ΑΝΕΠΑΡΚΕΙΑ ΤΡΙΓΛΩΧΙΝΑΣ

ΠΟΤΕ ΣΕ ΠΟΙΟΥΣ ΠΩΣ

Β. ΚΑΤΣΗ
ΚΑΡΔΙΟΛΟΓΟΣ
ΙΠΠΟΚΡΑΤΕΙΟ ΑΘΗΝΩΝ
ΣΕ ΣΧΕΣΗ ΜΕ ΑΥΤΗ ΤΗΝ ΟΜΙΛΙΑ ΔΕΝ ΕΧΩ ΛΑΒΕΙ ΟΥΔΕΜΙΑ ΟΙΚΟΝΟΜΙΚΗ ΕΠΙΧΟΡΗΓΗΣΗ
NO TOUCH APPROACH

For several years, FTR was not treated, as the common thinking was that it could be relieved simply by treating the MV-LEFT HEART disease. Calafiore J Thoraci Dise 2009

28 SLIDES
The truth is unique but neglected.

Complex TV apparatus: Non-circular, non-planar, 3D-semilunar.

Fibrous tricuspid annulus - Vague.
Primary Causes of TR 10%

VOLUME OVERLOAD  ANNULUS DILATATION

Rheumatic  RADIATION
Myxomatous
Ebstein anomaly
Endomyocardial fibrosis
Endocarditis
Carcinoid disease
Traumatic  (blunt chest injury, laceration)  FLAIL/MYXOMATOUS
Iatrogenic  pacemaker/defibrillator lead, RV biopsy
SECONDARY TR 90%  RV-Ra DILATATION

LEFT HEART DISEASE VALVE LV pulmonary htn

PULMONARY HYPERTENSION (chronic lung disease, pulmonary
THROMBOEMBOLISM L to R shunt 46% SEVERE PULM HTN ONLY MILD TR

RV dysfunction myocardial disease RV ischemia/infarction

**Figure 1** Anatomy of the normal tricuspid valve showing orientation of the leaflets and surrounding structures (A) and the outward dilation of the annulus toward the RV-free wall (B) (modified version of the original reprinted with permission from Dreyfus et al.69).
Clinical update

Tricuspid regurgitation diagnosis and treatment

Mani Arsalan1,2, Thomas Walther1, Robert L. Smith II1,2, and Paul A. Grayburn1,2*

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Figure 2. Pathophysiology of functional tricuspid regurgitation.
<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Class</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tricuspid stenosis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surgery is indicated in symptomatic patients with severe tricuspid stenosis.</td>
<td>I</td>
<td>C</td>
</tr>
<tr>
<td>Surgery is indicated in patients with severe tricuspid stenosis undergoing left-sided valve intervention.</td>
<td>I</td>
<td>C</td>
</tr>
<tr>
<td><strong>Primary tricuspid regurgitation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surgery is indicated in patients with severe primary tricuspid regurgitation undergoing left-sided valve surgery.</td>
<td>I</td>
<td>C</td>
</tr>
<tr>
<td>Surgery is indicated in symptomatic patients with severe isolated primary tricuspid regurgitation without severe right-ventricular dysfunction.</td>
<td>I</td>
<td>C</td>
</tr>
</tbody>
</table>
SEVERE PRIMARY TR - NO OR MILD SYMPTOMS?
DO YOU HATE DIURETICS?

MODERATE PRIMARY – LEFT SURGERY?

