TAVI Complications in the ICCU

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WHY WE TALK ABOUT THIS ISSUE?

TAVR Outcome- VARC Meta-Analysis 3519 pts

- 30 days outcome
  - Major stroke
  - Major vascular event
  - Life threatening
  - Major bleed
  - Transf
  - AR
  - er (corevalve) 29%

ers: Coronary occlusion,perforation,SBE,rupture

30 days mortality of 6-8%

Index Procedure/Admission

Resource use (per-protocol population)

Resource Category	TF-TAVR (N = 234)	AVR (N= 221)	Difference (95% CI)*	P-value
Procedure duration (min)	244±78	330±102	87 (69 – 104)	<0.001
Total hospital LOS, days	10.2 (7)	16.4 (12)	6.2 (3.8 – 8.2)	<0.001
ICU	3.3 (2)	5.6 (3)	2.3 (0.9 – 3.3)	<0.001
Non-ICU	6.9 (4)	10.8 (8)	4.0 (2.2 – 5.5)	<0.001
Post pro[illegible]dure	7.4 (5)	13.5 (10)	6.1 (3.7 – 8.0)	<0.001
Major vasc. complication	13.2%	3.2%	10.1% (5.1 – 15.1)	<0.001
Major bleeding	9.4%	22.6%	13.2% (-6.6 to -19.9)	<0.001
New pacemaker, n (%)	16 (6.8%)	13 (6.0%)	0.8% (-3.7 – 5.3)	0.73

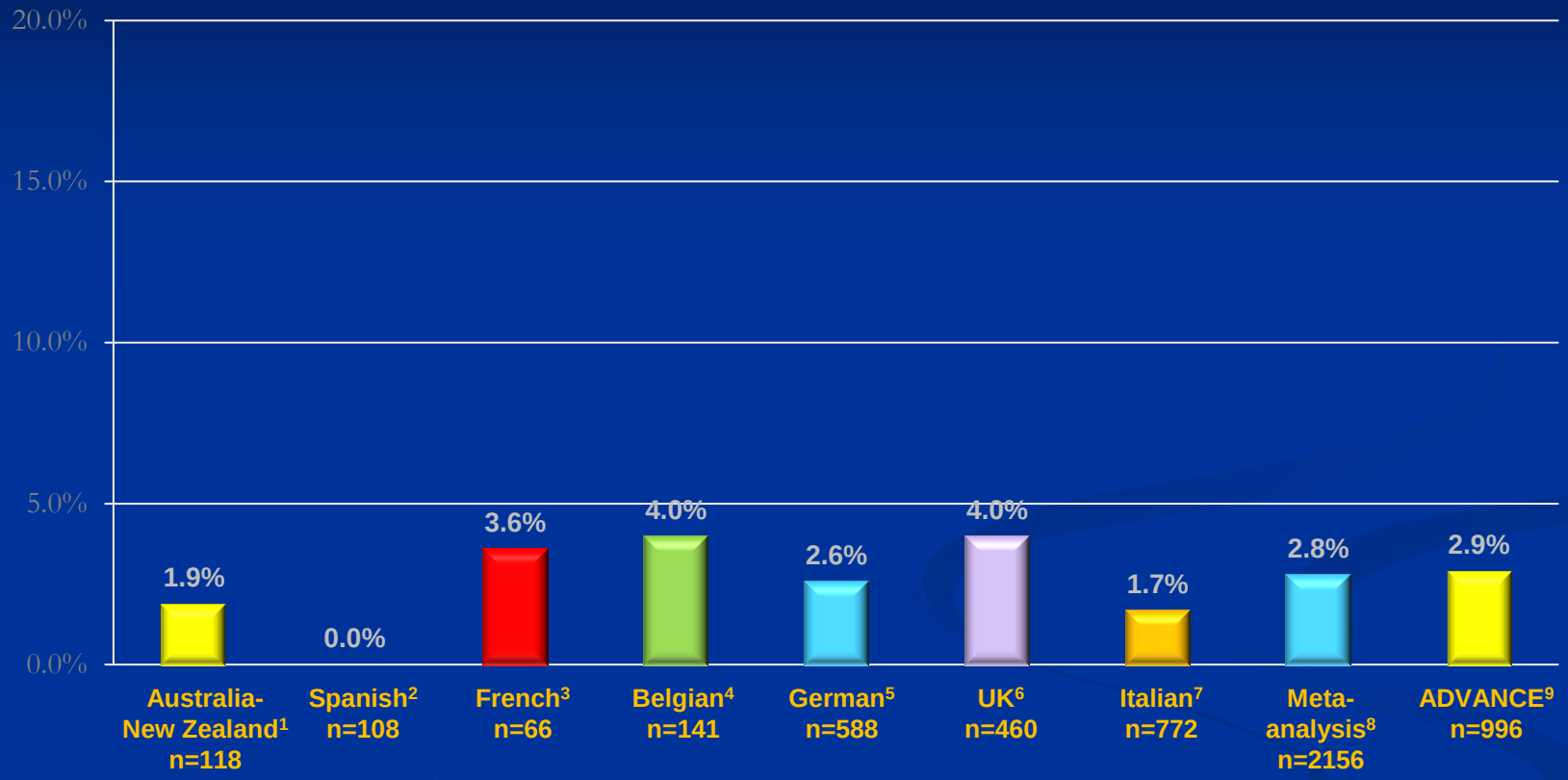
LOS data are shown as mean (median).
*95% CIs from 1,000 bootstrap replications of study data.

TAVR Complications

- ***Strokes***
- **Vascular Events/Bleeding**
- **New Pacemakers**
- **Para-Valvular Regurgitation**
- **Others**

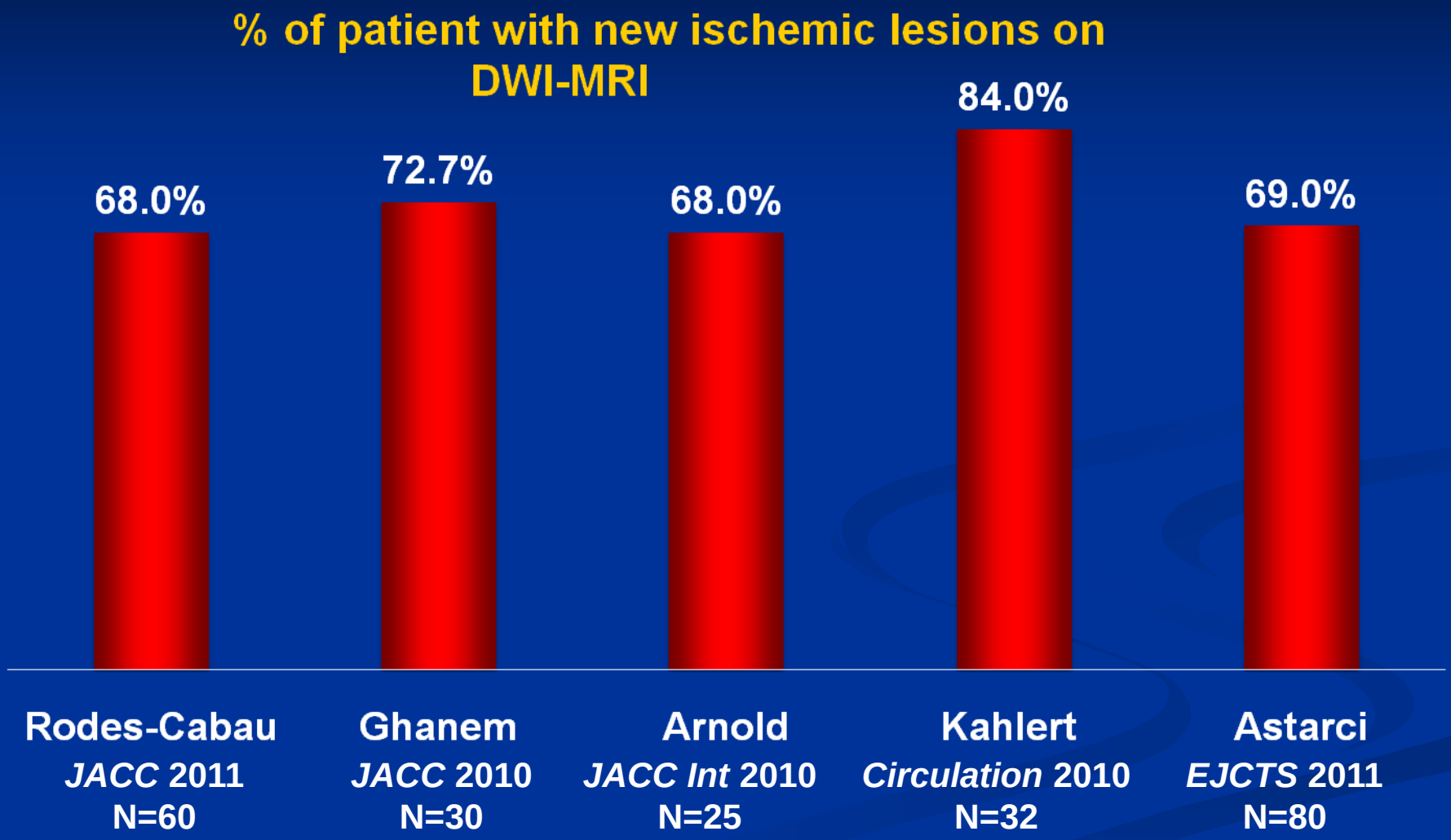
Procedural Predictors of Mortality

VARC Endpoint: Stroke



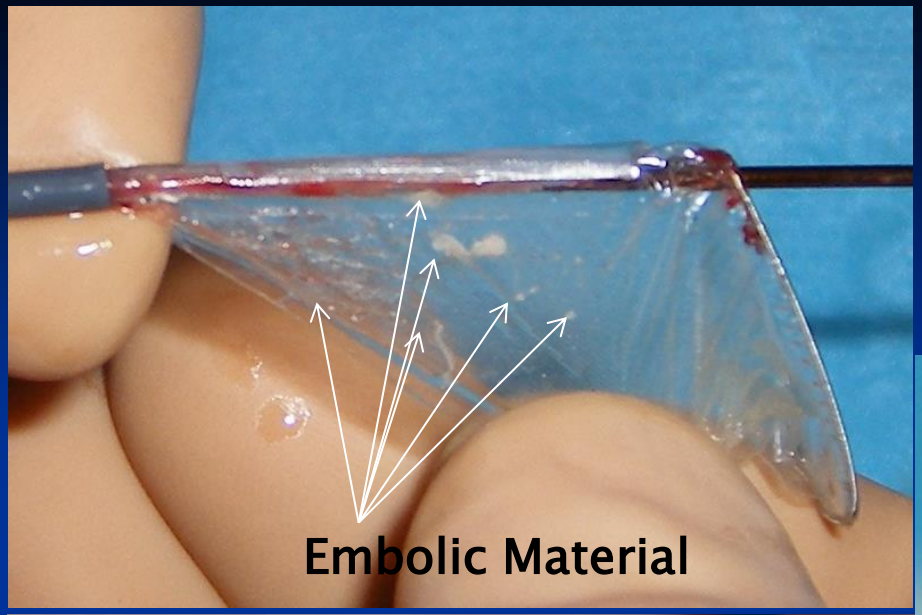
1. Meredith IT. The Australia-New Zealand Medtronic CoreValve® Registry: outcomes in inoperable and high risk AS patients. Presented at: TCT. 2010.
2. Avanzas P, et al. *Rev Esp Cardiol.* 2010;63:141-148.
3. Eltchaninoff H. French Registry. TAVI facts, figures and national registries. Presented at: EuroPCR; May 25-28, 2010; Paris, France.
4. Bosmans J. Belgian Registry. TAVI facts, figures and national registries. Presented at: EuroPCR; May 25-28, 2010; Paris, France.
5. Zahn R. German Registry. TAVI facts, figures and national registries. Presented at: EuroPCR; May 25-28, 2010; Paris, France.
6. Ludman P. UK Registry. TAVI facts, figures and national registries. Presented at: EuroPCR; May 25-28, 2010; Paris, France.
7. Petronio AS. Italian Registry. TAVI facts, figures and national registries. Presented at: EuroPCR; May 25-28, 2010; Paris, France.
8. Ruiz CE, et al. Weighted meta-analysis of early and late clinical outcomes after CoreValve® – TAVI in seven national registries. Presented at: EuroPCR; May 17-20, 2011; Paris, France. Analysis funded by Medtronic, Inc.
9. Linke, A, et al. Treatment of High Risk Aortic Stenosis Patients with Transcatheter Medtronic CoreValve Implantation. Presented at ACC 2012

