

# Why humans should not eat broom straws: Pericarditis and endocarditis

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## ABSTRACT

A broom straw was ingested and penetrated the esophageal wall, the pericardial space and its tip became lodged in the coronary sinus. Bacterial pericarditis and then fungal endocarditis ensued but were temporally separated by an asymptomatic 6-month period. On transthoracic echocardiography, the straw was mistakenly identified to be a “prominent Thebesian valve.” This child survived both life-threatening infections. The occurrence of infections caused by unusual organisms in the setting of immunocompetence highlights the need for a high index of suspicion for the presence of a causative foreign body.

**Keywords:** Broom straw, endocarditis, pericarditis

## CASE REPORT

An otherwise healthy 9-month-old male presented after a 3-day history of fever, grunting, and decreased appetite. The respiratory rate was 78/min, the temperature was 36.7°C, and an echocardiogram (ECHO) imaged a 1.8 cm wide accumulation of the pericardial fluid. Pericardiocentesis fluid grew *Haemophilus parainfluenzae* and *Klebsiella pneumoniae*, both sensitive to ceftriaxone. After 5 days of ceftriaxone, ECHO revealed a 2 cm × 4 cm mobile mass attached to the right atrial wall in the region of the coronary sinus. Fever abated after 25 days of antibiotic therapy.

After 3 months of continuous enoxaparin, the intra-atrial thrombus diameter measured only 3 mm. Enoxaparin was discontinued, and aspirin was initiated. A linear density was appreciated in the wall of the right atrium that moved with the heart [Figure 1]. This linear density was determined to be a prominent Thebesian valve and a likely nidus on which the clot or vegetation had formed. Clot was also imaged in the coronary sinus [Figure 2].

Four weeks after stopping enoxaparin, he again presented with a fever of 38.7°C and an ECHO, which demonstrated severe tricuspid regurgitation with a large tricuspid valve vegetation. Blood cultures grew *Candida tropicalis*. Amphotericin B was converted to micafungin and fluconazole. On hospital day 4, the septal leaflet of the tricuspid valve was debrided and reconstructed. *C. tropicalis* was isolated from the leaflet. A foreign body lodged within the vegetation, which measured 2.8-cm long, <0.1 cm in diameter and was consistent with a grass of the family *Poaceae*. At 20 months of age, the protein C level was 46% (70–180) and remained at 65% 10 months after recovery. A battery of testing for immunodeficiencies was unremarkable.

## DISCUSSION

Children, especially between 6 months and 3 years of life, explore objects by placing them into their mouths;

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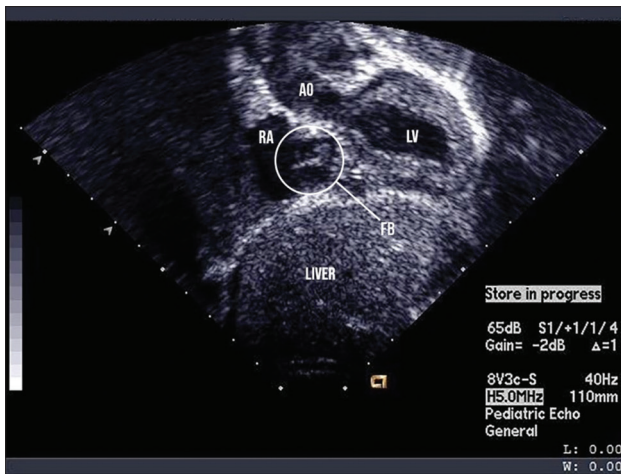
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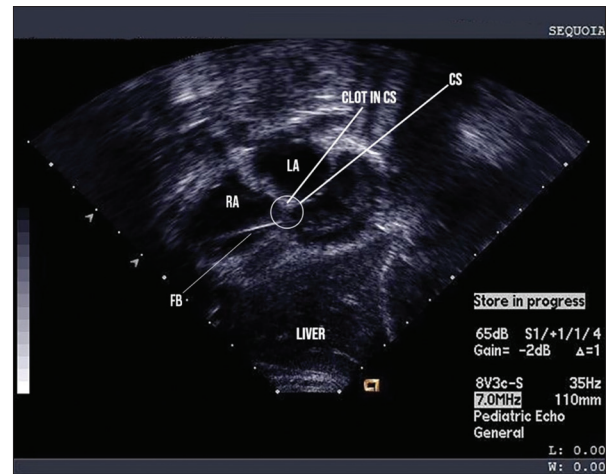


