Updates in Tricuspid Valve Surgery

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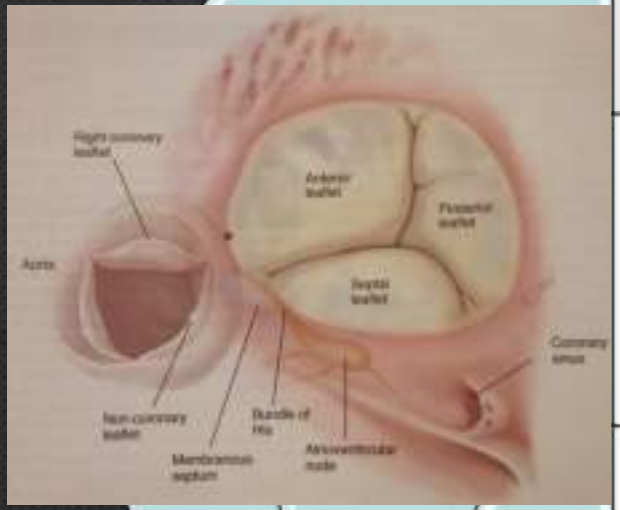


Right-sided cardiac valvular disease has traditionally been considered less clinically important than mitral or aortic valve pathology.

Its optimal management remains controversial.

Patients are rarely referred for isolated surgical tricuspid valve (TV) repair or replacement, and most procedure are done in the context of other planned cardiac surgeries

European Journal of Cardio-Thoracic Surgery 43 (2013) 2–8
doi:10.1093/ejcts/ezs441 Advance Access publication 3 August 2012

REVIEW

Role of concomitant tricuspid surgery in moderate functional tricuspid regurgitation in patients undergoing left heart valve surgery

Balakrishnan Mahesh, Francis Wells, Samer Nashef and Sukumaran Nair*

FTR Severity	Incidence %
Overall	27-30
Sever	7-14
Moderate	15-30
Mild	74-86

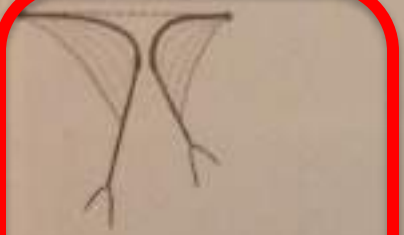
Until recently, surgical avoidance of TV repair was easily accepted in patients with Functional TR

TV repair remains too infrequent procedure at most surgical centers

Moderate to severe TR affects approximately 1.6 million patients in the United States,

Only 8,000 undergo tricuspid surgery annually

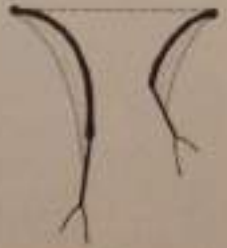
Carpentier's Functional Classification



Type I
Normal leaflet motion

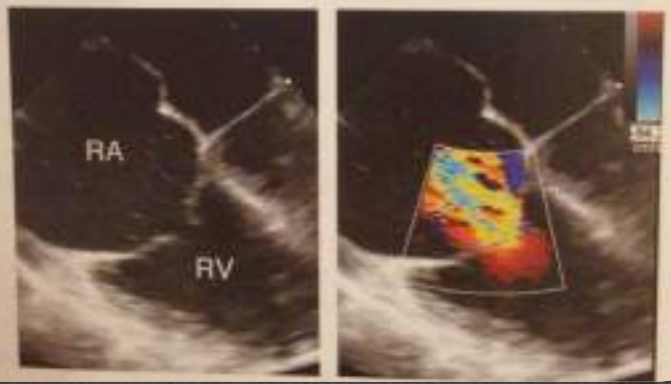
Type II
Leaflet prolapse (ex
leaflet motion)

Type IIIa
Restricted leaflet motion
(diastolic)



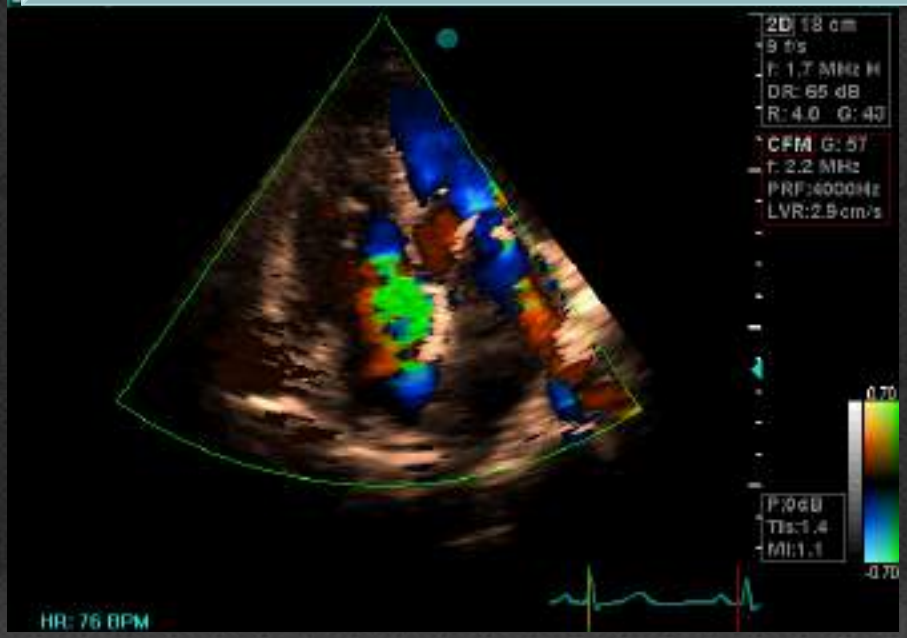
Type IIIb
Restricted leaflet mo
(systolic)

