

CASE REPORT

CLINICAL CASE: CARDIO-OBSTETRICS 2023

Balancing Hemostasis With Thrombosis

A Challenging Case of Pregnancy With a Mechanical Mitral Valve



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ABSTRACT

A 32-year-old pregnant woman with a mechanical mitral valve was admitted with vaginal bleeding and was found to have placenta previa. During her hospital stay, she developed acute valvular thrombosis. She underwent an emergency cesarean section followed by successful mechanical valve replacement. (J Am Coll Cardiol Case Rep 2024;29:102143) © 2024 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

HISTORY OF PRESENTATION

A 32-year-old pregnant female with a mechanical mitral valve (MMV) replacement for rheumatic heart disease presented at 27 weeks' gestation with a 4-week history of progressive vaginal spotting. A transvaginal ultrasound revealed a low lying placenta with partial separation from the uterine wall and clot extending to the cervical os, which was consistent with placenta previa. She was admitted for monitoring until delivery. Her anticoagulation was changed from enoxaparin to a heparin infusion and

aspirin was not given due to bleeding risk. Protocolized heparin assays were checked and noted to be within the therapeutic range. Three weeks later, she developed acute onset chest pain and shortness of breath. Examination was notable for respiratory distress, an elevated jugular venous pressure, and bilateral inspiratory crackles on exam.

PAST MEDICAL HISTORY

She was diagnosed with rheumatic heart disease 14 years prior during her first pregnancy when a murmur was discovered on routine care. A transthoracic echocardiogram (TTE) demonstrated severe mitral stenosis with typical rheumatic appearance. Following delivery, she underwent MMV replacement. Two years later, she decided to terminate her second pregnancy and undergo permanent sterilization with bilateral tubal ligation after she was quoted an estimated mortality of 4%-5%. Ethics committee approval was obtained. However, 10 months prior to this admission, she had reversal of tubal ligation in Mexico. A pregnancy test 2 months later was positive

LEARNING OBJECTIVES

- To highlight the need for thoughtful anticoagulant management in pregnant patients with an MMV.
- To emphasize the importance of a multidisciplinary approach in the care of patients with structural heart disease facing a high-risk pregnancy.

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the [Author Center](#).

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**ABBREVIATIONS
AND ACRONYMS****MMV** = mechanical mitral valve**TTE** = transthoracic
echocardiogram

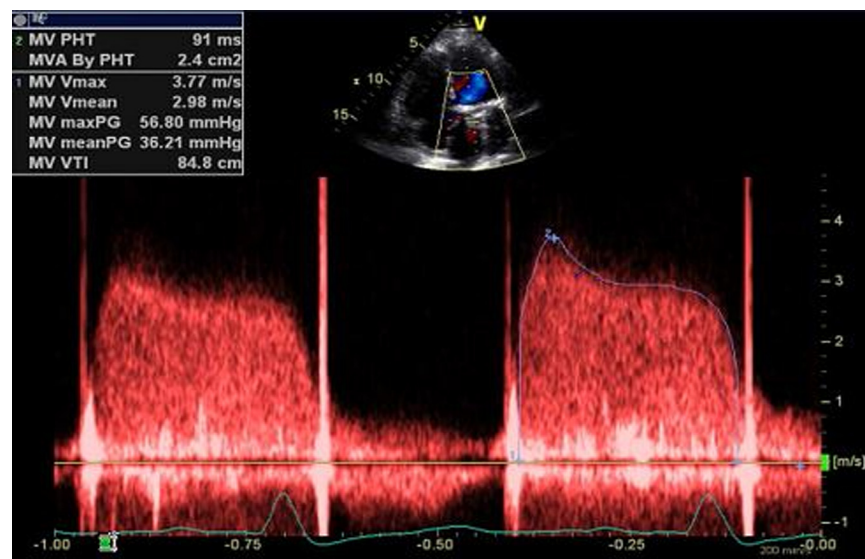
and, due to teratogenicity concerns, warfarin was switched to enoxaparin. Anticoagulation efficacy was confirmed by protocolized weekly monitoring of anti-Xa levels measured at 4 hours post administration. A TTE performed at that time demonstrated a normal left ventricular ejection fraction and a normal functioning MMV.

INVESTIGATIONS

Laboratory investigations demonstrated an elevated N-terminal pro-B-type natriuretic peptide (360 pg/mL) and a normal troponin (0.03 ng/mL). Daily heparin assays were within the therapeutic range throughout hospitalization (0.3-0.7 IU/mL). A chest radiograph demonstrated mild pulmonary congestion and edema. TTE showed a transmitral gradient of 36 mm Hg across the prosthesis at a heart rate of 110 beats/min, a mitral valve area of 2.4 cm², elevated pulmonary artery systolic pressure of 45 mm Hg, and normal biventricular function (Videos 1 and 2, Figure 1). Fluoroscopy demonstrated a restricted lateral prosthetic leaflet, concerning for mitral valve thrombosis (Video 3). A transesophageal echocardiogram was deferred as fluoroscopy had confirmed 1 mobile leaflet, and it was unlikely to change management.

