

Robot-assisted Transitional Atrioventricular Septal Defect Repair

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Abstract

Objective: Robot-assisted atrioventricular septal defect (AVSD) repair in adults remains uncommon, and the anatomical features defining optimal candidates are not well characterized. We report robotic repair of an adult transitional AVSD with apparent spontaneous closure of the ventricular component, a subset not well described in the robotic AVSD literature.

Methods: A 25-year-old woman presented following a syncopal episode and was found to have right bundle branch block, a 2.4-cm primum atrial septal defect, a widely patent left atrioventricular valve (LAVV) zone of apposition, and no ventricular septal defect on color Doppler. CT confirmed adequate peripheral vasculature. Robotic right-thoracic repair was performed with the da Vinci Xi platform, peripheral cannulation, IntraClude endoaortic balloon clamping, and del Nido cardioplegia. Intercostal nerve cryoablation (T3–T6) was performed for analgesia.

Results: Intraoperative inspection confirmed a common atrioventricular junction with bridging leaflet tissue densely adherent to the inlet ventricular septum and no residual interleaflet gap. The cleft was closed with interrupted CV-4 PTFE sutures and the primum defect with a bovine pericardial patch; the suture line was carried around the coronary sinus to commit it to the left atrium. The patient was discharged on postoperative day 4. At three months she was asymptomatic with mild residual LAVV regurgitation and no residual shunt.

Conclusions: Transitional AVSD with apparent spontaneous closure of the ventricular component may represent one favorable anatomical substrate for robot-assisted repair in selected adult patients.

Background

Epidemiology & Unmet Need:

- AVSDs account for 3–5% of congenital cardiac defects
- Traditionally repaired via median sternotomy
- Dedicated robotic adult AVSD experience: **<20 cases** described to date

Nomenclature (STS):

- **Partial AVSD:** primum ASD + LAVV cleft, no VSD
- **Transitional AVSD:** partial AVSD anatomy + restrictive inlet VSD (may close spontaneously)
- **Intermediate AVSD:** VSD shunt requiring patch closure

Aim:

To describe robotic repair of an **adult transitional AVSD with apparent spontaneous closure** of the ventricular component — a subset not well characterized in the robotic AVSD literature.

