

CASE REPORT: CLINICAL CASE

Emergency Aortic Valve Replacement in a 12-Week Pregnant Patient



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ABSTRACT

Urgent cardiac surgery was performed in a pregnant woman at 12 weeks of gestation for prosthetic valve thrombosis as result of noncompliance to anticoagulation. With this report we emphasize the importance of proper anticoagulation regimens and follow-up. (**Level of Difficulty: Intermediate.**) (J Am Coll Cardiol Case Rep 2020;2:107-11)

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HISTORY OF PRESENTATION

A 29-year-old female patient with G2P1 was admitted to our hospital at almost 12 weeks' gestation with fatigue and shortness of breath (New York Heart Association functional class III).

PAST MEDICAL HISTORY

Her medical history revealed an aortic valve replacement 11 years ago due to rheumatic aortic valve stenosis. The aortic valve had been replaced with a St. Jude mechanical prosthesis (St. Jude Medical Inc., St. Paul, Minnesota) in Damascus, Syria. As anticoagulant therapy, she was using low-molecular-weight

heparin injections (LMWH). Owing to personal circumstances, the LMWH compliance was suboptimal.

The physician who examined her on presentation saw a vital pregnant woman with blood pressure of 102/67 mm Hg, a regular pulse at 74 beats per min, and oxygen saturation of 98% without oxygen supplementation. On auscultation, audible valves clicks and a crescendo/decrescendo systolic murmur with a high frequency was noted at the right upper sternal border. The murmur radiated to the carotid arteries. Further, a diastolic murmur was noticed at the apex.

Based on symptoms and medical history, mechanical valve dysfunction due to pannus or thrombus formation was the most probable cause in this case. Alternatively, pulmonary embolism, coronary syndrome, aortic dissection, and severe pre-eclampsia should be considered in pregnant women presenting with nonphysiological dyspnea and fatigue.

INVESTIGATIONS

Electrocardiogram demonstrated regular sinus rhythm without conduction disturbances. Complete

LEARNING OBJECTIVES

- Anticoagulation during pregnancy in women with mechanical prostheses is essential.
- Cardiac surgery in the pregnant patient may be considered in the first trimester.

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Informed consent was obtained for this case.

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**ABBREVIATIONS
AND ACRONYMS**

LMWH = low-molecular-weight heparin

OAC = oral anticoagulant

TTE = transthoracic echocardiography

VKA = vitamin K anticoagulant

blood count showed a mild anemia with hemoglobin of 6.1 g/dl, no elevation of C-reactive protein (1 mg/ml), normal renal (creatinine 45 μ mol/l) and liver function (aspartate transaminase 15 U/l; alanine transaminase 17 U/l), and cardiac enzymes within normal range: troponin T 7 ng/l and creatine kinase 26 U/l. Transthoracic echocardiography (TTE 1) showed severe aortic regurgitation with aortic backflow and impaired opening of the valve with preserved systolic ventricular function (Figure 1, Table 1, TTE 1, Video 1, 2, and 3). The patient refused transesophageal echocardiography and, therefore, fluoroscopy was performed to confirm the diagnosis and revealed leaflet immobility of 1 leaflet and delayed movement in the other (Figure 2, Video 4). Under the suspicion of prosthetic valvular thrombosis, the patient was treated with intravenous unfractionated heparin guided by activated partial thromboplastin time.

MANAGEMENT

Despite adequate anticoagulant therapy for 1 week, TTE showed progressive valve dysfunction (Figure 3, Table 1, TTE 2, Videos 5, 6, and 7) After multidisciplinary consideration, including gynecologists, cardiac anesthesiologists, cardiac surgeons, and cardiologists, surgery was performed. Inspection of the valve showed, indeed, large thrombus formation. The prosthesis was carefully excised and replaced with a 21-mm CarboMedics mechanical aortic valve prosthesis (CarboMedics Inc., Austin, Texas). The patient was transferred to the intensive

care unit and fetal vitality was confirmed by trans-abdominal ultrasound.