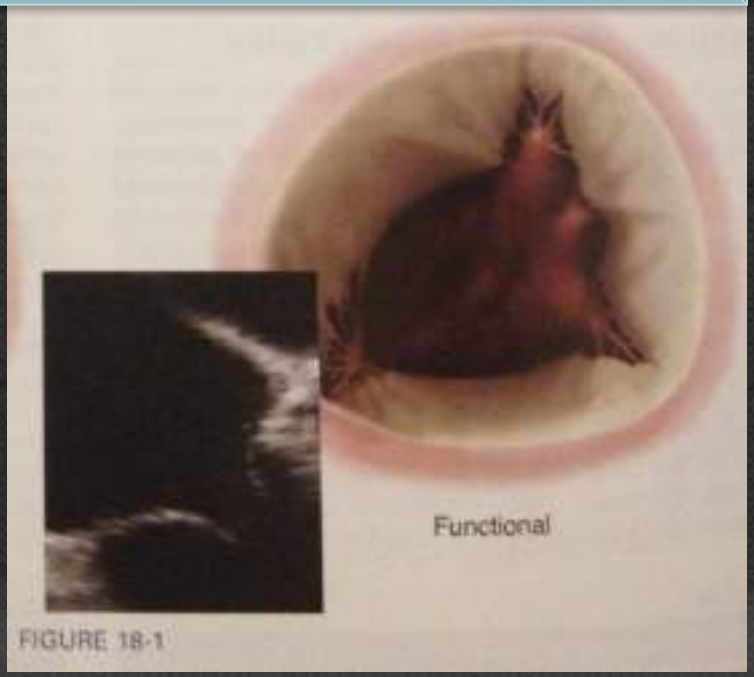
Type I -
Normal leaflet
motion

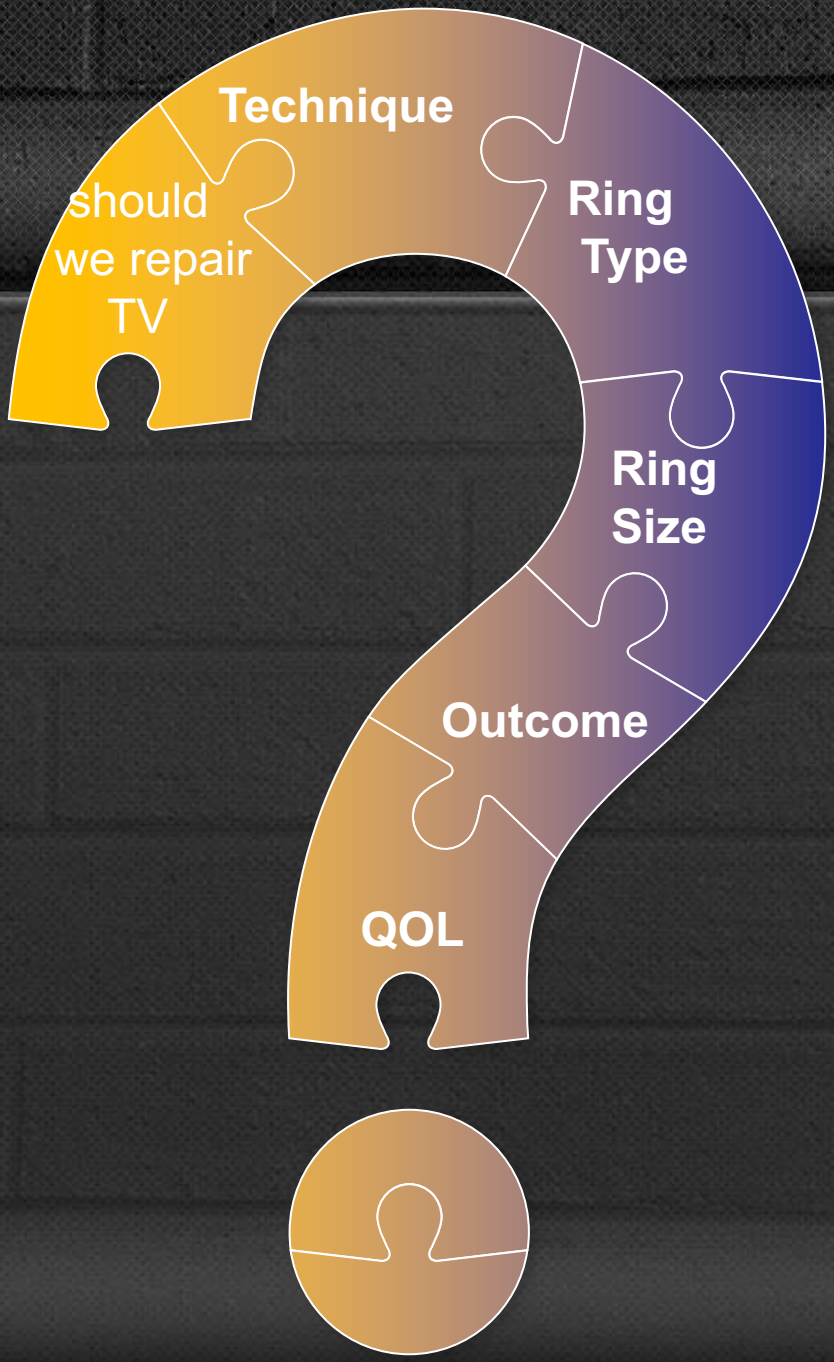


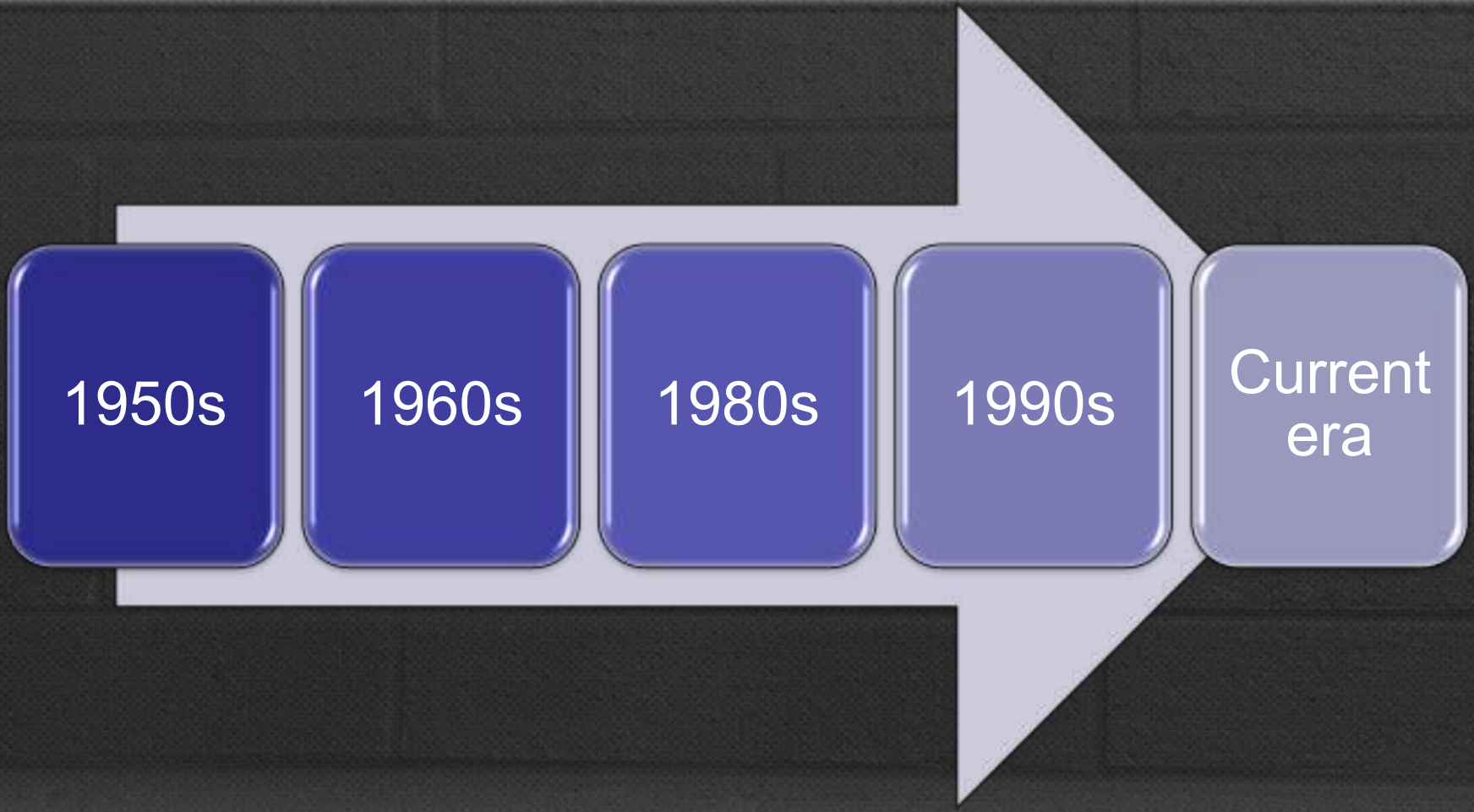
Clinical Scenario

A 43 Year old lady presented with DOE FC II and have A Sever MS, Moderate TR and pulmonary Hypertension (PAP 60)






Technique
should we repair TV
Ring Type
Ring Size
Outcome
QOL



The reasons for this progression

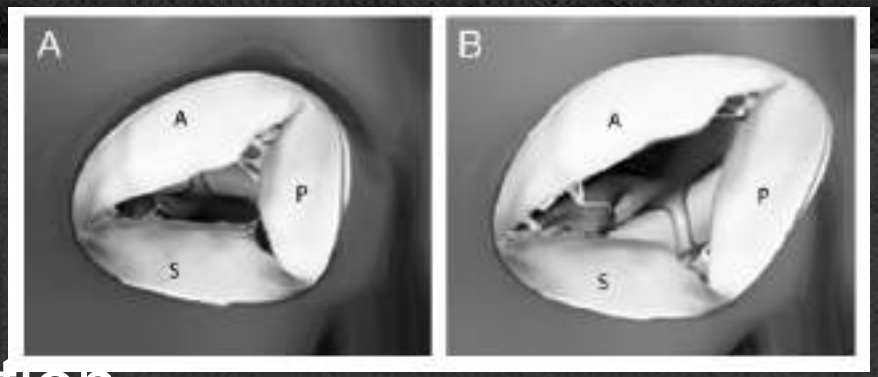
Up to 40% of patients undergoing isolated left sided valve surgery will develop

significant TR during long-term follow-up

TR is associated with increased early and late mortality and decreased functional outcome

Tricuspid annuloplasty is a safe and effective treatment for FTR

Pathophysiology of FTR:



- Leaflet tethering
- Asymmetrical annular dilatation
- Flattening of the TV annulus
-

Dilated TV cannot spontaneously return to normal size

complete reverse remodeling of the RV may not occur

Annular Dilatation
Different Definitions

- Values of more than 27 mm in either maximal early systolic or minimal late end-systolic diameters
- More than 40mm (21 mm/m2) maximum end-systolic diameter
- Mean diastolic annulus diameter of 51mmin the four-chamber view
- 54 mm in the short axis view

Principles of Surgical management of FTR

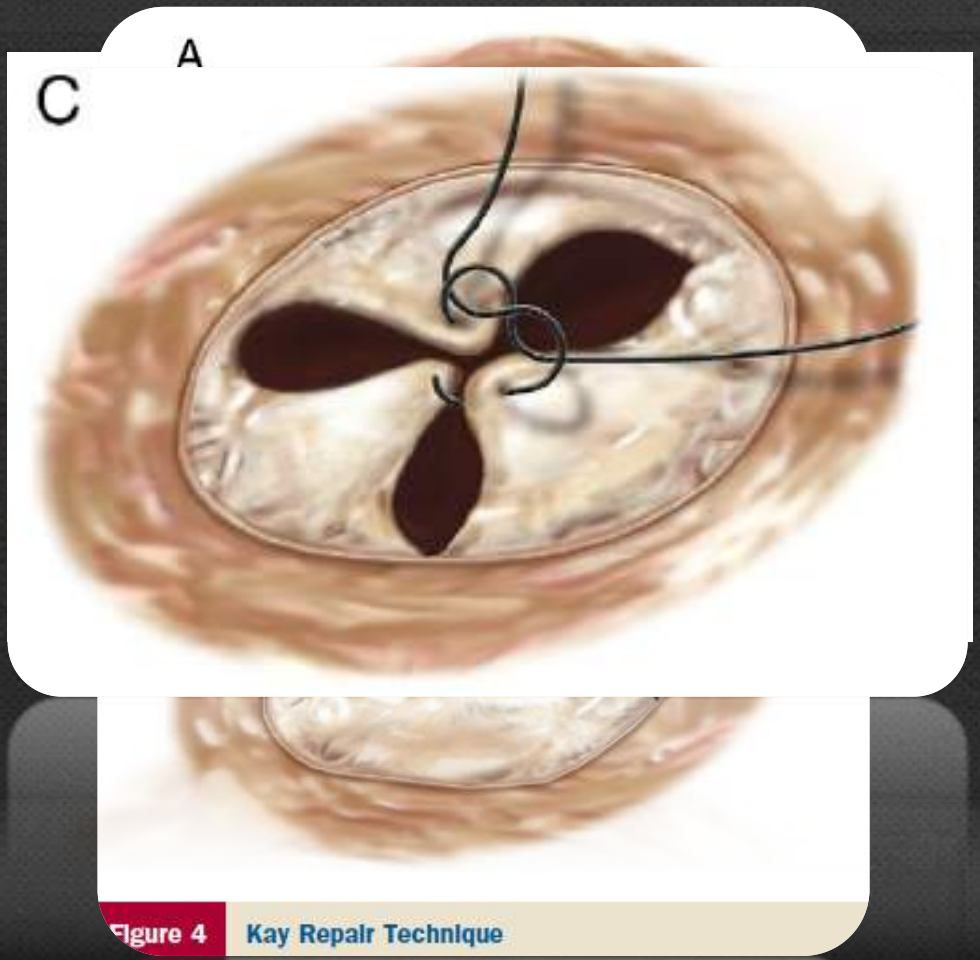
Elimination of increased afterload to the RV

