FIGURE 1. Computed tomography shows a patient with an extensive pseudoaneurysm that has eroded through the sternum and lies just under the skin. Reoperation in such cases is fraught with danger, because one must control circulation before sternal reentry to avoid extensive blood loss.

this approach, they reduce the risks associated with deep hypothermia, such as coagulopathy, by cooling only to 25°C. Further, they avoid the specific risk of left ventricular dilatation, which occurs when hypothermia results in ventricular fibrillation before sternal reentry, by placing a left ventricular vent.

We have to be mindful that when antegrade cerebral perfusion is used in the replacement of the aortic arch, most perioperative strokes are not secondary to a lack of cerebral

protection but rather are a consequence of embolization, and that the carotid arteries are prone to atherosclerosis in the patient population needing such surgery. Additionally, the approach excludes the vertebral arteries, which in many patients may be an important source of cerebral arterial inflow, particularly at higher temperatures.

Many complex issues are involved in the surgical treatment of patients with pseudoaneurysms adjacent to the back of the sternum (Figure 1), which often necessitate cannulation for cardiopulmonary bypass and cerebral protection before sternal reentry in such patients undergoing aortic arch replacement, and these issues demand innovative approaches and a diverse armamentarium for the cardiac surgeon. The techniques described by Wehman and colleagues¹ contribute to that arsenal. One size does not fit all, and there is more than one way to skin a cat.

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Lessons learned from a thorny case

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We report a case of pericardial penetration of a medium-sized cactus spine in a child.

CLINICAL SUMMARY

A 5.5-year-old boy was admitted to the emergency department of a level I regional hospital after being pushed onto a spiny cactus. He had difficulty breathing and refused to lie down. During transportation his vital signs were as follows: pulse, 111 beats/min; blood pressure, 136/87 mm Hg; and oxygen saturation by finger-probe pulse oximetry, 99%. At hospital admission (6:00 PM), the physical

FIGURE 1. A, On admission, a small thoracic entry wound was located on the upper anterior chest. B, After the patient was transferred to a level III pediatric emergency unit, the second thoracic computed tomographic scan showed an important pericardial effusion. C, The sternotomy revealed superficial scratches on the apex of the right ventricle. D, Two pieces of a 3.5-cm long cactus thorn were removed.

examination was only significant for the palpation of foreign bodies on the left knee and the forearm and a small entry wound on the upper anterior chest overlying the sternum (Figure 1, A). A chest radiograph appeared normal. After a surgical advice, the decision was taken not to extract the foreign bodies manually and to let the child go home with a prescription for pain killers and antibiotics. At home, the child refused to eat. He had intense thirst and was described as agitated and plaintive. In the middle of the night, he woke up and fainted; he was driven back to the emergency unit. On admission (4:20 AM), his vital signs were as follows: heart rate, 132 beats/min; blood pressure, 100/59 mm Hg; capillary refill, greater than 3 seconds; oxygen saturation by pulse oximetry, 95%; and capillary hemoglobin value, 10.8 g/dL. The patient was extremely pale and reported abdominal pain. The physical examination found abdominal distention, enlarged liver with hepatalgia, and tachycardia. Physicians thought the patient had an intra-abdominal injury. Volemic expansion was started with a bolus of normal saline solution (400 mL), followed by a transfusion of 200 mL of blood red cells (6:00 AM). The basic metabolic panel was remarkable for hyperglycemia (11 mmol/L) and elevated aspartate aminotransferase (64 U/L). Serum lactate was 3.1 mmol/L, and cardiac enzyme assay indicated a major increase of troponin (3590 ng/mL). Complete blood cell count was significant for leukocytosis (22,290 cells/mm³). Venous blood gas study revealed the following: pH, 7.35; venous Po₂, 61 mm Hg (8.1 kPa); venous Pco₂, 38 mm Hg (5.1 kPa); and bicarbonate 22 mmol/L. There was a global

