

Transcatheter Aortic Valve Replacement (TAVR) for Critical Aortic Stenosis in a Parturient

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Introduction

Severe aortic stenosis (AS) in pregnancy is rare, commonly associated with bicuspid valves, and confers an increased maternal mortality rate of 17.4%¹ as well as increased maternal and fetal morbidity.

Undiagnosed valvular heart disease may be unmasked by the physiologic changes that accompany pregnancy.

Transcatheter aortic valve replacement (TAVR) has been described in parturients but has been reserved for life-threatening cases.

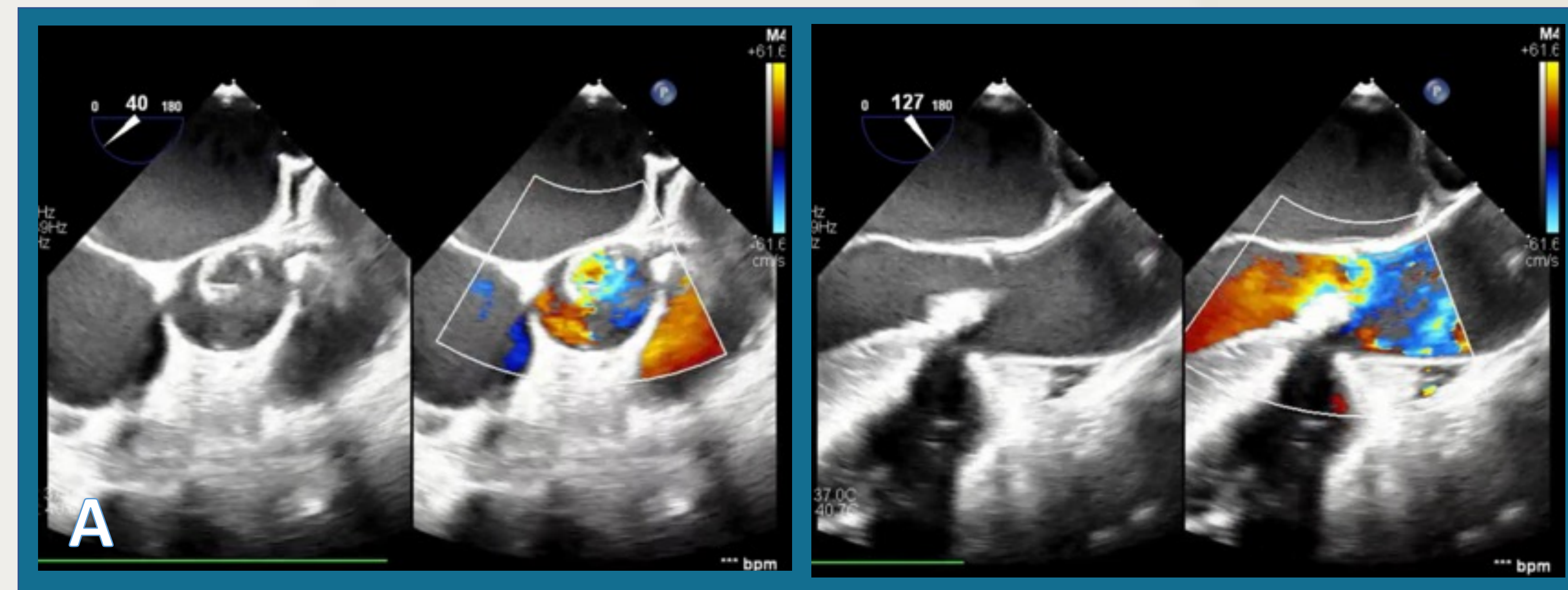
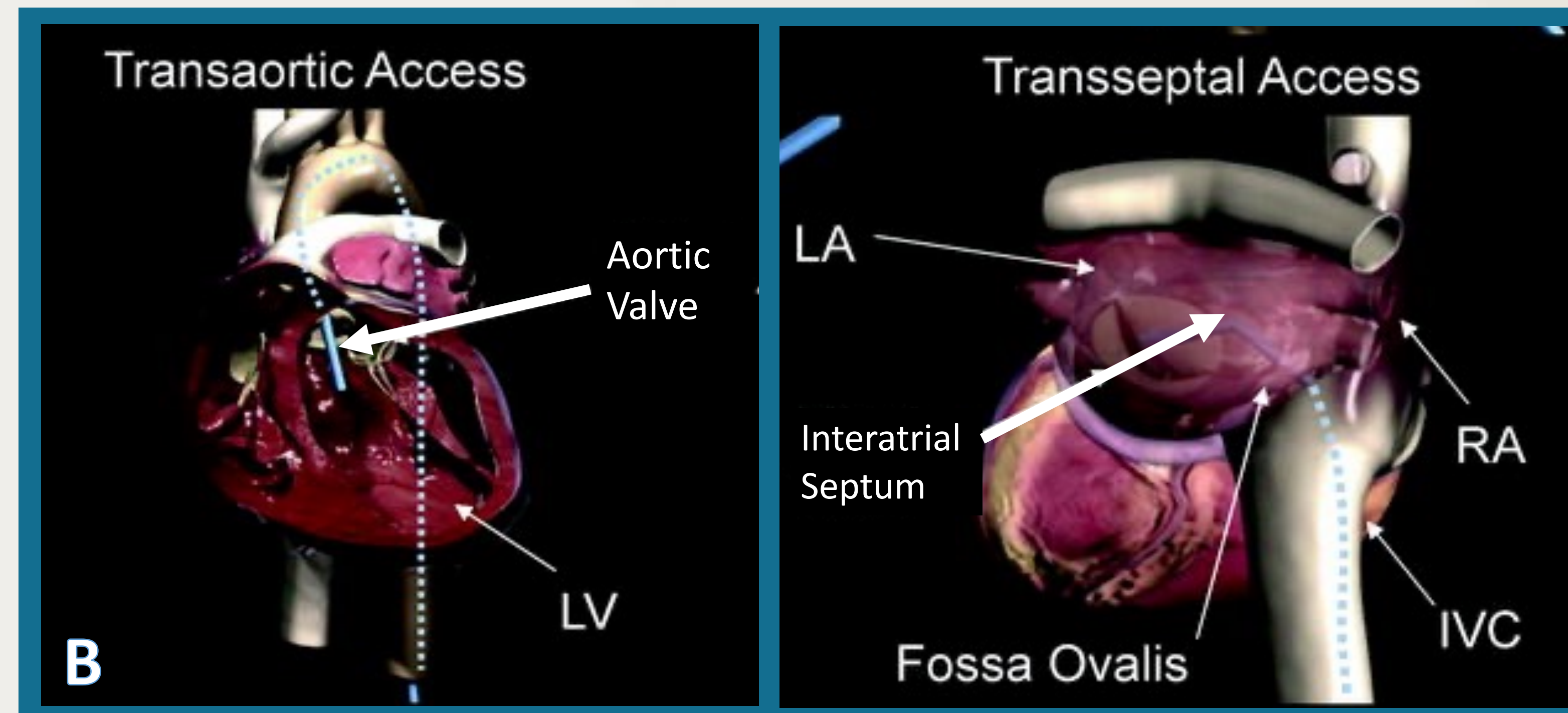