Correction of TA dilation and dysfunction

Two principal surgical methods for FTR

Suture Annuloplasty

Ring Annuloplasty



Suture or Ring Annuloplasty

Table 2. Comparison of Selected Annuloplasty Approaches for Functional TR

	Bicuspidization	Classic De Vega	Flexible Band	Rigid Ring
Simplicity	Yes	Yes	No	No
Added time	<5 min	<10 min	10-20 min	15-20 min
Reproducibility	Low	Moderate	High	Very high
Annular stabilization	Posterior	Anterior/posterior	Anterior/posterior	Septal/anterior/posterior
Risk of heart block	None	Minimal	Minimal	Low
Residual TR	High	Moderate	Low	Low
Recurrent TR	High	Moderate	Low	Low
Cost	Cheap	Cheap	Expensive	Expensive

Suture annuloplasty

De Vega

- High incidence of both residual and recurrent tricuspid regurgitation
- Residual moderateto- severe tricuspid insufficiency in more than 10% of Patients
- The recurrence of moderate-to-severe tricuspid regurgitation in more than 40% of patients at 10 years postoperatively

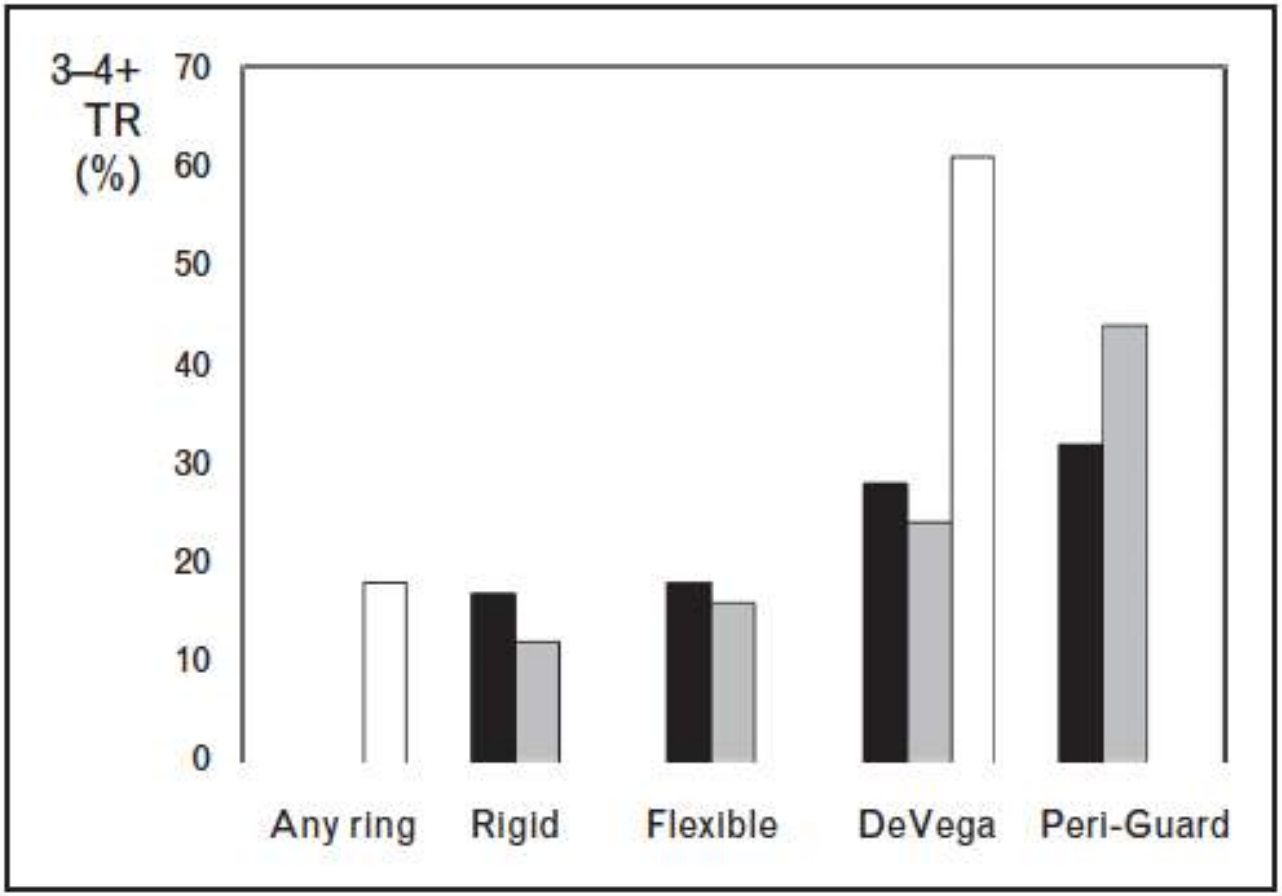


FIGURE 2. Recurrence of tricuspid regurgitation after ring and non-ring annuloplasty. Reported rates for the recurrence of grade 3 or 4+ tricuspid regurgitation after initial tricuspid valve annuloplasty by technique. Dark bars, McCarthy *et al.*, 5-year follow up [15]; gray bars, Navia *et al.*, 5-year follow up [17]; open bars, Tang *et al.*, mean 5.9-year follow up [16]. Reproduced with permission [18]. TR, tricuspid regurgitation.

Suture Versus Ring Annuloplasty

Despite the absence of randomized trials, it is currently accepted by the majority of surgeons that ring repairs are more durable than suture repairs and are associated with better long-term and event-free survival

•McCarthy PM, Bhudia SK, Rajeswaran J, et al. Tricuspid valve repair: durability and risk factors for failure. J Thorac Cardiovasc Surg 2004;127:674–85.

•Tang GH, David TE, Singh SK, Maganti MD, Armstrong S, BorgerMA. Tricuspid valve repair with an annuloplasty ring results in improved long-term outcomes. Circulation 2006;114:I577– 81.

•Navil JL, Nowicki ER, Blackstone EH, et al. Surgical management of secondary tricuspid valve regurgitation: annulus, commissure, or leaflet procedure? J Thorac Cardiovasc Surg 2010;139:1473–82.

Interactive CardioVascular and Thoracic Surgery 15 (2012) 129–135
doi:10.1093/icvts/ivs070 Advance Access publication 28 March 2012

BEST EVIDENCE TOPIC - ADULT CARDIAC

Is a tricuspid annuloplasty ring significantly better than a De Vega's annuloplasty stitch when repairing severe tricuspid regurgitation?

Maziar Khorsandi[a], Amit Banerjee[b], Harpreet Singh[b] and Aseem R. Srivastava[c,*]

[a] Department of Cardiothoracic Surgery, Royal Infirmary of Edinburgh, Edinburgh, UK
[b] Department of Cardiothoracic and Vascular Surgery, G B Pant Hospital, New Delhi, India
[c] Department of Cardiothoracic Surgery, University of Pittsburgh Medical Center, Pittsburgh, USA

They conclude that:

There is good evidence to support **ring annuloplasty over De Vega's** annuloplasty.

Multiple recent cohort studies support the use of ring annuloplasty for moderate to severe TR over De Vega's annuloplasty

both in terms of the **rate of recurrence of TR** leading to reoperation and **long-term mortality**.

Ring Types

Flexible Band

Semi-Rigid

2-dimensional shape and good results (97.5% freedom from TV reoperation at 10 years)

Onoda K, Yasuda F, Takao M, et al. Long-term follow-up afterCarpentier-Edwards ring annuloplasty for tricuspid regurgitation. Ann Thorac Surg 2000;70:796 –9.

Rigid

The incidence of recurrent significant TR 5 years after surgery with the standard Carpentier-Edwards ring and with the MC3 ring of 10% and 14% respectively, but this difference was not statistically significant

Navia JL, Nowicki ER, Blackstone EH, et al. Surgical management ofsecondary tricuspid valve regurgitation: annulus, commissure, or leaflet procedure? J Thorac Cardiovasc Surg 2010;139:1473–82.

Flexible, Semi-rigid or Rigid ring?

- Rigid and semirigid rings not only effectively **restore annular diameter** (reduction annuloplasty), but also

  restore the 3-dimensional geometry of the tricuspid annulus in a fixed systolic position (remodeling annuloplasty)

- The main advantage of rigid rings over flexible bands is that the dimension of the septal annulus, which contributes to annular dilation in severely diseased valves, is both normalized and better stabilized reducing late recurrence of regurgitation

Rigid rings may be preferable for treating severe regurgitation with severe annular dilation, where complete remodeling is desirable.

- In contradistinction,

Partial flexible bands may adequate for treating or preventing tricuspid regurgitation where there are milder degrees of annular dilation with less severe regurgitation, as the need to correct and prevent dilation of the septal annulus is less likely

Surgical management of subsets of FTR

Moderate FTR

- Moderate tricuspid regurgitation is associated with

worsening regurgitation in long-term follow-up

Greater reoperation rates

poorer long-term survival

It is not possible to predict those patients in whom moderate regurgitation will resolve after left-sided heart surgery,

A moderately dilated annulus may not be detected by

2-dimensional Echocardiography

3-dimensional

echocardiography or CMR probably offers a more accurate picture of tricuspid annular dilation.

