

Review Article

Ingestion of Foreign Objects in Prosthodontia: A Review

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ABSTRACT:

This article reviews several cases of foreign object ingestion in the field of Prosthodontia and also discusses prevention and management of such events. Failure to manage these can lead to significant morbidity and possibly death.

Key words: Accidental aspiration, foreign Objects, Prosthodontia.

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INTRODUCTION:

Foreign object ingestion and food bolus impaction occur commonly. The majority of foreign bodies that reach the GI tract, true foreign objects and food bolus impactions, will pass spontaneously. However, 10% to 20% will require non operative intervention, and 1% or less will require surgery. Although deaths caused by foreign body ingestion have rarely been reported.¹

The most often ingested objects are coins, meat impaction, button batteries, and dental objects. The second most likely objects to be ingested or inhaled that were reported are dental in origin, for example tooth picks, files, reamers, burs, impression materials, inlays, onlays, crowns, posts and cores, rubber dam clamps, removable prosthesis, orthodontic retainers, band and wires, implant components, and even parts of intraoral tracing apparatus.²

The majority of foreign body ingestions occur in the pediatric population. In adults, true foreign object ingestion occurs more commonly among those with psychiatric disorders, mental retardation, or impairment

caused by alcohol, and those seeking some secondary gain with access to a medical facility.¹

The accidental ingestion or aspiration of dental instruments, dental prostheses or materials used during the course of treatment can occur in virtually any field of dentistry and during nearly any procedure.³

Accidental aspiration of a dental appliance is a severe health hazard to the patient. The complications range from pneumonia to death. Removal of a foreign body from the lung is an intricate procedure. Swallowing a small appliance causes problems for the dentist, as well as for the patient. Explaining to the patient that he may pass the foreign body is usually embarrassing to the dentist. Nevertheless, both aspiration and swallowing of foreign bodies may be avoided.⁴

Swallowing or aspiration of a dental prosthesis/ foreign body is a complication that may arise from any procedure in the oral cavity. This article reviews various cases reported in the literature and; reviews and summarizes the management of foreign body ingestion.

Review of literature:

Year of study	place	Age	Sex	Symptoms	Time of onset if symptoms	Investigations	Type of Prosthesis	Location of prosthesis	Treatment/retrieval	Complications (if any)
1980	Ontario	-	M	Spasmodic coughing and choking episodes	-	Radiograph	Mandibular complete denture	Pharynx	Curved forceps ⁵	
1985	Edinburgh	46	M	Dysphagia, hoarseness of voice	6 months	Neck x-ray, on examination tenderness in the neck at the cricoid level, especially on eliciting crepitus, and a left vocal cord palsy. A barium swallow examination	jagged piece of denture plate 3 x 3 cm	widening of the postcricoid soft tissue shadow, in the cervical oesophagus	endoscopy	Hoarseness and left laryngeal palsy ⁶
1988		77	M	-			Maxillary mounted Simcrest central bearing plate (intraoral tracer) ⁷	-	-	
1988	Philadelphia,	64	M	painful retching	immediately after ingestion	Endoscopy, radiography	Nesbett partial	Esophagus (at the level of the ninth and tenth thoracic vertebrae)	left thoracotomy and esophagotomy	Mediastinitis, large fluid-filled pleural cavity ⁸
2006	New York	46	F	history of mycobacterium lung infection (mycobacterium avium-intracellulare [MAI]).	Asymptomatic (ingested during intubation)	flexible bronchoscopy, biopsy, and possible rigid bronchoscopy, chest x-ray	right maxillary fixed partial denture	stomach	Endoscopy ⁸	
2008	Louisville, KY	27	M	severe abdominal pain, diarrhea, and blood-tinged vomitus	10 days	Computed tomography (CT) of the abdomen and pelvis, Exploratory laparotomy	ingested three denture cleanser tablets in water over two days	extensive free fluid and free air in abdomen and pelvis, 0.5-cm gastric ulcer with perforation and 1 L of pus within the peritoneal cavity	Irrigation, debridement and Heineke-Mikulicz pyloroplasty ¹⁰	
2009	France	52	M	persistent dysphagia.	-	Neck and nasoendoscopy examination, CT scan	Denture plate	in the upper oesophagus at the level of cricopharynx	open oesophagotomy ¹¹	
2011	Bangladesh	62	M	chest pain, dyspepsia, early satiety leading to occasional self-induced vomiting	2 weeks (denture swallowed 3 years back)	Upper GI endoscopy	Partial denture	duodenal bulb.	Endoscopy ¹²	
2014	Aberdeen, UK	81	M	worsening dysphagia, dysphonia and weight loss, history of chronic lymphocytic leukaemia.	3 months ago	full ear, nose and throat Examination- fixed vocal cords with pooling of saliva in the bilateral pyriform fossa: Ct scan, endoscopy	impacted three teeth denture	in the cricopharynx and upper oesophagus. (leading to bilateral vocal cord paresis.)	Endoscopy ¹³	
2014	mexico	61	f	diarrhoea, involuntary weight loss and haematochezia, abdominal pain	9 months	Abdominal tomography, barium x-ray	Single tooth dental prosthesis	prosthesis lodged at both ends towards the sigmoid mucosa approximately 28 cm from the anal margin	exploratory laparotomy with sigmoidostomy	acute diverticulitis with perforation ¹⁴
2014	Mexico	62	F	dysphagia	5h	Endoscopy, x-ray	Metal dental	Third duodenal	Colonoscopy	

