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Sonographic detection of ingested foreign bodies in the inferior vena cava

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Abstract
Ingested foreign bodies usually proceed uneventfully through the intestinal tract; complications rarely occur. The wide variety of clinical presentations they produce often make the diagnosis difficult. We report two cases of sonographic detection of foreign bodies in the inferior vena cava, namely one toothpick and one small (chicken?) bone, which probably caused a duodenocaval fistula. Both patients were initially investigated for recurrent septic episodes, weight loss, and deterioration of general condition.

Key words: Foreign body—Toothpick—Ultrasonography—Inferior vena cava.

Ingested foreign bodies can cause gastrointestinal (GI) complications such as perforation, abscess formation, duodenocaval fistulas, and even death. For this reason, early recognition of this condition by the clinician is important. Unfortunately, sharp swallowed objects, which are more prone to cause these complications, often go unrecognized by the patient himself. These objects are usually toothpicks and fish and chicken bones. Such patients may have a wide variety of clinical manifestations that often lead the correct diagnosis to be made at surgery or autopsy. Ultrasonography (US) now has a key role in the investigation of abdominal and, in particular, of GI conditions. These newly recognized applications of US may allow a precise diagnosis of the clinically unsuspected complications.

We report two cases of sonographic detection of ingested foreign bodies that had migrated into the inferior vena cava (IVC) and were the source of recurrent febrile episodes and general deterioration of the patients' condition.

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Case Reports

Case 1

A 60-year-old man was transferred to our hospital for the investigation of intermittent septic episodes, asthenia, anorexia, and 15-kg weight loss of almost 5 months' duration.

Physical examination contributed no diagnostic information, and laboratory studies revealed slightly elevated white blood cells, low hemoglobin (Hb), and platelets. Erythrocyte sedimentation rate was normal. Hemocultures were subsequently positive for *Bacteroides fragilis*, *Proteus mirabilis*, *Streptococcus feacalis*, and *Candida albicans.* A first exploratory laparotomy only disclosed small nonspecific inflammatory adherences between the posteroinferior hepatic capsule and the omentum. Upper GI study only showed a duodenal diverticulum, and abdominal computed tomography (CT) was normal. Sonography disclosed a 6.0-×-2.0-cm hypoechoic, solid, fixed mass in the infrarenal IVC (Fig. 1A), which was confirmed at cavography the same week. Under long-term antibiotics and after many abdominal sonographies, the mass decreased gradually to 3.0 × 2.0 cm. Three months later, it had migrated into the right atrium, as shown by echocardiography (Fig. 1B). A right atriotomy disclosed a 3.0-×-2.0-cm septic thrombus surrounding an unsuspected 5.0-cm wooden toothpick (Fig. 1C). Retrospective analysis of the echocardiographic video showed, many times within the thrombus, the transverse appearance of the toothpick as a hyperechoic 4.0-mm dot with sharp posterior shadowing. Following surgery, the patient completely recovered from his previous illness. Even in retrospect, he never recalled having swallowed a toothpick.

Case 2

A 34-year-old woman was investigated for 1 year of asthenia, weight loss, and episodic fever of unknown origin. She did not present any other specific symptom, and physical examination was normal. Her Hb had dropped from 14.3 to 11.7 g/L in the last 3 months without