Surgical Strategies for Functional Tricuspid Regurgitation

Joanna Chikwe, MD, FRCS, and Ani C. Anyanwu, MSc, MD, FRCS

- We believe surgeons should systematically inspect the tricuspid valve during most mitral operations (by direct inspection preferably)

Direct intraoperative assessment

- Suggested indicators of requirement for tricuspid annuloplasty include:

A maximal annular diameter in the flaccid heart 70 mm

Annulus circumference 2 sizes or greater than a valve sizer corresponding to the combined posterior and anterior leaflet surface area

Pulmonary Hypertension

Isolated pulmonary hypertension is not an indication for tricuspid valve repair

The TV has otherwise
normal function and geometry

Secondary TR and ischemic mitral regurgitation

- Concomitant FTR is a frequent finding
- May lead to poor outcome and cardiomyophaty

- Moderate to severe FTR should be corrected at the same time as left-heart surgery.

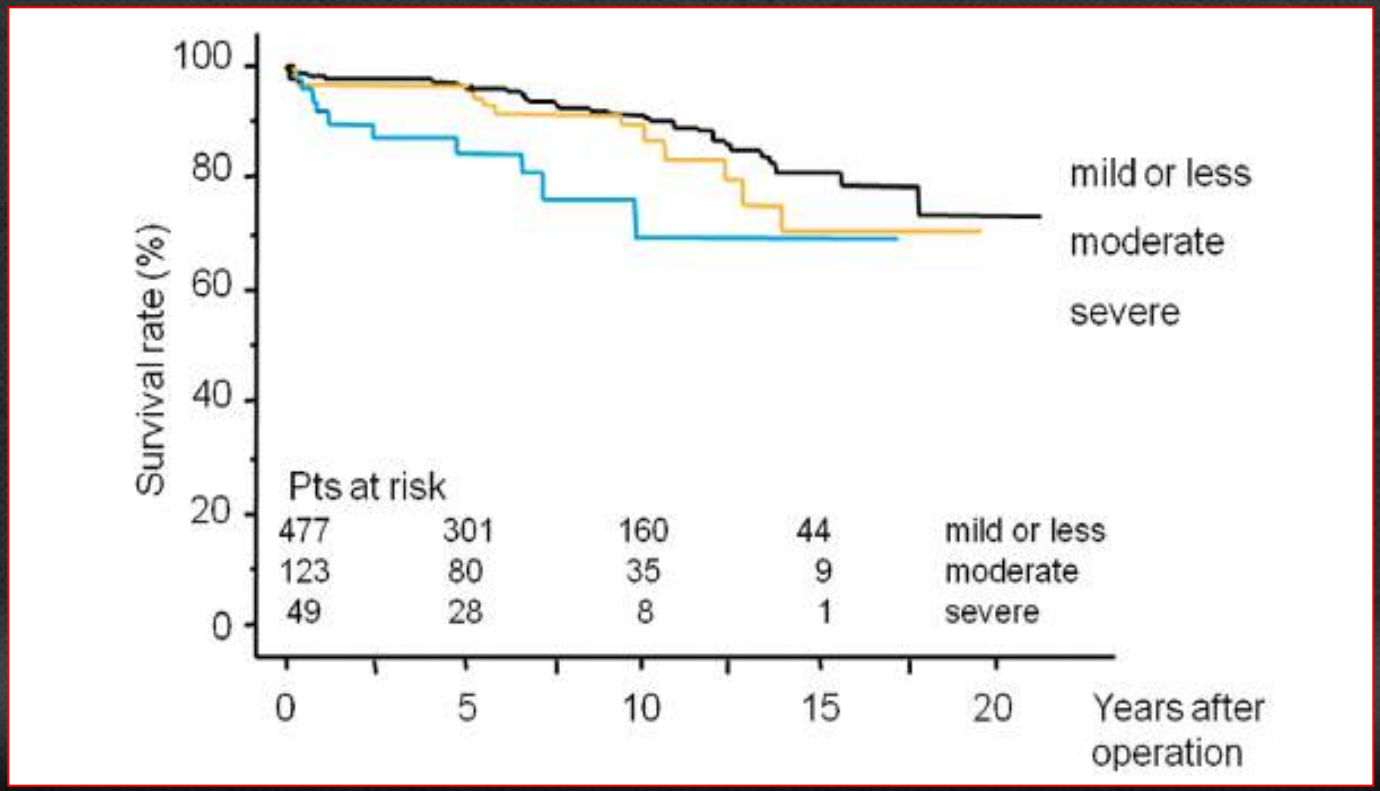
- If severe TV tethering is present (tethering distance 0.76 cm or tethering area 1.63 cm2), the use of adjunctive surgical techniques to tricuspid annuloplasty or TV replacement should be considered

Circulation Journal
Official Journal of the Japanese Circulation Society
http://www.j-circ.or.jp

ORIGINAL ARTICLE
Cardiovascular Surgery

Fate of Functional Tricuspid Regurgitation After Mitral Valve Repair for Degenerative Mitral Regurgitation

Takashi Murashita, MD; Yukikatsu Okada, MD, PhD; Hideo Kanemitsu, MD, PhD; Naoto Fukunaga, MD; Yasunobu Konishi, MD; Ken Nakamura, MD; Yoshito Sakon, MD; Tadaaki Koyama, MD, PhD



Late FTR after left heart valve surgery

- In reoperative setting, surgeons have historically waited for the development of severe symptoms before reoperating on patients with late tricuspid regurgitation.
- The poor results observed in these severely symptomatic patients reinforce the belief that reoperative surgery for tricuspid valve regurgitation is a very-high risk and dangerous operation
- Current strategy is to offer tricuspid valve repair to otherwise low-risk (typically young) minimally symptomatic patients who develop severe TR after left-sided heart surgery

European Heart Journal (2012) **33**, 2451–2496
doi:10.1093/eurheartj/ehs109

ESC/EACTS GUIDELINES

Guidelines on the management of valvular heart disease (version 2012)

Indications for tricuspid valve surgery

After left-sided valve surgery, surgery should be considered in patients with severe TR who are symptomatic or have progressive right ventricular dilatation/dysfunction, *in the absence* of left-sided valve dysfunction, severe right or left ventricular dysfunction, and severe pulmonary vascular disease.	IIa	C

Long-term outcomes of tricuspid valve replacement after previous left-side heart surgery†

Nicola Buzzatti*, Giuseppe Iaci, Maurizio Taramasso, Teodora Nisi, Elisabetta Lapenna, [illegible] Bonis, Francesco Maisano and Ottavio Alfieri

117 patients
1997-2012

Table 4: Preoperative predictors of 30-day mortality

	Alive (n = 110)	Dead (n = 7)	P-value	OR (95% CI)
Age mean, years	62.8 ± 9.7	58.4 ± 10.9	0.255	0.96 (0.89–1.03)
LES median, %	11.6 (8.1–16.0)	38.7 (13.3–45.9)	0.002*	1.16 (1.06–1.27)
Ascites	35 (31.9%)	6 (85.7%)	0.004*	12.86 (1.49–110.89)
Number of previous operations >1	30 (27.3%)	4 (57.1%)	0.091	3.56 (0.75–16.83)
I-TVR	56 (50.9%)	5 (71.4%)	0.292	2.41 (0.45–12.96)
LVEF mean, %	54.9 ± 8.5	46.2 ± 11.8	0.072	0.92 (0.84–1.01)
RV dysfunction ≥moderate	24 (21.8%)	4 (57.1%)	0.033*	4.78 (1.00–22.82)
sPAP mean, mmHg	47.5 ± 12.9	63.7 ± 24.9	0.046*	1.05 (1.00–1.11)

Numbers following mean values report sample standard deviation and numbers in brackets following median value denote 25th and 75th percentile limits. LVEF: left ventricle ejection fraction; RV: right ventricle; sPAP: systolic pulmonary artery pressure; OR: odds ratio; CI: confidence interval; NPV: negative predictive value; PPV: positive predictive value; Sens: sensitivity; Spec: specificity.

European Journal of Cardio-Thoracic Surgery (2014) 1–7

When we should replace TV in FTR?

- In cases of extreme leaflet tethering, prosthetic replacement of the valve should be considered.

- The ideal choice of prosthesis for tricuspid valve replacement remains a matter of controversy as both are associated with thromboembolism and relatively high frequency of reoperation.

When should a mechanical tricuspid valve replacement be considered?

Sameh M. Said, MD,[a] Harold M. Burkhart, MD,[a] Hartzell V. Schaff, MD,[a] Jonathan N. Johnson, MD,[b] Heidi M. Connolly, MD,[c] and Joseph A. Dearani, MD[a]

They recommend considering use of a mechanical valve in the tricuspid position in patients who:

Require warfarin anticoagulation,
Good right ventricular function,
less than moderate RV dilatation

(J Thorac Cardiovasc Surg 2013;■:1-6)

Tricuspid valve surgery

C.A. Mestres[1], G. Fita[2], V.M. Parra[3], J.L. Pomar[1], J.M. Bernal[4]

[1]*Department of Cardiovascular Surgery, Hospital Clínico. University of Barcelona. Barcelona, Spain;* [2]*Department of Anesthesiology, Hospital Clinico, University of Barcelona, Barcelona, Spain;* [3]*National Chest Institute and School of Medicine, University of Chile, Santiago Chile;* [4]*Department of Cardiovascular Surgery, Hospital Universitario Valdecilla, University of Cantabria, Santander, Spain*

HSR Proceedings in Intensive Care and Cardiovascular Anesthesia 2012; 4(4): 261-267

Table 2 - *Intra-, postoperative and follow-up data.*

	TV Replacement	TV Repair	p value
CPB time	79.9 ± 42.8	75.7 ± 45.7	
Ischemic time	21.8 ± 23.1	64.5 ± 48.8	n.s.
Mortality	8 (27.6 %)	-	0.0002
Cardiac	6	-	0.01
Bleeding	1	-	
Neurologic	1	-	
Late mortality	15 (51.7 %)	9 (50.0 %)	n.s.
Cardiac	2	3	
Valvular	1	1	
Unknown	7	1	
Reoperation	1	2	
Thromboembolism	1	-	
Hemorrhage	-	1	
Malignacy	1	-	
Others non cardiac	2	1	

