Computed Tomography Findings of Emergency Cases Resulting From Fish Bone Ingestion

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Abstract
Fish bones are some of the most commonly ingested foreign bodies. In most cases, fish bone ingestion is asymptomatic, and the bones are expelled from the body spontaneously. Otherwise, patients with fish bone ingestion can present to the emergency department with nonspecific symptoms. Fish bones can become impacted in various part of the body. Even in cases that are initially asymptomatic after ingestion, serious complications may develop at a later stage. Computed tomography (CT) plays an important role in the diagnosis of fish bone ingestion because it is the most sensitive modality for detecting these foreign bodies. It is important to be familiar with CT findings to detect ingested fish bones and the related complications and to direct further management of the condition.

Résumé
Les arêtes de poisson sont l'un des corps étrangers les plus fréquemment ingérés. Dans la majorité des cas, l’ingestion d’arête est asymptomatique et les arêtes sont expulsées du corps spontanément. Toutefois, après une ingestion d’arête, des patients peuvent se présenter au service des urgences avec des symptômes aspécifiques. Les arêtes peuvent se loger dans différentes parties du corps. Même dans les cas initialement asymptomatiques après une ingestion, de graves complications peuvent se développer ultérieurement. La tomodensitométrie (TDM) joue un rôle important dans le diagnostic d’ingestion d’arête, car elle représente la modalité la plus sensible pour la détection de ces corps étrangers. Il est primordial de maîtriser les signes visibles par TDM afin de détecter les arêtes de poisson ingérées et les complications associées, et ainsi de diriger la prise en charge de cet état médical.

Keywords
computed tomography, emergency, fish bone, foreign body, multiplanar reconstruction

Introduction
Fish bones are commonly accidentally ingested foreign bodies, especially in Asia due to the practice of serving fish whole, with the bones, as food.¹ However, as food cultures are becoming more diverse around the world, fish bone ingestion can occur anywhere. Patients with fish bone ingestion most often present to the emergency department with nonspecific symptoms.² However, some patients may have serious complications, such as gastrointestinal tract perforation, obstruction, and abscess formation. Computed tomography (CT) is the most sensitive modality for detecting ingested fish bones and a definitive diagnosis is established by identification of the fish bone as a linear hyperattenuating substance.²,³ The purpose of this article is to describe various CT presentations of complications associated with an ingested fish bone.

Common Complication: Perforation/Penetration
The predisposing factors for fish bone ingestion include the use of dentures, older age, alcoholism, mental retardation, and certain eating habits, such as eating rapidly, talking while eating, and swallowing without chewing.²,³ Most fish bones become lodged in the oral cavity or pharynx, particularly in the tonsils or at the base of the tongue; however, fish bones can become embedded anywhere in the aerodigestive tract, from the neck to the anus, including in the trachea and major bronchi.⁴ Complications vary, ranging from mild inflammatory changes to abscess formation, viscus perforation, intestinal obstruction, and bleeding. Plain radiographs are commonly ordered as the initial imaging modality for foreign body ingestion; however, most fish bones are radiolucent. Plain radiographs have been reported as having a low sensitivity (32%) for fish bone detection in the upper aerodigestive tract and esophagus.⁴ Unenhanced CT has a high sensitivity for fish bone

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detection. Ingested fish bones can be detected in almost all cases by using thin-slice images and multiplanar reconstruction (MPR). It is important to diagnose the condition by using appropriate window level and window width settings. Generally, it is easier to detect fish bones by setting a wider window width than the general abdominal setting. It makes easier to distinguish fish bone from other high attenuation materials including calcification and feces. Common CT findings of fish bone ingestion include the presence of a linear hyperattenuating substance, thickening of the wall of the penetrated organ, and surrounding fat stranding. Contrast-enhanced CT is also useful for evaluation of complications, such as the extent of inflammation or abscess formation.

**Neck**

In cases of simple impaction at the base of tongue, palatine tonsil, or vallecula, the ingested fish bones can be easily removed in a clinical setting without complications. However, fish bones can penetrate into deeper spaces of the neck causing edema, inflammation, airway narrowing, and abscess formation (Figure 1). Common symptoms of ingested fish bone impaction in the neck area include a foreign body sensation or sharp pain during swallowing. Most patients with fish bone impaction present to a hospital within 24 hours. If patients have attempted self-treatment at home, such as swallowing a bolus of food to dislodge the fish bone, they may present to the hospital late. Such a delay in treatment can lead to serious complications including airway stenosis, abscess formation, and sepsis.

**Upper Gastrointestinal Tract**

The most common site of fish bone impaction in the esophagus is within the cervical portion, mostly within the cricopharyngeus muscle at the C5/6 level, followed by the level of the aortic arch and gastroesophageal junction, where normal extrinsic impression or anatomical narrowing is expected. However, the impaction can occur anywhere in the esophagus (Figure 2). Patients with fish bone impaction within the cricopharyngeus muscle usually have symptoms, such as foreign body sensation, pain, and neck swelling. On the other hand, patients with fish bone impaction below the level of the cricopharyngeus muscle may present with nonspecific acute abdomen, mimicking acute cholecystitis or peptic ulcer disease.

