

## Original Research Article

# Spectrum of imaging findings in trans-gastric migration of accidentally ingested metallic foreign bodies

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### ABSTRACT

**Background:** An accidentally ingested foreign body may get lodged within the lumen of gastrointestinal tract, pass uneventfully with feces or may migrate extraluminally into the surrounding tissues in which case it may lead to suppurative or vascular complications. The aim of the endeavor was to study the spectrum of imaging findings in patients with accidental ingestion of foreign bodies with trans-gastric migration of metallic foreign bodies.

**Methods:** Total 33 patients with history of accidental ingestion of foreign bodies were subjected to preliminary radiograph of neck, chest and abdomen followed by upper gastrointestinal endoscopy. Failure to retrieve/ localize foreign body endoscopically from upper gastrointestinal tract with check radiograph reiterating the presence of foreign body in upper abdomen were subjected to computed tomography of abdomen.

**Results:** A total of 33 patients comprising of 27 females and 6 males with mean age of 23.76 years with history of foreign body ingestion were studied. Ingested foreign bodies were lodged in pharynx (n=7), esophagus (n=3), stomach (n=13) or duodenum (n=3). In 7 patients in whom endoscopy failed to locate and/or retrieve foreign body, computed tomography confirmed the presence of trans-gastrically migrated foreign body in the surrounding structures. The location of migrated foreign bodies was in lesser sac (n = 2), greater omentum (n = 3), lesser omentum (n = 1) and transmural (n = 1). Two patients had evidence of collection formation around the migrated foreign bodies.

**Conclusions:** Sharp or pointed metallic foreign bodies may migrate trans-luminally with various implications. Though radiography is the preliminary workhorse for the confirmation of ingested foreign bodies, computed tomography owing to its volumetric data acquisition helps in exact localization of migrated foreign bodies and should precede any therapeutic intervention for retrieval of migrated foreign bodies.

**Keywords:** Computed tomography, Metal foreign body, Radio-opacity, Radiographic visibility, Trans-gastric migration

### INTRODUCTION

Accidental ingestion of foreign bodies is a common cause of accident and emergency section visits with presentation ranging from patients being asymptomatic yet apprehensive to dramatic.<sup>1</sup> Common accidentally

ingested foreign bodies include fish bones, chicken bone, pieces of glass, dentures, coins, metallic pins and needles. An ingested foreign body may get lodged in upper aerodigestive tract (valleculae, pyriform sinuses, cervical esophagus) or may pass into esophagus and stomach and subsequently into lower gastrointestinal tract.<sup>1-3</sup> A sharp

edged foreign body may penetrate through the wall of gastrointestinal tract and either get stuck within the wall of gastrointestinal tract or may pass extraluminally into the surrounding tissues. Extraluminal migration of foreign body may occur through esophageal wall to get lodged within the soft tissues of neck or mediastinum or through the gastric or duodenal wall to get lodged within the surrounding tissues. Extraluminal migration of a foreign body may lead to pain, suppurative or vascular complications.<sup>1-3</sup> Radiographs, ultrasonography, fluoroscopy and computed tomography (CT) are the key imaging modalities to rapidly diagnose the exact location and nature of ingested foreign body. Key imaging features include size, shape, density, exact location and associated obstruction if any. Imaging findings together with the severity and acuteness of clinical presentation can change management or necessitate emergency interventions.<sup>4,5</sup> Timely imaging and intervention can be life-saving in accidentally ingested foreign body patients. We present the imaging features of trans-gastrically migrated ingested foreign bodies.

## METHODS

This was an observational study where we examined 33 patients in our Accident and Emergency section who presented with history of accidental ingestion of foreign bodies between August 2017 to December 2018. Institutional ethical committee clearance was obtained for the study with informed consent taken from the patients/attendants in each case. All the patients reporting with history of accidental ingestion of foreign body were subjected to preliminary lateral radiograph of neck, antero-posterior radiograph (AP) of chest and antero-posterior (AP) radiograph of abdomen. Based on the X-ray findings the patients were subjected to upper gastrointestinal tract endoscopy. Patients in whom foreign bodies could not be located and/or retrieved endoscopically despite the radiograph suggesting the presence of foreign body in upper abdomen were subsequently subjected to computed tomography of abdomen. The CT examination was done on 16 slice Siemens somatom sensation, Germany. Cases were reviewed on main workstation in axial, coronal and sagittal planes to determine the exact location of the migrated foreign body.

