SAFETY AND EFFICACY OF MODERN PERCUTANEOUS MECHANICAL THROMBECTOMY DEVICES IN ACUTE PULMONARY EMBOLISM: A SYSTEMATIC REVIEW AND META-ANALYSIS OF INVESTIGATIONAL DEVICE EXEMPTION TRIALS AND PROSPECTIVE MULTI-CENTER REGISTRIES

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BACKGROUND

- Acute pulmonary embolism is the third leading cause of cardiovascular death in the United States
- Catheter-based interventions have emerged as important modalities for treatment of selected patients with intermediate or high-risk acute PE.
- Alongside catheter-directed thrombolysis, a variety of large bore mechanical thrombectomy devices have emerged as adjuncts to anticoagulation.

METHODS

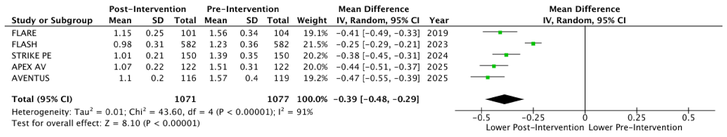
- A systematic literature search spanning PubMed/Medline, Embase, CENTRAL, and ClinicalTrials.gov databases (from inception to 14 May 2025) was conducted to retrieve investigational device exemption trials and large prospective multicenter registries or randomized controlled trials evaluating large bore (12F and above) thrombectomy devices for the management of acute PE.
- Mean differences and proportions were pooled using random effects model.
- Statistical analyses were performed using RevMan version 5.4.1 and OpenMeta[Analyst] version 10.12.

RESULTS

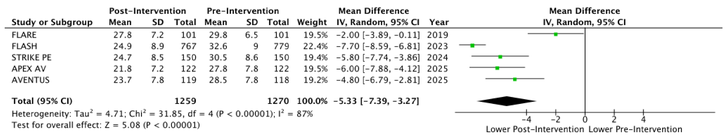
- 6 studies (FlowTriever: FLARE, FLASH and PEERLESS; Alphavac F1885: APEX AV, Indigo: STRIKE-PE Interim Analysis, Aventus: AVENTUS) with a total of 1,571 patients were included

FIGURES

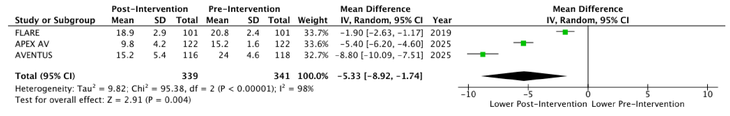
A. Change in RV/LV ratio



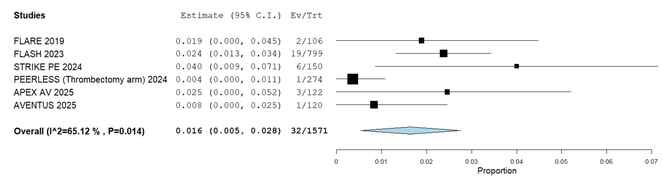
B. Change in Mean pulmonary artery pressure (MPAP)



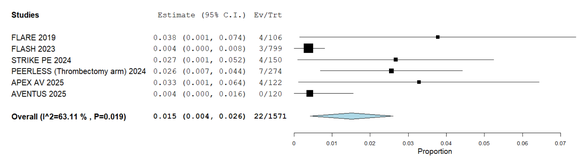
C. Change in Modified Miller Score



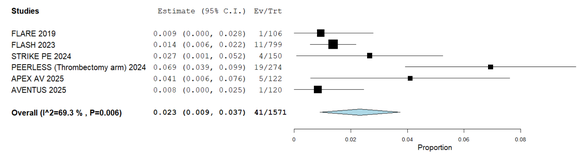
D. Adjunctive therapy use



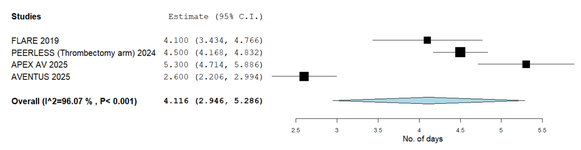
E. Device or procedure related major adverse events



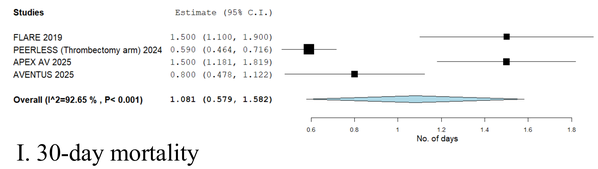
F. Major bleeding



G. Hospital length of stay (days)



H. ICU length of stay (days)



I. 30-day mortality

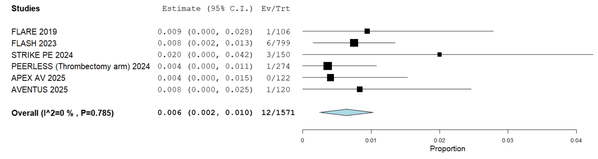


Fig A-I: Forest plots demonstrating safety and efficacy outcomes for large bore mechanical thrombectomy devices: A) Change in RV/LV ratio, B) Change in mean pulmonary artery pressure C) Change in Modified Miller Score, D) Adjunctive therapy use (systemic thrombolysis, catheter directed thrombolysis or different mechanical thrombectomy device), E) Device or procedure related major adverse events, F) Major bleeding, G) Hospital length of stay (days), H) ICU length of stay (days), I) 30-day mortality.

RESULTS (CONT'D)

- Pooled estimate reported change in:
  - RV/LV ratio by -0.39 (95% CI: -0.48, -0.29, I^2= 91%)
  - Mean pulmonary artery pressure by -5.33 mmHg (95% CI: -7.39, -3.27, I^2=87%)
  - Modified miller score by -5.33 (95% CI -8.92, -1.74, I^2= 98%)
- Pooled estimate for hospital and ICU length of stay were 4.11 days (95% CI: 2.95, 5.29, I^2=96%) and 1.08 days (95% CI 0.58, 1.58, I^2=93%), respectively
- Pooled estimate for adjunctive therapy usage was 1.6% (95% CI 0.005, 0.028, I^2= 65%)
- Pooled estimate for device or procedure related major adverse events, major bleeding, and 30-day mortality were 1.5% (95% CI 0.004, 0.026, I^2=63%), 2.3% (95% CI 0.009, 0.037, I^2=69%) and 0.6% (95% CI 0.002, 0.010, I^2=0%) respectively

CONCLUSION

- Large bore mechanical thrombectomy devices provide safe and efficacious treatment options in the management of acute PE.
- Further research is needed to identify reasons contributing to high heterogeneity in outcomes between studies comparing different thrombectomy devices

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DISCLOSURES

The authors declare that they have no relevant financial interests related to the research in this paper