**Lower Gastrointestinal Tract**

In the small bowel, the most common site of perforation is the ileum due to decreased mobility and acute angulations of the bowel (Figure 3). In the large bowel, perforation is commonly seen at the rectosigmoid junction (Figure 4). Common
CT findings include localized pneumoperitoneum, bowel wall thickening, mesenteric fat stranding, and abscess formation (Figures 3 and 4). Generalized pneumoperitoneum is rare because bowel perforation occurs gradually, and the perforation is spontaneously sealed by fibrin and the omentum. Patients with fish bone impaction to the bowel may present with nonspecific acute abdomen, mimicking acute appendicitis, diverticulitis, or enteritis. Bowel obstruction can be caused by marked inflammatory narrowing of the involved segment.

**Rare and Critical Complications**

**Aortoesophageal Fistula and Pseudoaneurysm**

Fish bone perforation of the esophagus may cause severe mediastinitis. The aortic wall is damaged by the surrounding inflammation, leading to formation of an aortic pseudoaneurysm. Aortoesophageal fistula is a very rare life-threatening condition that is defined as an abnormal communication between the esophagus and the aorta. It may result from aortic aneurysm, foreign body ingestion, advanced esophageal cancer, and iatrogenic condition including complications after aortic or esophageal surgery and after thoracic endovascular aortic repair. Aortoesophageal fistula has been reported in 0% to 0.08% of patients in studies included more than 1000 patients with foreign body ingestion. The classic triad of aortoesophageal fistula (Chiari’s triad) includes midthoracic pain, initial arterial hemorrhage, and subsequent exsanguination. Delayed diagnosis and treatment could lead to a very high mortality rate. One-year mortality has been reported, ranging from 30% to 64% even at specialized centers. Contrast-enhanced CT clearly shows the extent of aortic disease and the relationship between the fistula and the fish bone (Figure 5). Aortoesophageal fistula should be treated immediately; however, its treatment is complex and controversial. Open
surgery is the only cure for aortoesophageal fistula. Recently, it has been reported that endovascular aortic stent-grafts before surgery can reduce the risk of aortic rupture.

**Biliary Stone Formation**

Fish bones in the biliary tract are rare. Biliary stones can form around fish bones, which can cause cholangitis (Figure 6). The predisposing factors for regurgitation of fish bones into the biliary tract include sphincter of Oddi dysfunction, previous digestive tract reconstruction, presence of a choledochoduodenal fistula, and endoscopic sphincterotomy. Recently, endoscopic sphincterotomy has become widely used as a minimally invasive treatment for choledocholithiasis, therefore, the number of patients with fish bone migration to the biliary tract may increase. Most of the reported cases of fish bones in the biliary tract after pancreaticoduodenectomy have been asymptomatic; however, asymptomatic migration of fish bones and uneventful disappearance can be occasionally observed in daily clinical practice. In symptomatic cases, patients may complain of fever, right upper quadrant pain, epigastric pain, and jaundice. There are some treatment options for symptomatic patients to remove migrated fish bones, such as open surgery, and endoscopic or percutaneous foreign body removal. If possible, endoscopic removal is preferable because it is less invasive; however, it is sometimes difficult to approach the biliary duct safely in patients who have undergone digestive tract reconstruction.

**Fournier’s Gangrene**

Fournier’s gangrene due to penetration of the intestinal tract by fish bones is extremely rare. Only about 10 cases have been reported, and almost all case reports of Fournier’s gangrene due to fish bone were from Japan. Ingested fish bone may perforate the rectosigmoid colon and cause anorectal infections that can develop into Fournier’s gangrene. Risk factors for Fournier’s gangrene are diabetes mellitus, alcohol abuse, and liver cirrhosis. Patients with Fournier’s gangrene can have various symptoms, such as fever, pain and swelling in the genital or anal area, an unpleasant odor from the affected skin tissue, and a crackling sound when touching the affected area. Computed tomography findings of Fournier’s gangrene are soft tissue thickening, surrounding fat stranding, and the presence of gas in the involved area (Figure 7). Fournier’s gangrene is a severe subcutaneous infection with a high mortality; therefore, emergency extensive surgical debridement should be performed.

**Other Sites of Fish Bone Migration**

Although extremely rare, fish bone can migrate to other sites, various parts in the body. There are various case reports of rare sites of fish bone migration, which included the thyroid,
salivary gland, tongue, vocal code, internal jugular vein, trachea/bronchus, lung, left atrium, gallbladder, pancreas, spleen, portal vein, renal vein, urinary bladder, abdominal wall, omentum, appendix, and Meckel’s diverticulum (Table 1). Therefore, even though uncommon sites, when a linear hyperattenuating substance is observed, fish bone migration should be considered.

Conclusion

The clinical diagnosis of fish bone ingestion may be challenging, especially if the clinical history is unclear. Computed tomography is the most sensitive modality for detecting fish bones. Emergency cases resulting from fish bone ingestion are rare, especially critical complications; however, correct diagnosis can direct further management of the condition. Therefore, it is important to know various imaging features of fish bone migration and to be attentive to linear hyperattenuating features on thin-slice and MPR CT images because CT can provide a comprehensive evaluation of complications resulting from fish bone ingestion.

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