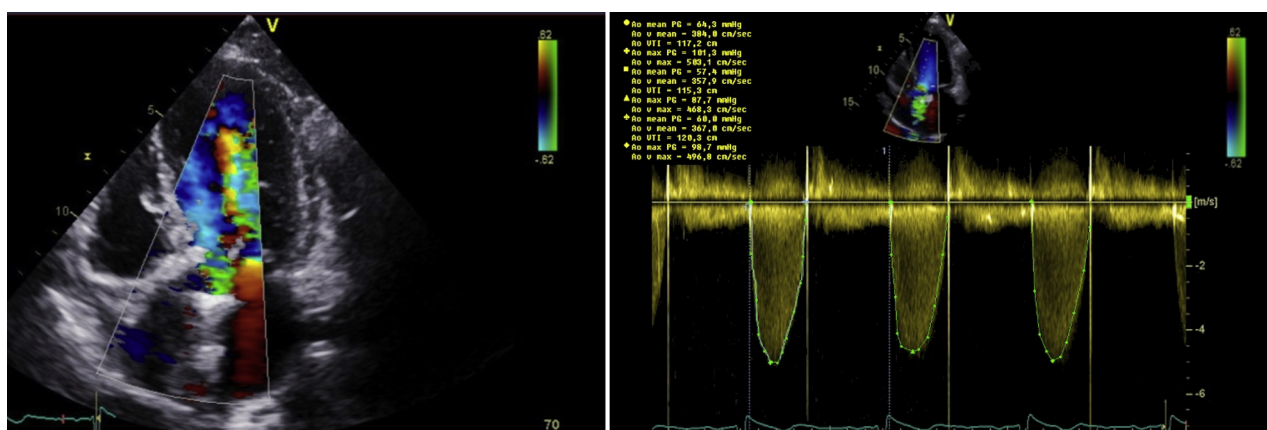
FOLLOW-UP

In the post-operative period, the gynecologist made several ultrasounds to confirm viability of the fetus and the patient made an uneventful recovery. After discharge, the patient was invited for advanced ultrasound screening at 20 weeks' gestation to evaluate malformation of the fetus and cerebral damage. Oral anticoagulation therapy (warfarin) was given in the second and third trimesters. At 37+4 weeks, a healthy boy was successfully delivered by cesarean due to breech position, weighing 3,132 g with an Apgar score of 2/6/9. There was no congenital abnormality identified. Mother and infant were discharged 11 days later. Up to 1 year after the surgery, mother and child are in good condition.

DISCUSSION

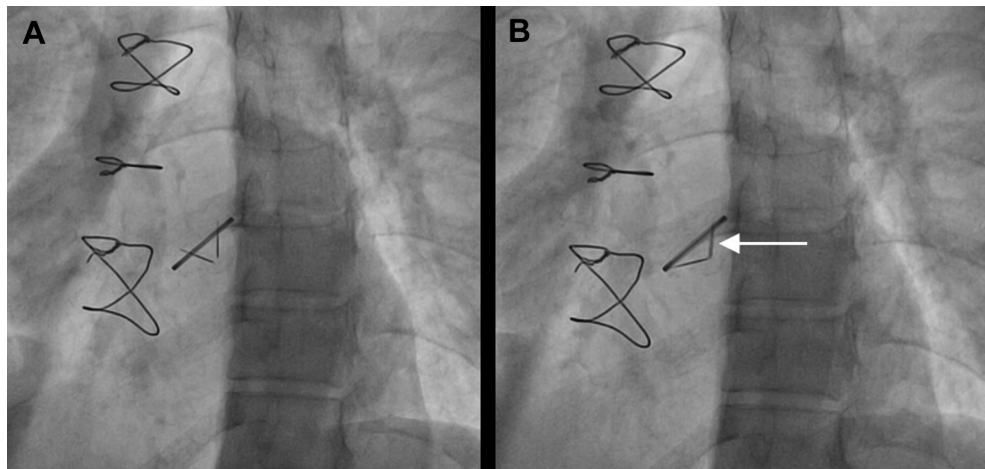
Pregnant women with a mechanical valve prosthesis pose a serious clinical challenge because of an increased risk of fetal and maternal mortality and thrombotic and hemorrhagic events, mostly resulting from anticoagulation regimens (1,2). Maintaining the delicate balance with oral anticoagulants (OACs) between adequate protection from thrombosis and prevention of bleeding is not easy, but as our case presents, indisputable. We presented an example of an unfortunate course due to OAC noncompliance and hereby stress the importance of proper