Case Presentation

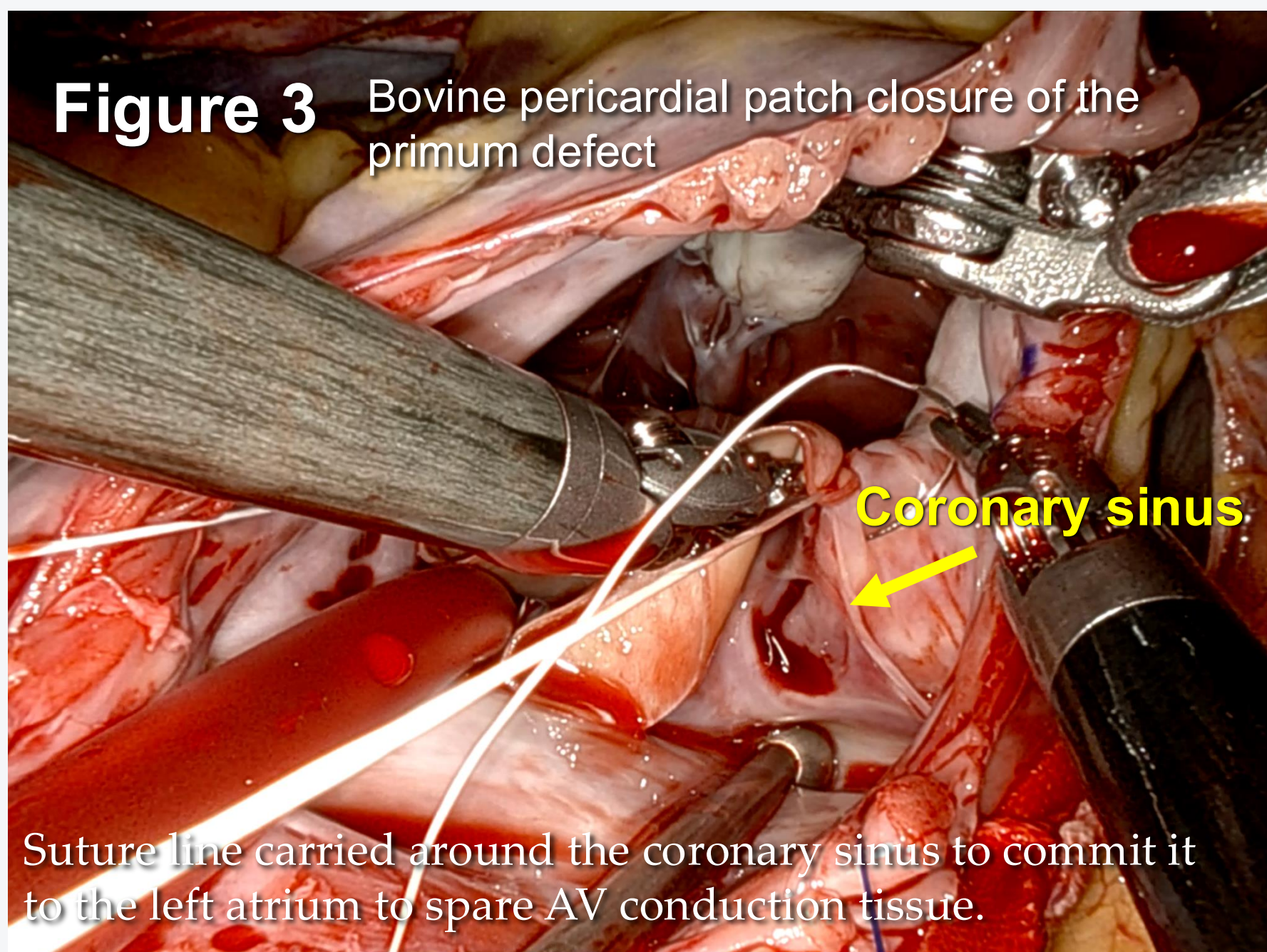
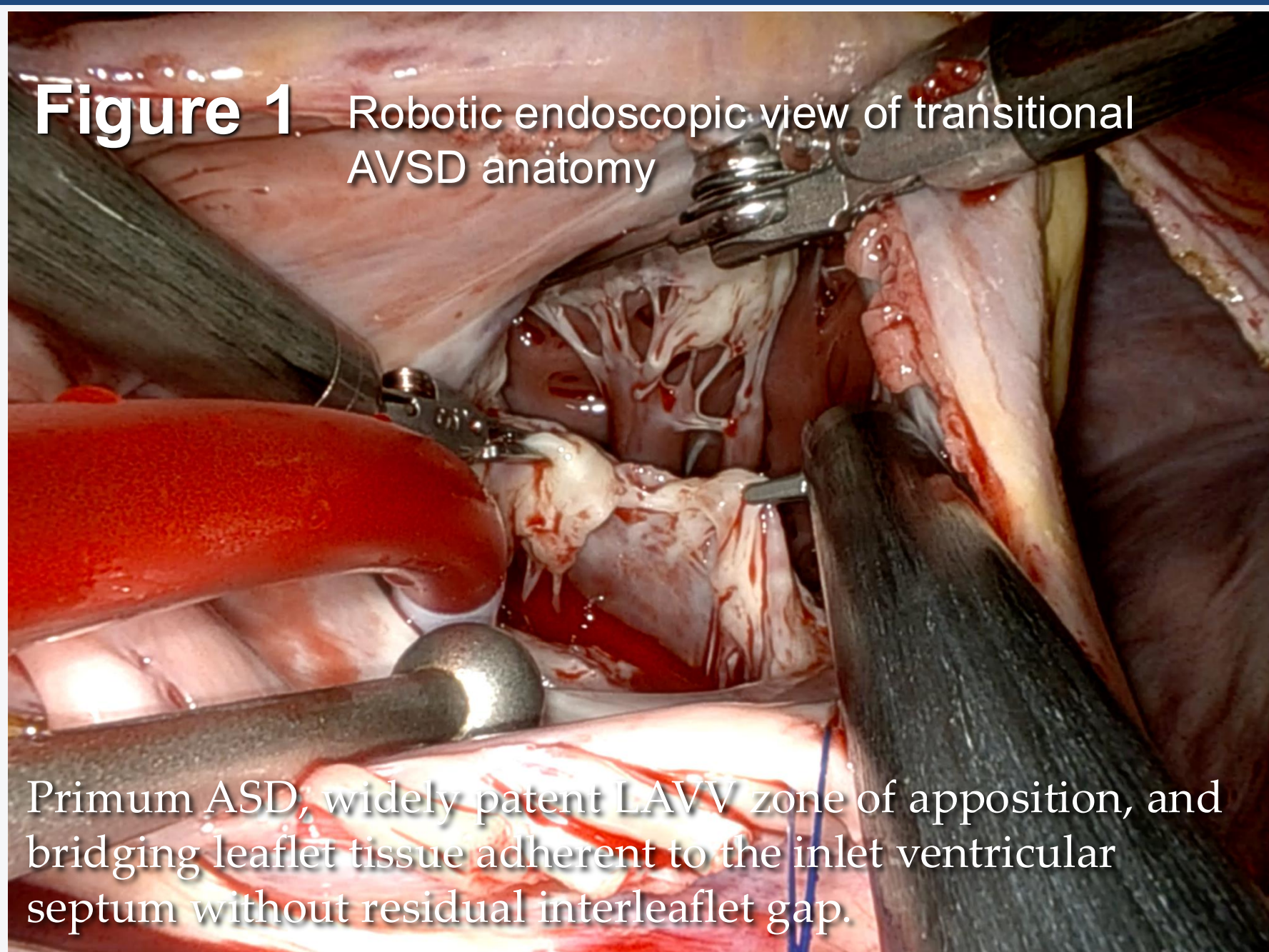
A 25-year-old woman was found to have a primum ASD on workup of an isolated syncopal episode that disclosed right bundle branch block