## RESULTS

Thirty-three patients who reported to our accident emergency department with history of accidental ingestion of foreign body were subjected to preliminary lateral radiograph of neck, AP radiograph of chest and AP radiograph of abdomen. The mean age of patients was 23.76 years (age range 11 to 45 years). With regards to gender there was preponderance of females (n = 27). The most common ingested foreign body was metallic pin (n = 26) followed by coin (n = 3). Two patients had accidentally swallowed wooden foreign body while an equal number reported swallowing of fish bone. In three

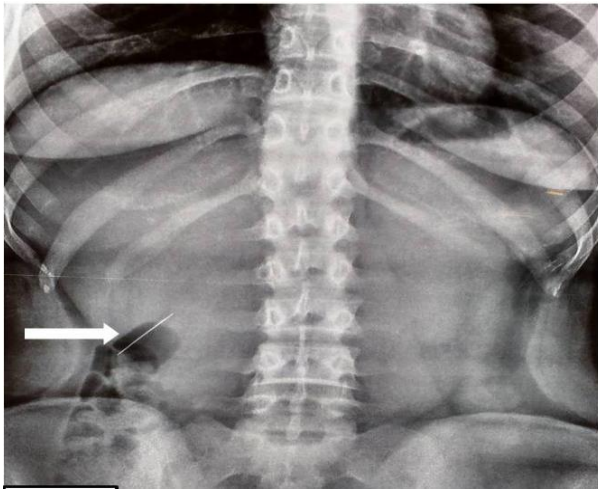
cases the radiograph did not show any radiopaque foreign body. However, 30 cases showed presence of radiopaque foreign body in the upper digestive tract. Among these 30 patients, 7 cases revealed presence of radiopaque foreign body in the pharyngeal region, 3 cases showed foreign body in the esophagus. In 20 cases the foreign body was located in the upper abdomen corresponding to the stomach and duodenum. All the cases were subsequently subjected to endoscopic examination with retrieval of foreign bodies in 26 patients from upper gastrointestinal tract (5 from vallecule, 5 from pyriform sinuses, 3 from esophagus, 10 from stomach and 3 from duodenum). In the remaining 7 patients, failure to locate and/or retrieve foreign body endoscopically mandated a check radiograph of abdomen which again confirmed the presence of foreign body in the upper abdomen. These 7 patients were subsequently subjected to CT scan which confirmed the presence of trans-gastrically migrated foreign body in the surrounding structures. The location of migrated foreign bodies was either in lesser sac (n = 3), greater omentum (n = 2), lesser omentum (n = 1) or transmural (n = 1). Two patients had evidence of collection formation around the migrated foreign bodies. None of the patients had pneumoperitoneum. Laparoscopic retrieval of the foreign body was achieved in all 7 cases and metallic pins were retrieved in all 7 of them.

## DISCUSSION

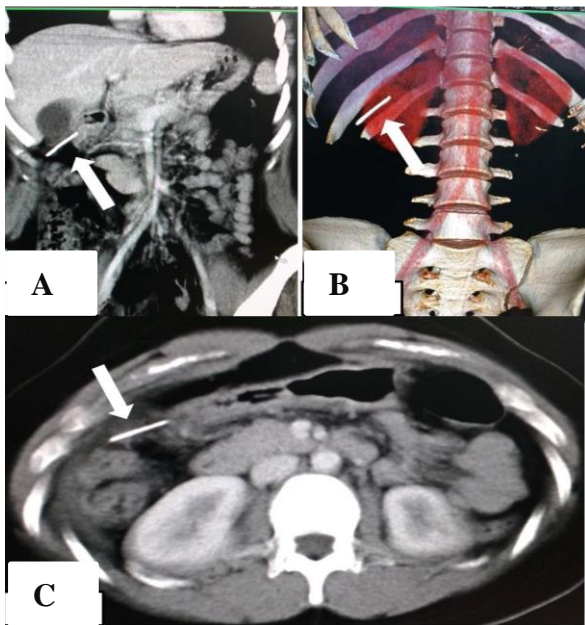
Accidental ingestion of foreign bodies is a common cause of otorhinolaryngologic and gastrointestinal emergencies. Common accidentally ingested foreign bodies include fish bones, chicken bone, pieces of glass, dentures, coins, metallic pins and needles. An ingested foreign body may get lodged in the vallecule, pyriform sinus, esophagus or may pass into stomach.<sup>1</sup> Commonly reported symptoms following foreign body ingestion include coughing, choking, dysphagia and odynophagia. Radiographs, ultrasonography, fluoroscopy and computed tomography (CT) are the key imaging modalities to rapidly diagnose the exact location and nature of ingested foreign body. Radiography is the initial imaging modality to determine the site, size and nature of foreign body. Visualization of ingested foreign bodies on x-ray is a complex interplay of two vital concepts namely radio-opacity and radiographic visibility.<sup>6</sup> Radio-opacity is the inherent ability of an object to absorb the x-ray photons whereas radiographic visibility is the sum total of radio-opacity and the influence of surrounding structures (overlying and underlying structures).<sup>6</sup> Wooden and plastic foreign bodies are radiolucent on x-ray whereas metal, glass and stone foreign bodies are radio-opaque (Figure 1). Ultrasonography has role in detection of superficially located foreign bodies.<sup>7,8</sup> CT is an excellent modality for detection of high density metallic foreign bodies within or outside gastrointestinal tract.<sup>9-11</sup>

Ingested foreign bodies commonly get impacted in upper esophagus at the level of cricopharynx, at the level of

aortic arch or at the level of gastroesophageal junction.<sup>12-15</sup>



**Figure 1: Antero-posterior abdominal radiograph showing a sharp pointed linear foreign body (white arrow) in right subhepatic location.**

