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Title: Acute Ischemic Stroke secondary to Cardiac Embolus of a ‘Foreign Body’

Material after a Redo Sternotomy for Mitral Valve Replacement: A Case Report

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Summary:

Cardiac surgery has been shown to be associated with increased risk of acute ischemic stroke. This report presents a case of successful mechanical embolectomy procedure to treat a patient for an acute ischemic stroke, which was caused by the cardiac embolization of 'foreign body' containing debris following a redo sternotomy procedure for mitral valve replacement and tricuspid valve annuloplasty.

Introduction:

Mitral valve disease is the most common cardiac valve disorder, affecting more than 4 million people in in the United States. The definitive treatment for patients with mitral valve disease is surgical valve repair or replacement with either mechanical or biological valves [1]. Among patients with severe, symptomatic mitral valve disease who are not candidates for surgical repair, mitral valve replacement is the recommended treatment [1]. Furthermore, bioprosthetic valves are recommended in elderly patients with a relatively low likelihood of prosthetic structural valve degeneration, thereby reducing re-surgery rates in these patients. However, mechanical prosthetic valves lead to an increased risk of thromboembolic and hemorrhagic complications along with lifelong anticoagulation therapy [2].

Despite the use of embolic protection devices, several studies have shown that embolic debris from cardiac procedures can result in an acute ischemic stroke [3-5] and previous case reports have demonstrated a variety of causes of embolic debris following cardiac surgery leading to an acute ischemic stroke such as valve tissue [6], chordae tendineae [7], and calcified and collagenous tissue [8].

Herein we report a case of a patient who underwent a mitral valve repair and who suffered a large vessel occlusion secondary to a foreign body embolism which was successfully treated with mechanical thrombectomy.

Case Report:

A 79-year-old Caucasian male had a history of coronary artery disease and severe mitral insufficiency and underwent coronary artery bypass grafting and mitral valve repair with an annuloplasty in 2009. Additionally, he had been diagnosed with chronic atrial fibrillation, type 2 diabetes, hypertension, hyperlipidemia, and obstructive sleep apnea. The patient was completely independent in his activities of daily living and had evidence of recurrent severe mitral regurgitation, moderate tricuspid regurgitation, and papillary fibroelastomas on the aortic valve. He underwent a redo-sternotomy procedure for mitral valve replacement with 29mm St Jude Medical mechanical valve, tricuspid valve annuloplasty, and debridement of fibroelastoma on the aortic valve.

On the second post-operative day, the patient was noted to have left hemiparesis and progressive weakness since the procedure. An acute stroke alert was activated with the clinician initially concerned about the possibility of an intraparenchymal haemorrhage given the presence of IV heparin. A STAT CT scan of the head did not show any acute infarction or evidence of a haemorrhage. The patient was reexamined whilst he was in the CT scanner room, and progressive deficits were noted. The case was discussed with Neuro ICU at this time, and a decision was made to proceed with CT angiography (CTA) of the head and neck.

The CTA showed complete occlusion of the right internal carotid artery (ICA) distal cavernous and supraclinoid segments, with the presence of some collateral flow (Figure 1 A and B). The pre-procedure NIH stroke scale was 16. The patient was not an intravenous tissue plasminogen activator (IV-tPA) candidate due to the unclear time of onset as well as recent history of major surgery. The patient underwent successful mechanical clot retrieval. A 6-French SOFIA aspiration catheter was used to make one pass in the right supraclinoid ICA to

remove embolus by mechanical embolectomy and complete revascularization (TICI 3) was achieved (Figure 1 C and D).

Following the procedure, the retrieved clot was collected for histological analysis and was immediately fixed in 10% phosphate-buffered formalin. The clot underwent standard tissue processing and was embedded in a paraffin block. Serial sections (3 μm) of the clot were cut using a microtome and mounted on glass slides. Representative slides from the clot were stained with Hematoxylin and Eosin (H&E).

A trained pathologist visually inspected the slides and noted the presence of non-human, 'foreign body' material contained within the clot (Figures 2). The histopathological assessment of the clot demonstrates that there are cells intertwined with the 'foreign body' material, that we suspect could potentially be a part of sewing ring of the St. Jude Medical mechanical valve prosthesis (Figure 2 D). The material did not bear any histological resemblance to previously reported causes of embolic debris following cardiac surgery such as valve tissue [6], chordae tendineae [7], and calcified and collagenous tissue.

Outcome and Follow-Up:

Following the procedure, the patient's strength began to improve as did his neglect. Post-procedure NIH Stroke Scale was 11.