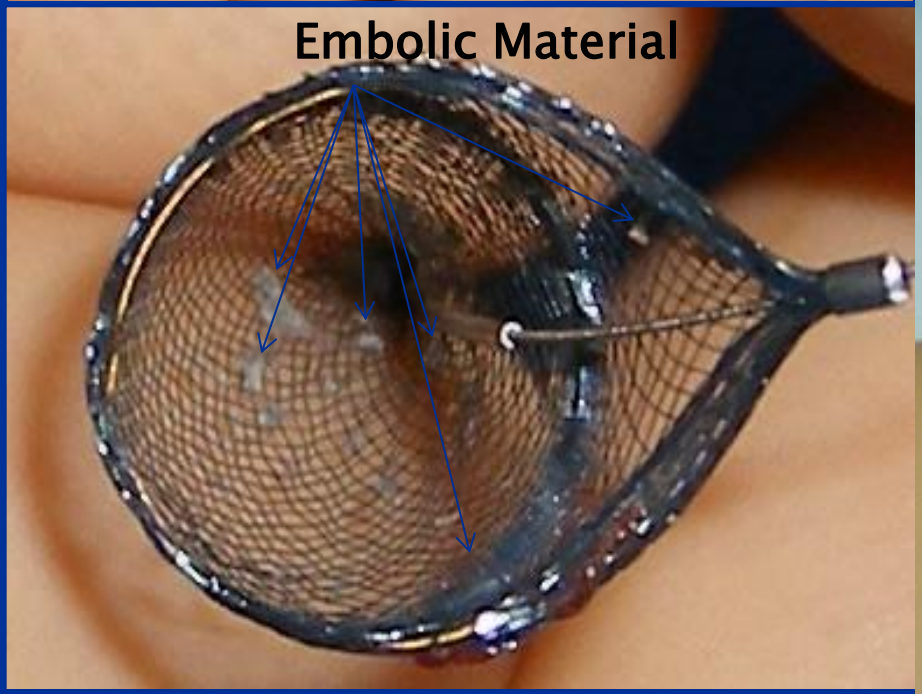
Neuro-imaging with TAVR

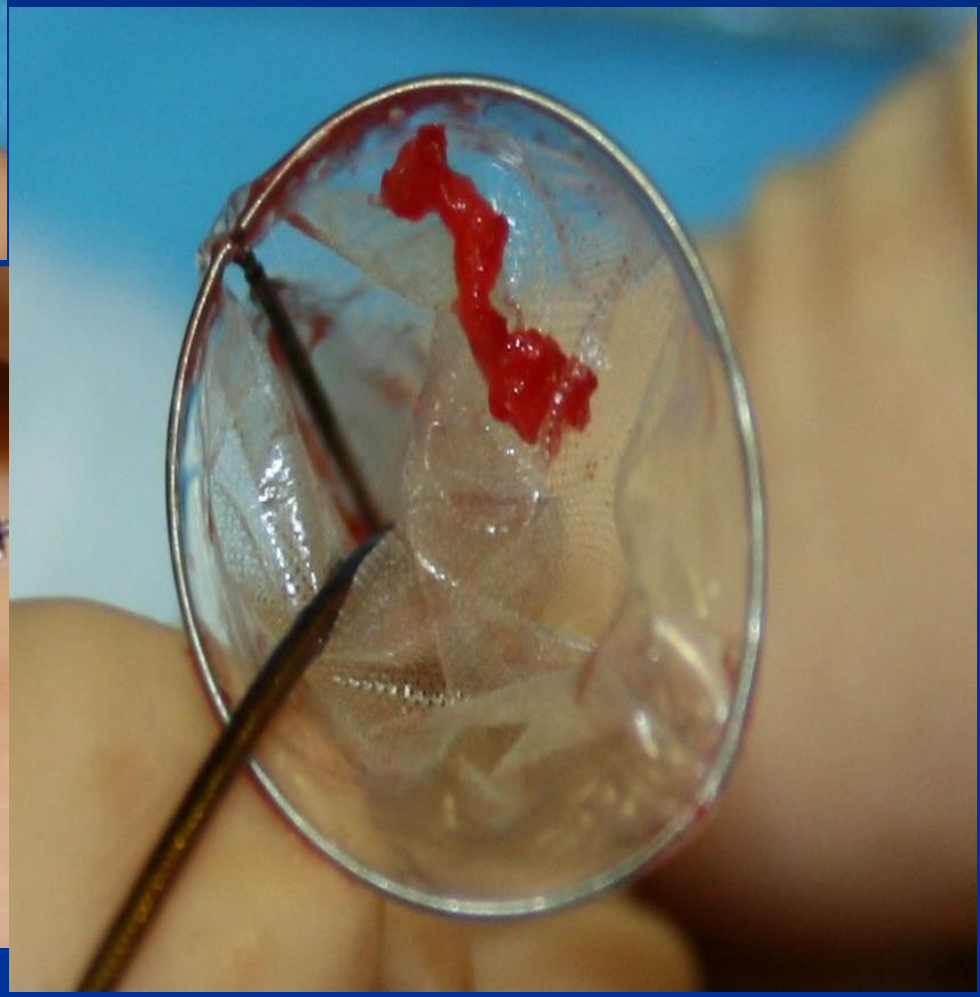


Daneault et al., *JACC* 2011;58: 2143-50

Embolic Material after TAVR

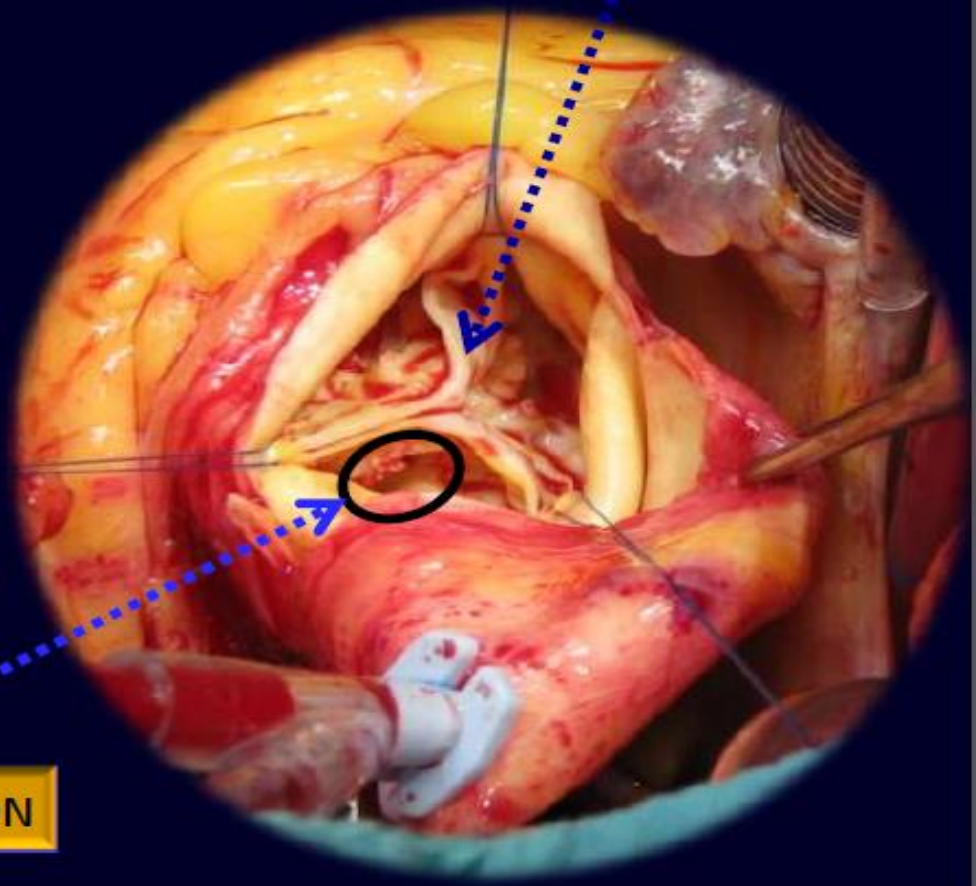






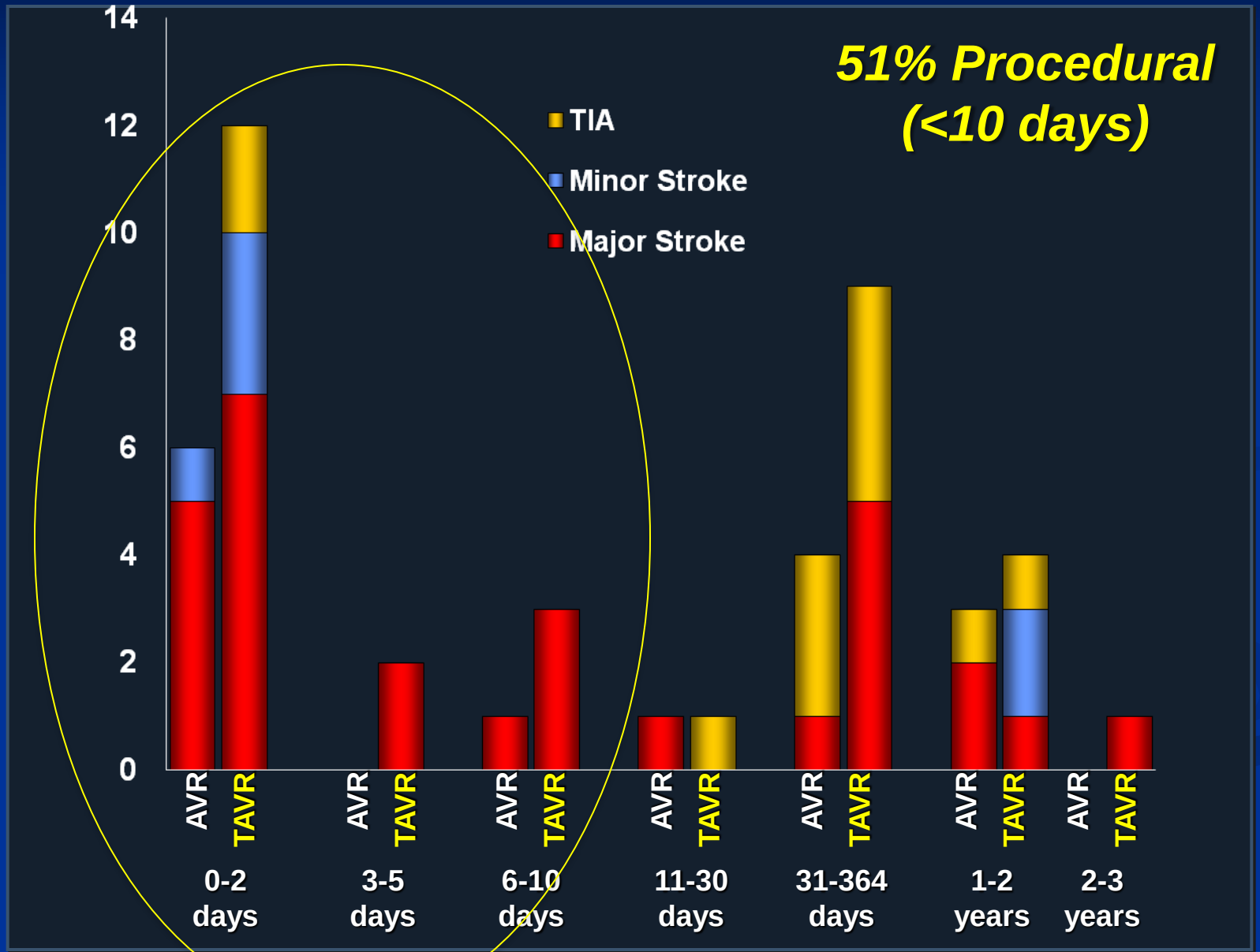
Degenerative & Calcified Aortic Arch

Calcified Cusps



Free Calcification

Timing and Types of Neurologic Events (strokes and TIAs)



Incremental Risk Factors for Neurological Events

- Severity of AS
- Pre-dilatation
- Post-dilatation
- Multiple position attempts
- Valve in valve

AF and TAVR: Strokes

Incidence, Predictive Factors, and Prognostic Value of New-Onset Atrial Fibrillation Following Transcatheter Aortic Valve Implantation

Ignacio J. Amat-Santos, MD, Josep Rodés-Cabau, MD, Marina Urena, MD, Robert DeLarochellière, MD, Daniel Doyle, MD, Rodrigo Bagur, MD, Jacques Villeneuve, MD, Mélanie Côté, MSc, Luis Nombela-Franco, MD, François Philippon, MD, Philippe Pibarot, DVM, PhD, Eric Dumont, MD

Quebec City, Quebec, Canada

METHODS:

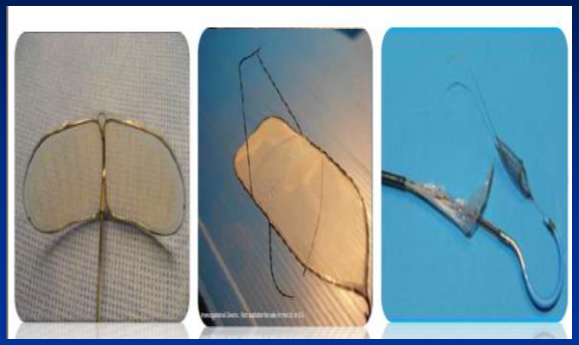
- **129 pts with no prior h/o AF treated TAVR)**

RESULTS:

- **NOAF in 44 pts (31.9%) at median time 48 hrs**
-