**Figure 1: Broom straw in the heart. Labels: RA: Right atrium, Ao: Aorta, FB: Foreign body, LV: Left ventricle**

sometimes, they swallow them.<sup>[1]</sup> Sharp and elongated foreign bodies are responsible for 15%–35% of the alimentary tract perforations following foreign-body ingestion.<sup>[2]</sup> Broomstick bristle ingestion has been associated with purulent pericarditis and fatal bacterial endocarditis after the bristle had entered the right ventricle from beneath the diaphragm in a 1 year old.<sup>[3]</sup> Massive duodenal hemorrhage from a “whisk-broom” bristle<sup>[4]</sup> that perforated the duodenum was reported in a 1.5-year-old child. A broom straw that had penetrated the right atrium was embedded in a papillary muscle was identified at autopsy in a 21-month-old who died of sepsis and endocarditis; this straw entered from either the esophagus or stomach.<sup>[5]</sup> In each instance, it was presumed that the child swallowed a broomstick bristle.

In our report, an otherwise healthy 9-month-old child was diagnosed with polymicrobial *H. parainfluenzae* and *K. pneumoniae* pericarditis. These bacteria were likely introduced from the alimentary tract into the pericardial space from the esophageal penetration site. Purulent pericarditis in the setting of esophageal perforation is associated with a survival rate of only 17%.<sup>[6]</sup> Although these organisms are part of normal gut flora<sup>[7,8]</sup> they are not typical bacterial pericarditis isolates<sup>[9]</sup> in healthy immunocompetent individuals. *H. parainfluenzae* is however associated with heart valve infections and other serious invasive disease in children with preceding identifiable illnesses.<sup>[7]</sup> No prior illness had been reported in this child. This organism was not isolated from any blood culture before, during, or within the 6 months following the treatment of pericarditis. Notably, neither recurrent bacterial pericarditis nor endocarditis was identified to occur during the subsequent 6 months despite retention of the foreign body.

When *C. tropicalis* endocarditis became apparent, antibacterial treatment for pericarditis was temporally



**Figure 2: Broom straw with a clot in the coronary sinus. Labels: FB: Foreign body, RA: Right atrium, CLOT IN CS: Clot in the coronary sinus, CS: Coronary sinus, LA: Left atrium**

far removed and seems unlikely to have been a contributing factor in making the child susceptible to this fungal infection.<sup>[10]</sup> *Candida* was isolated from blood, vegetations, and the broomstick bristle. *C. tropicalis*, resides as normal flora in the alimentary tract but does not cause disseminated infection in immunocompetent patients, especially not in those with vigorous neutrophilic responses. Our child had both good neutrophilic response and appropriate lymphocyte proliferation to the *Candida* antigen. *Candida albicans* has conventionally identified as the species responsible for candidiasis in immunocompetent patients. *C. tropicalis* has been recognized as an emerging pathogen for systemic, life-threatening infections. In our otherwise immunocompetent patient, the presence of an intracardiac foreign body provided an adequate explanation for the development of this invasive *Candida non-albicans* infection.

The foreign surface of the broom straw was the ultimate cause of clot formation. Factor XII, prekallikrein, and the intrinsic clotting cascade were activated. During both of the bacterial and fungal infections, tissue factor was no doubt released from the blood vessel endothelial cells, activating the extrinsic clotting cascade. The underlying protein C deficiency further promoted clot formation. Definitive treatment involved surgical removal of the foreign body with the damaged tricuspid valve leaflet, treatment of systemic infection, and utilization of enoxaparin.

In our child, the broomstick bristle was identified by the transthoracic ECHO to be a prominent Thebesian valve of the coronary sinus. In keeping with this interpretation, the “linear artifact” was located above the septal leaflet of the tricuspid valve and moved with the heart. Florid tricuspid regurgitation that developed prompted urgent debridement of the septal leaflet of the

tricuspid valve and the discovery of the broom straw. The clot had almost completely resolved after the 3 months of enoxaparin therapy after bacterial pericarditis was diagnosed, but the echocardiographic artifact remained. Perhaps, computed tomography of the chest, magnetic resonance imaging, or a transesophageal ECHO might have helped to better define the presence of the broom straw, but his clinical condition had improved and did not signal the need for another procedure.

Bacterial pericarditis and fungal endocarditis with unusual organisms resulted following the ingestion of a straw that penetrated the esophagus, the pericardium, and atrial wall. Remarkably, this child survived. The broom straw was misidentified as a Thebesian valve on the transthoracic ECHO. The correct diagnosis followed removal at cardiac surgery for right-sided *C. tropicalis* endocarditis. It is unclear whether additional imaging might have helped delineate the foreign body before fungal endocarditis developed.

Informed consent was obtained for this case report from the parent of the patient of interest who was reported in the study.

#### **Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient's parents have given their consent for his images and other clinical information to be reported in the journal. The patient's parents understand that their his names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

#### **Conflicts of interest**

There are no conflicts of interest.

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