Percutaneous technologies to correct TR: Myth or Reality?

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Disclosures

- Ownership Interest: Millipede and Pipeline
TR is BAD

Decreased CO
Fatigue, decreased exercise tolerance
“Right-sided” Heart Failure
Ascites, edema, decreased appetite, fullness

FTR - feel terrible

Valve repair for functional tricuspid valve regurgitation: anatomical and surgical considerations
FTR increases Mortality

Severe and MODERATE TR increase mortality independent of PASP, LVEF, IVC size, RV size/ function, 5223 pts

Severe and moderate TR decreases survival.

Topilsky. JACC 2014.

Having TR is BAD!
TR after MitraClip for FMR

More TR at baseline - worse outcome

Moderate or Severe TR is BAD...even percutaneously!

FTR: Reality

Mod/severe TR - BAD
What size?

NORMAL TRICUSPID ANNULAR DIMENSION

\[ 2.8 \pm 0.5 \text{ cm} \]

Late TR after Functional MR Surgery


More TR with ↑ TV annulus size
FTR: Reality

Mod /severe TR - Bad
Dilated annulus - Bad
Secondary Tricuspid Regurgitation or Dilatation: Which Should Be the Criteria for Surgical Repair?

Gilles D. Dreyfus, MD, Pierre J. Corbi, MD, K. M. John Chan, AFRCS, and

311 Patients MV Repair

Preop TR 0.7 – 0.9

93 % no/trace/mild

7 % moderate

NONE Severe!
TR Does Not Just “Go Away” After MVr

311 undergoing MVr, mostly degenerative, all with dilated TV annulus
TR Worsening by > 2 Grades

“Undersized” TV repair for FTR

Undersized Tricuspid Annuloplasty Rings Optimally Treat Functional Tricuspid Regurgitation

Mehrdad Ghoreishi, MD, Jamie M. Brown, MD, Craig E. Stauffer, BS, Cindi A. Young, Mary J. Byron, PA-C, Bartley P. Griffith, MD, and James S. Gammie, MD
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Background. In contrast to mitral valve repair, residual and recurrent regurgitation after tricuspid valve (TV) repair for functional tricuspid regurgitation (TR) is common. We have systematically used undersized, rigid 3-dimensional annuloplasty rings to treat functional TR.

Methods. From March 2006 to October 2009, 101 consecutive patients with moderate or greater functional TR underwent TV repair with an undersized rigid 3-dimensional annuloplasty ring. All patients had a predischarge echocardiography evaluation in a core echocardiography laboratory. Follow-up echocardiography was available for 96% of surviving patients. Mean follow-up was 17 ± 9 months.

Results. Twenty-nine percent of patients had undergone previous cardiac operations, 74% were in New York Heart Association functional class III or IV, and 48% had atrial fibrillation. Mitral valve operations were performed in 93 patients, aortic valve operations in 17, coronary artery bypass grafting in 21, and CryoMaze procedures in 40. Size 26 or 28 rigid tricuspid annuloplasty rings were used in 88% of patients, and no ring larger than a 28 has been used since November 2008. The operative mortality rate was 6% (n = 6). Freedom from significant TR (TR > moderate) at hospital discharge, as assessed by the clinical core laboratory, was 97%. Only 3% of patients had TR greater than moderate during follow-up. No patient required TV reoperation. New postoperative permanent pacemakers were inserted in 3 patients.

Conclusions. Tricuspid valve repair with an undersized (size 26 or 28) rigid 3-dimensional annuloplasty ring is the method of choice for reliable and durable treatment of functional TR.