• Echo: 2.4-cm primum ASD; widely patent LAVV zone of apposition with mild regurgitation; no VSD on color Doppler; LVEF 72%; moderate right heart enlargement; normal PA pressure

• Findings supporting transitional versus partial AVSD: common atrioventricular junction with loss of normal AV valve offset; bridging leaflet tissue closely apposed to the inlet ventricular septum

• CT angiography: absent left SVC; right CFA 8 × 7 mm, CFV 13 × 8 mm, IJV 12 × 12 mm

Operative Technique

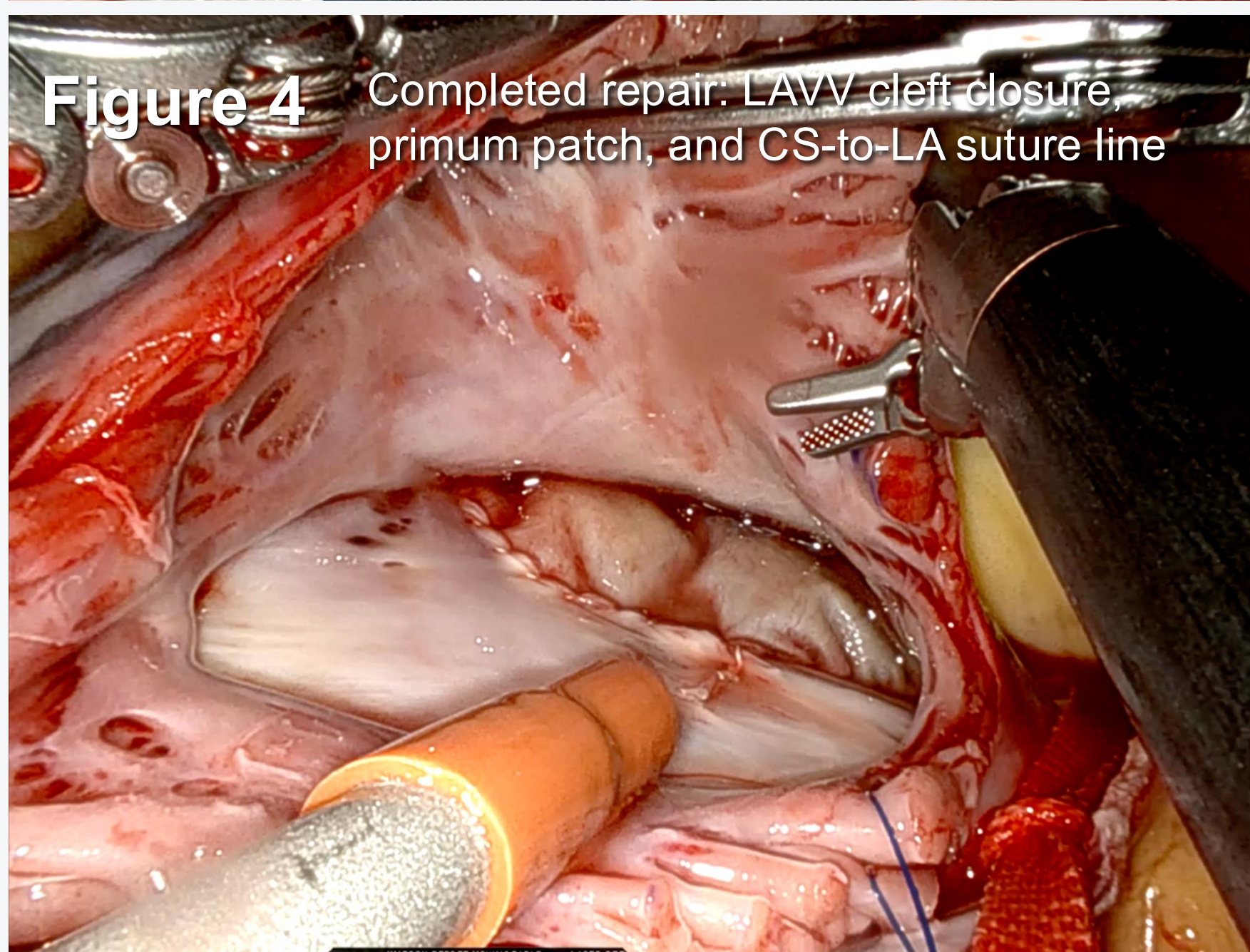
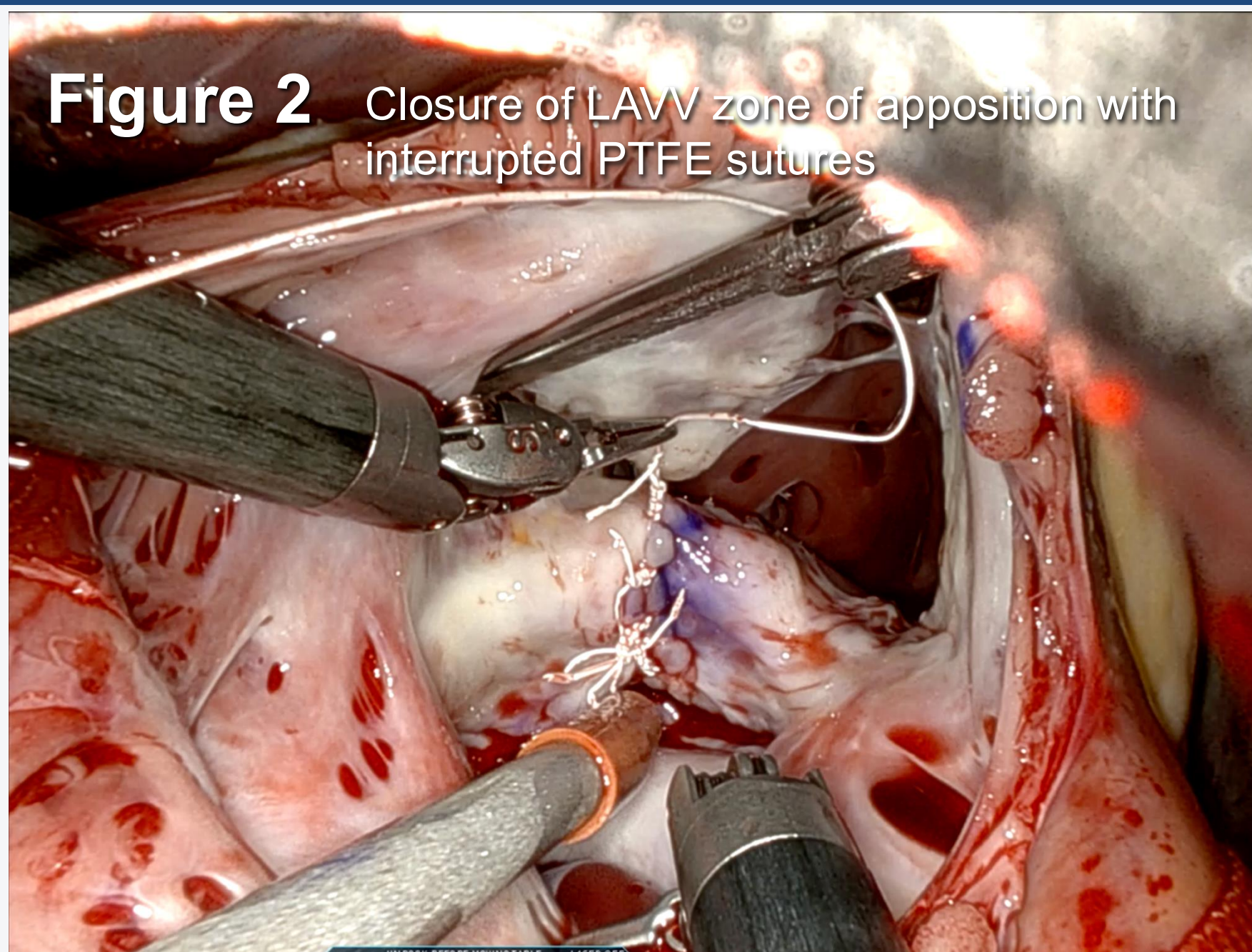


