# An Alternate Approach: Percutaneous Axillary Cannulation for Minimally Invasive Cardiac Surgery

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## Background

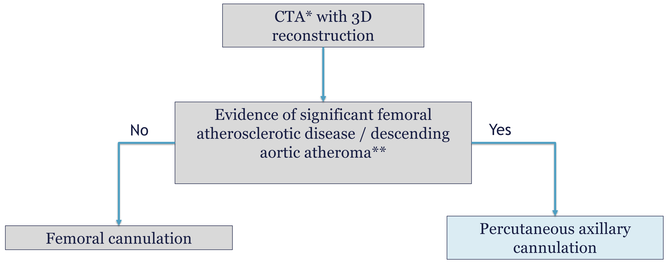
To expand the application of minimally invasive cardiac surgery (MICS), innovative approaches to large bore vascular access are necessary. Though the femoral vessels have historically been used for cardiopulmonary bypass (CPB) in MICS, alternate access sites must be considered in those with contraindications to use of these vessles.[1,2]

To our knowledge, percutaneous cannulation of the axillary artery for CPB has not yet been demonstrated during robotic cardiac surgery. We aim to highlight our experience using axillary artery cannulation to safely facilitate CPB for minimally invasive cardiac surgery.

## Methods

In this single-center case series, four patients who underwent robotic cardiac surgery utilizing the axillary artery for percutaneous cannulation between November 2019 and August 2021 were identified. A retrospective review was performed to collect preoperative, intraoperative, and postoperative data for analysis.

## Patient Selection




*Computed tomography angiography of the chest, abdomen, and pelvis with 1 mm cuts*

*** Or other contraindications to femoral perfusion*

## Preoperative Characteristics

| Variable | Patient 1 | Patient 2 | Patient 3 | Patient 4 |
|---|---|---|---|---|
| Age (years) | 72 | 61 | 72 | 68 |
| Sex (M = male) | M | M | M | M |
| Ejection fraction (%) | 60 | 60 | 65 | 65 |
| Anticoagulated | N | Y | N | Y |
| Diabetes | N | N | N | Y |
| Hypertension | Y | Y | N | Y |
| Hyperlipidemia | N | Y | N | Y |
| Hypercholesteremia | N | Y | Y | N |
| Coronary artery disease | N | Y | Y | N |
| Aortic atheroma | N | Y | N | Y |

## Intraoperative Details

| | Patient 1 | Patient 2 | Patient 3 | Patient 4 |
|---|---|---|---|---|
| Procedure | Secundum atrial defect closure; resection of aneurysmal residual atrial septum; left atrial appendage closure | Endoscopic robotic mitral valve replacement | Redo robotic mitral valve repair (MVP at P3, A3 and commissure), left atrial appendage closure | Redo cardiac surgery (prior CABG), robotic mitral valve repair (triangular resection of P2), ASD closure |
| Right Axillary Artery Cannulated | Y | Y | Y | N |
| Planned Axillary Cannulation | Y | N | Y | Y |
| Hematoma | N | N | N | N |
| Brachial plexus injury | N | N | N | N |
| Neurovascular injury | N | N | N | N |
| CPB time (min) | NA | 157 | 154 | 135 |
| Cross-clamp time (min) | NA | 94 | 100 | NA |
| Sheath size | 18FR | 22FR | 19FR | 17FR |

## Postoperative Outcomes (30 Day)

| | Patient 1 | Patient 2 | Patient 3 | Patient 4 |
|---|---|---|---|---|
| Stroke | N | N | N | N |
| Atrial fibrillation | N | N | N | N |
| Functional deficit | N | N | N | N |
| Hospital readmission | N | N | N | N |
| Mortality | N | N | N | N |
| Length of Stay (days) | 2 | 4 | 4 | 3 |

## Surgical Approach

Ultrasound guidance was utilized to identify the axillary artery (AA) for percutaneous cannulation. The AA was accessed using a 5 French micropuncture set and upstaged to a 6 French sheath. It was subsequently pre-closed with two Perclose ProGlide percutaneous sutures (Abbott Laboratories, Chicago, IL, USA) and an 8 French sheath was placed for hemostasis. Arteriogram of the selected axillary artery was then performed to verify anatomy and confirm proper positioning. The patient was then fully heparinized for CPB.

## Conclusions

In select patients, percutaneous cannulation of the axillary artery represents an innovative and less invasive alternative to facilitate CPB during robotic cardiac procedures. In our limited single-center case series, we observed relatively short length of stay with early postoperative ambulation. No adverse outcomes were identified within thirty days postoperatively.

Percutaneous cannulation of the axillary artery should be considered as an alternative access site for CPB in patients with extensive peripheral atherosclerotic disease or other contraindications to peripheral cannulation.

## Disclosures

Dr. Guy is a consultant for Edwards Lifesciences, Medtronic, and proctor for Intuitive Surgical.

## References

1. El-Sherief AH, Wu CC, Schoenhagen P, et al. Basics of cardiopulmonary bypass: Normal and abnormal postoperative ct appearances. *Radiographics*. 2013;33(1):63-72.
2. Chan EY, Lumbao DM, Iribarne A, et al. Evolution of cannulation techniques for minimally invasive cardiac surgery A 10-year journey. 2012.