

EVOLUTION OF FEMORAL CANNULATION TECHNIQUES IN MIMVS: A 10-YEAR EXPERIENCE

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Introduction

Minimally invasive mitral valve surgery (MIMVS) via a right mini-thoracotomy has evolved into a well-established alternative to conventional median sternotomy, significantly improving patient satisfaction and accelerating functional recovery by minimizing surgical trauma. A critical and technically demanding cornerstone of this approach remains the establishment of safe peripheral femoro-femoral access to initiate cardiopulmonary bypass (CPB). Historically, access to the femoral artery and vein was routinely established through an open surgical cut-down. [1] Although this traditional method offers direct visual control of vessels, surgical dissection within the sensitive inguinal lymphatic triangle carries a relevant risk of access-site morbidity. This includes postoperative lymph fistulas, seromas, and wound healing disorders, which can complicate the clinical course and prolong hospital length of stay. Driven by the advancement of large-bore transcatheter interventions, ultrasound-guided percutaneous femoral puncture has emerged as a less invasive alternative for cardiac surgeons. Combining real-time ultrasound guidance with specialized equipment—such as smart venous cannulas for optimized drainage and plug-based vascular closure devices (e.g., the MANTA system)—allows for a completely percutaneous workflow that minimizes local tissue disruption in the groin.[2]

Study Objective: This study evaluates our 10-year institutional transition from routine open femoral cut-down to standardized, ultrasound-guided percutaneous cannulation in patients undergoing MIMVS. We aimed to analyze how this procedural evolution influenced workflow efficiency, resource utilization, and access-site safety over a full decade of clinical program development. [6]

Methods

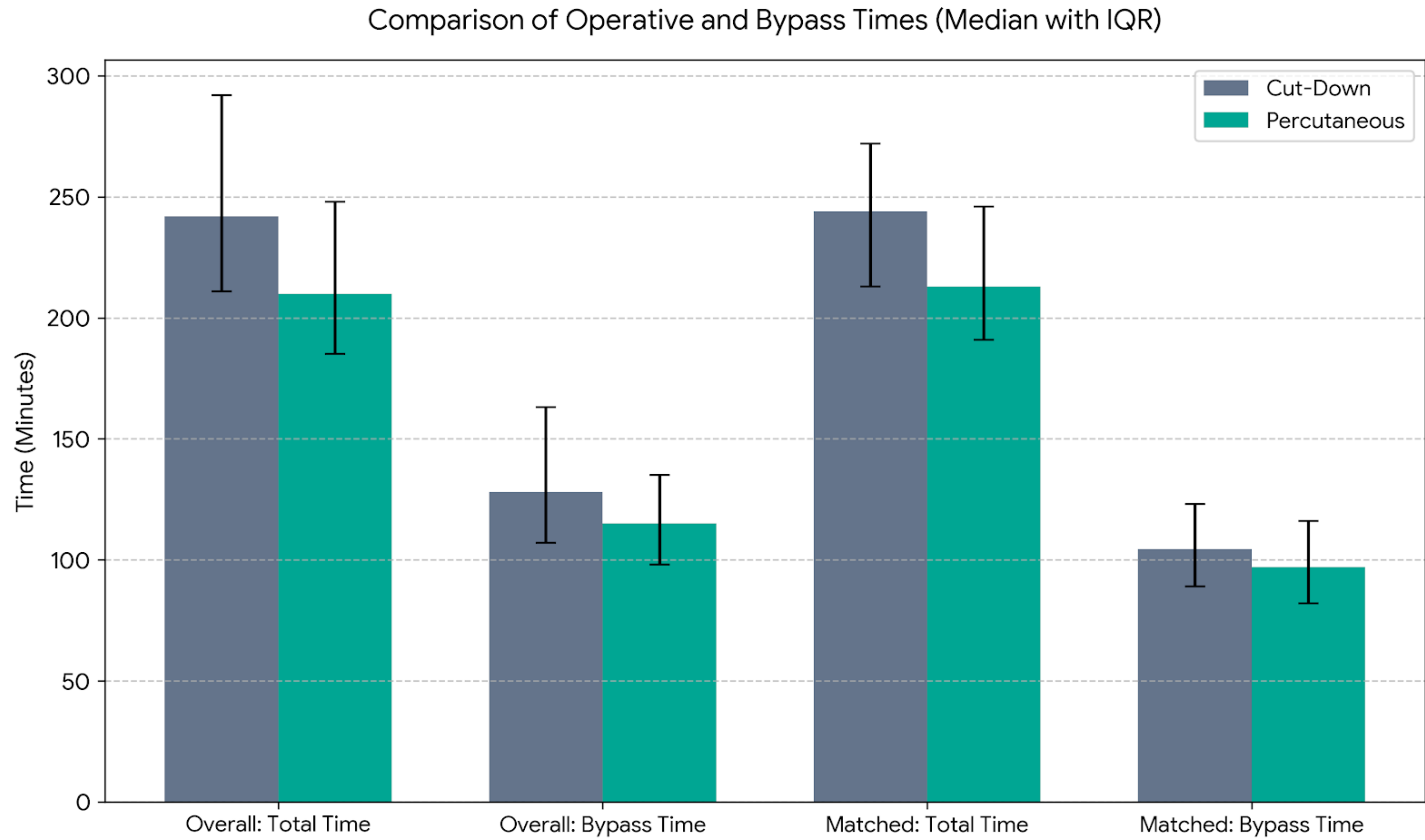
- Study Period:** January 2014 – August 2025
- Cohort:** 575 patients (Cut-down: 393; Percutaneous: 182).
- Technique:** Ultrasound-guided puncture vs. open preparation.
- Analysis:** Retrospective study with Propensity Score Matching (PSM) for 72 matched pairs adjusted for Age, sex, obesity (BMI > 30 kg/m²), EuroSCORE II, NYHA class, COPD, chronic dialysis, and prior cardiac surgery. Unmatched Cohort Tests (N=575): Mann-Whitney U test for continuous parameters; Fisher's exact test or Chi-square test for categorical differences. Matched Cohort Tests (72 pairs): Wilcoxon signed-rank test for continuous outcomes; McNemar's test for binary/categorical endpoints to account for within-pair correlation.