FIGURE 1 Prosthetic Aortic Valve Regurgitation and Stenosis on Presentation



See Videos 1, 2, and 3.

FIGURE 2 Fluoroscopy



(A) Prosthetic aortic valve leaflet on fluoroscopy in mid-systole; special notice to the increased opening angle. (B) Prosthetic aortic valve on fluoroscopy in diastole, special notice to immobilized leaflet (arrow). See Video 4.

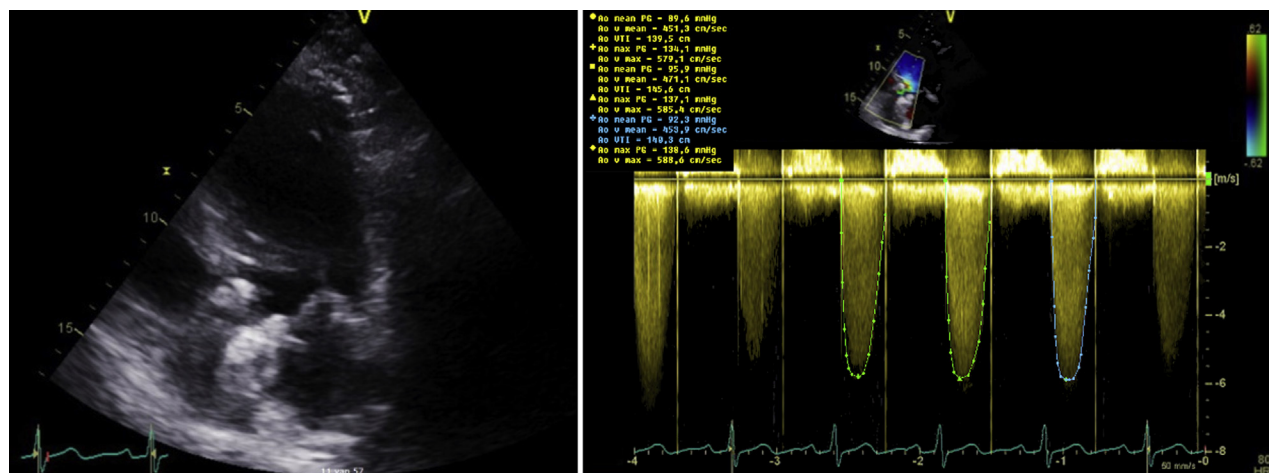
anticoagulation management in pregnant women with mechanical prosthetic valves.

Vitamin K anticoagulant (VKA) therapy forms the corner stone in anticoagulation therapy in mechanical valve prosthesis and is preferred in the second and third trimesters of pregnancy (2,3). Its use throughout pregnancy is associated with low risk of thrombus formation (3.9%) compared with LMWH use (33%) (4). It is advised to substitute OAC for unfractionated heparin of LMWH between 6 and 12 weeks in patients requiring high-dose OAC because VKA passes the

placenta and can be teratogenic with increasing doses (2). Risk for valve thrombosis with this regimen is moderate and is averaged at 10% (2,4). If women experience prosthetic valve thrombosis, they usually present with sudden-onset dyspnea and fatigue and urgent TTE followed by transesophageal echocardiography is indicated (2,3). Fluoroscopy can be considered to confirm leaflet dysfunction with limited radiation harm to the fetus (2).