TV = tricuspid valve; CPB = Cardiopulmonary Bypass

Rev Esp Cardiol. 2013;66(8):629-635

Original article

Short- and Long-term Outcomes of Surgery for Severe Tricuspid Regurgitation

Jorge Rodríguez-Capitán,[a,*] Juan J. Gómez-Doblas,[a] Leticia Fernández-López,[b] Raúl López-Salguero,[c] Manuel Ruiz,[d] Inés Leruite,[e] Fernando Cabrera-Bueno,[a] María J. Mataró-López,[a] Gemma Sánchez-Espín,[a] José M. Melero-Tejedor,[a] Carlos Porras-Martín,[a] Miguel Such,[a] and Eduardo de Teresa[a]

Surgical Outcomes by Type of Valve Surgery or Replacement

	Overall sample (n=119)	Tricuspid repair (n=84)			Tricuspid replacement (n=35)		
		Ringless (n=61)	Ring (n=23)	*P*	Biological valve (n=11)	Mechanical valve (n=24)	*P*
ECC time, min	126.7±43.3	118.9±34.6	128.4±35.1	.31	116.3±52.5	146.9±58.8	.25
Low post-surgery cardiac output	38.7% (46/119)	36.1% (22/61)	30.4% (7/23)	.63	45.5% (5/11)	50% (12/24)	.8
Complications							
Infectious	14.3% (17/119)	11.5% (7/61)	17.4% (4/23)	.47	0 (0/11)	25% (6/24)	.06
Neurological	5% (6/119)	3.3% (2/61)	8.7% (2/23)	.3	9.1% (1/11)	4.2% (1/24)	.56
Respiratory	32.8% (39/119)	24.6% (15/61)	30.4% (7/23)	.59	36.4% (4/11)	54.2% (13/24)	.32
Renal	14.3% (17/119)	13.1% (8/61)	21.7% (5/23)	.33	0 (0/11)	16.7% (4/24)	.15
Reoperation due to bleeding	7.6% (9/119)	8.2% (5/61)	4.3% (1/23)	.54	9.1% (1/11)	8.3% (2/24)	.94
Post-surgery	66.4% (79/119)	67.2% (41/61)	52.2% (12/23)	.2	72.7% (8/11)	75% (18/24)	.89
Mortality	18.5% (22/119)	13.1% (8/61)	26.16% (6/23)	.15	18.2% (2/11)	25% (6/24)	.66

They conclude that

- Ringless repair was significantly associated with recurrence of severe TR.
- The use of mechanical prostheses was associated with a high rate of thrombosis.
- No significant differences in perioperative or total mortality were found between the different methods used for repair or valve replacement

Circulation Journal
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Table 3. Univariate Analysis of Predictors for Recurrence of Severe TR in the TV Repair (–) Group

	HR	95% CI	P value
Age	0.99	0.95–1.04	0.769
Male sex	0.31	0.09–1.12	0.748
Preoperative atrial fibrillation	4.85	1.38–17.1	0.014
Preoperative RVP	0.99	0.95–1.03	0.631
Preoperative TR grade	5.16	1.78–14.9	0.003
Postoperative severe MR recurrence	2.27	0.22–23.3	0.491

CI, confidence interval; HR, hazard ratio; RVP, right ventricular pressure; TR, tricuspid regurgitation; MR, mitral regurgitation.

Risk factors for repair failure

- Higher preoperative TR severity
- Higher pulmonary artery pressures,
- Larger ring size
- MV replacement rather than repair,
- worse LV dysfunction
- Increased LV remodeling
- Suture annuloplasty
- Presence of pacemaker leads through the valve area

Kilic A, Saha-Chaudhuri P, Rankin JS, Conte JV.
Trends and outcomes of tricuspid valve surgery in North America: an analysis of more than 50 000 patients from the Society of Thoracic Surgeons Database.
Ann Thorac Surg 2013.

- **54 375 TV SURGERY FROM 2000 TO 2010 IN THE STS DATABASE**

89% WERE TV REPAIR AND 86% HAD CONCOMITANT SURGERY

The proportion of tricuspid valve repairs increased from 84.6% in 2000 to 89.8% in 2010 (P. 0.01).

TVR with bioprostheses (81.5%),

increasing from 77.4% in 2000 to 86.6% in 2010 (P. 0.001)

Desai RR, Vargas Abello LM, Klein AL, et al.
J Thorac Cardiovasc Surg 2013; 146:1126–1132.

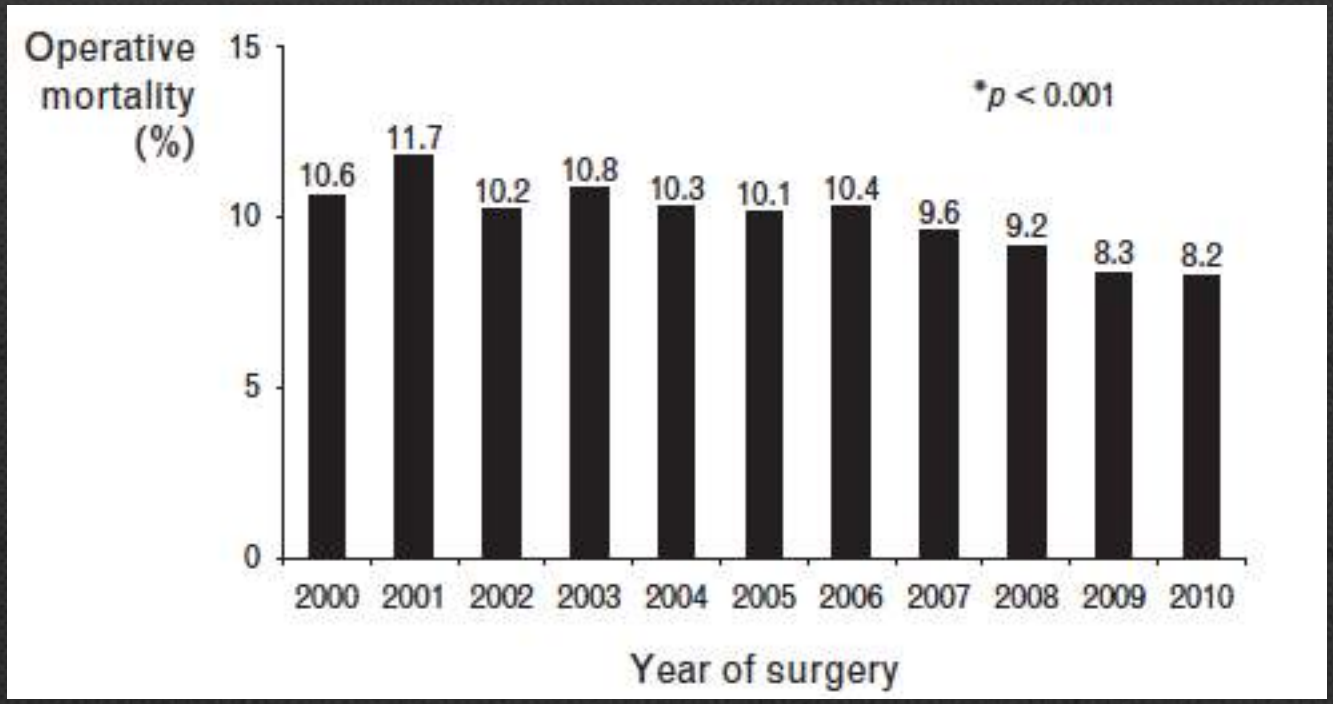
These improvements were temporary and by 3 years returned to preoperative levels

More aggressive approach to FTR

REVIEW

Surgical approach to functional tricuspid regurgitation: should we be more aggressive?

Jason H. Rogers[a] and Steven F. Bolling[b]



This rate was 20 % from1977-1998

Despite 75% of mitral valve patients having tricuspid annular geometric changes associated with FTR

TVr still remains underused, with tricuspid operative volume representing only 10% of mitral valve operations performed,

European Heart Journal (2012) **33**, 2451–2496
doi:10.1093/eurheartj/ehs109

ESC/EACTS GUIDELINES

Guidelines on the management of valvular heart disease (version 2012)

Indications for tricuspid valve surgery

Surgery is indicated in patients with severe primary or secondary TR undergoing left-sided valve surgery.	I	C
Surgery should be considered in patients with moderate primary TR undergoing left-sided valve surgery.	IIa	C
Surgery should be considered in patients with mild or moderate secondary TR with dilated annulus (≥40 mm or >21 mm/m²) undergoing left-sided valve surgery.	IIa	C

REVIEW J CARDIOVASC ULTRASOUND 2013;21(1):1-9

TRICUSPID REGURGITATION: CLINICAL IMPORTANCE AND ITS OPTIMAL SURGICAL TIMING

Table 1. A side-by-side comparison of ACC/AHA vs. ESC surgical guidelines for tricuspid regurgitation

	ACC/AHA	ESC
Primary TR		
Symptomatic severe TR without RV dysfunction	Class IIa	Class I
Moderate TR in MV surgery	Not mentioned	Class IIa
Secondary TR		
Severe TR in MV surgery	Class I	Class I
Severe, symptomatic isolated TR after previous left-sided valve surgery without RV dysfunction and without pulmonary hypertension	Not mentioned	Class IIa
Severe isolated TR with mild or no symptom and RV dysfunction	Class III	Class IIb
Moderate TR in MV surgery and tricuspid valve annular dilation	Class IIb	Class IIa

ACC/AHA: American College of Cardiology/American Heart Association, ESC: European Society of Cardiology, TR: tricuspid regurgitation, RV: right ventricle, MV: mitral valve

