Impact of Concomitant Tricuspid Annuloplasty on Tricuspid Regurgitation Right Ventricular Function and Pulmonary Artery Hypertension After Degenerative Mitral Repair

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Disclosures

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• None of the sponsoring organizations had any role in the design and conduct of the study.

• None of the other authors have any conflicts of interest to disclose.
Functional tricuspid regurgitation
Rationale

1. Moderate TR is not benign
2. TR is downgraded by intraoperative TEE
3. Correcting left sided lesions alone does not prevent TR
4. TR repair is safe
5. TR repair is effective
Honored Guest’s Address

Cardiac valve surgery—the “French correction”

Alain Carpentier, M.D., Paris, France
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Consensus Guidelines

ACC / AHA 2014

- Class I: TV repair for severe TR in patients undergoing MVR (C)
- Class IIa: TV repair for mild, moderate or greater functional TR in patients undergoing MV surgery, when there is prior evidence of right heart failure or TV dilatation* (B)

* >40mm diameter, or 21mm/m², or >70mm on direct intraoperative measurement

ESC 2012

- Class I: Severe TR in patients undergoing left sided valve surgery (C)
- Class IIa: Mild or moderate secondary TR with dilated annulus* in a patient undergoing left sided valve surgery (C)

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Concomitant tricuspid repair algorithm

Moderate or Severe TR on intra-operative or pre-operative echocardiography? Yes → Repair
Concomitant tricuspid repair algorithm

Moderate or Severe TR on intra-operative or pre-operative echocardiography?

Yes → Repair

No

Assess annular dilatation

Yes → Repair

No → Leave alone

>40mm on 4 chamber prebypass TEE? Or obvious size mismatch between leaflet and annulus?
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Fig. 16. Sizing is performed by measuring the anterior leaflet area using obturators.
Concomitant tricuspid repair algorithm

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Yes

No

Assess annular dilatation

>40mm on 4 chamber prebypass TEE? Or obvious size mismatch between leaflet and annulus?

Yes

No

Leave alone

Repair
Methods

• Inclusion criteria:
  – Consecutive patients undergoing primary surgery for degenerative mitral regurgitation
  – 2003-2011

• Exclusion criteria:
  – Aortic valve intervention
  – Severe coronary artery disease
  – Reoperation
Methods

645 consecutive degenerative MV repairs

Moderate or severe TR on intra-operative or pre-operative echocardiography? Yes n=72

Repair n=72
Methods

645 consecutive degenerative MV repairs

Moderate or severe TR on intra-operative or pre-operative echocardiography?

Yes
n=72

No

Assess annular dilatation

Yes
n=347

>40mm on 4 chamber prebypass TEE? (n=126)
Or obvious size mismatch between leaflet and annulus? (n=221)

No

Leave alone n=226

Repair n=419
Methods

645 consecutive degenerative MV repairs

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Yes
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No

Leave alone n=226
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**Tricuspid regurgitation grade**

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*Tricuspid regurgitation grade*

| None or trace                      | 59%                   | 31%                | <0.001  |
| Mild                               | 42%                   | 52%                |         |
| Moderate                           | 0%                    | 15%                |         |
Results

- Overall operative mortality was 0.6% (n=4), mitral repair rate was 99.8%
- Tricuspid repair was not associated with increased operative mortality or morbidity (p=0.6)
- There was no difference in implantation of permanent pacemakers in the tricuspid repair group (2.4%, n=10) and the control group (1.3%, n=3) (p=0.6)
- Clinically significant tricuspid stenosis was not observed (mean gradient 2.1mmHg)
- 7-year survival for the tricuspid group was 91±5% versus 97±2% in the control group (p=0.1)
Freedom from moderate or severe TR

![Graph showing freedom from moderate or severe TR over years since surgery. The graph includes data points for MVR only and MVR+TVR patients, showing a trend towards lower events in the MVR+TVR group. The hazard ratio (HR) is 0.26 (95% CI 0.07-0.94), with P=0.04.]
Change in pulmonary artery pressure
Change in right atrium area

![Graph showing change in right atrium area over time comparing Mitral only and MVR+TVR groups.](chart)

- Preop: Mitral only 16, MVR+TVR 18
- Predis: Mitral only 16, MVR+TVR 18
- <1 y: Mitral only 16, MVR+TVR 16
- 1-3 y: Mitral only 16, MVR+TVR 16
- 3-5 y: Mitral only 14, MVR+TVR 14

Significant difference observed before and after intervention with P<0.001.

Mean follow-up duration: 4.9 years.
Change in patients with RV dysfunction

![Graph showing percent of patients with RV dysfunction over different time periods and treatment groups.](image-url)
Change in patients with RV dysfunction

Percent of Patients With Normal RV Function (%)

Years Since Surgery

MVR only 226
MVR+TVR 419

HR=1.40 (95% CI 1.06-1.96), P=0.02
Summary

- This strategy selects patients with higher prevalence of AF, worse TR grade, more RV dysfunction and tricuspid annular dilatation, and worse pulmonary artery hypertension to undergo concomitant tricuspid valve repair.

- These patients were more likely to be free from significant TR in long term follow-up, and more likely to see an improvement in their pulmonary artery pressures and right-sided remodelling.
Conclusions

- Tricuspid regurgitation can be nearly eliminated by a strategy of routine ring annuloplasty in patients with moderate TR or tricuspid annular dilatation.

- This can be achieved without adverse clinical consequences and is associated with evidence of enhanced long-term right-sided remodelling.

- These findings confirm current guideline recommendations for routine tricuspid repair of mild or greater functional tricuspid regurgitation with tricuspid annular dilatation.
Conclusions

- Further, in patients with risk factors for post-operative TR such as AF, pulmonary artery hypertension or RV dysfunction and equivocal echocardiographic findings, our data supports a strategy of direct intra-operative evaluation.
Impact of Concomitant Tricuspid Annuloplasty on Tricuspid Regurgitation, Right Ventricular Function, and Pulmonary Artery Hypertension After Repair of Mitral Valve Prolapse

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