elevation of the ST segment on the electrocardiogram. Echocardiography showed a pericardial effusion with no sign of compression of the right cavities and an ejection fraction of 70%. A minimal left pleural effusion and a perihepatic effusion were identified on a body scan in addition to the pericardial effusion. Because of the critical condition of the child, he was transferred to our level III pediatric university hospital. On arrival (8:35 AM), he had signs of cardiogenic shock and cardiac tamponade. His vital signs were as follows: pulse rate, 133 beats/min; blood pressure, 122/73 mm Hg; respiratory rate, 20 breaths/min; oxygen saturation by pulse oximetry, 98%; and capillary hemoglobin value, 4 g/dL. Echocardiography and a second thoracic computed tomographic scan (Figure 1, B) confirmed a voluminous pericardial effusion and showed a transpericardial foreign body. A median sternotomy without extracorporeal circulation was performed. The cactus spine did not penetrate the heart but did create superficial scratches on the apex of the right ventricle (Figure 1, C). Through a pericardiectomy, 200 mL of blood was evacuated and 2 pieces of a 3.5-cm long cactus thorn were removed (Figure 1, D). During the following days, the patient did well. He was transferred on day 5, after an uncomplicated stay, to Switzerland for recovery. The cactus was identified as an *Agave americana* “mediopicta alba.”

DISCUSSION

This is the first pediatric description of an intracardiac foreign body involving a cactus spine. A case of a mediastinal penetration was published in 2008 involving a

4.5-year-old boy who had fallen chest first onto a barrel cactus.¹ Several pediatric cases of intracardiac or intrapericardial penetration from a sewing needle have been reported.²⁻⁴ Several lessons should be learned from the present case. First, immediately after injury, children (or adults) may have minimal clinical signs or be symptom free when a foreign body is embedded in the myocardium or in the pericardial space.⁴ The time between penetration and diagnosis can take several hours.² Second, radiography of the chest has usually failed to show any abnormality; most vegetal spines are radiolucent. Computed tomographic scanning has limitations in identifying small foreign bodies and objects with densities similar to surrounding structures.⁵ Third, a small thoracic puncture wound can hide potentially serious cardiac injuries. Finally, treatment options for cardiac foreign body or bodies have to be discussed case by case with cardiovascular surgeons. The presence of symptoms is a primary indication for surgery, especially in cases of cardiac tamponade, and median sternotomy is recommended if pericardiectomy is needed.⁴

CONCLUSIONS

Intracardiac vegetal spines or needles can be revealed by a 2-phase clinical evolution. This can lead to a delay in appropriate management in a life-threatening situation.

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Open chest core needle biopsy of left ventricle in the evaluation of suspected focal myocardial inflammation

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Although clinical diagnosis is sufficient in most mild and moderate cases of myocarditis, histologic verification and classification by endomyocardial biopsy (EMB) are necessary if the clinical course is fulminant and when cardiac sarcoidosis (CS), giant cell myocarditis (GCM), or eosinophilic myocarditis is suspected.¹ The well-known weakness of EMB is its limited sensitivity in patchy myocardial involvement. In our experience, a single EMB session detects at best 1 of 5 cases of CS² and two thirds

of cases of GCM³ even when targeted with the help of modern cardiac imaging. Biventricular biopsies may increase the diagnostic yield,⁴ as may the use of electrophysiologic mapping⁵ or intracardiac ultrasound⁶ to guide the sampling procedure. Unfortunately, despite repeated EMBs, the diagnosis may remain elusive.²

Surgical core needle myocardial biopsy through a left minithoracotomy provides several advantages over EMB in exchange for being more invasive, and therefore it is rarely used today. First and foremost, it gives access to areas of myocardium that are not reachable with a biptome from inside the ventricular cavities. Further, instead of small endomyocardial samples, it provides full-thickness specimens of the left ventricular (LV) wall, and the possibility of visual inspection and palpation of the epicardial surface may help target the biopsy to areas of abnormal myocardium. We describe 3 patients with focal myocardial disease in whom histologic diagnosis was considered crucial for prognostic assessment and treatment. After multiple nondiagnostic EMBs, open surgical LV biopsy gave the diagnosis in each of them.

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