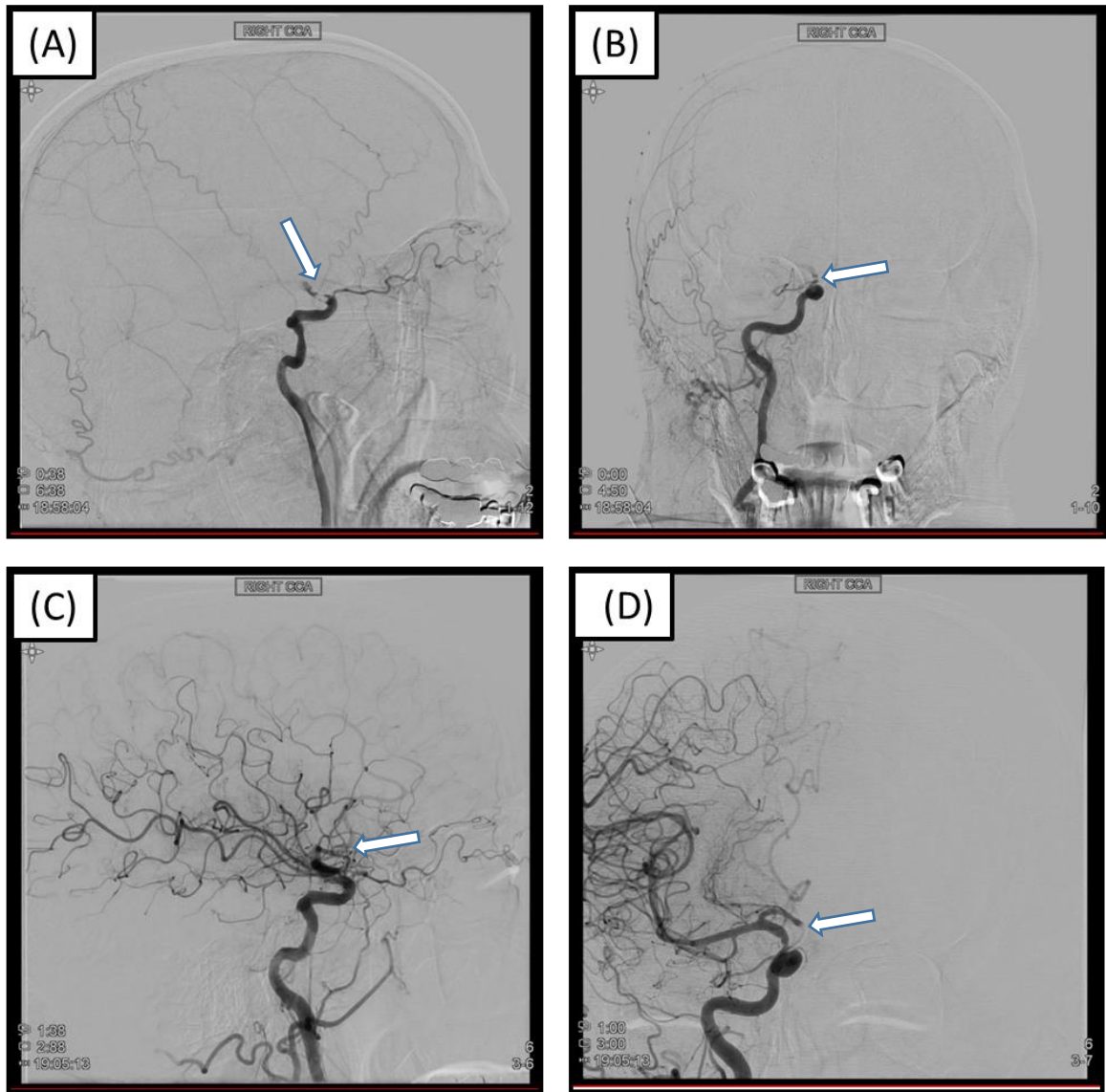


Figure 1: CTA images pre and post-mechanical thrombectomy. (A & B) CTA images show a filling defect in the right internal carotid artery (White Arrows). (C & D) CTA images after retrieval of the embolic material from the right ICA show good subsequent flow (White Arrows).