MORE AGGRESSIVE APPROACH IN ESC/EACTS GUIDELINE

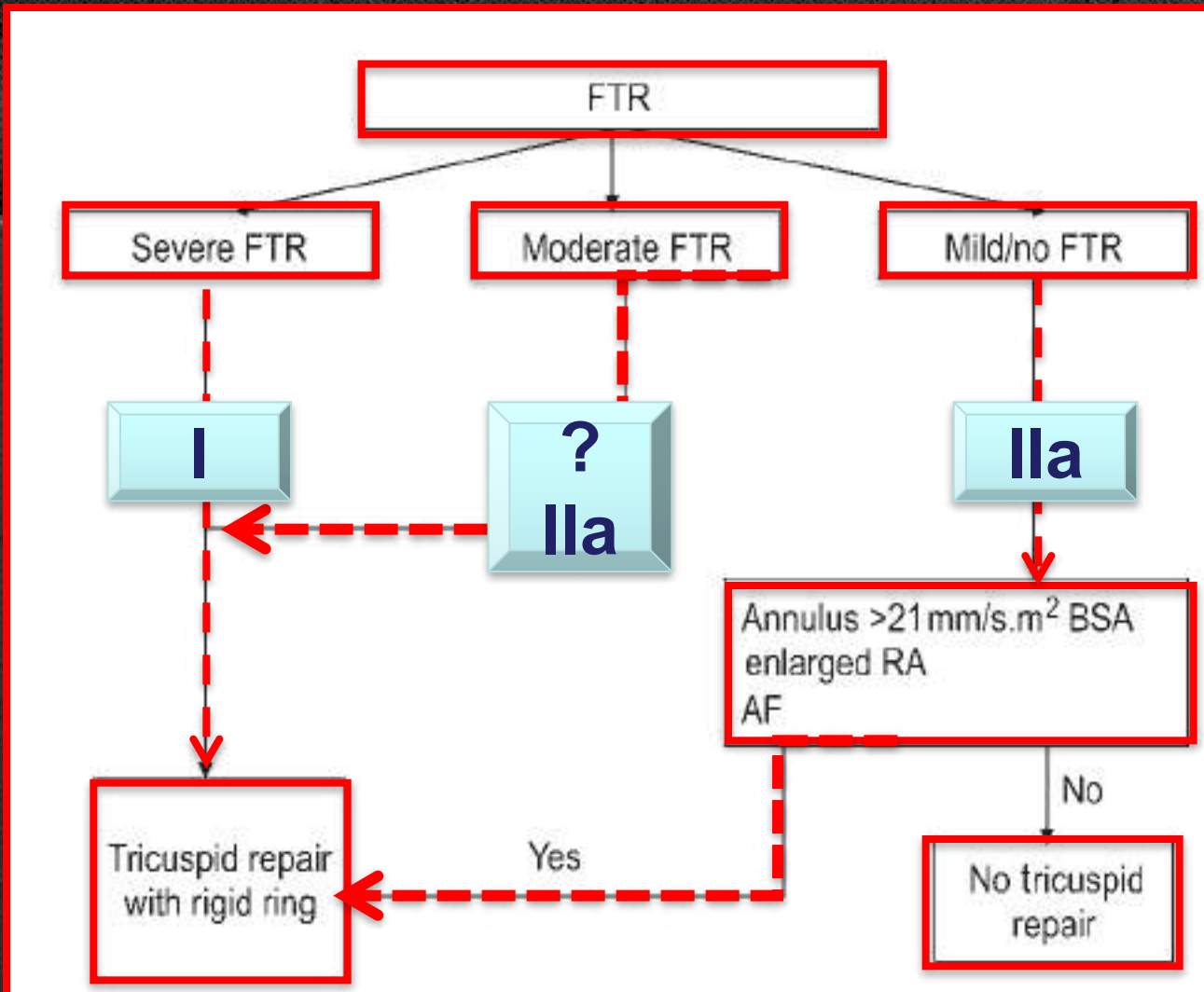


Figure 2: Proposed algorithm for the treatment of functional tricuspid regurgitation (FTR) in patients undergoing left heart valve surgery. RA: right atrium; AF: atrial fibrillation; BSA: body surface area.

European Journal of Cardio-Thoracic Surgery 43 (2013) 2–8

Future Perspective

Randomized trials to study the effects of ‘prophylactic’ tricuspid regurgitation

Percutaneous annuloplasty, edge-to-edge repair

Millipede system (Millipede, LLC, AnnArbor, Michigan) involves the placement of a tricuspid ring

Valved Stent: animal models and a few case reports
Implantation of separate valves in the superior vena cava and inferior vena cava to prevent damage to the liverand other organs

"Prophylactic" Tricuspid Repair for Functional Tricuspid Regurgitation

Nicholas R. Teman, MD, Lynn C. Huffman, MD, Marguerite Krajacic, RN, Francis D. Pagani, MD, PhD, Jonathan W. Haft, MD, and Steven F. Bolling, MD

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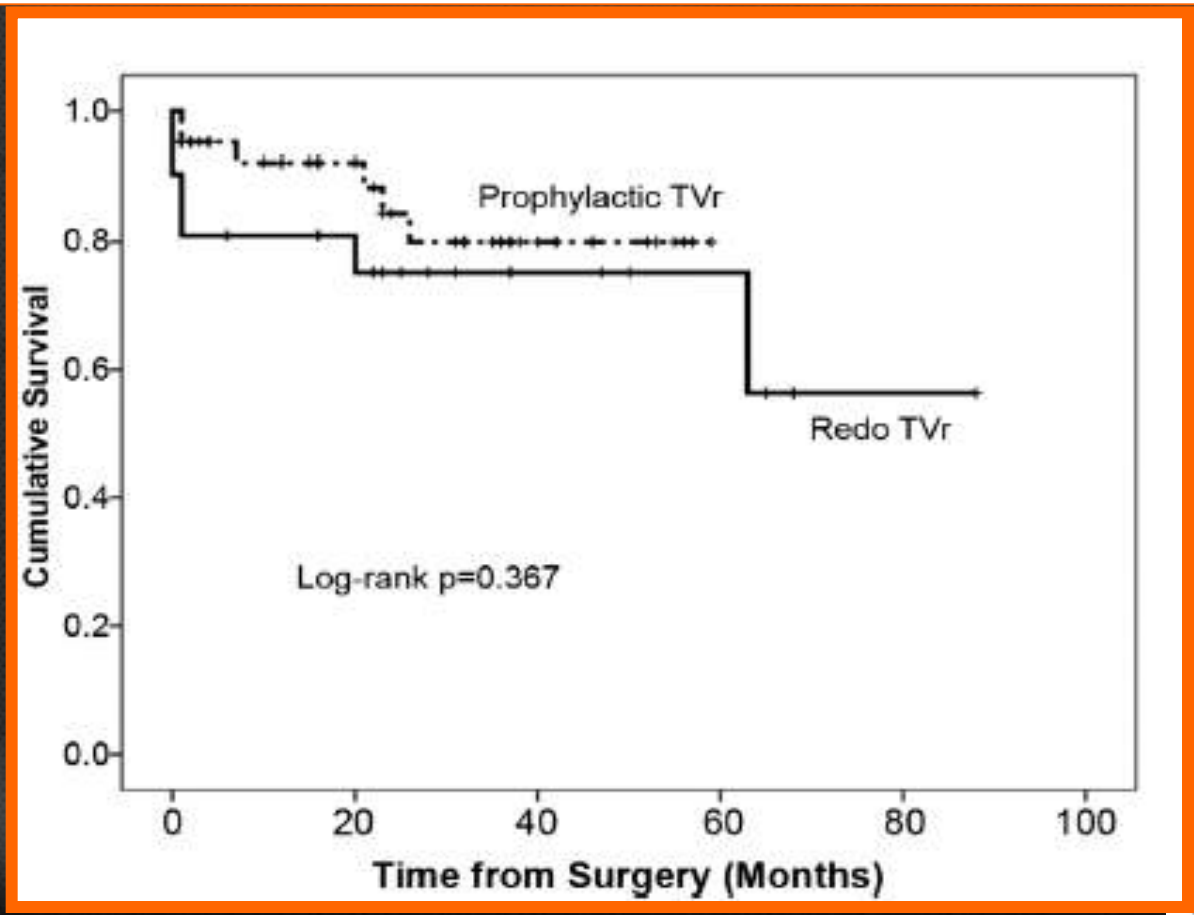

(Ann Thorac Surg 2014;■:■–■)

Minimally invasive tricuspid valve surgery in patients at high risk

Davide Ricci, MD,[a,b] Massimo Boffini, MD,[a] Cristina Barbero, MD,[a] Suad El Qarra, MD,[a] Giovanni Marchetto, MD,[a] and Mauro Rinaldi, MD[a]

TABLE 2. Type of surgical procedures and operative data (n, %) (N = 64 patients)

TV repair	35 (54.7%)
Annular ring	33/35 (94.3%)
De Vega annuloplasty	2/35 (5.7%)
TV replacement	27 (42.2%)
Tricuspid prosthesis replacement	2 (3.1%)
Isolated TV procedures	16 (25%)
Combined procedures	48 (75%)
MV repair	14 (29.2%)
MV replacement	14 (29.2%)
Mitral prosthesis replacement	14 (29.2%)
ASD closure	5 (10.4%)
Myxoma resection	1 (2%)
TV procedures on beating heart	33 (51.5%)
Isolated TV procedures on beating heart	16/16 (100%)
Combined procedures on beating heart	17/48 (35.4%)
AF cryoablation	5/43 preoperative AF (11.6%)
Conversion to sternotomy	1 (1.6%)