IIa
## Indications for tricuspid valve surgery (continued)

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Class</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgery should be considered in patients with moderate primary tricuspid regurgitation undergoing left-sided valve surgery.</td>
<td>IIa</td>
<td>C</td>
</tr>
<tr>
<td>Surgery should be considered in asymptomatic or mildly symptomatic patients with severe isolated primary tricuspid regurgitation and progressive right-ventricular dilatation or deterioration of right ventricular function.</td>
<td>IIa</td>
<td>C</td>
</tr>
<tr>
<td><strong>Secondary tricuspid regurgitation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surgery is indicated in patients with severe secondary tricuspid regurgitation undergoing left-sided valve surgery.</td>
<td>I</td>
<td>C</td>
</tr>
<tr>
<td>Surgery should be considered in patients with mild or moderate secondary tricuspid regurgitation with dilated annulus (≥40 mm or &gt;21 mm/m² by 2D echocardiography) undergoing left-sided valve surgery.</td>
<td>IIa</td>
<td>C</td>
</tr>
</tbody>
</table>
### Indications for tricuspid valve surgery (continued)

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Class</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgery may be considered in patients undergoing left-sided valve surgery with mild or moderate secondary tricuspid regurgitation even in the absence of annular dilatation when previous recent right heart failure has been documented.</td>
<td>IIb</td>
<td>C</td>
</tr>
<tr>
<td>After previous left-sided valve surgery and in the absence of recurrent left-sided valve dysfunction, surgery should be considered in patients with severe tricuspid regurgitation who are symptomatic or have progressive right-ventricular dilatation/dysfunction, in the absence of severe right or LV dysfunction, and severe pulmonary vascular disease/hypertension.</td>
<td>IIA</td>
<td>C</td>
</tr>
</tbody>
</table>
CONCOMITANT SURGERY LEFT HEART - TR

IT DOES NOT INCREASE RISK REVERSAL RV REMODELLING IMPROVEMENT OF FUNCTIONAL STATUS EVEN IN THE ABSENCE OF SUBSTANTIAL TR WHEN ANNULUS DILATATION IS PRESENT OR RV failure happened
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 Agyewu, MD, David H. Adams, MD
SEVERE LATE TR AFTERT LEFT HEART SURGERY

TR incidence after LEFT SIDED SURGERY 16-60% KWAK AHJ 2008
No or mild symptoms but progressive RV dilatation/dysfunction?

EVEN IF LEFT HEART AND PULMONARY PRESSURE IS FINE
Pathogenesis of TR in Mitral Disease
Shiran JACC 2009
LONG standing PRESSURE OVERLOAD-

PAH
Passively
Muscular hyperplasia
Pulmonary Resistance
FIBROSIS  HEMOSIDERIN OSSIFICATION

DREYFUS  2005
IF POSSIBLE VALVE REPAIR IS PREFERABLE TO VALVE REPLACEMENT
RING ANNULOPLASTY – SECONDARY TR REPLACEMENT
SEVERE DILATATION OT TETHERING
TRANS VALVULAR LEAD - SURGEON’S EXPERIENCE
PERCUTANEOUS REPAIR TECHNIQUES
INFANCY
1.6 million suffer from moderate – severe TR
8000 undergo surgery (high risk up to 25%)

UNMET NEED - FEW DATA

Novel Therapeutic Concepts

Percutaneous tricuspid valve therapies: the new frontier

Maurizio Taramasso¹*, Alberto Pozzoli², Andrea Guidotti¹, Fabian Nietlispach³, Devas T. Inderbitzin¹, Stefano Benussi¹, Ottavio Alfieri², and Francesco Maisano¹

¹Herz-Gefäß Chirurgie, UniversitätsSpital Zürich, University of Zürich, Rämistrasse 100, Zurich 8091, Switzerland; ²Cardiac Surgery Department, San Raffaele University Hospital, Milan, Italy; and ³Klinik für Kardiologie, UniversitätsSpital Zürich, University of Zürich, Zurich, Switzerland

Received 27 July 2015; revised 5 December 2015; accepted 28 December 2015; online publish-ahead-of-print 21 January 2016
Heterotopic transcatheter tricuspid valve implantation: first-in-man application of a novel approach to tricuspid regurgitation