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2014	Mich	47	F	pain in the right lower quadrant	2 months later	Abdominal radiograph	Dental implant screwdriver	ileocecal valve	Colonoscopy3	
2014	Mich	54	M	coughing and wheezing.	2 months	Chest radiograph and CT	crown	right middle bronchus	Bronchoscopy 15	
2014	Mich	75	M			Chest radiograph	Part of restorative crown	e right distal mainstem bronchus.	Bronchoscopy 15	
2015	Russia	54	f	clinical manifestation of acute small bowel obstruction	22h	laparotomy	retractable one-tooth denture	Small bowel	enterotomy 16	
2015	Russia	31	M	-	-	Preparation of colonoscopy	fixed one-tooth prosthesis	ileocaecal valve	passed out with stools16	
2015	Brazil	65	M	vomiting	Immediate	Radiographs, endoscopy	Hexagonal 1.7 wrench	Gastric region	Endoscopy17	
August 2009 to December 2015	Niigata	6-92 years	29 patients	Discomfort in the throat3 (10.3%) Pain in the throat1 (3.4%) Dyspnea1 (3.4%) None24 (82.8%)		Plain radiography	23 dentures (13 crowns, 4 bridges, 4 partial dentures, and 2 other dentures) and 6 dental instruments	Pharynx-esophageal entrance2 (7.1%) Esophagus6 (21.4%) Stomach12 (42.9%) Duodenum4 (14.3%) Jejunum1 (3.6%) Colon (cecum)2 (7.1%)	Twenty-seven upper gastrointestinal endoscopies and 2 colonoscopies were performed, 2 cases of removal failure which required surgical removal18	
2015	Japan	91	F	Severe cough	3 days	radiographs	Complete denture 6.2x4.4x1.2cm	Rectum	Manually via transnasal route	Perforative peritonitis19
2015	Bronox, NY	24	M	Dysphagia, Sudden coughing and vomiting of blood, respiratory difficulty	6 months	Radiographs, gastrointestinal study	Denture with single tooth connected to a broad plate	In anterior wall of upper esophagus	Unable to detect denture	Traheal perforation, erosion of right subclavian artery, Death20

Classification of foreign bodies as per Peter Ambe et al20

- Size
Length greater/smaller than 6 cm
- Surface consistency
 - Sharp/pointed versus blunt
 - Rounded versus sharp edges
- Material/contents, for example
 - Food
 - Drugs
 - Battery
 - Magnet
- Characteristics
 - Radio-dense+/-
 - Metallic+/-
 - Chemically inert +/-

Classification of swallowed foreign bodies as per Michael Birk et al21

- Type**
Examples
 Blunt objects Round objects: coin, button, toy Batteries, magnets
 Sharp-pointed objects Fine objects: needle, toothpick, bone, safety-pin, glass pieces

	Sharp irregular objects: partial denture, razor blade
Long objects	Soft objects: string, cord Hard objects: toothbrush, cutlery, screwdriver, pen, pencil
Food bolus	With or without bones
Others	Packets of illegal drugs

Classification of swallowed foreign bodies according to radiodensity as per Michael Birk et al21

