SURGICAL APPROACHES TO TV DISEASE; TECHNIQUES; GUIDELINE RECOMMENDATIONS

Prepared by **Dr. Sidhartha Mullapudi**, DrNB (Cardiology), MD (General Medicine)
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I SURGICAL APPROACHES (ACCESS & INCISIONS)

- **Median Sternotomy:** The traditional and most common approach. Mandatory when Tricuspid Valve (TV) surgery is performed concomitantly with left-sided heart surgery (e.g., Mitral Valve Replacement or CABG).
- **Minimally Invasive Right Anterolateral Minithoracotomy:** The preferred approach for *isolated* TV surgery, especially in "re-do" cases (patients with prior sternotomy for left-sided lesions). It avoids re-entry injuries and reduces bleeding.
- **Beating Heart Surgery:** Isolated TV surgery is frequently performed on a beating heart (on cardiopulmonary bypass but without aortic cross-clamping or cardioplegia). This avoids ischemic arrest and protects the vulnerable Right Ventricle (RV) from post-operative stunning.

II SURGICAL TECHNIQUES (REPAIR VS. REPLACEMENT)

- **Guideline Maxim:** Tricuspid Valve Repair (TVr) is generally preferred over Tricuspid Valve Replacement (TVR), with lower perioperative mortality and better long-term survival.

A Tricuspid Valve Repair (TVr) Techniques

- **Ring Annuloplasty (The Gold Standard):** Insertion of a rigid or semi-rigid prosthetic ring.
  - *Mechanism:* Secondary Tricuspid Regurgitation (TR) is primarily driven by annular dilation along the free wall (anterior and posterior leaflets). The septal annulus is fixed. The ring downsizes the annulus and restores the native 3D saddle shape.
  - *Evidence:* Rigid/semi-rigid rings have significantly lower TR recurrence rates compared to flexible bands.
- **Suture Annuloplasty (De Vega Procedure):** A historical, purse-string suture placed around the annulus to cinch it down.
  - *Current Status:* Largely abandoned in contemporary practice due to unacceptably high rates of late TR recurrence. Only used if rings are unavailable or in active endocarditis to avoid foreign material.
- **Leaflet Augmentation (Anterior Leaflet Patching):** Used in severe tethering (e.g., advanced secondary TR with apical displacement of leaflets). A pericardial patch is used to enlarge the anterior leaflet to ensure coaptation.
- **Bicuspidalization (Kay Annuloplasty):** Obliterates the posterior leaflet to create a two-leaflet valve. Rarely used in modern practice.

B Tricuspid Valve Replacement (TVR)

- Reserved for valves that are anatomically unrepairable (e.g., severe rheumatic destruction, carcinoid heart disease, severe radiation damage, or massive infective endocarditis).
- **Valve Choice: Bioprosthetic valves are strongly preferred over mechanical valves** in the tricuspid position.
  - *Reason:* The right heart is a low-pressure, low-velocity system. Mechanical valves in the TV position carry an exceptionally high risk of thrombosis. Furthermore, managing strict INR targets is difficult in patients with congestive hepatopathy (liver dysfunction from right heart failure).

III GUIDELINE RECOMMENDATIONS FOR SURGERY (ACC/AHA 2020 & ESC/EACTS 2025)

A Concomitant TV Surgery (During Left-Sided Surgery)

- **Class I:** TV surgery is recommended for patients with **severe TR** (primary or secondary) undergoing left-sided valve surgery.
- **Class IIa:** TV repair should be considered for patients with **mild or moderate secondary TR** undergoing left-sided surgery IF there is:
  - Annular dilation (Tricuspid annulus diameter >= 40 mm, or > 21 mm/m2 on echocardiography).
  - Prior history of right heart failure.
  - *Rationale:* Prophylactic repair prevents the inevitable late progression of TR, which carries prohibitive mortality if a “re-do” isolated TV surgery is required years later.

B Isolated TV Surgery

- **Class I:** Symptomatic severe primary TR without severe RV dysfunction (asymptomatic severe primary TR with progressive RV dilation or dysfunction is a Class IIa indication).
- **Class IIa:** Symptomatic severe isolated secondary TR despite optimal medical therapy (diuretics), provided the RV and LV are not severely dysfunctional and severe pulmonary hypertension is absent.
- **Futility:** Surgery is generally futile in patients with severe, irreversible RV failure or end-stage multi-organ failure (cardiac cirrhosis, severe renal failure). The surgical mortality in this “too late” cohort exceeds 20-30%.

IV CRITICAL PERIOPERATIVE COMPLICATIONS

- **Complete Heart Block (CHB):** The Atrioventricular (AV) node and the Bundle of His run superficially along the triangle of Koch, immediately adjacent to the septal leaflet of the tricuspid valve. Suture placement here carries a 5-10% risk of CHB requiring a permanent pacemaker.
- **Unmasking RV Failure:** Severe TR acts as a low-resistance “pop-off” valve for a failing RV. When the surgeon fixes the TR, the RV must suddenly pump against the full pulmonary vascular resistance. This acute increase in afterload can cause profound acute RV failure post-operatively, requiring inotropes (Milrinone, Epinephrine) or inhaled Nitric Oxide (iNO).