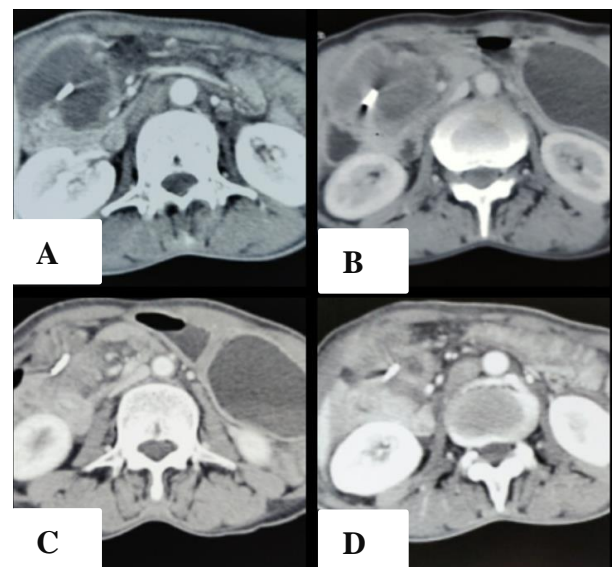


**Figure 2: Coronal MPR CT scan image (a), volume rendered 3D CT scan image (b) and axial MPR CT scan image (c) showing a linear pointed metallic pin (white arrows) extra-luminally within the omentum on right side.**

Blunt, oval or rounded foreign bodies after negotiating the gastroesophageal junction usually make an uneventful exit with the feces. However, pointed or sharp foreign bodies may get stuck anywhere in gastrointestinal tract or may migrate outside the gastrointestinal tract. The sharper the foreign body, the greater the risk of perforation. Horizontally oriented foreign bodies are more likely to penetrate the esophageal lumen. The exact mechanism of perforation is still unknown. Possible

mechanisms include peristaltic movements of gut against the foreign body, movement and careless manipulation of the foreign body while attempting to remove it may actually induce migration. Tissue reaction to the foreign body as well as infection and abscess formation could also play a part.<sup>1,4</sup> A migrated foreign body may remain quiescent or may lead to pain, odynophagia or may result in complications which may include suppurative complications like retropharyngeal, parapharyngeal, peri-gastric or intraperitoneal collections and mediastinitis. Vascular complications like carotid rupture, penetration of facial artery, aorto-esophageal and innominate-esophageal fistula have also been reported.<sup>1,2,5</sup> Migration of a foreign body should be suspected when endoscopy fails to locate and/or retrieve the foreign body. An abdominal radiograph is the preliminary investigation to locate a foreign body. CT scan with thin sections is the investigation of choice to predict the exact location and nature of the foreign body.

When upper gastrointestinal endoscopy failed to locate or retrieve an ingested foreign body despite the radiograph showing the foreign body in the upper abdomen in the region of stomach and duodenum, CT was the next tool in our diagnostic armamentarium to precisely locate the foreign body. In 7 cases where we encountered this scenario CT scan helped us in confirming and locating the site of foreign body. CT revealed presence of foreign body in lesser sac in 2 patients, in greater omentum in 3 patients and in lesser omentum in 1 patient and 1 patient had a transmural foreign body (Figure 2). Three patients had mild gastric wall thickening close to the migrated foreign body. Two patients had formation of collections around the foreign bodies (Figure 3).



**Figure 3: Axial contrast enhanced CT images (a and b): showing linear metal density foreign body in greater omentum with a large collection around it. Another patient shows a metallic foreign body in greater omentum with surrounding phlegmon formation (c and d).**



**Figure 4: Photograph of the metallic pin used by girls to fasten the headscarf.**

All the 7 cases with trans-gastric migration of foreign bodies were found to have ingested sharp metallic pins and all the 7 patients were young girls. Authors observed that headscarf/headgear worn by these girls in deference to the cultural beliefs is fastened around head by sharp metallic pins with a slippery rounded plastic head (Figure 4). While wrapping the head scarf these girls have a tendency to hold these pins between their lips or in their mouth and accidentally ingest them. Trans-luminal migration of these sharply pointed foreign bodies induces transient gastric wall inflammation near the site of penetration, thus endoscopy done after gap of few days might not reveal any insignia of antecedent penetration by the foreign body.

Outside the gastrointestinal lumen these foreign bodies induce inflammatory reaction and may also lead to formation of collections which may be sterile or infected. The small diameter of these sharp metallic pins together with the fact that they migrate extraluminally insidiously over a period of days possibly explains the absence of features of perforation or pneumoperitoneum in these patients.

In summary, ingested foreign bodies meet either of these fates: they may get stuck at the anatomically narrow junctions in the upper digestive tract; they may pass the entire length of gastrointestinal tract and get excreted or they may migrate extraluminally. The latter scenario is encountered in case of sharp and pointed foreign bodies. Failure of endoscopic localization/retrieval of foreign body despite x-ray confirming the presence of foreign body in upper abdomen should be evaluated with computed tomography to confirm the exact location, shape and nature of these foreign bodies. Extra-luminally migrated foreign bodies are usually retrieved laparoscopically.<sup>16-18</sup>

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