(Ann Thorac Surg 2011;92:89–96)
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Actually Re-NORMAL size!
“Undersized” TV repair for FTR

Preoperative

Predischarge

Follow-up (mean = 1 yr)
Impact of Concomitant Tricuspid Annuloplasty on Tricuspid Regurgitation, Right Ventricular Function, and Pulmonary Artery Hypertension After Repair of Mitral Valve Prolapse

Joanna Chikwe, MD, Shinobu Itagaki, MD, Anelechi Anyanwu, MD, David H. Adams, MD

CONCLUSIONS In patients with moderate TR or tricuspid annular dilation who were undergoing degenerative mitral repair, concomitant tricuspid annuloplasty is safe, effective, and associated with improved long-term right-sided remodeling. Routine treatment of moderate TR or tricuspid annular dilation at the time of MV repair appears to be beneficial. (J Am Coll Cardiol 2015;65:1931-8) © 2015 by the American College of Cardiology Foundation.

Far less TR, better RV
NO ↑ mortality or PPM
Outcomes of Guideline directed repair of FTR performed during MV surgery

Ward, Romano, Bolling: JTCVS 2018

262 pts TVr, mod or < mod TR, 26/28/30 ring
No mortality, No TS, RV improved

1% progression to severe TR,
2.6 % de novo PPM rate
FTR : Reality

Mod/severe TR - BAD
TR ring - GOOD
Do many patients have TR?

STS Database: 58,000 Patients Isolated MR

- Moderate TR: 12.4%
- Severe TR: 7.1%
- Moderate or Severe: 19.5%

Mayo: 145/699
- 21.8% Mod/Sev TR

Matsuyama: 46/174
- 26% Mod + TR
Annular Dilation / Shape Change of FTR:

75% - all cases of MR!

Normal Tricuspid Annulus

Tricuspid Annulus with Functional TR

TR is ignored!

STDS Database

60,000

MR + TR

Annual New MR

Annual MR Surgeries

Annual TR Surgeries

7,000 TVr

MR - 4,000,000

TR - 1,600,000

250,000
Why Not Fix TR at Surgery?

- 136 pts, mostly TV repair
- 8 yr follow up, PPM in 21%

I HATE PACEMAKERS!

Cumulative survival (%)

Follow-up (years)

Patients at risk

PM + group

PM - group

\( p = 0.050 \)
Tricuspid Repair Rate when fixing MR

Based on Preop TR Grade

Percent of Patients Having Tricuspid Repair

Source: STS Database, N = 46500
V 2.73 2011-2013
FTR: Reality

Mod/severe TR - Bad
TR ring - Good
TVR - Sad
Percutaneous Implications for TR
Tricuspid Regurgitation
4-TECH

Step 1: Access via Inferior Vena Cava
Step 2: Aim at the anterior annulus
Step 3: Implant the anchor on the annulus
Step 4: Pull tension, check, secure.
Tricuspid Regurgitation
Mitralign... Trialign
FTR: Perc McKay ?

FAILED
Additional Pledget Pair Configuration

- 4 pledgets
- 2 Locks
- Target: Full Posterior Annulus
Perc DeVega ?
12/14 patients received one pair of implants
- Average annular reduction – 35%
- Average EROA reduction – 58%
- Adverse event – 1 access complication

Trialign Compassionate Use
Acute Reduction: Goal accomplished
TR goal is different..

TR grades 1-4 and...

5+ “massive”

6+ “torrential”
FTR: Percutaneous “other things”

Remain calm!

Carry on!
FTR Surgery : Percutaneous Implications

TV Perc Rings !
Tricuspid Regurgitation
Cardioband
Pre-op Echo : 4+ MR, 3-4+ TR
Post MVR / TVR Millipede FLUORO
24 month Post MVR / TVR Millipede TTE
24 month Post MVR / TVR Millipede TTE
Tricuspid Regurgitation - Reality

**TR is BAD**

“The biology of TR will not change with the method of therapy”

A new grading method will not “fool” nature
TR severity - reality

Sustained, meaningful reduction of TR
TR  Percutaneous : Myth and reality

Less impact...Earlier intervention

Best TR is zero

Good enough ?  1-2+TR

Reality : Huge market - $$

Patients want it...it will happen