MANAGEMENT

She was stabilized in the intensive care unit with diuresis and continued anticoagulation with heparin. Her symptoms improved rapidly and she remained hemodynamically stable. A repeat TTE demonstrated reduced transmitral gradient to 17 mm Hg at a heart rate of 60 beats/min with normalization of pulmonary artery pressures. Reduction in gradient was thought to be due to diuresis and a reduction in heart rate. Multidisciplinary discussions were held among obstetrics, cardiothoracic surgery, and cardiology to determine the optimal treatment strategy for maternal and fetal well-being. At 32 weeks, she underwent cesarean section (c-section) while anticoagulated on a heparin drip with the extracorporeal membrane oxygenation team on standby. Delivery was complicated by an estimated blood loss of 1 L. Hemostasis was achieved with an intrauterine balloon and the patient remained hemodynamically stable. Her postpartum course was complicated by a urinary tract infection. After a complete course of antibiotics, the patient underwent mitral valve replacement 2 weeks following delivery. The prior MMV was found to have large thrombus superior and inferior to the annulus on the lateral leaflet with minimal pannus formation. Following removal, a 27-mm St Jude MMV was implanted without incident.

FIGURE 1 Continuous-Wave Doppler

Continuous-wave Doppler across the mitral valve annulus demonstrating elevated gradients.

Postoperative care in the cardiac intensive care unit was routine. She was discharged 1 week following mitral valve replacement with a therapeutic international normalized ratio on warfarin.

DISCUSSION

Caring for patients with MMV during pregnancy poses a great clinical challenge. Expectedly, pregnant patients with mechanical valves suffer from much higher rates of serious complications, many related to bleeding or thrombosis.¹ Pregnancy is a prothrombotic state due to increased circulating prothrombotic factors, among other reasons.² As such, patients with mechanical valves require diligent anticoagulant management, and even so, they can develop thrombotic complications, such as in the presented case. However, physiologic changes associated with pregnancy, such as increased volume of distribution and renal clearance, make anticoagulation difficult to manage.³ As such, the risk of both bleeding and valve thrombosis, even with careful anticoagulant management, is high.⁴

Due to its teratogenicity, the routine use of warfarin is not recommended during the first trimester or with doses >5 mg/d.⁵ Therefore, anticoagulation is often limited to parenteral heparinoid agents: low molecular weight heparin and unfractionated heparin. As heparinoid agents do not cross the placenta, they carry less risk to the fetus, but they bring higher rates of maternal thromboembolic events and mortality.⁴ Current guidelines recommend shared decision making when it comes to anticoagulant choice following the first trimester and switching to low molecular weight heparin at least 1 week prior to anticipated delivery to reduce bleeding risk.⁵ In the present case, unfractionated heparin was used because of its shorter half-life and ability to rapidly reverse if she developed recurrent bleeding or required emergent intervention. Vigilant monitoring of heparin, in this case over the course of weeks, was undertaken to reduce the risk of thrombosis.

Once valve thrombosis occurs, management decisions are complex and involve weighing both maternal and fetal risk. As in nonpregnant patients, surgery is often the treatment of choice. However, timing of surgery and delivery, valve choice, and support options are questions best answered by a multidisciplinary team.^{5,6} In general, emergency c-section is recommended prior to cardiac surgery due to elevated fetal mortality and neonatal complications with cardiopulmonary bypass.⁷ Another option is fibrinolysis, because the complication rate

appears similar between pregnant and nonpregnant patients.⁸ Finally, valve choice between a bioprosthetic or mechanical valve should involve consideration of both immediate and long-term risks.

The decision to pursue a surgical approach in the presented case, with c-section performed prior to valve replacement, was deemed favorable over fibrinolysis given her relative stability following initial management and concern for bleeding risk with placenta previa. Given the presence of a partially thrombosed valve and the risk of acute hemodynamic decompensation during c-section, heparin was continued through delivery, with the extracorporeal membrane oxygenation team on standby. A mechanical valve was chosen due to her age and life expectancy; however, a bioprosthetic valve was considered to reduce the risk of postpartum bleeding and thrombosis.

A final salient question related to the present case was the decision to reverse tubal ligation without expert opinion. Although she initially opted for permanent sterilization following her second pregnancy, she later desired more children and sought a reversal procedure in Mexico. At that time, she did not have regular follow-up with cardiology. Although no absolute contraindications to pregnancy with a mechanical heart valve exist, a detailed conversation prior to the procedure regarding the elevated maternal and fetal morbidity and mortality associated with pregnancy would have allowed her to make an informed decision. Ultimately, after discussing her contraceptive options, the patient decided on pursuing permanent sterility following delivery.

FOLLOW-UP

As noted, the patient opted for repeat tubal ligation after delivery. Five years post delivery, both she and her child have done well with no recurrent valvular-related complications.

CONCLUSIONS

Pregnancy with an MMV carries significant fetal and maternal risks. Prepregnancy consultation with cardiology is paramount in safe planning. Anticoagulation is required for the duration of pregnancy, and choice of anticoagulation strategy should include a thorough discussion of risk and patient preferences. If bleeding or thromboembolic complications occur, involvement of a multidisciplinary team with obstetrics, cardiology, and cardiothoracic surgery is essential to manage the multitude of complexities presented.

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The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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KEY WORDS anticoagulation, mitral valve, pregnancy, thrombosis, valve replacement

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



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