

Pediatric cardiac tamponade caused by metallic wire penetration into the heart: A case report and literature review

Hajime Yamazaki¹, Muneaki Matsubara¹, Hideyuki Kato¹, Kazuo Imagawa¹, Takashi Murakami¹, Bryan Mathis¹, and Yuji Hiramatsu¹

¹Tsukuba Daigaku Igaku Iryokei

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Abstract

Thin, metallic wires can easily penetrate the gastrointestinal system if ingested and cause serious cardiac issues in children. We report a pediatric case of such an object that caused cardiac tamponade after lodging in the left ventricle. The wire was extracted without cardiopulmonary bypass and a full recovery was made. Cardiac issues after ingestion of foreign objects are rare but immediate surgery is required for resolution.

Introduction

Foreign body ingestion in children is common but usually causes gastrointestinal issues and not serious cardiac complications. Here, we present a pediatric case of cardiac tamponade caused by an ingested metal wire penetrating into the left ventricle and also review relevant literature.

Case

A 2-year-old girl was transferred to our hospital with a 5-day history of epigastric and left-upper-quadrant pain, plus intermittent fever. Transthoracic echocardiography revealed massive pericardial effusion and tamponade causing right atrial diastolic compression and tachycardia. Emergent pericardial drainage was performed, collecting 40ml of hemorrhagic effusion; however, post-drainage chest radiography (posteroanterior view) showed a radio-opaque foreign body within the cardiac silhouette at the left lower border (Figure, A). Computed tomography of the chest confirmed that a metal wire was lodged in the posterior wall of the left ventricle through the left diaphragm (Figure, B, C). Surgical removal was then executed under general anesthesia. Endoscopic esophagogastroduodenoscopy revealed only a small punctate area of erythema on the gastric mucosa of the fundus, but no fistula. Following a median sternotomy, the surface of the heart was revealed to be covered with reactive fibrous tissues which were carefully released. The wire appeared to have migrated into the left ventricle through the diaphragm and was successfully removed from the left ventricle with forceps but without cardiopulmonary bypass (Figure, D). The wire was 2cm, non-rusted, sharp, and metallic (Figure, E). No bleeding from the heart was noticed and primary closure of the diaphragmatic fistula was carried out. The patient made an uneventful recovery and was discharged in good condition.

Discussion

Foreign body swallowing by children is common, especially in the toddler and early childhood stages, but cardiac tamponade caused by an ingested foreign body is rare and usually from chicken or fish bone fragments.^{1,2} Most metallic foreign bodies pass spontaneously through the gastrointestinal tract, but sharp, thin objects are more likely to cause gastrointestinal perforation which has been reported in 15 to 35% of cases.³ The precise sequence of events affecting our patient remain unknown; however, it seems most plausible that the patient accidentally swallowed a broken steel mesh strainer wire with food which then penetrated into the

left ventricle from the gastric fundus and led to cardiac tamponade. Table 1 shows the demographics and clinical outcomes of five pediatric cases of ingested metallic foreign bodies with cardiac complications published since 2001, including the present case^{4,5,6,7}. The age of the patients ranged from 9 months to 2 years and the perforation site of the gastrointestinal tract was the esophagus in four previously reported cases. The cardiac injury site was the pericardium in three of these cases, plus one case each of right atrium and left ventricle injury. All reported patients developed cardiac tamponade and hemodynamic instability that required early surgical intervention, but all also had good postoperative outcomes. In three of these cases, the cause was a safety pin, one case was a metallic needle, and, in this case, a metal wire fragment from kitchenware. In our case, the stomach was unusually penetrated and the perforation mechanism was thought to be initial impact, followed by necrosis due to local inflammation and direct pressure.⁸ To the best of our knowledge, there are no reports of pediatric cases of cardiac injury caused by accidental ingestion of metal wires since 2001 and only three adult cases have been reported^{9,10,11}. Incidentally, in all reported adult cases, the symptoms and surgical interventions were the same as the pediatric cases. Although cases of pericardial tamponade secondary to accidental ingestion of a metallic foreign body are rare, pediatricians should be aware that delayed diagnosis of both gastrointestinal perforation and acute hemorrhagic pericardial effusion can have fatal consequences. It is important to remember that, even if symptoms are subclinical, prompt examination and rapid treatment are crucial for a favorable clinical outcome. Our report and the weight of the literature cases underscore the need for precise diagnosis and surgical intervention in the pediatric population since accidental ingestion of metal objects usually manifests as gastrointestinal injury and not cardiac tamponade with hemodynamic instability. In addition, tamponade in otherwise healthy children may warrant exploration for wire or other sharp, thin objects that could penetrate into the pericardium through the stomach or diaphragm.

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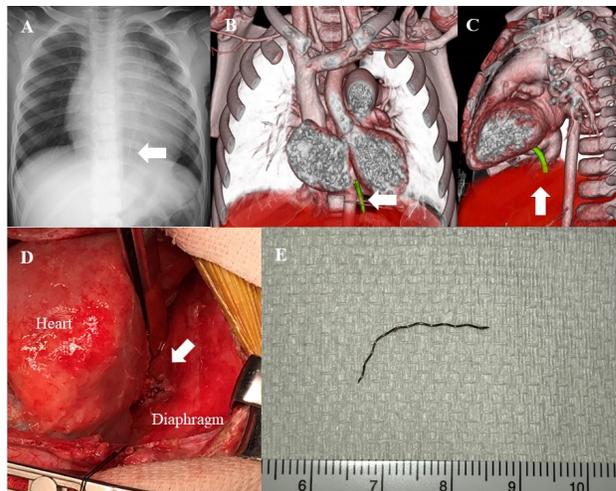
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Figure Legends

Figure 1:

Radiological and operative findings after cardiac tamponade caused by ingestion of a metallic object (wire). Arrows indicate the wire before treatment on (A) X-ray and (B & C) transthoracic echocardiography. (D) Intra-surgical and (E) post-surgical views of the wire.



Table

Table 1:

References	Year published	Age	Gender	Penetration site	Localization	Type	Cardiac com
Kalayci et.al.	2002	9 mo	M	Esophagus	Right Atrium	Safety pin	Cardiac tam
Krishnamohan et.al.	2009	8 mo	F	Esophagus	Pericardium	Safety pin	Cardiac tam
Fenesty et.al.	2009	9 mo	M	Esophagus	Pericardium	Metallic needle	Cardiac tam
Sugunan et.al.	2018	10 mo	N/A	Esophagus	Pericardium	Safety pin	Cardiac tam
Present case	2020	2y	F	Stomach	Left ventricle	Metallic wire	Cardiac tam

Reported pediatric cases of ingested metallic foreign bodies with cardiac complications