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Title:

Pannus-related left main trunk ostial stenosis after aortic valve replacement

Running Head:

LMT stenosis by pannus after AVR

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Classification: Case Report

Word Count: 1346

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Data availability statement:

24 Data sharing is not applicable to this article as no datasets were generated or analyzed during

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the current study.

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Funding: None.

28

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Conflict of Interest: None.

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International Review Board approval or waiver:

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No need for IRB approval for this study.

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Patient Consent Statement:

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Verbal consent was obtained from the patient.

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37Abstract

38A 34-year-old woman was hospitalized with shortness of breath and chest tightness and pain.

39She had undergone aortic valve replacement for aortic stenosis at the age of 18 years.

40Transthoracic echocardiography showed left ventricular asynergy and a high aortic valve

41pressure gradient. Thus, structural valve deterioration was diagnosed. Coronary computed

42tomography and coronary angiography revealed left main trunk ostial stenosis that had caused

43acute anteroseptal myocardial infarction. Urgent surgery revealed pannus formation around the

44prosthetic valve and covering the ostium of the left main trunk. A Bentall procedure and

45coronary artery bypass grafting were performed. The postoperative course was uneventful.

46Introduction

47Pannus overgrowth following prosthetic valve replacement is a well-recognized complication of
48this procedure and sometimes causes prosthetic valve dysfunction. However, coronary artery
49ostial stenosis caused by pannus overgrowth after aortic valve replacement (AVR) is rare. We
50herein report a patient with acute myocardial infarction (AMI) attributable to left main trunk
51(LMT) ostial stenosis caused by pannus overgrowth accompanied by structural valve
52deterioration (SVD), 16 years after AVR.

53Case Report

54 A 34-year-old woman presented with shortness of breath and chest tightness and pain
55and was admitted to our hospital. She had undergone AVR with a 19-mm Carpentier–Edwards
56pericardial bioprosthesis for aortic stenosis at the age of 18 years. Six months before the present
57admission, during a second pregnancy, she had symptoms of heart failure, namely shortness of
58breath and orthopnea, but was not hospitalized.

59 On admission, her New York Heart Association class was III. A chest radiograph
60showed a cardiothoracic ratio of 56% and pulmonary congestion. An electrocardiogram
61demonstrated both ST elevation in leads V1–V4 and ST depression in leads II/III/aVF.
62Transthoracic echocardiography (TTE) showed diffuse severe hypokinesis and apex dyskinesis
63of the left ventricle with an ejection fraction of 32%. Both severe mitral regurgitation and a high
64prosthetic valve gradient were also identified. Her troponin I was 1186 pg/mL (normal range ≤
6526), and brain natriuretic peptide 454 pg/mL (normal range 0–18.4). Both coronary computed
66tomography and coronary angiography revealed severe LMT ostial stenosis (Figs. 1 and 2,
67respectively). Diagnoses of AMI caused by LMT ostial stenosis and SVD of the prosthetic
68aortic valve were made.

69 Intra-aortic balloon pumping was immediately instituted and urgent surgery
70performed. Both internal mammary arteries were harvested after median sternotomy. Cardiac

71arrest was achieved under cardiopulmonary bypass and the ascending aorta opened. It was noted
72that the stent post of the prosthetic valve was attached to the wall of the sinus of Valsalva
73between the left- and non-coronary sinus and there was thickened fibrous tissue around the
74prosthesis. The LMT ostium could not be adequately assessed because of the thickened fibrous
75tissue. After removing the prosthetic valve and fibrous tissue, the LMT ostium became visible.
76Thus, pannus overgrowth around the prosthetic valve had caused LMT ostial stenosis, leading to
77AMI (Fig. 3). After debridement of the aortic root, we performed the Bentall procedure (ATS-
78AP 20 mm, Medtronic, Minneapolis, MN, USA; Gelweave Valsalva graft, 24 mm, Terumo
79Aortic, Glasgow, UK), mitral valve annuloplasty, and coronary artery bypass grafting to both
80the left anterior descending and left circumflex coronary arteries. The postoperative course was
81uneventful and the patient was in good condition 1 year after the second surgery, with an
82ejection fraction of 48% on TTE.

83

84Comment

85 Pannus overgrowth following prosthetic valve replacement is a well-recognized
86complication of this procedure and sometimes causes prosthetic valve dysfunction¹. However, to
87the best of our knowledge, pannus resulting in coronary ostial stenosis has not been previously
88reported. This case provides two important lessons. First, although pannus generally forms on

89the inflow side of a prosthetic valve, it can also form on the outflow side, as in our patient. In
90our case, the suture ring and stent post were positioned close to the LMT ostium because the
91aortic root was small, possibly accounting for the pannus formation over the LMT ostium.
92Teshima and colleagues have reported that pannus formation is associated with persistent
93inflammation caused by the prosthesis². Our patient had other known risk factors for pannus
94formation, including being female, pregnancy, and younger age at the initial operation^{3,4}.
95Second, pannus formation following AVR may cause coronary stenosis. Thus, particular care
96should be taken regarding identification of coronary events after AVR. Funada and colleagues
97reported that aortic prosthesis-related coronary events generally develop within the first 6
98months after surgery⁵. However, coronary events occurring in the early postoperative period
99following AVR are more likely to be related to technical problems than to pannus formation.
100Our patient first manifested angina approximately 10 years after her initial operation. Although
101both apical hypokinesis of the left ventricle and SVD had been found on TTE 9 years after the
102initial operation, she had only been diagnosed as having SVD, not angina, at that time. When
103she presented to our institution, we diagnosed AMI, assuming preoperatively that this was
104caused by coronary atherosclerosis. However, we discovered intraoperatively that she had LMT
105stenosis attributable to pannus overgrowth. Thus, even patients who have undergone AVR and
106have few risk factors for atherosclerosis may develop angina and coronary events. This

107possibility should be kept in mind during ongoing outpatient surveillance.

108 To the best of our knowledge, this is the first report of coronary ostial stenosis caused
109by pannus overgrowth following AVR. Further investigation should be considered without delay
110in symptomatic patient who have undergone AVR, even in long-term patients whose condition is
111stable.

112

113**Acknowledgment**

114 We thank Dr Trish Reynolds, MBBS, FRACP, from Edanz Group ([https://en-author-](https://en-author-services.edanz.com/ac)
115[services.edanz.com/ac](https://en-author-services.edanz.com/ac)) for editing a draft of this manuscript.

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134**Figure legends**

135**Fig. 1.** Preoperative three-dimensional reconstructed coronary computed tomographic images

136(A) Computed tomographic image showing a hyperplastic right coronary artery.

137(B) Image of the left anterior descending artery reformatted as a stretch view. Stenosis of the
138orifice of the left main trunk is visible.

139(C) A 3-D image showing the relationship of the positions of the aortic prosthesis and left
140coronary artery ostium (solid arrow). Dashed arrow represents the direction of blood flow into
141the left main trunk. The prosthetic valve is depicted in blue.

142**Fig. 2.** Coronary angiography image shows stenosis of the left main trunk

143**Fig. 3.** Intraoperative photographs of the left main trunk

144(A) Thickened tissue covering the left main trunk (black arrows) is visible after removing the
145prosthetic valve.

146(B) The left main trunk (black arrow) is visible after removing the thickened fibrous tissue
147(white arrow).

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