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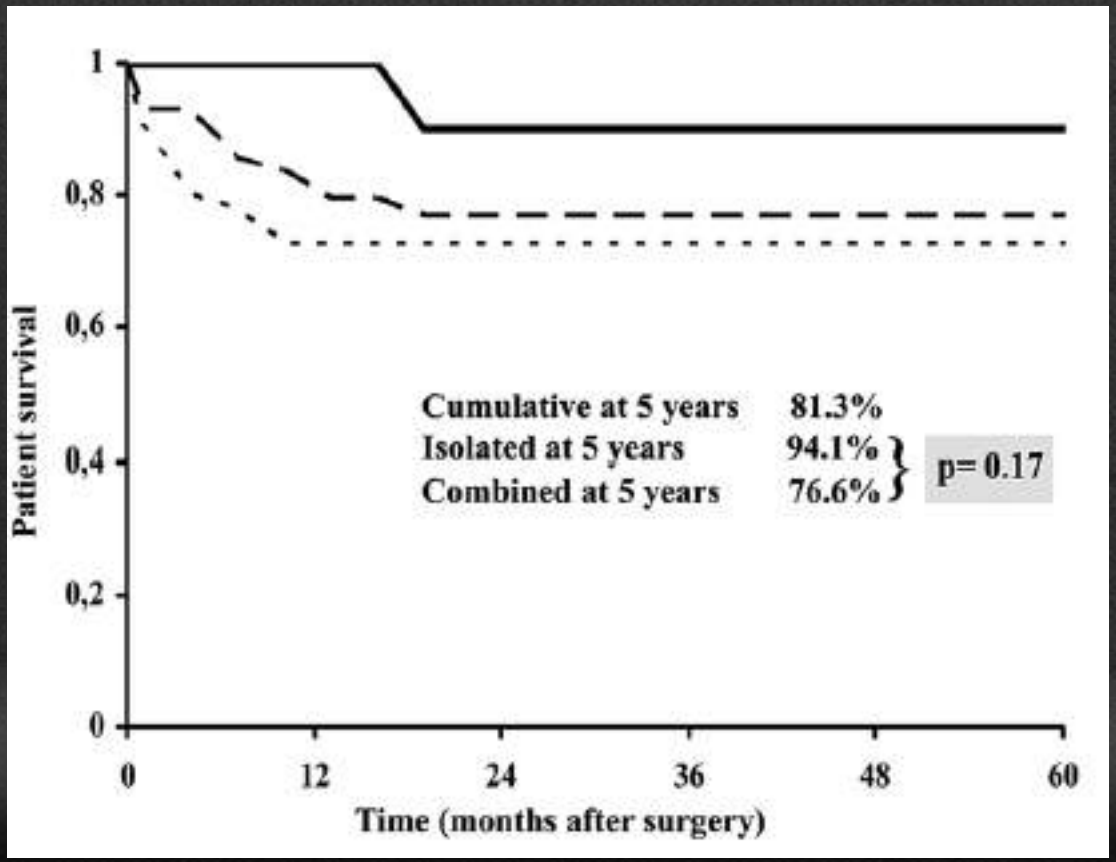
TABLE 3. Postoperative outcomes (N = 64 patients)

Hospital mortality (n, %)	5 (7.8%)
Length of postoperative stay (d) (mean, SD, median)	14.1 ± 19.0 (8)
Reoperation for bleeding (n, %)	5 (7.8%)
Stroke (n, %)	1 (1.6%)
Acute renal failure (n, %)	5 (7.8%)
Blood loss (mL)	471 ± 382
Pacemaker requirement (n, %)	1 (1.6%)



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ORIGINAL ARTICLE

Off-pump tricuspid valved stent implantation: the next step

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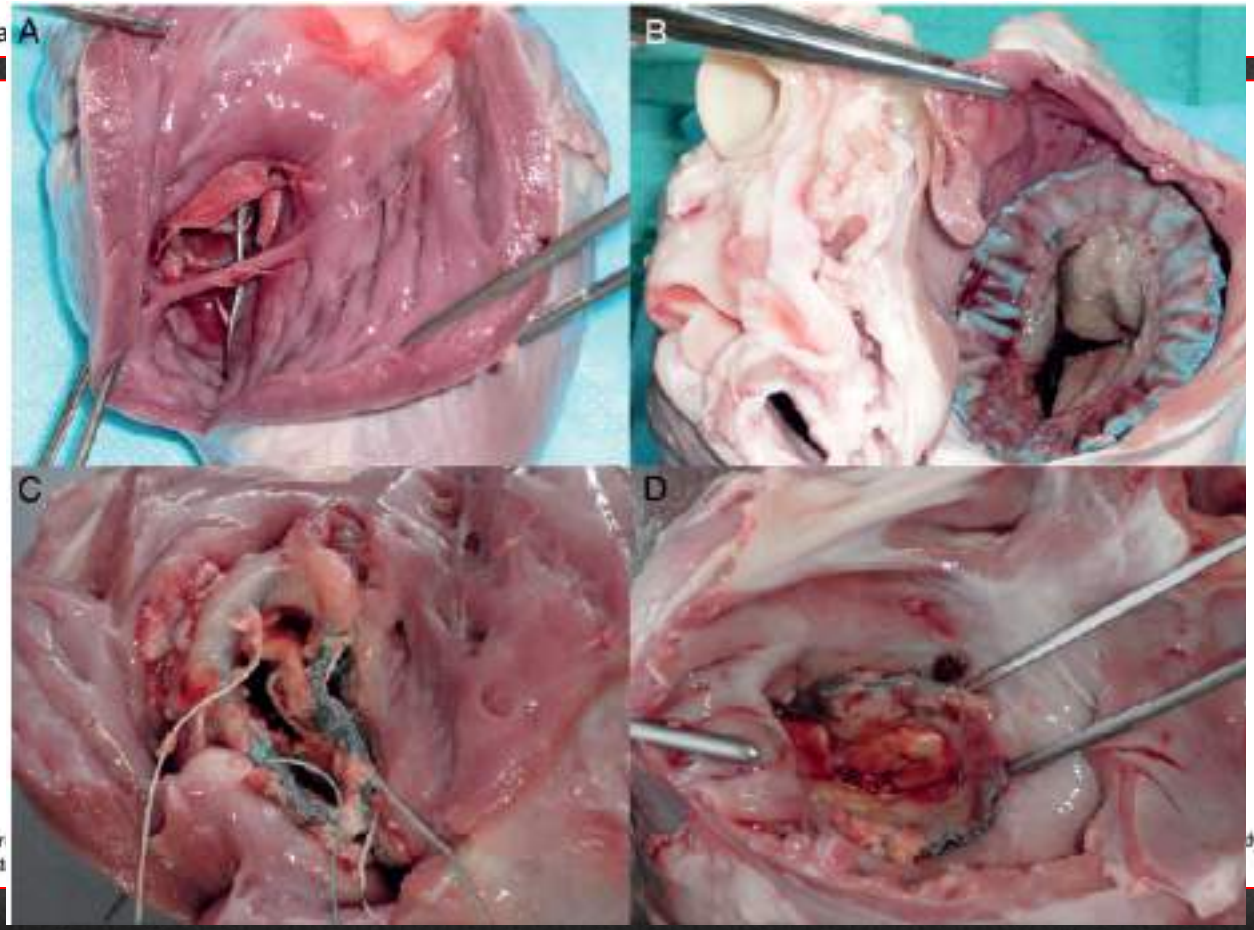
Department of Cardiovascula



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Percutaneous Transcatheter Valve-in-Valve Implantation With the Balloon-Expandable Valve for the Treatment of a Dysfunctional Tricuspid Bioprosthetic Valve — A Pediatric Case Report

Baher Matta Hanna, MD[1], Josep Rodés-Cabau, MD[2], Nagib Dahdah, MD[1]