- ***Strokes/systemic embolisms in NOAF vs. no-NOAF were 13.6% vs. 3.2% (P=0.021) at 30 days***

Amat-Santos IJ et al; J Am Coll Cardiol 2012;59:178-88

Prevention



- Operator :
  - Patient selection and approach
  - Technical issues during the procedure
  - Cerebral protection devices
  - Anticoagulation during the procedure: Heparine
- ICCU :
  - Clopidogrel –ASA :3-6 months
  - Warfarine- ASA or Clopidogrel : 3-6 monts

Standarized Neuro-Monitoring after Tavi

- First neurological assessment directly after the intervention by anesthesiologist or nurse
- Neurological check at time of ICU admission
- 60 minutes interval- neuro check

Stroke suspicious: Stroke team

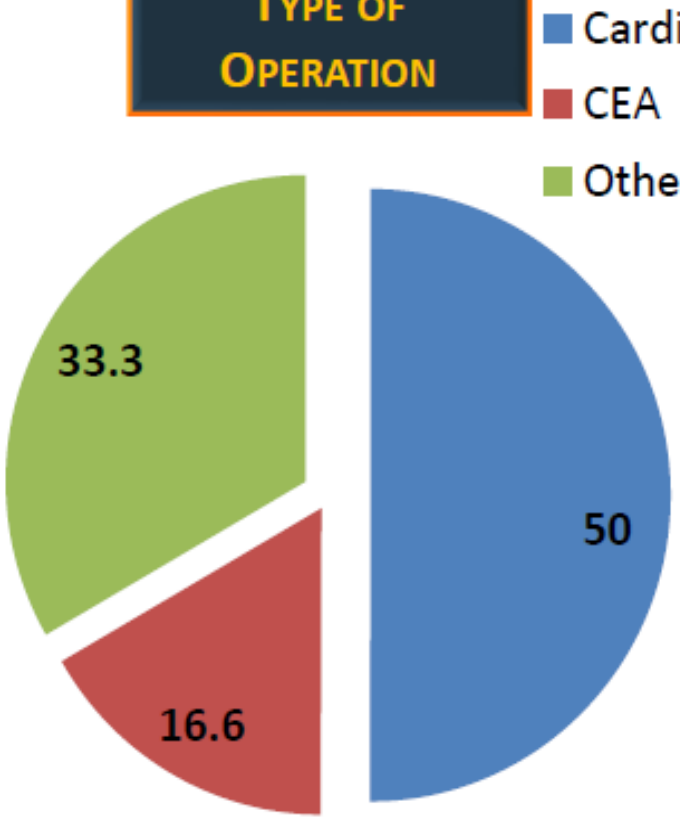
- Immediate neurological assessment
- Urgent cerebral imaging assessment: MRI-MSCT
- Urgent treatment strategy - “Time is brain”

Intra-arterial Thrombolysis During The Post-Procedural Period

Chalela J et al. Stroke 2001;32:1365-1369

Mean Age 71.5 years
Males 69%, N=36

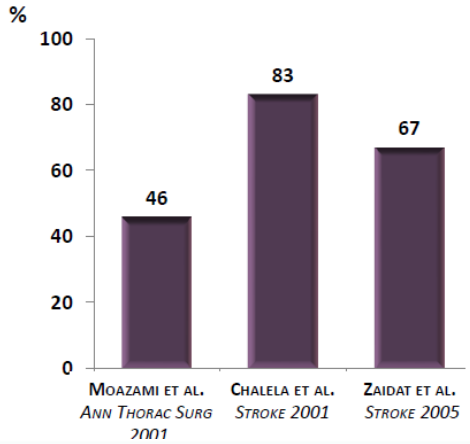
Type of Operation



Fibrinolytic therapy with Urokinase or rTPA

83% Success - Recanalization of the Vessel

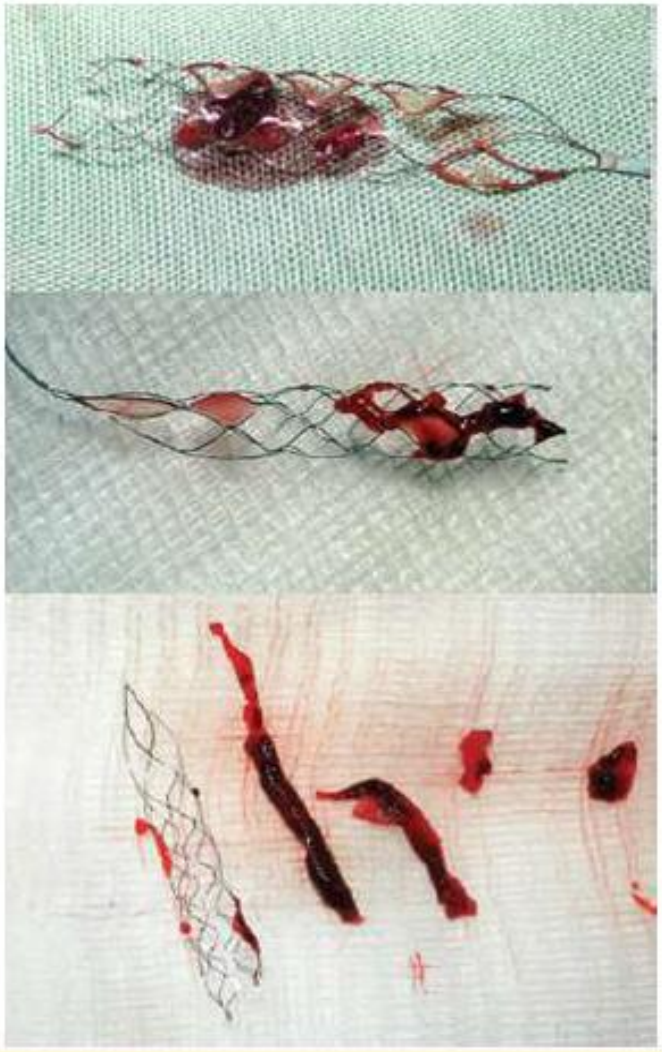
Procedural Success
Intra-Arterial Thrombolysis (Recanalization)



