementation of porcelain inlays
- Check post-retention when impressions are made for indirect post and cores.

Rubber Dam

Sometimes, there are chances of aspiration of dam clamp itself. To reduce this risk, Alexander and Delholm and Meyers have suggested that dental floss be used to secure the rubber dam clamp [10].

Fixed prosthodontics

Preventive measures during try-in and cementation of prosthesis



Fig-3: Dental floss attached to core during intraoral evaluation



Fig-5b: Completed crown with loop



Fig-4: Completed restoration with loop



Fig-6: Full cast crown with pin and floss attached(left).Porcelain-fused-to-metal crown with pin

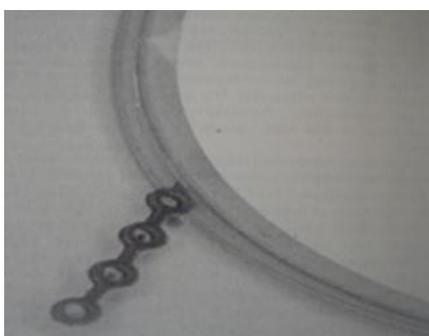


Fig-5a: Orthodontic elastic chain

During the preparation of wax pattern, a hole can be created in the middle of the wax pattern (Fig 3)[11], or form a V- shaped loop using blue sprue wax (Fig 4)[12], use of Orthodontic elastic single loop of chain(Fig 5a & 5b)[13] or pin(Fig 6)[14] and attach to the lingual surface of wax pattern. Proceed with investing, casting and finishing procedures. Floss is used to secure the prosthesis and prevent slippage during the evaluation or cementation. The hole is then filled with composite restorative material or Loop or pin is easily removed after cementation and the attachment site is polished.

- When porcelain-fused-to-metal restorations are removed with chisel, ceramic chips are immediately collected by dental assistant, keeping suction close to abutment.

- Check fixation of restorations placed with nonpermanent cement.

During impression

- Two main causes of aspirating the impression material may be attributed to the use of excess amount of material &/or low viscosity material. And also full arch impressions does not allow barrier technique. So custom impression tray should be used to minimize the amount of impression material required and leave palate open, it also directs the material to the required areas.
- After taking the impression, the oral cavity should be rinsed with high vacuum suction and examined for any residual debris.

Removable prosthodontics

- A relationship between foreign body ingestion and the wearing of complete dentures has been reported and ascribed to the reduced tactile sensitivity of the palatal mucosa. The major drawback of the materials used in dentures is that they are made of radiolucent material and hence their localization is very difficult. All polymeric materials used in the mouth should be radio-opaque or dentures be made with metal framework to allow radiographic location of inhaled / ingested objects.
- Check retention of removable appliances.
- Take extra care during placement of small root copings.
- Seal off oropharynx when relining posterior prostheses base with self-curing acrylic resin.

Oral surgery and Implantology

- Consider gauze partition during extractions.
- Use dental floss to tether screwdriver.
- Place gold screws in screw access holes of restoration and seal with gel for protection (extra orally).
- Few of the healing abutments have the option for tying dental floss.
- One can also place 4x4 inch gauze protective barrier in the oral cavity distal to the area where small items are being manipulated.

Orthodontic instruments

There are documented cases of ingestion of bonded tube in descending colon and, arch wire in stomach and in large intestine. Hence as a precautionary measure, all the arch wires should be cinched down distal to a bonded attachment, and secured before intra – oral cutting [15].

Menu of tests [16]

Sometimes regardless of all possible precautions taken, iatrogenic accidents during clinical procedures are unpredictable. If aspiration / ingestion occur, following tests have to be done:

- Plain radiograph
- Contrast esophagram
- CT
- Less commonly MRI

Plain Radiograph [16]

- Initial evaluation for anyone suspected of foreign body ingestion or aspiration.
- Ingestion: Anteroposterior and lateral views of the chest as well as KUB.
- Aspiration: Anteroposterior and lateral films of chest (Fig 7) [17].

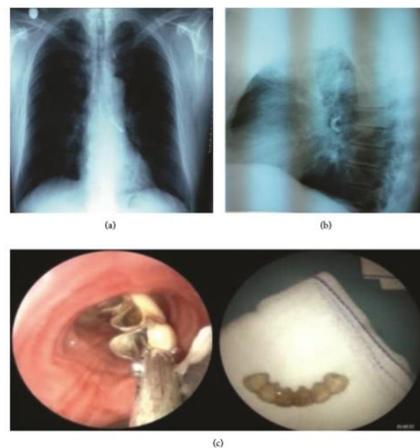


Fig-7: PA (a) and lateral (b) chest x-ray view in the main bronchus radiopaque foreign body was considered as a dental prosthesis. (c) Extracted dental prosthesis with bronchoscopy.