Management of mechanical valve thrombosis is comparable to nonpregnant women and can consist

FIGURE 3 Progression of Prosthetic Aortic Valve Stenosis Under Heparin Treatment



Notice the increase in pressure gradient compared with Figure 1. See Videos 5, 6, and 7.

TABLE 1 Most Important Echocardiographic Parameters Used to Define and Follow-Up Prosthetic Valve Obstruction

	Normal	TTE 1	TTE 2
AV mean gradient, mm Hg	<20	61	90
AV peak velocity, m/s	<3	4.9	5.7
LVOT peak velocity, m/s		1.0	0.9
Dimensionless index, TVI_{AV}/TVI_{LVOT}	≥ 30	0.21	0.17
Effective orifice area, cm^2	>1.2	0.72	0.58
Acceleration time, ms	<80	130	140
Acceleration time/ejection time	<0.4	0.42	0.47

AV = aortic valve; LVOT = left ventricular outflow tract; TVI = time velocity integral.

of either thrombolytic agents or surgery after optimal medical anticoagulant therapy (e.g., with intravenous heparin) (5,6). A recent meta-analysis by Jha et al. (7) estimated fetal mortality in cardiac surgery in pregnant women as high as 33%, with maternal mortality comparable to nonpregnant patients (3-5%) (8). The timing of cardiac surgery in pregnant patients is challenging and largely depends on the clinical stability of the patient. Guidelines advise to perform surgery in the second trimester because of risk of fetal malformations in the first trimester and hemodynamic collapse of the mother and the fetus in the third trimester and directly postpartum, but evidence is thin, mainly because specific reports on fetomaternal outcome stratified by trimester are not available (9). Thrombolysis carries a concern for subplacental bleeding and embolization (10%) (2), although the TROIA (Comparison of Different TRansesophageal Echocardiography Guided thrombolytic Regimens for prosthetic valve Thrombosis) trial found lesser risk of fetal death (20%) (5). The decision to proceed with thrombolysis or surgery should therefore be made after careful multidisciplinary discussion and must include the preference of the patient (10). Because of progressive obstruction during heparin treatment in our presented case, we decided to perform cardiac surgery and not postpone surgery to the second trimester.

After successful management for prosthetic valve thrombosis with either surgery or thrombolysis, continuation of OAC is strongly advised (2,3). The additional use of low-dose aspirin is debated, and

significant discrepancy exists between the most recent European Society of Cardiology and American College of Cardiology/American Heart Association guidelines on management of prosthetic valve disease (10). The ESC recommends use of aspirin in addition to VKA only in patients who experience thromboembolic events despite adequate international normalized ratio or patients with coronary artery disease (Class IIa) (2). In contrast, the American College of Cardiology/American Heart Association indefinitely recommends additional aspirin to OAC in nonpregnant patients (Class I) (3). Our patient admitted to having difficulty with medication adherence, and aspirin in addition to VKA was discontinued.

When a woman of childbearing age must undergo valve replacement, valve selection remains challenging. Mechanical valves have excellent long-term durability, but are accompanied by lifelong anticoagulation requirement and increased fetomaternal morbidity and mortality during pregnancy (1,2). A bioprosthetic valve has advantages with regard to anticoagulation, but almost certainly requires reoperation because of valve failure later in life (approximately 50% at 10 years after surgery in women younger than 30 years of age) (2). Extensive counseling and discussion with the young woman is therefore essential for prosthesis selection.

CONCLUSIONS

Proper anticoagulation management and compliance in pregnant women with mechanical valve prosthesis is essential to minimize risk of serious thromboembolic complications and fetomaternal mortality. Even though cardiac surgery is considered most feasible in the second trimester, our case demonstrates that the first trimester might also be considered for cardiac surgery. Future studies should elucidate outcome differences between the stages of pregnancy.

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KEY WORDS anticoagulation, cardiac surgery, pregnant patient, prosthetic aortic valve thrombosis

APPENDIX For supplemental videos, please see the online version of this paper.