# Axillary/Subclavian vs Femoral Arterial Cannulation for Peripheral VA-ECMO in Cardiogenic Shock: A Systematic Review and Meta-Analysis

*Authors: Saif-Eddin Dabour, MD; Diya Asad, MD; Elmustafa Hamad; Abdullah Kouli; Muhammad Mian, MD; Sana Tahir, MD; Matthew Frank, MD; Waqas Ullah, MD, FSCAI*

## Background

Femoral arterial cannulation is the default peripheral access strategy for venoarterial extracorporeal membrane oxygenation (VA-ECMO) in many centers, but it may increase the risk of lower-extremity ischemia and access-site complications. Whether axillary/subclavian inflow is associated with different clinical outcomes in adults receiving peripheral VA-ECMO for cardiogenic shock remains uncertain.

## Methods

We performed a systematic review and meta-analysis of retrospective comparative cohort studies evaluating axillary/subclavian versus femoral arterial cannulation for peripheral VA-ECMO in adult cardiogenic shock. PubMed/MEDLINE, Embase, and Cochrane were searched through March 8, 2026. Two reviewers independently screened studies, extracted data, and assessed risk of bias using the Newcastle-Ottawa Scale. Random-effects meta-analyses were performed using Mantel-Haenszel risk ratios (RRs) with 95% confidence intervals (CIs).

## Results

Five studies comprising 1,256 patients were included. In the primary analysis, axillary/subclavian cannulation was not associated with a significant difference in in-hospital mortality compared with femoral cannulation (RR 1.10, 95% CI 0.89-1.37; P=0.37; $I^2$=55%). Cannulation-related limb ischemia numerically favored axillary/subclavian access but was not significantly different and showed substantial heterogeneity (RR 0.37, 95% CI 0.07-2.02; P=0.25; $I^2$=83%). No significant associations were observed for ischemic stroke (RR 1.27, 95% CI 0.84-1.92; P=0.26; $I^2$=0%), successful ECMO weaning/decannulation (RR 0.90, 95% CI 0.65-1.26; P=0.55; $I^2$=67%), or clinically significant bleeding (RR 1.27, 95% CI 0.90-1.79; P=0.17; $I^2$=54%). Mortality findings were directionally consistent in sensitivity analyses.

Short-term mortality

| Study or Subgroup | Axillary/Subclavian Access Events | Total | Femoral Access Events | Total | Weight | Risk ratio M-H, Random, 95% CI |
|---|---|---|---|---|---|---|
| Ranney 2017 | 7 | 16 | 48 | 79 | 9.1% | 0.72 [0.40 , 1.29] |
| Ohira 2020 | 86 | 218 | 66 | 153 | 22.3% | 0.91 [0.72 , 1.17] |
| Moussa 2022 | 32 | 52 | 150 | 320 | 22.4% | 1.31 [1.03 , 1.68] |
| Do Vale 2025 | 101 | 209 | 74 | 124 | 24.9% | 0.81 [0.66 , 0.99] |
| Telliogiu 2025 | 29 | 38 | 32 | 47 | 21.3% | 1.12 [0.86 , 1.46] |
| **Total (Wald[a])** | | **533** | | **723** | **100.0%** | **0.98 [0.80 , 1.21]** |
| Total events: | 255 | | 370 | | | |

Test for overall effect: Z = 0.16 (P = 0.87)

Heterogeneity: Tau² (DL[b]) = 0.03; Chi² = 11.56, df = 4 (P = 0.02); I² = 65%

Risk ratio M-H, Random, 95% CI

0.01 0.1 1 10 100

Favours Axillary/Subclavian Access | Favours Femoral Access

**Footnotes**

[a]CI calculated by Wald-type method.

[b]Tau² calculated by DerSimonian and Laird method.

Cannulation-related limb ischemia

| Study or Subgroup | Axillary/Subclavian Access Events | Total | Femoral Access Events | Total | Weight | Risk ratio M-H, Random, 95% CI |
|---|---|---|---|---|---|---|
| Ranney 2017 | 1 | 16 | 0 | 79 | 15.7% | 14.12 [0.60 , 331.94] |
| Ohira 2020 | 0 | 218 | 16 | 153 | 17.9% | 0.02 [0.00 , 0.35] |
| Moussa 2022 | 5 | 52 | 22 | 320 | 32.8% | 1.40 [0.55 , 3.53] |
| Do Vale 2025 | 9 | 209 | 13 | 124 | 33.6% | 0.41 [0.18 , 0.93] |
| **Total (Wald[a])** | | **495** | | **676** | **100.0%** | **0.63 [0.12 , 3.32]** |
| Total events: | 15 | | 51 | | | |

Test for overall effect: Z = 0.54 (P = 0.59)

Heterogeneity: Tau² (DL[b]) = 1.96; Chi² = 15.28, df = 3 (P = 0.002); I² = 80%

Risk ratio M-H, Random, 95% CI

0.01 0.1 1 10 100

Favours Axillary/Subclavian Access | Favours Femoral Access

**Footnotes**

[a]CI calculated by Wald-type method.

[b]Tau² calculated by DerSimonian and Laird method.