Results & Efficiency

Analysis of patient cohort showed

- the transition to percutaneous access significantly optimized procedural timelines. [3,4]
- Total operative time dropped by approximately half an hour (210 vs. 242 min, $p < 0.0001$) and
- cardiopulmonary bypass times were significantly reduced (115 vs. 128 min, $p < 0.0001$).

This efficiency gain occurred despite temporal increase in reconstructive mitral techniques. Postoperatively, median hospital stays were shortened from 11 to 8 days ($p < 0.0001$). [5] Most notably, local lymphatic complications were completely eliminated (0% vs. 4.3%, $p = 0.0004$). [6]



Outcome (Median)	Cut-down	Percutaneous
ICU Stay (Days)	3 [2–5]	2 [2–4]
Hospital Stay (Days)	11 [8–16]	8 [7–11]
30-Day Mortality	4.6%	1.6%

Safety & Closure

The large-bore plug-based MANTA device was utilized in 97.2% of percutaneous cases, demonstrating excellent reliability with a low device-related complication rate of 2.2% (1.1% bleeding, 1.1% limb ischemia) under full surgical heparinization. In the propensity-matched cohort, overall groin complication rates were identical between the open cut-down and percutaneous groups (2.8% vs. 2.8%, $p = 1.00$), confirming that advanced efficiency was achieved without compromising patient safety.

Conclusions

- Institutional transition to ultrasound-guided percutaneous femoral cannulation was found to be a rather **safe, effective, and efficient method in the respective patient cohort (REF) thus,**
- Reducing operative and bypass times.
 - Eliminating lymphatic morbidity.
 - Shortening ICU and hospital stays without increasing vascular risks.

References

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