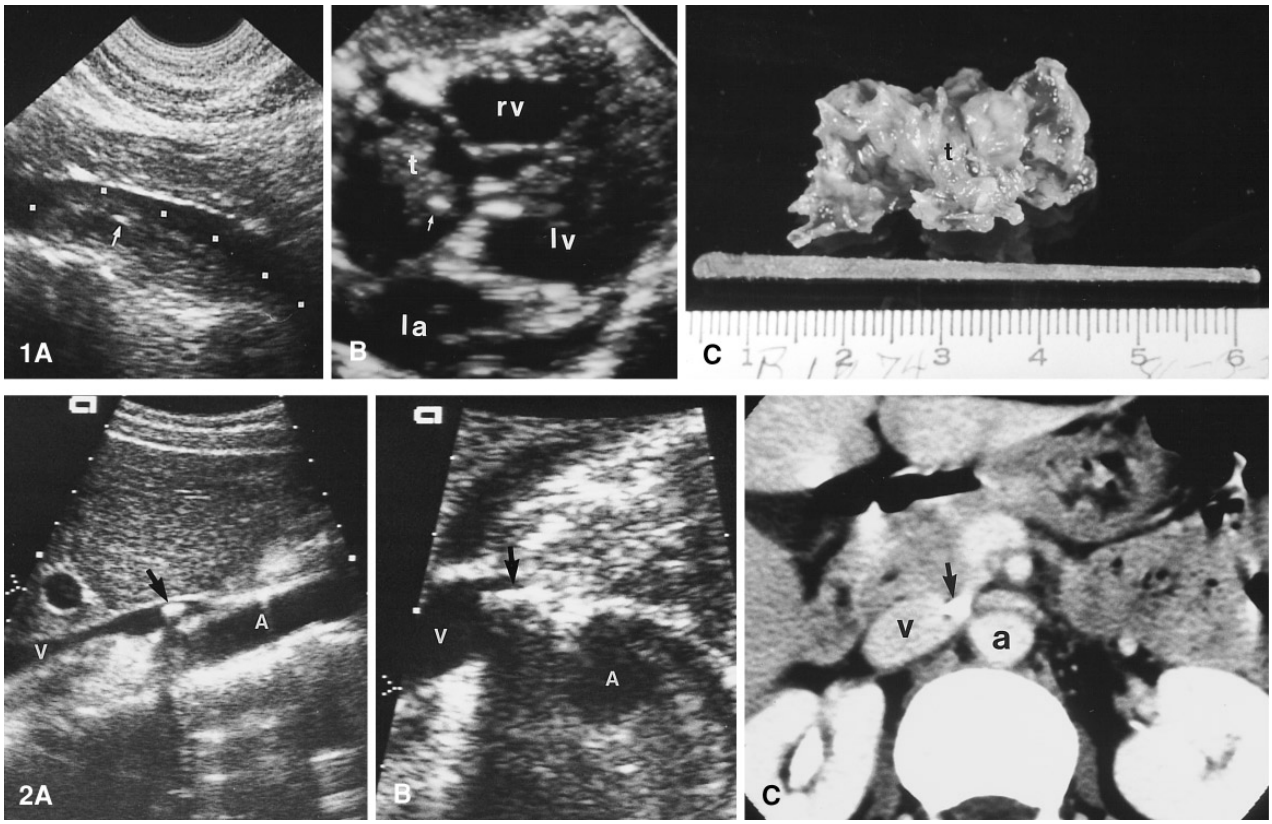

Fig. 1. Presumed toothpick perforation of the third duodenum into the IVC, with septic thrombus formation and its migration into the right atrium 8 months later. **A** Longitudinal view of the infrarenal IVC shows the endoluminal fixed thrombus (under white dots). Within the thrombus, a hyperechoic dot (*arrow*) represents, in retrospect, part of the incorporated toothpick. **B** Echocardiography from a subxyphoid approach shows the four chambers of the heart. A 3-×-2-cm polylobulated echogenic mass (*t*) is seen in the right atrium. The hyperechoic dot (*arrow*) in the mass was constant and at intervals was revealed as a clear and sharp posterior shadow (not shown). This last finding was observed in retrospect on the echocardiographic video. t = thrombus, rv = right ventricule, la = left atrium, lv = left ventricule. **C** Photograph shows the mass found in the right atrium, which corresponds to a lobulated septic thrombus (*t*) surrounding a complete toothpick.

Fig. 2. Calcified foreign body (bone) within the IVC of a 34-year-old woman who presented with weight loss, asthenia, and episodic fever of 3 months. V = inferior vena cava, A = aorta. **A** Longitudinal view of the IVC shows a hyperechoic 4-mm dot (*arrow*) within the lumen with clear posterior acoustic shadowing. **B** Transverse view shows that the bone fragment (*arrow*) is located near the junction of the IVC and the left renal vein. **C** A 5-mm CT image confirms the calcified nature and location of the foreign body (*arrow*).

any evidence of bleeding or nutritional deficiency. Hemocultures were negative, and the rest of laboratory studies failed to contribute diagnostic information. Gastroscopy and barium enema did not reveal any abnormality. Besides a small duodenal lipoma also confirmed by abdominal CT and upper GI study, sonography revealed a 2.2-×-10.0-mm hyperechoic mass with sharp posterior shadowing within the IVC at the level of the renal veins. In the transverse plane, this mass partly projected into the origin of the left renal vein (Fig. 2A–B). Abdominal CT confirmed the calcified nature of the mass (Fig. 2C). Surgery disclosed a (2.2 × 7.0 mm) bone fragment within the IVC at the origin of the left renal vein. A tremendous amount of fibrous adhesions between the IVC and the third duodenum was also observed. Postoperatively, the patient recovered uneventfully. As with case 1, she did not remember ingesting any foreign body.