Study-defined cannulation-related bleeding

| Study or Subgroup | Axillary/Subclavian Access Events | Total | Femoral Access Events | Total | Weight | Risk ratio M-H, Random, 95% CI |
|---|---|---|---|---|---|---|
| Ranney 2017 | 6 | 16 | 11 | 79 | 12.5% | 2.69 [1.17 , 6.22] |
| Ohira 2020 | 33 | 218 | 26 | 153 | 25.4% | 0.89 [0.56 , 1.43] |
| Moussa 2022 | 36 | 52 | 198 | 320 | 41.9% | 1.12 [0.92 , 1.37] |
| Telliogiu 2025 | 17 | 38 | 13 | 47 | 20.3% | 1.62 [0.90 , 2.89] |
| **Total (Wald[a])** | | **324** | | **599** | **100.0%** | **1.27 [0.90 , 1.79]** |
| Total events: | 92 | | 248 | | | |

Test for overall effect: Z = 1.37 (P = 0.17)

Heterogeneity: Tau² (DL[b]) = 0.06; Chi² = 6.48, df = 3 (P = 0.09); I² = 54%

Risk ratio M-H, Random, 95% CI

0.01 0.1 1 10 100

Favours Axillary/Subclavian Access | Favours Femoral Access

**Footnotes**

[a]CI calculated by Wald-type method.

[b]Tau² calculated by DerSimonian and Laird method.

Successful ECMO weaning / explantation

| Study or Subgroup | Axillary/Subclavian Access Events | Total | Femoral Access Events | Total | Weight | Risk ratio M-H, Random, 95% CI |
|---|---|---|---|---|---|---|
| Ohira 2020 | 171 | 218 | 111 | 153 | 47.3% | 1.08 [0.96 , 1.22] |
| Moussa 2022 | 18 | 52 | 160 | 320 | 29.6% | 0.69 [0.47 , 1.02] |
| Telliogiu 2025 | 15 | 38 | 21 | 47 | 23.1% | 0.88 [0.53 , 1.47] |
| **Total (Wald[a])** | | **308** | | **520** | **100.0%** | **0.90 [0.65 , 1.26]** |
| Total events: | 204 | | 292 | | | |

Test for overall effect: Z = 0.60 (P = 0.55)

Heterogeneity: Tau² (DL[b]) = 0.06; Chi² = 6.08, df = 2 (P = 0.05); I² = 67%

Risk ratio M-H, Random, 95% CI

0.01 0.1 1 10 100

**Footnotes**

[a]CI calculated by Wald-type method.

[b]Tau² calculated by DerSimonian and Laird method.

Ischemic stroke

| Study or Subgroup | Axillary/Subclavian Access Events | Total | Femoral Access Events | Total | Weight | Risk ratio M-H, Random, 95% CI |
|---|---|---|---|---|---|---|
| Ranney 2017 | 2 | 16 | 6 | 79 | 7.5% | 1.65 [0.36 , 7.43] |
| Ohira 2020 | 20 | 218 | 10 | 153 | 32.1% | 1.40 [0.68 , 2.91] |
| Moussa 2022 | 9 | 52 | 50 | 320 | 41.0% | 1.11 [0.58 , 2.11] |
| Do Vale 2025 | 13 | 209 | 6 | 124 | 19.3% | 1.29 [0.50 , 3.30] |
| **Total (Wald[a])** | | **495** | | **676** | **100.0%** | **1.27 [0.84 , 1.92]** |
| Total events: | 44 | | 72 | | | |

Test for overall effect: Z = 1.12 (P = 0.26)

Heterogeneity: Tau² (DL[b]) = 0.00; Chi² = 0.36, df = 3 (P = 0.95); I² = 0%

Risk ratio M-H, Random, 95% CI

0.01 0.1 1 10 100

Favours Axillary/Subclavian Access | Favours Femoral Access

**Footnotes**

[a]CI calculated by Wald-type method.

[b]Tau² calculated by DerSimonian and Laird method.

Need for dialysis / RRT

| Study or Subgroup | Axillary/Subclavian Access Events | Total | Femoral Access Events | Total | Weight | Risk ratio M-H, Random, 95% CI |
|---|---|---|---|---|---|---|
| Ranney 2017 | 0 | 16 | 11 | 79 | 3.7% | 0.20 [0.01 , 3.31] |
| Ohira 2020 | 63 | 218 | 55 | 153 | 60.0% | 0.80 [0.60 , 1.08] |
| Telliogiu 2025 | 14 | 38 | 12 | 47 | 36.3% | 1.44 [0.76 , 2.74] |
| **Total (Wald[a])** | | **272** | | **279** | **100.0%** | **0.95 [0.55 , 1.63]** |
| Total events: | 77 | | 78 | | | |

Test for overall effect: Z = 0.20 (P = 0.84)

Heterogeneity: Tau² (DL[b]) = 0.11; Chi² = 3.72, df = 2 (P = 0.16); I² = 46%

Risk ratio M-H, Random, 95% CI

0.01 0.1 1 10 100

Favours Axillary/Subclavian Access | Favours Femoral Access

**Footnotes**

[a]CI calculated by Wald-type method.

[b]Tau² calculated by DerSimonian and Laird method.

## Conclusion

In currently available retrospective comparative cohorts, axillary/subclavian versus femoral arterial cannulation for peripheral VA-ECMO in adult cardiogenic shock was not associated with a significant difference in in-hospital mortality or other pooled clinical outcomes. Although upper-extremity inflow was directionally associated with less limb ischemia, the estimate was imprecise and highly heterogeneous, and current data do not support a preferred access strategy.