Radiodensity	Foreign body
Can mostly be identified on radiography	True foreign bodies (i. e. nonfood objects) Steak bones
Cannot (regularly) be identified on radiography	Food bolus, Fish or chicken bones, Wood, Plastic, Glass, Thin metal Objects

PATIENT-RELATED FACTORS

It has been reported that the patients who most often swallow foreign bodies form select groups; these groups include prisoners, psychotic individuals, people with alcoholism, the senile, mentally retarded individuals, patients who are nervous or restless, and patients with an excessive gag reflex

Predisposing factors to be checked with medical questionnaire, patient’s medical history, and during examination

- Is on medication and/or has used a sedative
- Abuses alcohol and/or drugs
- Is serving a long-term prison sentence
- Is psychotic
- Is senile
- Is mentally retarded
- Has experienced a traumatic loss of consciousness (eg, during an accident)
- Has a hiatal hernia and symptoms of reflux esophagitis
- Is pregnant and/or overweight, with increased intra-abdominal pressure
- Is barrel-chested or obese, with difficult access sites
- Is nervous and/or restless and may move unexpectedly
- Has hyperactive gag-reflexes
- Has limited mouth opening, a small oral cavity, or macroglossia
- Wears complete dentures22

Clinical presentation, complications and management

Clinical presentation of denture ingestion correlates with the site of impaction and complication emerged.

Complications, clinical presentation and treatment modalities according to the site of denture impaction16:

Site of denture impaction	Primary complication	Secondary complication	Clinical Presentation	Treatment modalities
Pharynx	Necrosis Perforation	Retropharyngeal abscess Deep neck infection	Hoarseness, choking sensation, cough, hypersalivation, dysphagia, odynophagia, hyperthermia	Endoscopic removal, Surgery (transcervical approach)
Esophagus: Cervical Thoracic Abdominal	Necrosis Perforation Penetration Obstruction Bleeding	Deep neck infection Mediastinitis Sepsis Esophagorespiratory fistula	Hoarseness, choking sensation, cough, hypersalivation, dysphagia, odynophagia, hyperthermia, retrosternal pain, weakness, lethargy, hemoptysis, hematemesis	Endoscopic removal Transcervical esophagotomy Esophagectomy
Stomach	Ulceration Bleeding	Anaemia	Hematemesis, melena, epigastric pain	Endoscopic removal Gastrotomy (laparotomy or laparoscopy)
Small bowel	Necrosis Perforation Obstruction Penetration	Peritonitis Sepsis Entero-colic fistula	Abdominal pain, nausea, vomiting, diarrhea, constipation, peritoneal signs, septic signs	Endoscopic removal Enterotomy, retrieval Small bowel resection Ileocecal resection
Large bowel	Perforation Obstruction	Peritonitis Sepsis	Abdominal pain, nausea, vomiting, diarrhea, constipation, peritoneal signs, septic signs	Endoscopic removal Colic resection, anastomosis Colic resection, colostomy

Management of denture impaction

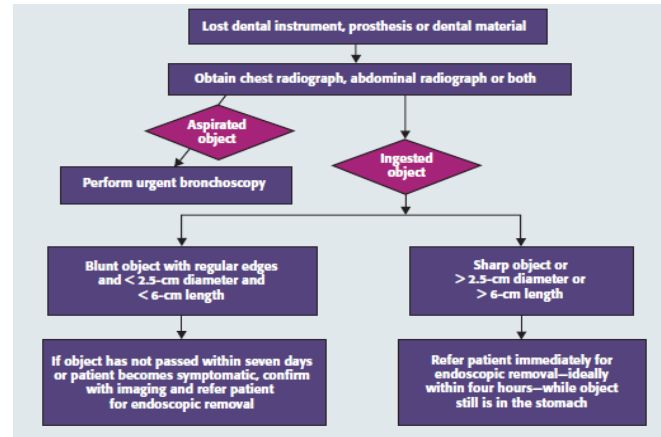
Denture ingestion as well as all other foreign bodies can be accidental and intentional . The key questions in the management of denture ingestion are:

1. The fact of denture ingestion (a-history, b-assessment of mental status, c-oral exam, assessment of denture)
2. The site of denture impaction (a-clinical presentation, bcomplication, c-assessment of denture itself, d-diagnosis)
3. Treatment modality¹⁶