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\(^1\)Department of Internal Medicine I (Cardiology, Angiology and Intensive Care Medicine), University Heart Center Jena, Erlanger Allee 101, 07747 Jena, Germany;
\(^2\)Department of Cardiothoracic Surgery, University Heart Center Jena, Erlanger Allee 101, 07747 Jena, Germany; and \(^3\)Department of Radiology, University Hospital Jena, Erlanger Allee 101, 07747 Jena, Germany

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Figure 2  Self-expanding percutaneous heart valve for inferior vena cava implantation. (A) The device was designed with the upper valve segment protruding into the right atrium and the lower segment for anchoring in the inferior vena cava. The middle segment constrained to facilitate fixation at the cavoatrial junction. The proximal stent segment is mounted with a tri-leaflet porcine pericardial valve and a sleeve covering the inside down to the base of the leaflets. (B) The valve was loaded into a 27 Fr catheter for implantation.
A dedicated plication lock device was used to bring the 2 pledgeted sutures together, plicating the annulus and effectively bicuspidizing the tricuspid valve. (A) Illustration of the sutures placed in the postero-anterior commissure and the septo-posterior commissure (yellow arrows). (B) Illustration of the 2 sutures after plication. Patient’s 3-dimensional transesophageal echocardiographic images are shown before plication (C) and after plication (D). Ant = anterior leaflet; Post = posterior leaflet; Sept = septal leaflet.

Baseline images of the native tricuspid annulus are shown. (A) Image of the native tricuspid annulus before repair; (B) image of 3-dimensional reconstruction of the annulus and effective regurgitant orifice area (EROA); (C) associated 3-dimensional volume. (D to F) Corresponding post-transcatheter tricuspid valve repair images of the tricuspid annulus. Asterisks in E and F show the position of the pledgeted sutures. A = anterior tricuspid valve leaflet; S = septal leaflet; P = posterior leaflet.
CORKSCREW SYSTEM-STENT
San Raffaele Scientific Institute, Milan

NOT SO DEMANDING
RETRIEVABLE
FEMORAL
IVC?
ΕΜΦΥΤΕΥΜΑ ΣΤΗΝ ΚΟΛΠΟΚΟΙΛΙΑΚΗ ΑΥΛΑΚΑ
BETHESDA 2014

Transatrial intrapericardic tricuspid annuloplasty (TRAIPTA concept)

A different approach is used by the TRAIPTA concept (transatrial intrapericardic)

Figure 5 (A and B). The transatrial intrapericardic tricuspid annuloplasty concept. (A) A circumferential implant is delivered along the atrioventricular groove. (B) Tension on the implant is then adjusted to modify annular geometry.
FORMA concept

Figure 6: The 'caval valve implantation' concept. Transcatheter prostheses is implanted in inferior and superior vena cava.

Figure 7: The FORMA concept. A spacer is positioned into the tricuspid regurgitant orifice and distally anchored to the right ventricle, to create a platform for native leaflet coaptation.
Percutaneous Transfemoral Management of Severe Secondary Tricuspid Regurgitation With Edwards Sapien XT Bioprosthesis
First-in-Man Experience

implanted in the IVC in patients 1 and 2, whereas patient 3 received dual-valve implantation. Echocardiography and multislice computed tomography (MSCT) were performed to assess disease severity (Table 1, right heart parameters) and to carefully evaluate the relationship/distance between RA, IVC, and hepatic veins.
Transcatheter Tricuspid Valve Repair With the PASCAL System

Neil P. Parw, MD, MS; Edwin C. Ho, MD; Mohammed Zahrani, MD; Sondos Samargady, MD; Rino A. Connelly, MD, PhD

REFERENCES
Tricuspid regurgitation after successful mitral valve surgery

Vasiliki Katsi, Leonidas Raftopoulos, Constantina Aggeli, Ioannis Vlasseros, Ioannis Felekos, Dimitrios Tousoulis, Christodoulos Stefanadis and Ioannis Kallikazaros