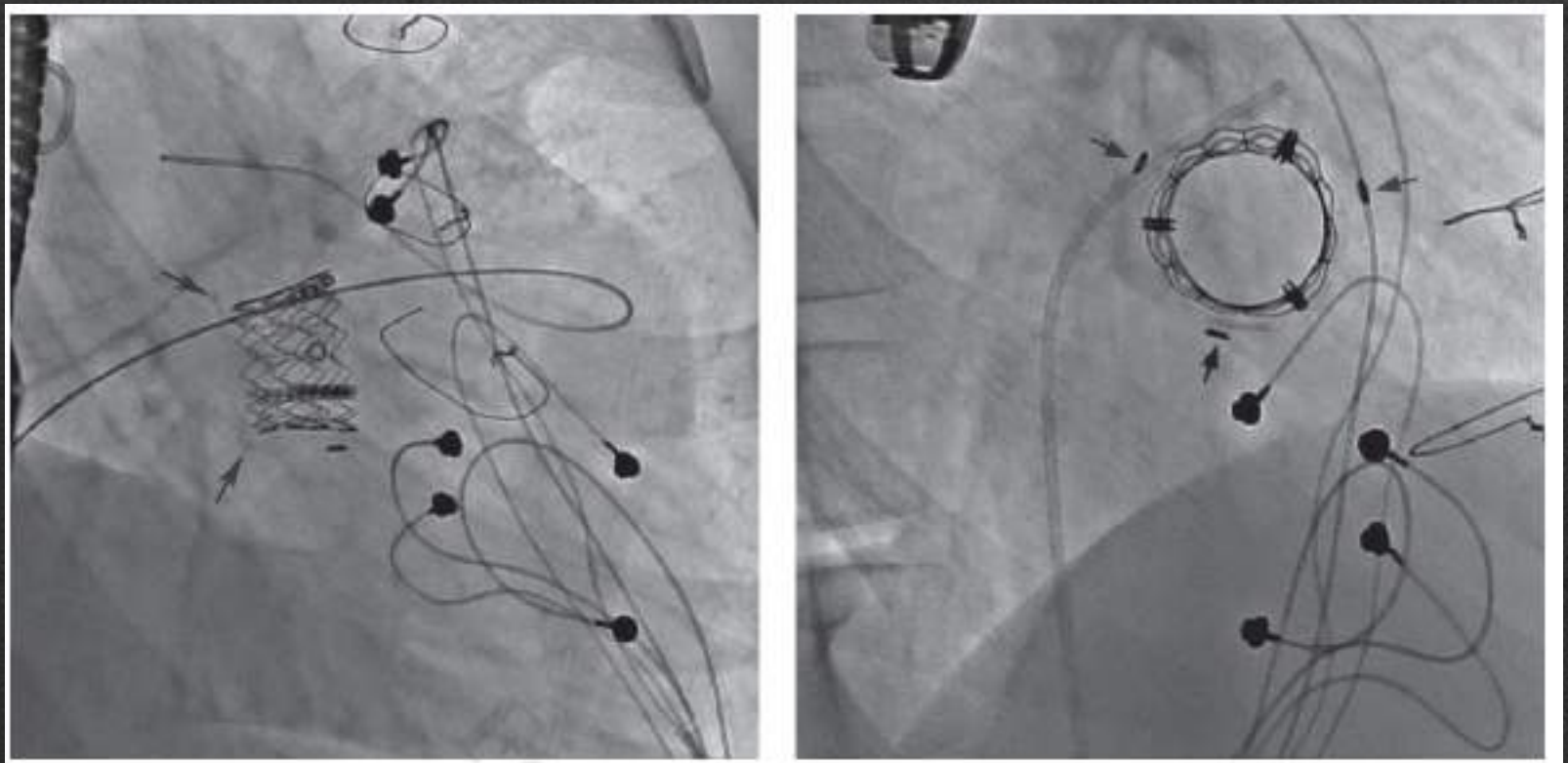

Figure 3. (A) *Following deployment, the SAPIEN stent is well seated between the proximal calcification (arrows) of the Mosaic frame and the distal radiopaque markers. The distal flare of the SAPIEN stent is due to the shape of the Mosaic frame.* (B) *A coaxial view of the SAPIEN valve inside*

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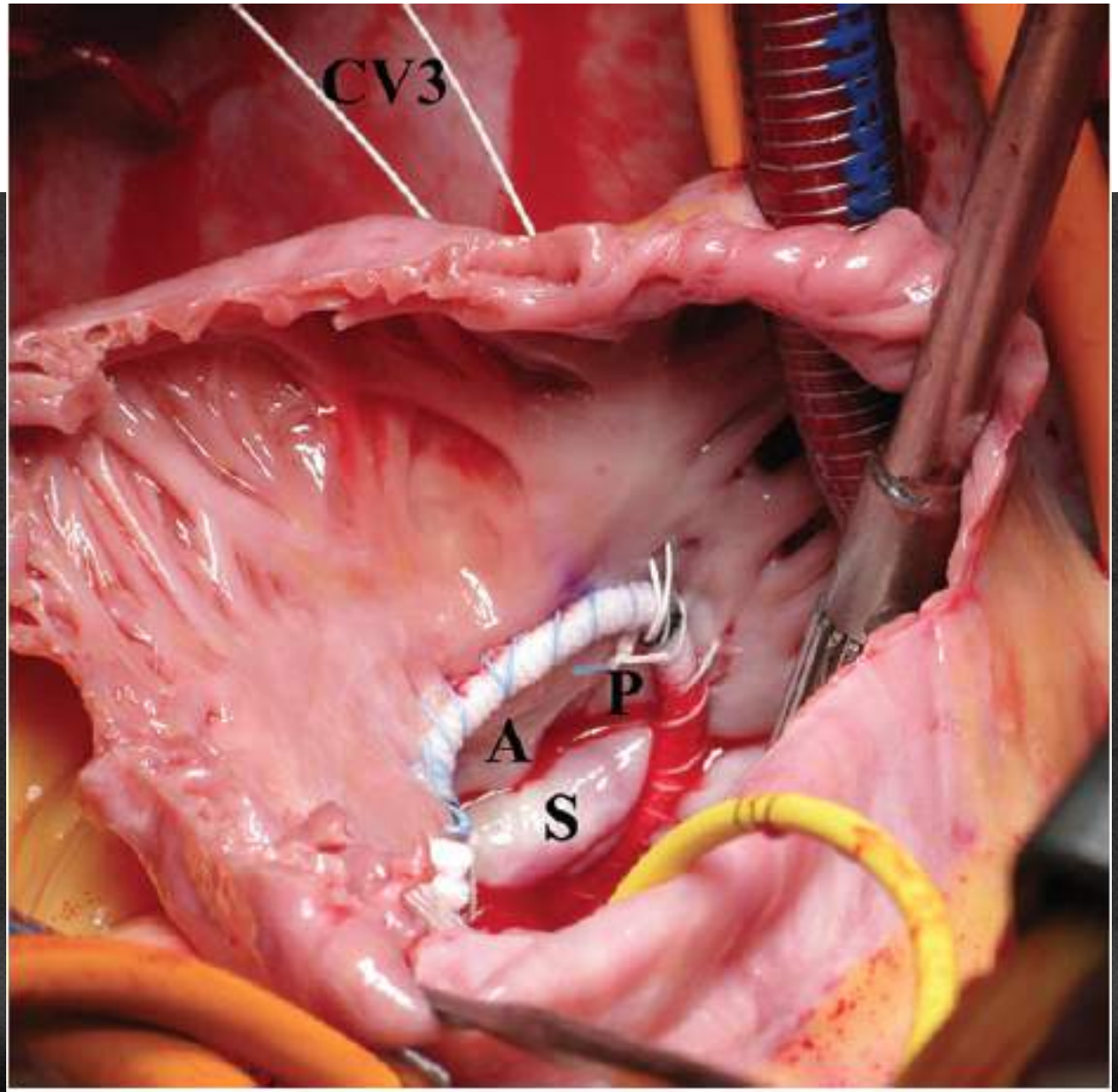
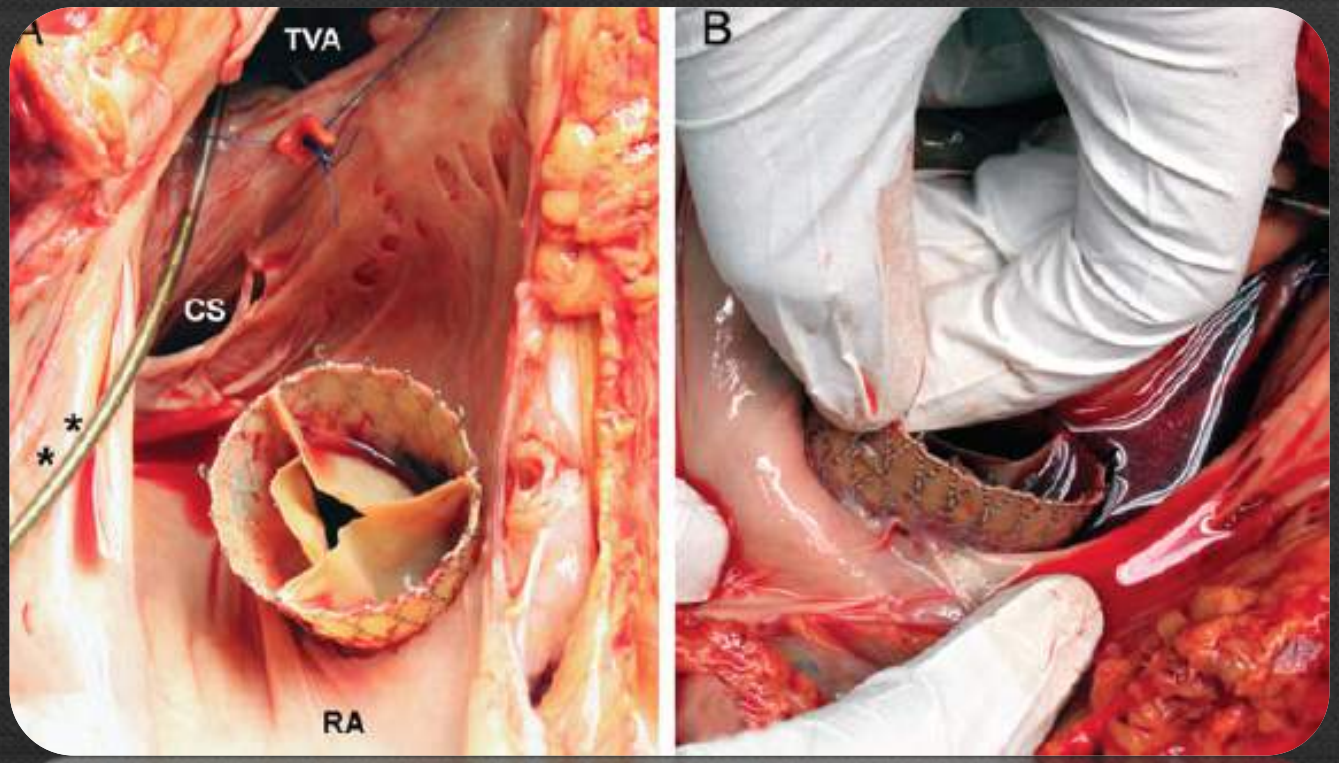


doi:10.1

Caval valve implantation for treatment of tricuspid regurgitation: post-mortem evaluation after mid-term follow-up

Alexander Lauten[1]*, Ali Hamadanchi[1], Torsten Doenst[2], and Hans R. Figulla[1]



Take home messages

Should we be more aggressive in surgical management FTR ?

YES

Is early TVr Improve the patients outcome and QOL?

YES

Is the Ring annuloplasty superior to the Suture annuloplasty?

YES

Is the rigid rings have better surgical results?

Maybe YES