Interventional Stroke Treatment

Stent Assisted Mechanical Recanalization

Roth C et al. Stroke. 2010;41:2559-67



Mean Age 64.8±20
Time Symptom Onset to Recanalization 277±118min

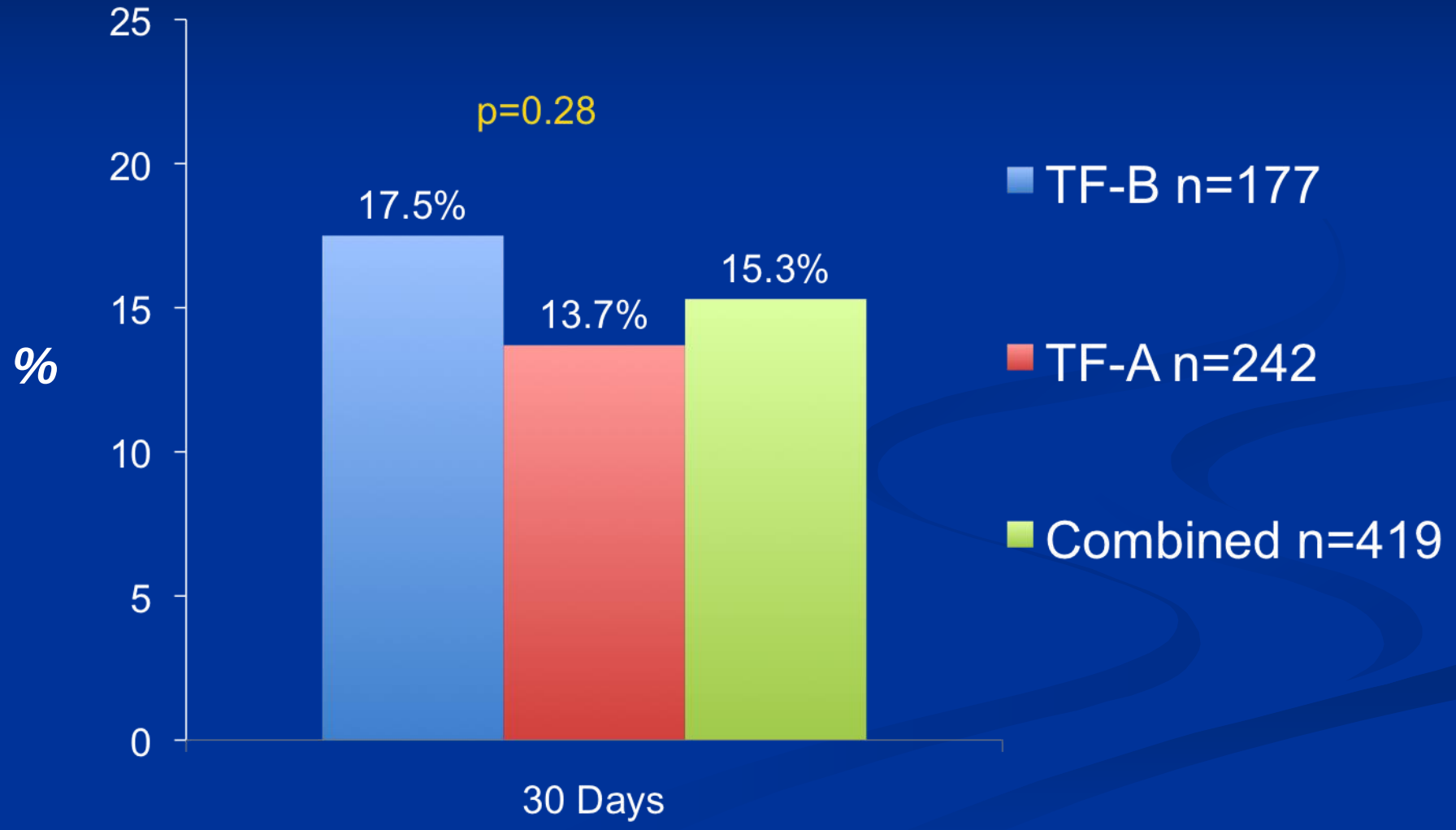
- Self Expanding and fully retrievable Nitinol Stent device
- Stent assisted mechanical recanalization and Thrombus Extraction
- Recanalization in **91%**
- Complete Perfusion **(TICI 3)** in **54.5%**
- Neurological Recovery **63.6%**

TAVR Complications

- Strokes
- *Vascular Events/Bleeding*
- New Pacemakers
- Para-Valvular Regurgitation
- Others

Procedural Predictors of Mortality

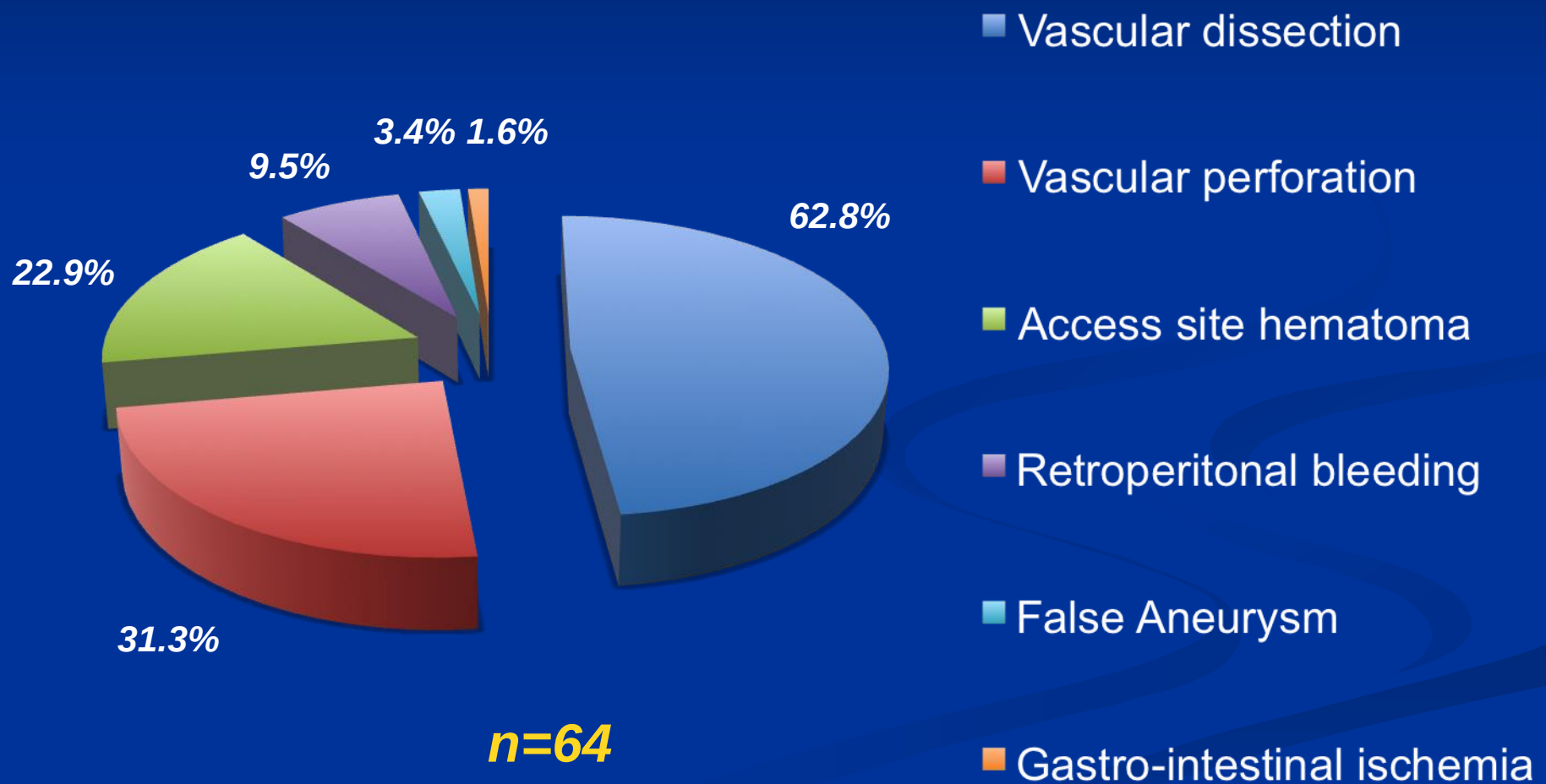
Major Vascular Complications
PARTNER TF-Cohort A and B (AT)



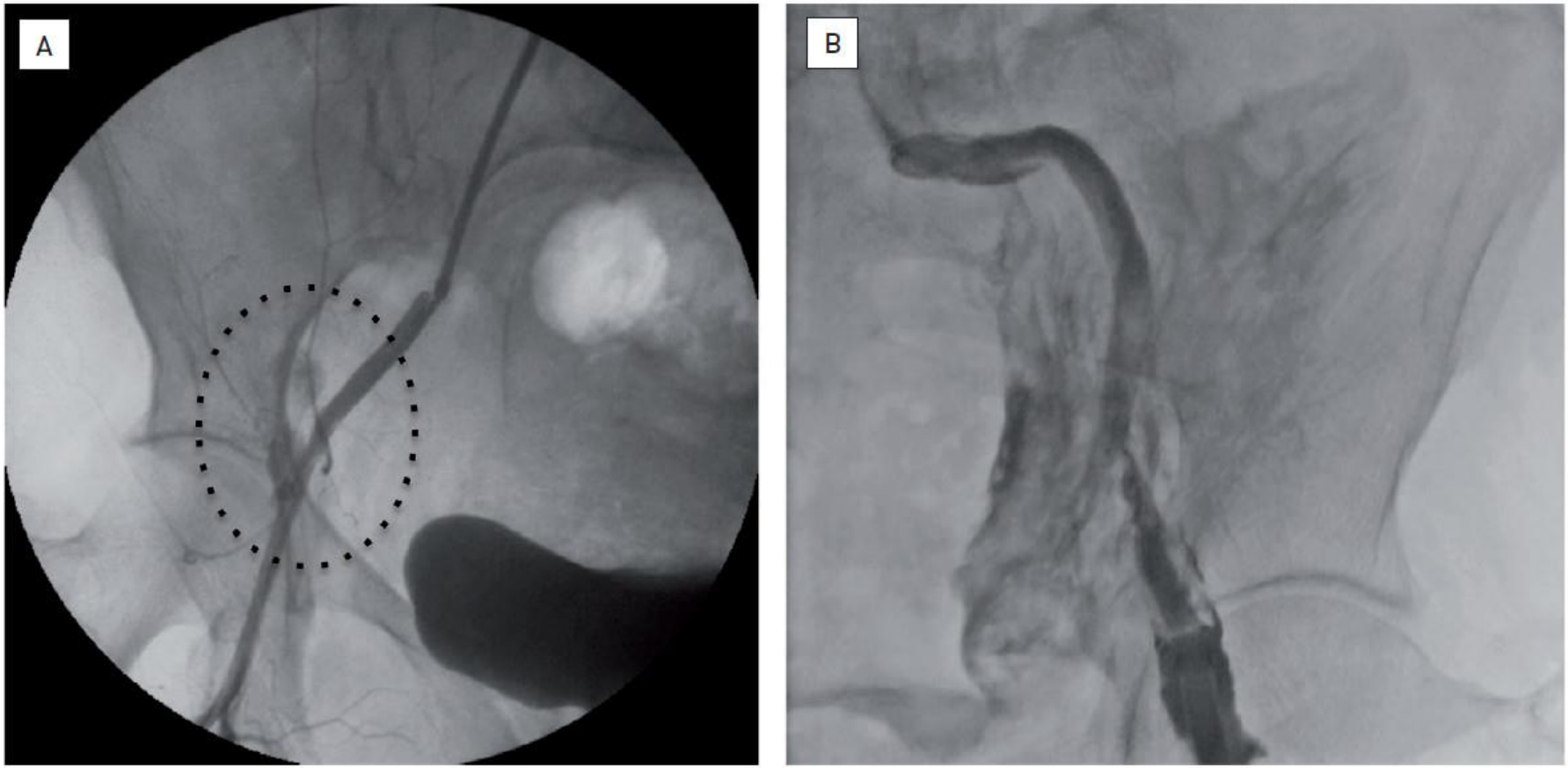
Association between Major VC, Bleeding and Renal Failure

	Major VC n=64	No Major VC n=355	Combined n=419	Hazard Ratio [95% C.I.]	
Hemorrhagic Event	71.9% (46)	13.6% (48)	22.5% (94)	7.60 [5.01,11.52]	<0.0001
Major bleeding	60.9% (39)	6.8% (24)	15.1% (63)	12.73 [7.57,21.42]	<0.0001
Minor bleeding	11.0% (7)	7.1% (25)	7.7% (32)	1.60 [0.69,3.69]	0.26
Renal Failure (Dialysis required)	8.1% (5)	1.7% (6)	2.7% (11)	4.96 [1.51,16.27]	0.003
Dialysis lasting > 30 days	1.6% (1)	0.6% (2)	0.7% (3)	2.91 [0.26,32.08]	0.36