Once foreign body ingestion is diagnosed, the physician must decide whether or not intervention is necessary, what degree of urgency is called for, and by what means. Management is influenced by the patient’s age and clinical condition; the size, shape, and classification of the ingested material; the anatomic location in which the object is lodged; and the technical abilities of the endoscopist.^{1,15,21,22}

The timing of endoscopic intervention in foreign body ingestion is dictated by the perceived risks of aspiration and/or perforation. Urgent endoscopic intervention is required when a sharp object or disk battery is lodged in the esophagus. Urgent intervention is also required to prevent aspiration when an ingested foreign object or food bolus impaction creates a high-grade obstruction and the patient is unable to manage his or her secretions. Those without evidence of high-grade obstruction who are not in acute distress can be handled less urgently because spontaneous passage may occur.^{1,15,21, 22}

Under no circumstances should a foreign object or food bolus impaction be allowed to remain in the esophagus beyond 24 hours from presentation. When the duration of the esophageal foreign body is not known, the endoscopy is best performed with the patient under general anesthesia, and surgical consultation is suggested.^{1,15,21, 22} A management algorithm was proposed for ingested dental instruments. Prosthesis or dental materials.¹⁵



European Society of Gastrointestinal Endoscopy (ESGE) have provided guidelines for removal of foreign bodies in the upper gastrointestinal tract in adults. But they might not apply in all situations and should be interpreted in the light of specific clinical situations and resource availability.²²

Methods of Prevention

1.	Sedation/Local/General anesthesia	Consciousness is altered, sensations are altered, diminished protective reflexes	Use throat pack in sedation and general anesthesia Rubber dam for restorative and endontic work alongwith floss tied to clamps(Barrier method) An alternative to rubber dam- Gauze protective pack distal to the area where small items are being manipulated ^{2,3,15,23}
2.	Head position	Upright position preferred	Avoid recline position ^{3,4} Prevents gag reflex ²³
3.	Loose teeth/Loose prosthesis	Dental consultation required before GA ^{2,3,15}	
4.	Instrument fatigue		Don't overuse instrument ^{2,3}
5.	Impression material Impression technique	Use high viscosity Closed mouth dual arch impression technique preferred	Avoid low viscosity ²³ Avoid open mouth technique as it exposes oropharynx directly ²³
6.	Type of tray	Use custom tray	Helps in preventing overflow of material ²³
7.	Intraoral tracer, cast post restoration	Use floss ^{7,24}	
8.	Implant	Use of floss with screwdriver ^{3,15,17}	
9.	Denture cleansers	Instruct patient properly regarding its usage	Educate patient regarding harmful effects if accidentally ingested.
10.	Radiolucent materials	Addition of radiopaque materials	Placement of radiopaque discs in dentures ^{22,25}
11.	Fixed prosthodontics	During prosthesis removal suction close to abutment to immediate remove material chips	Always check fixation of restorations especially with temporary cements ³
12.	Removable prosthodontics	Check retention carefully	Seal oropharynx while relining ³

DISCUSSION

The cases reported in the literature depict the importance of precautionary measures to be followed during treatment of a patient. As symptoms of foreign body ingestion resemble other medical conditions, a complete case history and complete examination is necessary for diagnosis.²⁻²³

Bronchoscopy is the treatment of choice for removal of the foreign body. If it is impossible to remove the foreign body by flexible bronchoscopy, rigid bronchoscopy is used as an appropriate alternative treatment option, but this requires the administration of general anesthesia. The advantages of rigid bronchoscopy include a larger working channel and better visualization of the central bronchial tree, but foreign bodies located more distally are out of reach.^{3,2-23}

If a patient has ingested foreign object, careful monitoring and follow up is always necessary.¹⁻²³

As objects vary in their radiodensities, radiopacity has always proven to be boon.^{2-23, 25}

Ideally any material to be used in and around mouth should be radiopaque, but addition of radio-opacifiers have always compromised the dental properties of a material. Till now there is material which has fulfilled the ideal properties.²⁵

CONCLUSION

The ingestion of foreign objects in prosthodontia are reviewed here along with their clinical symptoms, diagnosis, treatment and precautionary methods along with their complications. A Prosthodontist should always examine the case carefully beginning with case history to treatment till follow ups taking care of all the risk/predisposing factors of foreign object ingestion. As prevention is always better than cure, it is necessary to follow precautionary methods to make treatment atraumatic for patient.

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