Cannulation & Setup

- da Vinci Xi; right thoracic ports
- Peripheral CPB: 26F vein, 21F artery, 17F RIJV
- IntraClude endoaortic balloon (TEE + fluoroscopy)
- Del Nido antegrade cardioplegia
- Intercostal cryoablation (T3–T6) for analgesia

Intracardiac Repair

- Oblique right atriotomy + bicaval snaring
- Common AV junction; bridging tissue closes the inlet septum
- LAVV cleft closed with CV-4 PTFE sutures
- Bovine patch closes the primum defect; CS-to-LA suture line spares the AV node



Course & Outcomes

- CPB 228 min / aortic cross-clamp 177 min
- Rewarming-phase VT: 2 defibrillations + amiodarone; transient ST elevation resolved within minutes; balloon position reconfirmed; no new wall-motion abnormality
- Femoral arterial intimal disruption (~50% circumference) repaired primarily; pulsatile distal flow restored
- Post-bypass TEE: complete closure of the primum defect; no residual shunt; trivial LAVV regurgitation; mean LAVV gradient 3 mmHg
- Extubated POD 1; sinus rhythm without AV block; discharged POD 4
- 3-month follow-up: asymptomatic; LVEF 70%; no residual shunt; mild residual LAVV regurgitation; mean LAVV gradient 3 mmHg; RVSP 23 mmHg
- 6-month follow-up: asymptomatic; clinically stable

Discussion

Limited prior experience: Fewer than 20 adult AVSD-spectrum robotic repairs have been described, clustering at the partial end of the spectrum or in intermediate forms requiring ventricular patch closure. Transitional AVSD with apparent spontaneous closure of the ventricular component is not well characterized in this literature.

Favorable substrate: Apparent spontaneous closure eliminates the need for inlet ventricular patch closure under restricted right-atrial angulation, while preserving the elements that benefit most from magnified three-dimensional visualization.

Contemporary platform: Unlike earlier dedicated reports (da Vinci Si + direct transthoracic clamping), the present case used the da Vinci Xi with IntraClude endoaortic balloon, del Nido cardioplegia, and intercostal nerve cryoablation.

Honest learning points: CPB and cross-clamp times were longer than those reported in published dedicated case reports and considerably longer than cohort averages from established robotic congenital programs, reflecting our early institutional experience. A borderline femoral arterial caliber resulted in cannulation-site intimal injury; this experience has lowered our threshold for femoral cut-down with chimney-graft arterial interposition.

Conclusions

Robot-assisted repair of an adult transitional AVSD with apparent spontaneous closure of the ventricular component was feasible and yielded an uncomplicated three-month outcome. This anatomical subset may represent one favorable substrate when robotic repair is being considered in adults with AVSD-spectrum lesions.

Key Message

Adult transitional AVSD in which the ventricular component has apparently undergone spontaneous closure is functionally a primum atrial septal defect with a cleft of the left atrioventricular valve.

This anatomy eliminates the need for inlet ventricular septal defect closure under restricted right-atrial angulation, while preserving the elements that benefit most from magnified robotic visualization:

- precise cleft alignment,
- primum patch placement, and
- conduction-conscious suturing around the triangle of Koch.

It may therefore represent one favorable anatomical substrate for robot-assisted repair in selected adult patients.

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