Major Vascular Complications PARTNER TF-Cohort A and B (AT)



n=64



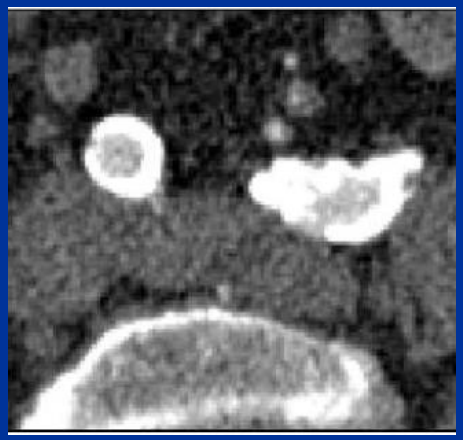
The PCR-EAPCI Textbook – Percutaneous interventional cardiovascular medicine

Transcatheter aortic valve implantation

Nicolo Piazza, Alain Cribier

Vascular Complications Management

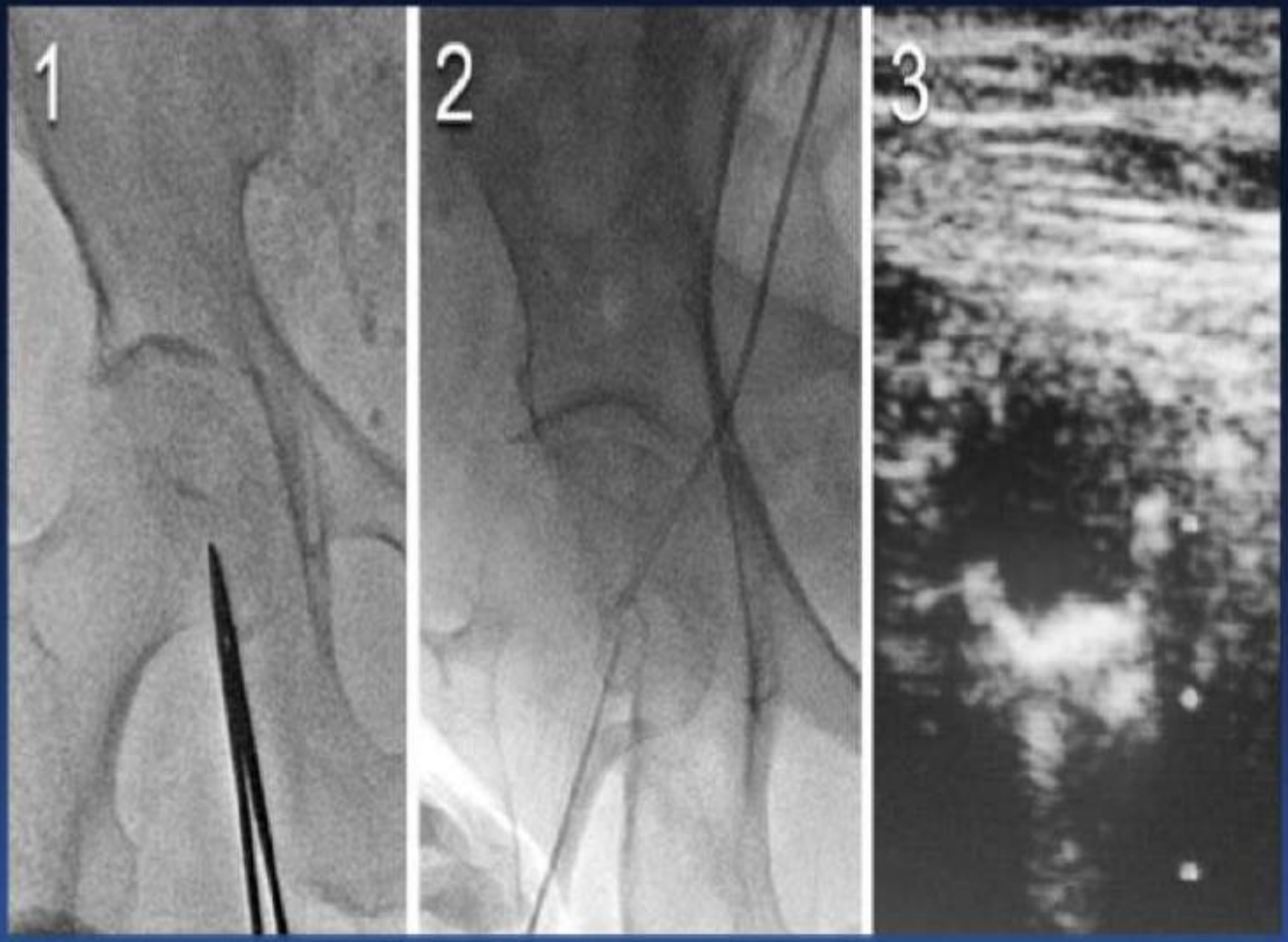
- Prevention
  - Appropriate selection of the vascular approach
    - CTA or/and angiography
    - Look for vessel size
    - Look for tortuosity and calcifications, stenosis,



Vascular Complications Management

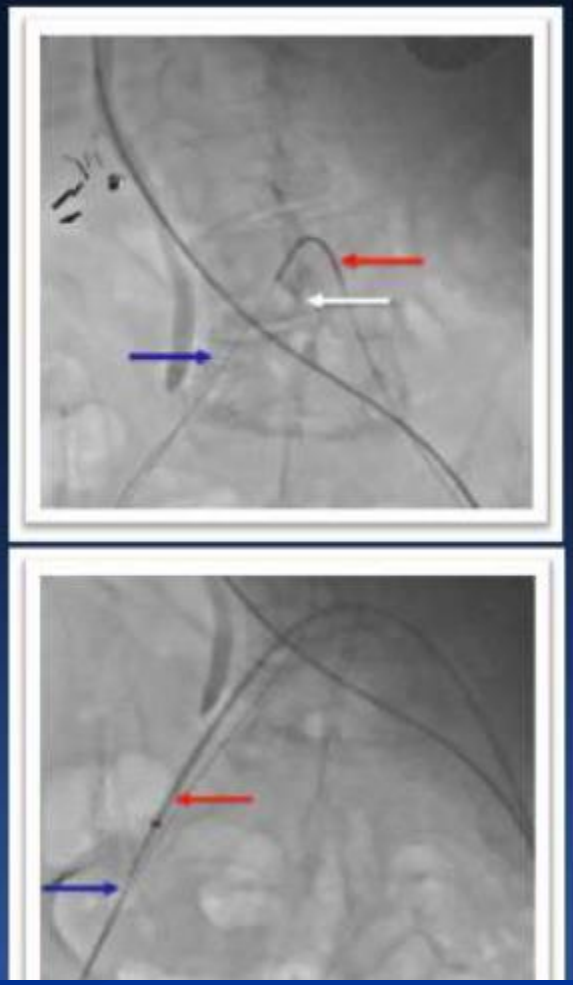
- Intraoperative prevention, diagnosis and treatment
  - Appropriate stick: central, over the bifurcation, no too high, avoid calcification, anterior wall
  - Appropriate management of the suture vessel device
  - Do not push hard during advancing
  - Use crossover technic
  - Be ready with peripheral equipment
  - Vascular surgeon should be on call

A Higher Standard for Percutaneous Access



Crossover Balloon Occlusion Technique (CBOT)

- Using a **hydrophylic** guidewire (Glidewire, Terumo) from the **contralateral** side, a **crossover catheter** (Omni Flush) is advanced into the TAVR delivery sheath
- A **stiff** 0.035 inch guidewire is advanced through the crossover catheter and into the TAVR delivery sheath
- The crossover catheter is exchanged for a **long crossover sheath**



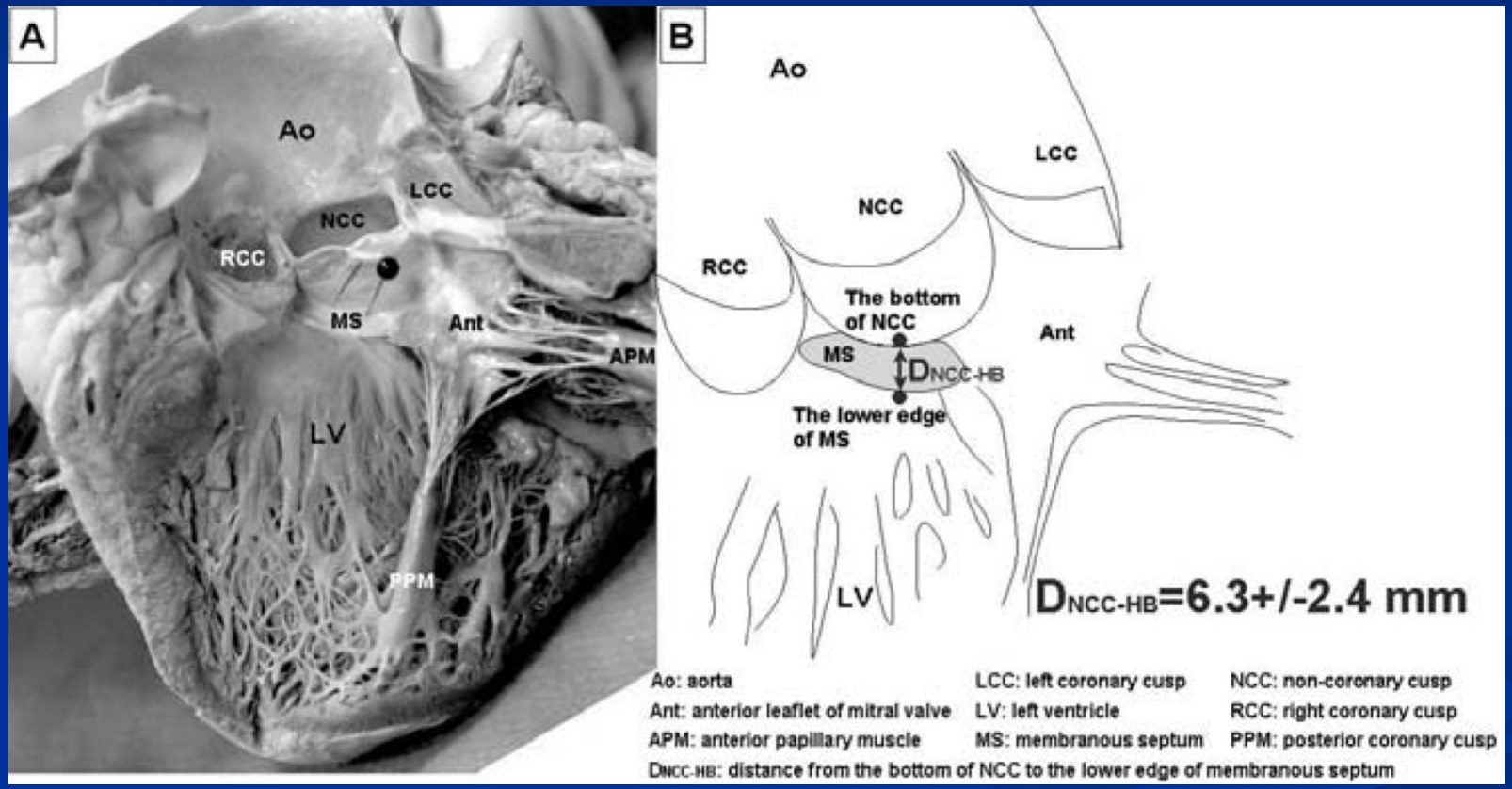
Postoperative Care

- Vascular check at ICCU admission
- Vascular check every 60 minutes during six hours
- Look for hematoma, loss of pulses, signs of leg ischemia
- Hemoglobin check after three hours
- Hypotension = Hemoglobin
- Doubts?:
  - Sheath in place=reinjection
  - No sheath= CT
  - Vascular surgeon