Contrast Esophagram[16]

- Can identify non – radiopaque foreign body ingestions.
- Generally not indicated
- May obscure subsequent endoscopy
- If obstructed, risk for aspiration of contrast.
- May be helpful post – removal of foreign body to identify posttraumatic pseudodiverticulum or underlying stricture.

CT

- Ingestion: CT with 3-D reconstruction can identify radiolucent foreign bodies.

- Aspiration: Near 100% sensitivity.

MRI[16]

- Less commonly used.
- May identify radiolucent foreign bodies.
- Contraindicated if the suspected foreign body is metallic.

Complications of Ingestion

- Aspiration pneumonia from obstruction.
- Trauma leading to esophageal stricture, ulceration, perforation, aorto-esophageal fistula, or tracheo-esophageal fistula[18]

Complications of Aspiration

- Complete airway obstruction, respiratory distress, atelectasis, post-obstructive pneumonia.
- Long- standing aspiration may lead to bronchiectasis[16]

Management

The risk of accidental ingestion or aspiration of foreign object by a patient during dental treatment has been well documented [19-23]. Dentist must be aware of proper management of such an incident when it occurs which is crucial to the health and safety of the patient (Fig 8)[15].

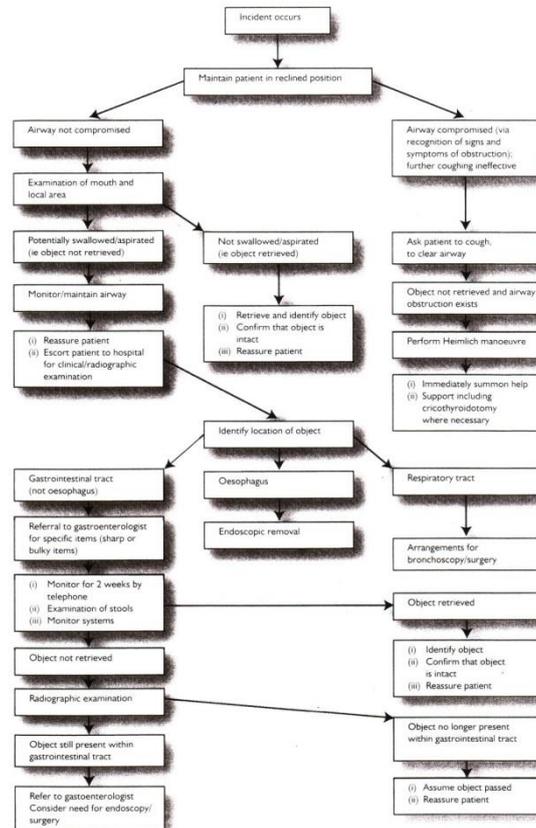


Fig-8: Flow chart for management of ingested / aspirated dental objects

Indications for endoscopy following fb ingestion

- Foreign object should not remain in esophagus more than 24h after presentation.
- Emergent endoscopy: esophageal obstruction, sharp – pointed objects in esophagus.
- Urgent: Sharp – pointed objects in stomach (early endoscopic removal)[24]
- Nonurgent removal: long objects (more than 5cm) in the stomach, blunt objects failing to pass stomach in 3-4 weeks, blunt objects distal to duodenum remaining in same location for more than 1 week needs surgical intervention (early endoscopic removal).²⁴
- Most ingested foreign bodies will otherwise pass spontaneously once clearing esophagus[16]
- There is no evidence of laxatives being helpful rather may increase the risk of perforation[25]

Management of aspirated foreign body

- Complete airway obstruction (inability to speak or cough): back blows and chest compressions in infants; Heimlich in older children [26, 27].

- Otherwise removal by rigid bronchoscopy [28, 29] with ventilation under general anesthesia
- Laryngospasm and respiratory embarrassment are potentially life threatening requiring cricothyrotomy[15].
- Object lodged in very small bronchi towards lung periphery, with presence of mucosal inflammation and oedema around the object, thorachotomy needs to be performed.

CONCLUSION

Episodes of foreign body ingestion/aspiration have the potential to result in acute medical and life threatening emergencies. To prevent such occurrence, during any procedures, the dentist must follow the standard practice guidelines and be extremely attentive when using minor instruments especially in the supine or semi – recumbent position of the patient. It is also advised to accept and practice within one's capability.

Although such accidents have rare occurrence, the associated risks and morbidity are too high to be

overlooked, especially from the viewpoint of special care, resources, and the associated financial cost required for their management.

Preventing complications of foreign body ingestion and aspiration is of great importance. Practitioners must be aware of the protocol for management of the patients who are suspected of having ingested or aspirated a foreign body to avoid catastrophic effects. A close monitoring of clinical signs and symptoms should be done until the foreign body aspirated/ingested is excreted or removed.

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