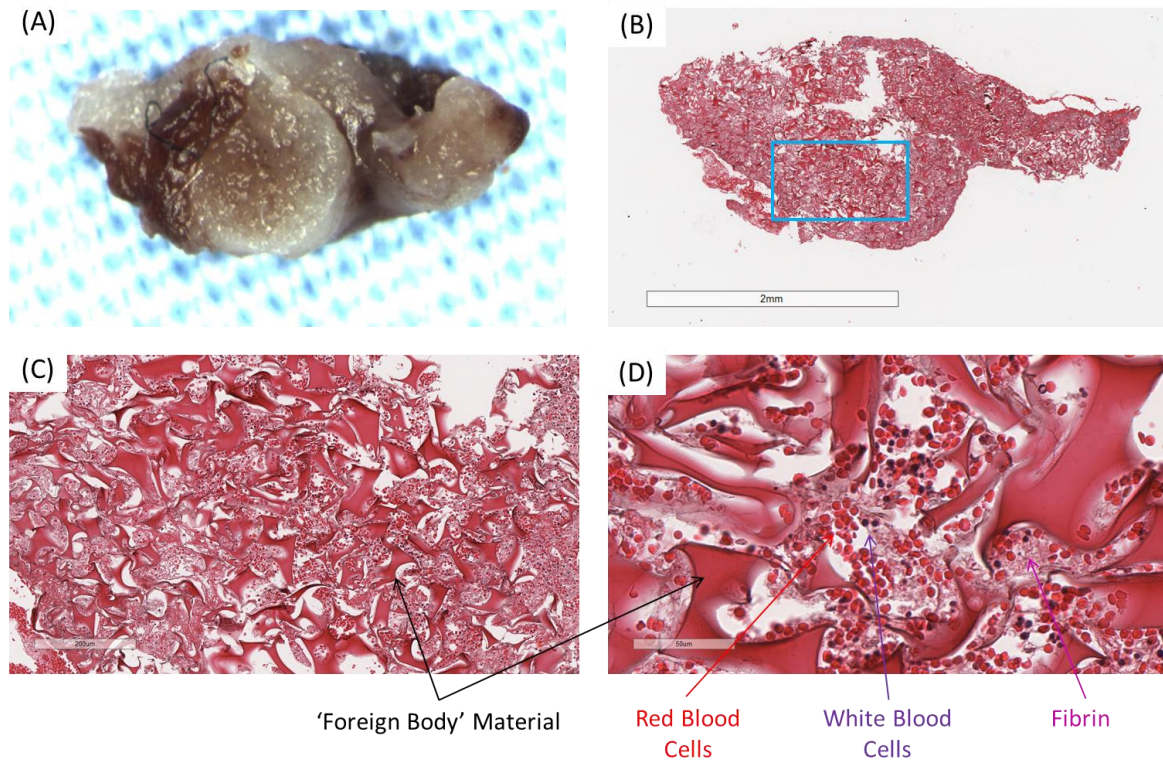


Figure 2: Gross Photo and Histological Images of Embolic Debris Material. (A) Gross Photograph of the removed clot following the mechanical thrombectomy procedure, 1.6x magnification. (B, C & D) Histological images of the H&E stained clot sample containing the non-human 'Foreign-Body' material (black arrows) at 1.6x, 20x and 40x respectively. The presence of the 'foreign body' material (Black Arrow) along with the common AIS clot components of Red Blood Cells (Red Arrow), White Blood Cells (Purple Arrow) and Fibrin (Pink Arrow) is clearly visible in the 40x image (D).

Discussion:

Acute ischemic stroke is a common complication of cardiac surgery that usually occurs more often during surgery. However, up to 38% of strokes occur within 2 days following the surgical procedure [9]. Previous reports have demonstrated a variety of causes of embolic debris following cardiac surgery and histopathological analysis of embolic debris, captured in embolic protection devices used during cardiac procedures, demonstrated that 'foreign body' was collected in 10% of trans catheter aortic valve replacement (TAVR) cases. However, the origin of these foreign bodies remains somewhat unclear [10].

We believe that this is one of the first confirmed cases of large vessel occlusion following cardiac surgery caused by 'foreign body' material. The histopathological assessment of this clot demonstrates that the common components of AIS clots such as Red Blood Cells, White Blood Cells and Fibrin are intertwined with the 'foreign body' material. The authors suspect that the 'foreign body' material could potentially be a part of the sewing ring of the St. Jude Medical mechanical valve prosthesis (Figure 2 D). Therefore, it is the author's considered opinion that the 'foreign body' material likely embolized during the procedure and over the course of the subsequent 2-days, cells began to adhere to the material resulting in the formation of an occlusive thromboembolus. This aligns with the patient's symptoms as the patient demonstrated progressive weakening over the 2-days post-surgery. Therefore, patients that are post-cardiac surgery should be observed closely for signs and symptoms of stroke.

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