TAVR Complications

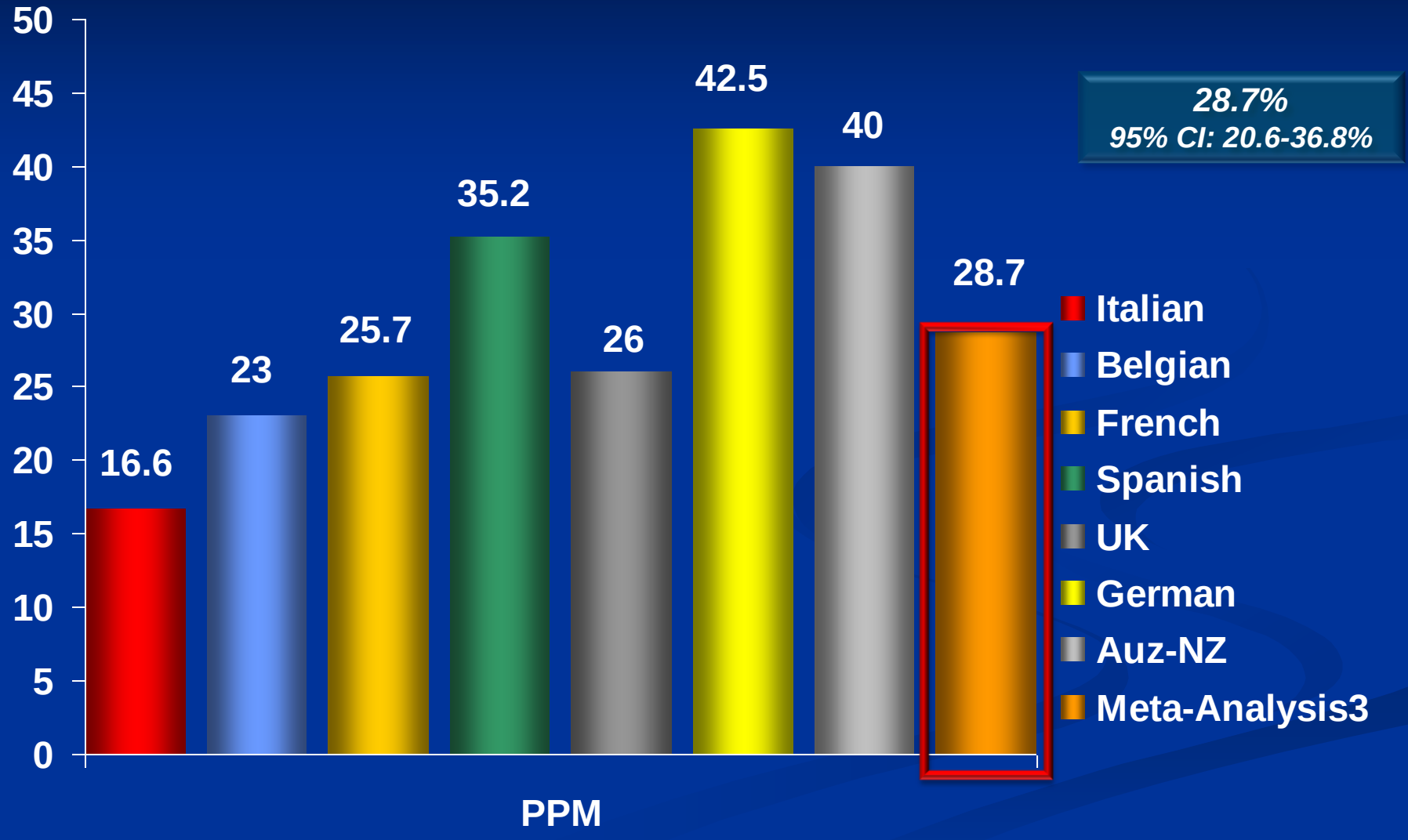
- Strokes
- Vascular Events/Bleeding
- *New Pacemakers*
- Para-Valvular Regurgitation
- Others

Relationship between the Non-Coronary Cusp and the HIS Bundle



Igawa et al *Tottori University Hospital, Yonago, Japan*

Meta-Analysis – PPM



Predictors for PPM
Medtronic CoreValve

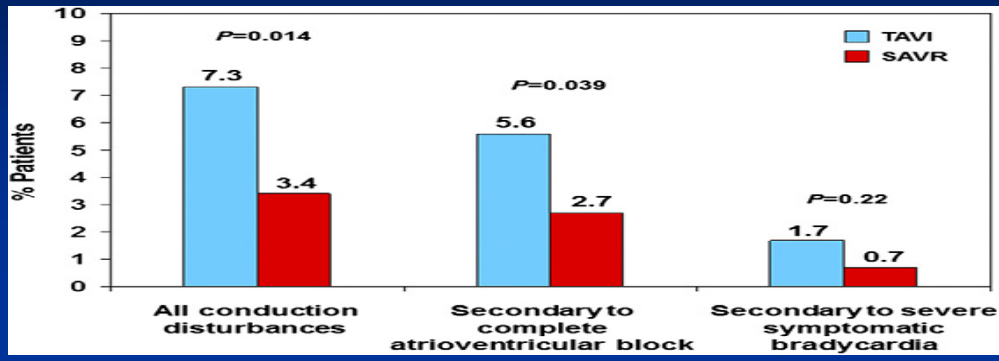
Pre-existing RBBB	✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔
Depth of implantation	✔ ✔ ✔ ✔ ✔ ✔ ✔
Small LVOT/annulus	✔ ✔
Septal wall thickness	✔ ✔
Calcification	✔

Complications

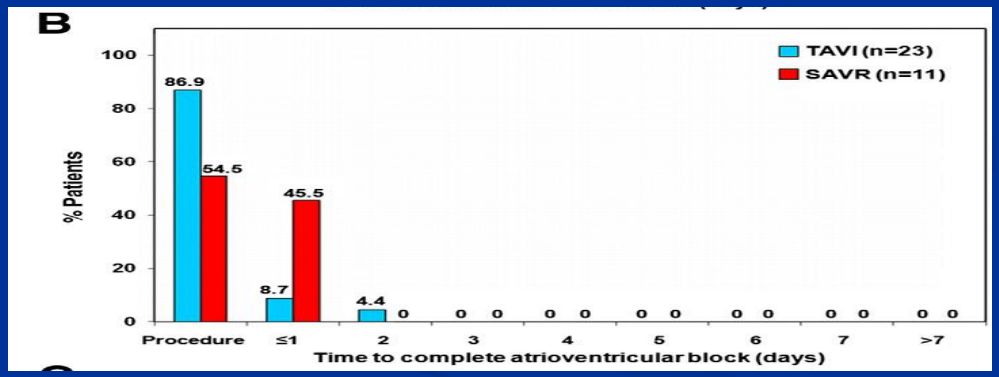
- Conduction Disturbances
  - Monitor patients post procedure
    - Daily ECGs
    - Continuous telemetry ECG monitoring should be required in patients with any evidence of new conduction system abnormalities
  - Document new conduction system abnormalities requiring permanent pacemakers within 30 days of the procedure
    - Left bundle branch block
    - Third degree atrioventricular block