Figure 1: (A) Intraoperative transesophageal echo images of aortic stenosis, short axis (left) and long axis (right) (B) Transaortic versus transseptal access for TAVR⁵

Case Summary

Preoperative

- 35-year-old female, G2P0101 at 23w0d, with congenital asymptomatic bicuspid aortic valve (AV), prior classical cesarean section at 26 weeks due to placental abruption, presents with acute decompensated HFpEF (NYHA IV).
- Transthoracic echocardiography:
 - Normal left ventricular size with moderate to severely increased wall thickness. Left ventricular ejection fraction 50-55% with grade 3 diastolic dysfunction. Normal right ventricular size and systolic function.
 - Heavily calcified bicuspid aortic valve with restricted leaflet motion. Severe aortic stenosis - **mean aortic valve area 0.54 cm², mean gradient 94 mmHg**, peak systolic velocity 5.90 m/s. Moderate aortic insufficiency.
 - Mildly dilated ascending aorta measuring 40 mm.
- Admitted to the CVICU for monitoring; a multidisciplinary team determined an urgent valve replacement was indicated given severe symptomatic AS, with expected worsening of AV gradients by +50% at 28-32 weeks due to increased cardiac output. Consensus was to proceed with TAVR. Surgical aortic valve replacement (SAVR) deferred due to very high-risk for IUFD at current gestational age. Perfusion and Cardiac Surgery to be on standby in room in case of emergent conversion to SAVR. Percutaneous valvuloplasty was contraindicated due to aortic insufficiency.

