MANAGEMENT OF MECHANICAL PROSTHETIC HEART VALVE (PHV) THROMBOSIS

Prepared by **Dr. Sidhartha Mullapudi**, DrNB (Cardiology), MD (General Medicine)
Last reviewed: October 2026

I CORE CONCEPTS AND CLINICAL URGENCY

- **The Clinical Emergency:** Mechanical PHV thrombosis is a life-threatening complication, more common in the **Mitral** and **Tricuspid** positions due to lower flow velocities.
- **The Pathophysiology:** It results from inadequate anticoagulation, leading to the formation of an obstructive clot that restricts leaflet motion, causing acute heart failure or systemic embolism.
- **The Critical Distinction:** One must differentiate **Thrombus** (acute, soft, associated with sub-therapeutic INR) from **Pannus** (chronic, fibrous ingrowth, slow progression, independent of INR).

II DIAGNOSTIC WORKUP FOR MANAGEMENT

- **Cine-Fluoroscopy:** The gold standard for assessing **leaflet mobility**. A restricted "opening or closing angle" confirms obstruction.
- **Transthoracic (TTE) and Transesophageal Echo (TEE):**
  - Essential to measure the **Mean Gradient**. An increase in gradient (e.g., doubling from baseline) is highly suggestive.
  - TEE is mandatory to quantify the **size of the thrombus** (measured in square cm or mm).
- **Multidetector CT (MDCT):** Highly accurate in differentiating low-attenuation thrombus from high-attenuation pannus.

III MANAGEMENT RECOMMENDATIONS (2021 ESC/EACTS & 2020 ACC/AHA)

The choice of therapy depends on the **Clinical Stability** of the patient and the **Size/Location** of the thrombus.

A Obstructive Thrombus (Critical Stenosis)

- **Emergency Surgery (ESC Class I):** Preferred for critically ill patients (NYHA Class 3 or 4) without serious comorbidity who are good surgical candidates. (2020 ACC/AHA gives a Class I recommendation to either urgent low-dose slow-infusion fibrinolysis or emergency surgery for symptomatic obstructive left-sided thrombosis.)
- **Fibrinolysis (ESC Class IIa):** Considered if:
  - Surgery is high-risk or unavailable.
  - The thrombus is on the Right Side (Tricuspid).
  - The patient is in extremis (too unstable for the OR).

B Non-Obstructive Thrombus (Incidental Finding)

- **Small Thrombus (Less than 10 mm or 0.8 square cm):** Managed with optimized **Heparin/Warfarin** therapy.
- **Large Thrombus (Greater than 10 mm):**
  - If associated with embolism: Surgery or Fibrinolysis is indicated.
  - If asymptomatic: Intense anticoagulation is tried first; if the thrombus does not regress, surgery is indicated to prevent future embolism.

IV THE EVIDENCE BASE: LANDMARK TRIALS

- **The TROIA Study (Özkan et al., 2013):** A large multicentre observational registry of TEE-guided fibrinolysis. **Low-Dose, Slow-Infusion Tissue Plasminogen Activator (tPA)** (25 mg over 6 hours, repeated if needed) was associated with fewer complications (embolism and bleeding) than higher-dose rapid regimens while maintaining high success rates; the ultra-slow 25-hour infusion was evaluated in later studies by the same group.
- **PROACT and PROACT Xa Trials:** PROACT showed that a lower INR target (1.5 to 2.0) after 3 months was non-inferior for thromboembolism with less bleeding in the On-X aortic valve specifically; PROACT Xa (apixaban versus warfarin in On-X aortic valves) was stopped early for excess thromboembolic events with apixaban, confirming that vitamin K antagonists remain mandatory for mechanical valves.
- **The "Slow Infusion" Evidence:** Observational series suggest that slower infusion regimens are associated with lower embolic and bleeding complications in stable patients.

V FIBRINOLYSIS PROTOCOL (THE DISTINCTION DATA)

- **Agent:** Recombinant tPA (Alteplase).
- **Dosage:** 25 mg slow infusion over 6 to 25 hours.
- **Monitoring:** Continuous TTE and Fluoroscopy to watch for leaflet "opening."
- **Contraindications:** Large Left Atrial Thrombus, recent stroke, or active internal bleeding.

VI PRACTICAL CONSIDERATIONS IN THE INDIAN CLINICAL CONTEXT

- **The "Sub-Therapeutic" Reality:** Many Indian cases are related to inconsistent drug supply or poor INR monitoring in rural areas.
- **The Fibrinolysis Preference:** Given the limited access to cardiac surgical units in many parts of India, **Low-Dose, Slow-Infusion Fibrinolysis** is often the practical first-line strategy for stable patients in non-surgical centers.
- **The Streptokinase Alternative:** While tPA is preferred, **Streptokinase** (2.5 Lakh units bolus followed by 1 Lakh units per hour) is still a valid, cost-effective alternative in Indian settings if tPA is unaffordable.
- **Post-Recovery Plan:** Structured anticoagulation education before discharge is essential, together with **Home INR monitoring** if feasible to prevent recurrence.

KEY REFERENCES

- **Vahanian A, Beyersdorf F, Praz F, et al.:** 2021 ESC/EACTS Guidelines for the management of valvular heart disease, *European Heart Journal*, 2022.
- **Otto CM, Nishimura RA, Bonow RO, et al.:** 2020 ACC/AHA Guideline for the Management of Patients With Valvular Heart Disease, *Circulation*, 2021.
- **Özkan M, Gündüz S, Biteker M, et al.:** Comparison of different TEE-guided thrombolytic regimens for prosthetic valve thrombosis: the TROIA trial, *JACC: Cardiovascular Imaging*, 2013.