Need for PM : TAVR vs. SAVR

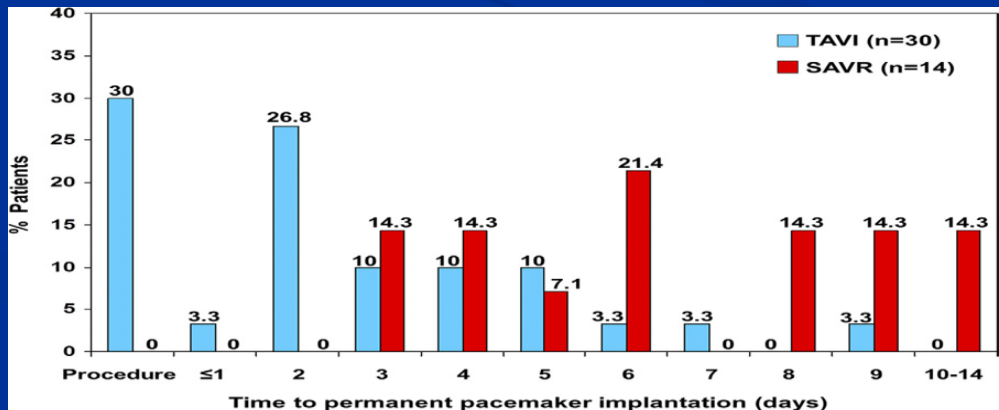
More conduction disturbances



Earlier complete AV block

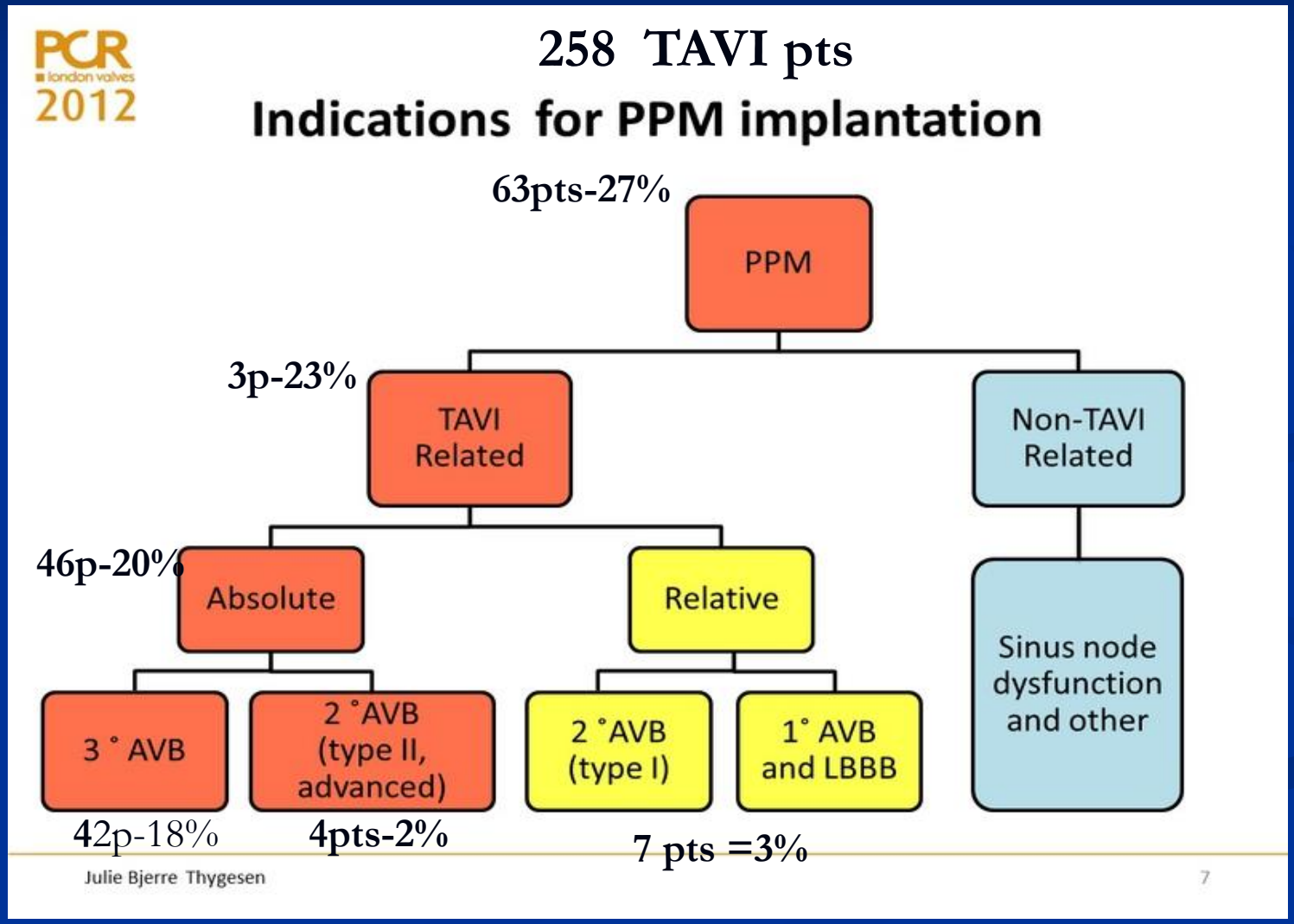


Earlier PM implantation



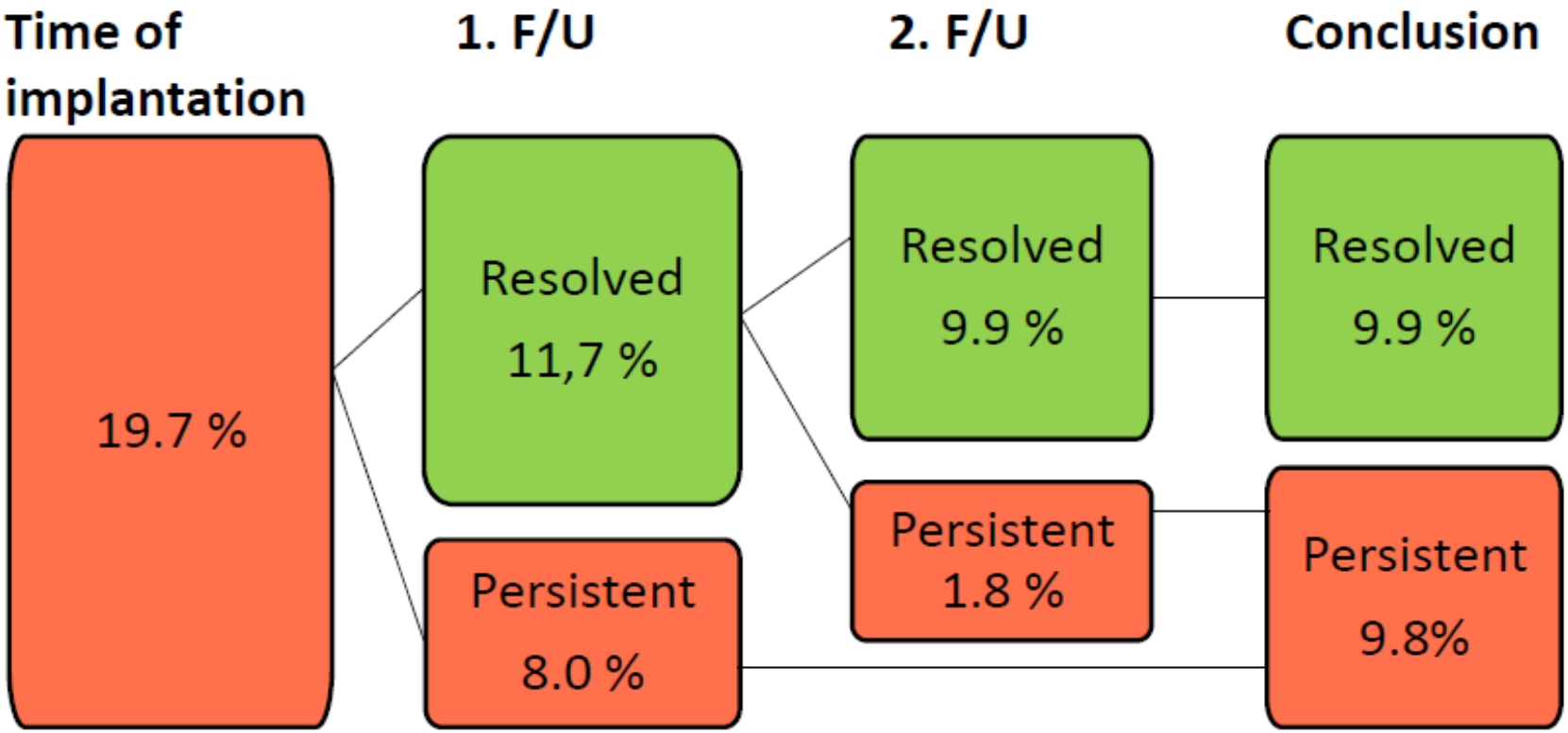
JG Webb. JACC CI. 2012

Incidence of permanent pacemaker implantation after TAVI and re-evaluation of the indications after the peri-procedural period



PCR london valves 2012

Re-evaluating of absolute PPM indication



Clinical impact of persistent LBBB after TAVI with Corevalve revalving system

- 818 pts
- Immediate LBBB:43% - Resolved in 52% (group A)
- Delayed developed of LBBB :8%(group B)
- PMK: Group A:5%

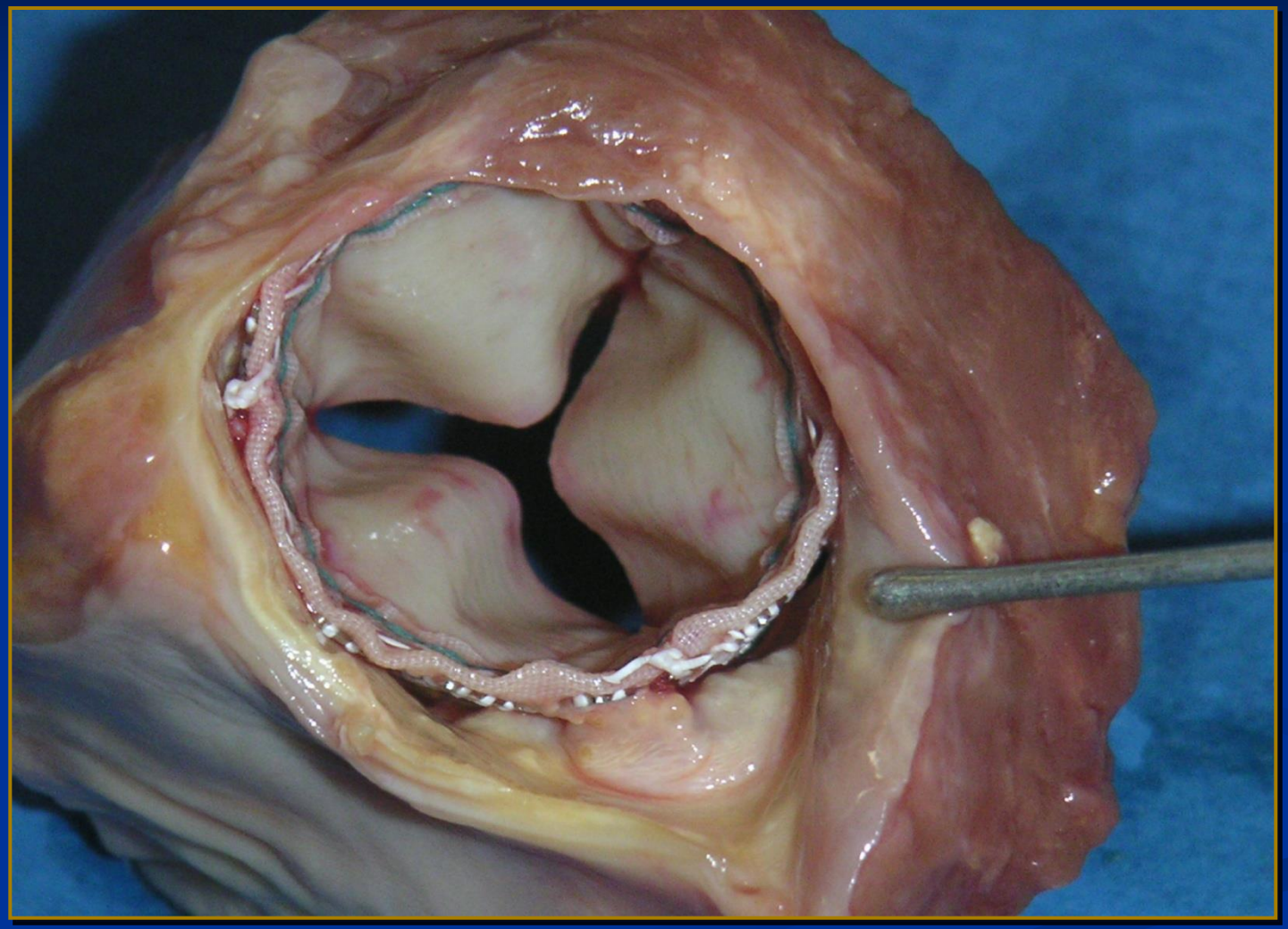
  Group B:2%

Testa L, Colombo et al. Circulation, february 2013

TAVR Complications

- Strokes
- Vascular Events/Bleeding
- New Pacemakers
- Para-Valvular Regurgitation
- *Others*

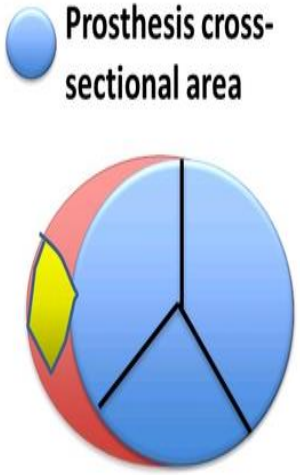
Para-valvular Regurgitation

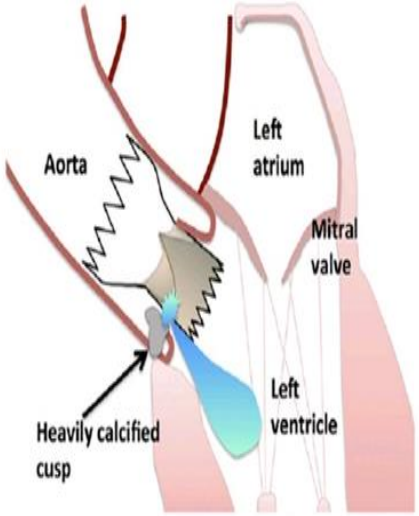


AR after TAVI - Incidence

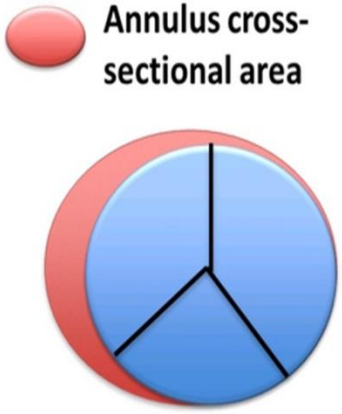
1. Varies from 48% to 93%
2. Moderate to severe AR in 14% to 21%
3. Differences in incidence due to:
   - Assessment technique
   - Timing after TAVI
   - Lack of accurate grading