Intraoperative

- Anesthetic: pre-induction arterial line placed. A combined volatile and intravenous general anesthetic was administered
- Hemodynamics: notable for **marked hemodynamic instability** requiring a norepinephrine infusion up to 15 mcg/min and vasopressin infusion at 0.04 units/min as well as boluses of epinephrine and vasopressin prior to valve deployment with **significant improvement in pressor requirement post-valve placement**.
- Transesophageal echocardiography utilized to monitor cardiac function and guide valve positioning; severity of stenosis and calcification prohibited traditional supra-avalvular catheter approach via the ascending aorta despite multiple attempts with conversion to the less conventional transseptal approach leading to satisfactory valve deployment with confirmation of well seated 23 mm Edwards SAPIEN 3 valve (mean gradient 13 mmHg, no perivalvular regurgitation).
- Intraoperative hypoxemia requiring oxygenation with 100% FiO₂ due to flash pulmonary edema; therefore, decision made to defer extubation in order to optimize pulmonary status with diuresis and positive pressure ventilation in CVICU.

Postoperative

- Extubated to BiPAP POD1 with near complete resolution of symptoms.
- Discharged on POD3 on low dose aspirin and metoprolol for management of bicuspid aortopathy.
- Presented at 36w2d with painful contractions and underwent uncomplicated repeat cesarean section under combined spinal-epidural anesthesia.

Discussion

- Cardiovascular disease impacts 1-3% of pregnancies [in North America] and is the most common cause of maternal mortality. Untreated cardiac disease accounts for 10% to 15% of maternal mortalities.²
- Pregnant patients with mild or moderate aortic stenosis (AS) tolerate pregnancy well, but the rate of maternal and fetal complications rises dramatically with increasing severity of AS, with about one-third of mothers with AVA <1.5 cm² requiring hospitalization.²
- A retrospective study by *Pomini* et al. of 69 pregnant patients who underwent open-heart surgeries with cardiopulmonary bypass showed a fetal mortality rate of 24%.³
- Although TAVR during pregnancy has been described in case reports, it has not been studied in this population of patients. *Hodson* et al. described one of first successful cases.⁴
- Current guidelines exist for treatment of valvular heart disease prior to pregnancy; however, for parturients with a class IIb cardiovascular disease with symptomatic AS where surgical intervention is recommended, little guidance exists. This highlights the need for individualized plans for patients based on the degree of their pathology, severity of symptoms, and estimated gestational age.
- As demonstrated by this successful case, TAVR should be further investigated as a safe option for the treatment of symptomatic AS during pregnancy.

References

1. Arias F, Pineda J. Aortic stenosis and pregnancy. *J Reprod Med*. 1978;20(4):229-232.
2. Nanna M, Stergiopoulos K. Pregnancy complicated by valvular heart disease: an update. *J Am Heart Assoc*. 2014;3(3):e000712.
3. Pomini F, Mercogliano D, Cavalletti C, Caruso A, Pomini P. Cardiopulmonary bypass in pregnancy. *Ann Thorac Surg*. 1996;61(1):259-268.
4. Hodson R, Kirker E, Swanson J, Walsh C, Korngold E, Ramelli S. Transcatheter Aortic Valve Replacement During Pregnancy. *Circulation: Cardiovascular Interventions*. 2016;9:e004006
5. Transcatheter Mitral Repair and Replacement. *Thoracic Key*. September 15, 2016. Accessed April 20, 2023. <https://thoracickey.com/transcatheter-mitral-repair-and-replacement>