Discussion

Intestinal perforation from ingestion of foreign bodies is uncommon. It is estimated that 80–90% will pass spontaneously and that fewer than 1% will cause perforation [1]. Early diagnosis has always been difficult because most patients do not remember having swallowed a foreign body and many objects will be nonradiopaque on a standard abdominal X-ray. Barium studies are useless if these objects have already migrated outside the GI tract, as illustrated by our two cases. In this view, some investigators have already reported the efficacy of US in detecting unsuspected swallowed toothpicks and the consequential GI complications [2, 3].

Duodenocaval fistula is a rare condition. Fewer than 15 cases have been reported. Many were secondary to radiotherapy following renal or pelvis neoplasms, peptic ulcers, gunshots, IVC umbrella, and from ingested foreign bodies. Sepsis and GI bleeding

is the clinical presentation of all patients with duodenocaval fistula, except for those with ingested foreign bodies, who do not show any evidence of active GI bleeding. Four cases of toothpicks having migrated into the IVC from the duodenum have already been reported [4–7]. The first three cases [4–6] had abdominal pain and sepsis progressing for only a few days. Two of them died from septic shock, each consequent to an endocaval septic thrombus surrounding a complete toothpick. The third patient had similar symptoms but was operated on and survived following the early diagnosis of an endocaval septic thrombus by CT and cavography [4]. The fourth patient suffered from sepsis and candida endocarditis secondary to an intracardiac foreign body (a toothpick). Autopsy revealed a scar between the third duodenum and the IVC, with fibrous tissue and hemosiderin-filled histiocytes replacing the media of the vessel and suggesting a previous hemmorhage. This venous defect likely represented the portal of entry of the toothpick [7]. This last situation is similar in many aspects to our case 1, where GI hemorrhage was also absent despite surgical findings supporting previous duodenocaval passage of the toothpick. We suggest that lack of bleeding could be due to the speed at which the fistula develops and to its size. It is conceivable that gunshot or perforating duodenal ulcers will create a sufficiently large hole to allow bleeding from the IVC. In this view, foreign bodies such as toothpicks probably go through the bowel and the IVC walls slowly, allowing enough time to induce a sufficient inflammatory reaction to seal the fistula during the migration period. This view could explain the relative indolent nature of this entity, the absence of GI hemorrhage, and the reason this diagnosis remains clinically unsuspected in all cases. However, for the cases [5] mentioned in this report, we can assume that an isolated septic thrombus within the IVC is a constant feature of toothpick penetration of the IVC and, moreover, that its sonographic or CT detection seems related to the survival of patients (two of five cases).

The second patient reported here, in contrast with previously reported toothpicks in the IVC [4–6], did not present with acute symptoms. This could be explained, at least in part, by the fact that the bone in the IVC was not part of a septic thrombus. Toothpicks are probably much more thrombogenic than bone, and the infected thrombus becomes a continuous source of bacteria and sepsis, which leads to rapid clinical deterioration.

Interestingly, a duodenal anomaly was detected in both cases: a diverticulum in the first case and a lipoma in the second. Both lesions were closely related to the junction between the second and third portions of the duodenum. That particular site, because of its fixed and abrupt angulation, could explain why a toothpick or another sharp foreign body exibits a propensity to lodge there and progressively perforate and migrate in the immediately posterior IVC. Although such associated duodenal anomalies have not been previously reported in duodenocaval fistulas secondary to foreign bodies [4–6], we suspect that, in our two cases, the duodenal lipoma and diverticulum may have been precepitant factors of these events.

Following our first case we learned that, when facing similar clinical features, sonography could detect an isolated echogenic mass in the retroduodenal IVC. In the absence of other conditions such as the previous migration of the thrombus from the veins of the lowers limbs, presence of a renal, adrenal, or retroperitoneal mass, or previous iatrogenic procedure on the IVC, the possibility of a septic thrombus caused by the indolent passage of a foreign body from the duodenum into the IVC should be considered. Moreover, such a foreign body could be detected as a hyperechogenic dot inside the thrombus (Fig. 1). In fact, experience from our first case led us to suspect the right diagnosis in our second case, even when there was no associated thrombus. To our knowledge, this is the first reported case of a duodenocaval fistula secondary to an ingested foreign body that was initially diagnosed by US.

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