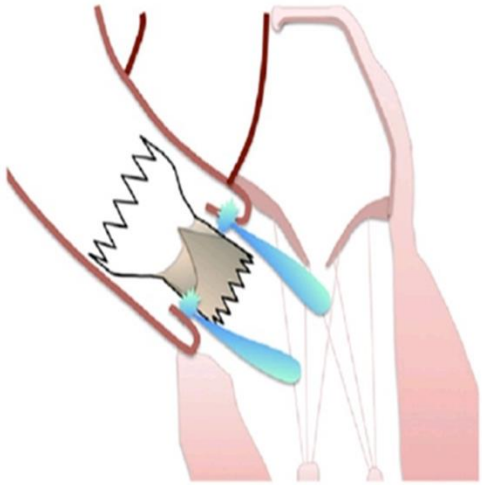
Para-valvular Aortic Regurgitation
Incomplete prosthesis apposition





Calcific nodule preventing full apposition of the prosthesis, causing focal paravalvular leak

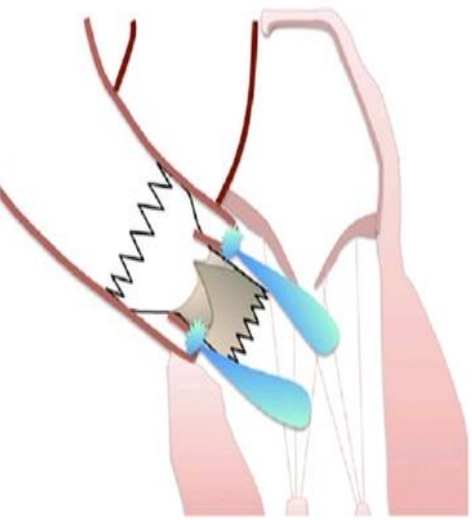


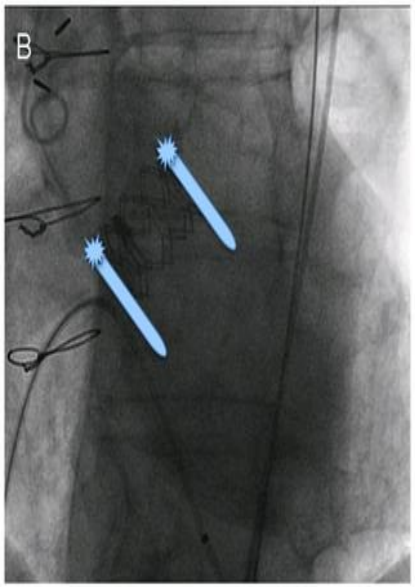


Very elliptical annulus or undersized prosthesis, causing multiple paravalvular leaks

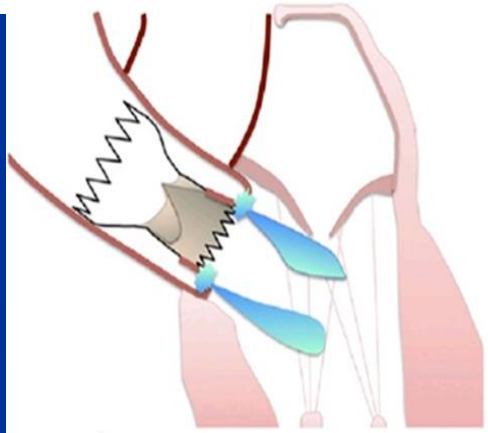
Para-valvular Aortic Regurgitation
Malpositioning

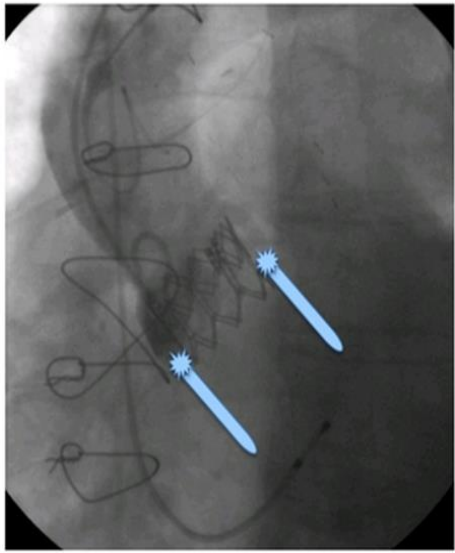
low prosthesis implantation





high prosthesis implantation





When you detect AR: Quantify!!

- Aortography
- AR index : [(D
  - < 25= Se
- Multiple criteria

Quantification of AR is difficult and not accurate

Why is important to quantify?

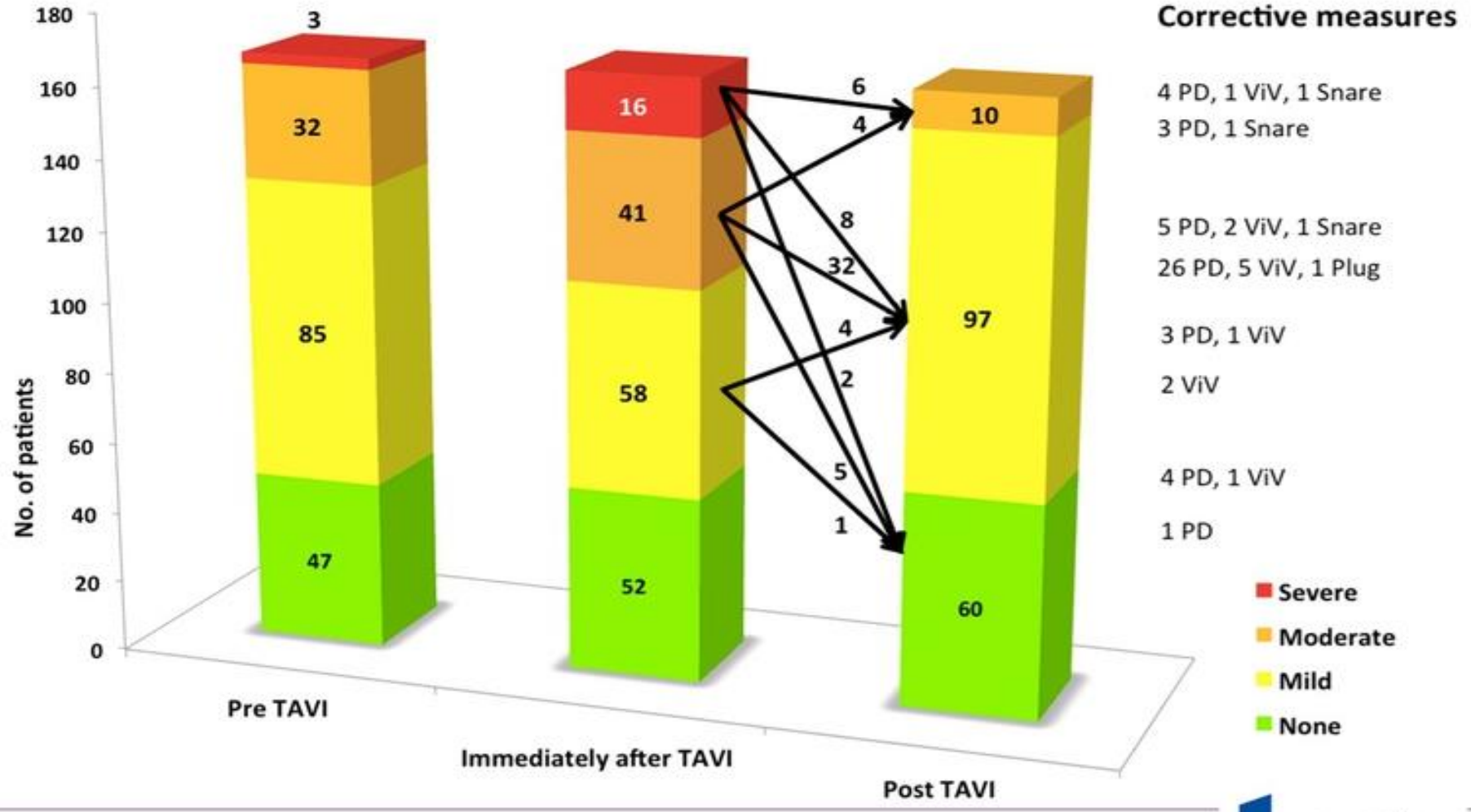
- Moderate to severe AR is associated with:
  - Poor treatment response
  - Early in hospital death
  - Increased mid term mortality

Diagnosis : Moderate/Severe AR

- Look for the mechanism:
  - Valvular or para-valvular
  - Malposition or incomplete apposition
- Corrective Measures!
  - Post-dilatation
  - Retrieve with snare
  - Valve in valve
  - Surgery

euro PCR 2013

Corrective Measures (N = 62)



universitäts klinikum bonn

Aortic Regurgitation at ICCU

1. Clear and nice situation:
   - ***No severe AR with clinical improvement***
2. Not nice but clear situation :
   - ***Recognized severe AR without clinical improvement***
     - Treatment of severe acute AR
     - Vasodilators
     - Rapid pacing
     - Conventional Surgery

Aortic Regurgitation at ICC

3) Not nice and not clear situ

- **Unrecognized severe** **ithout clinical improvement**
  - Worsen art failure
  - An

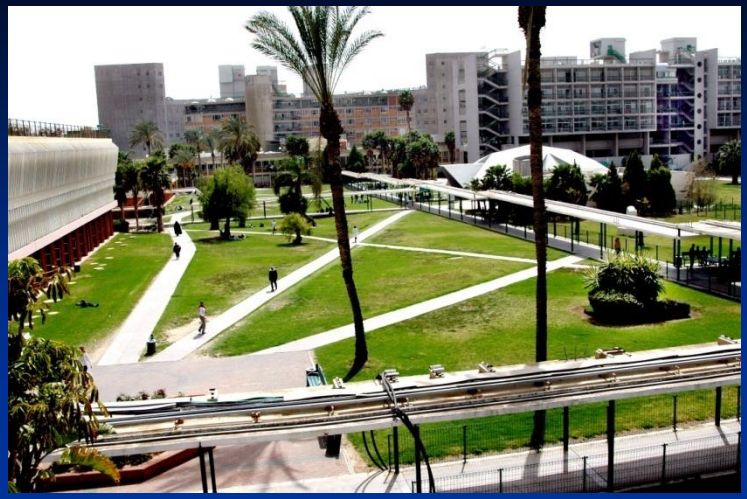
Look for unrecognized severe aortic regurgitation

Aortic Regurgitation at ICCU

- **Unrecognized severe AR**
  - Diagnosis: TEE- Aortography
- **Treatment**
  - Vasodilators – rapid pacing
  - Conventional surgery
  - Re-intervention
    - Post-dilatation
    - Retrieve with snare
    - Valve in valve

Conclusions

- ICCU management has a key impact on the survival of the patient after TAVI
- ICCU management of the TAVI patient includes
  - Treat the consequences of the complications developed and corrected during the procedure.
  - Monitoring, early detection and treatment of new complications .
  - First evaluation of the “clinical successful” of the procedure



THANK YOU!!!