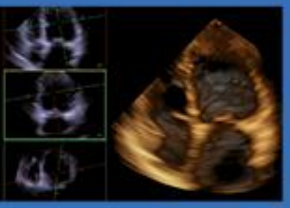

EuroValve
April 26-27, 2018

# Is TAVR already arguable in low risk patients? NO


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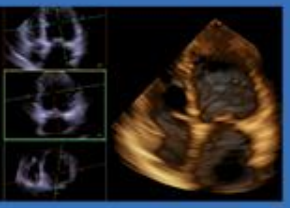

EuroValve
April 26-27, 2018

# Faculty disclosure

***Joelle KEFER***

*I disclose the following financial relationships:*

**Consultant** for StJude-Abbott
**Receive grant/research support** from Edwards Lifesciences

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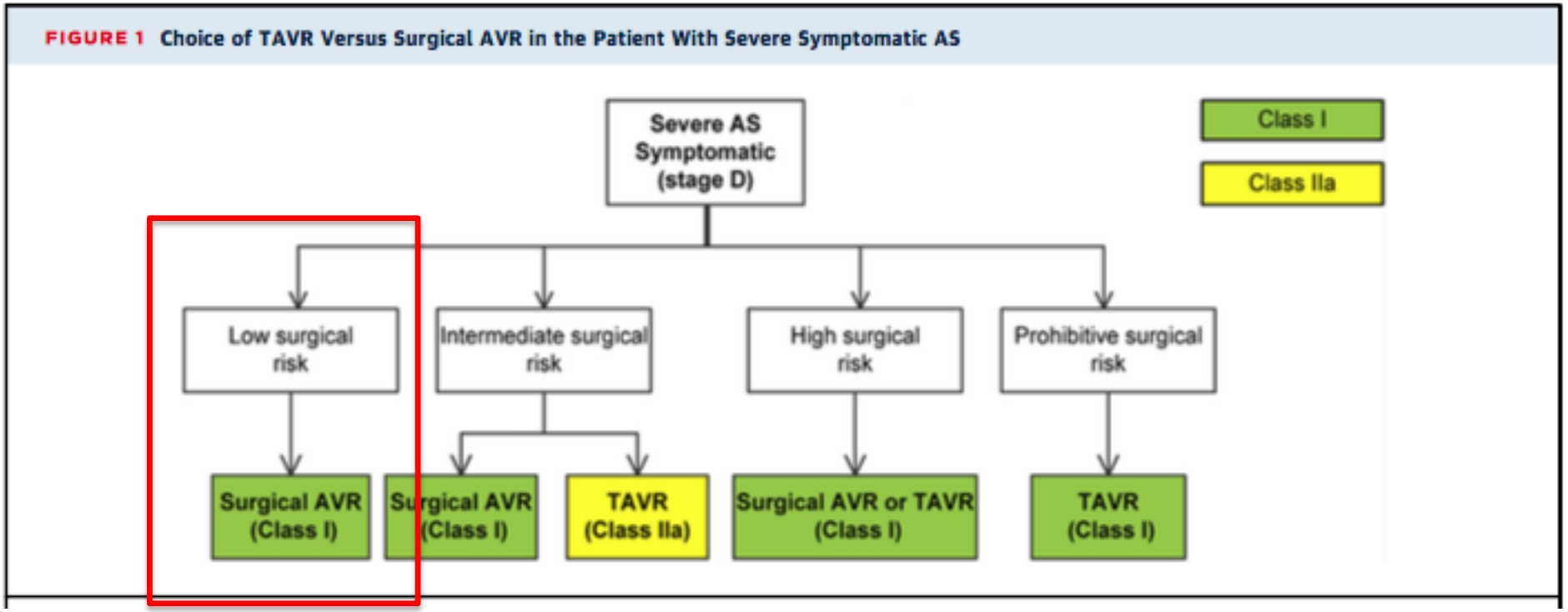
**Table 5. Risk Assessment Combining STS Risk Estimate, Frailty, Major Organ System Dysfunction, and Procedure-Specific Impediments**

| | Low Risk (Must Meet ALL Criteria in This Column) | Intermediate Risk (Any 1 Criterion in This Column) | High Risk (Any 1 Criterion in This Column) | Prohibitive Risk (Any 1 Criterion in This Column) |
|---|---|---|---|---|
| STS PROM* | <4% | 4%–8% | >8% | Predicted risk with surgery of death or major morbidity (all-cause) >50% at 1 y |
| | AND | OR | OR | OR |
| Frailty† | None | 1 Index (mild) | ≥2 Indices (moderate to severe) | |
| | AND | OR | OR | |
| Major organ system compromise not to be improved postoperatively‡ | None | 1 Organ system | No more than 2 organ systems | ≥3 Organ systems |
| | AND | OR | OR | OR |
| Procedure-specific impediment§ | None | Possible procedure-specific impediment | Possible procedure-specific impediment | Severe procedure-specific impediment |

**FIGURE 1** Choice of TAVR Versus Surgical AVR in the Patient With Severe Symptomatic AS

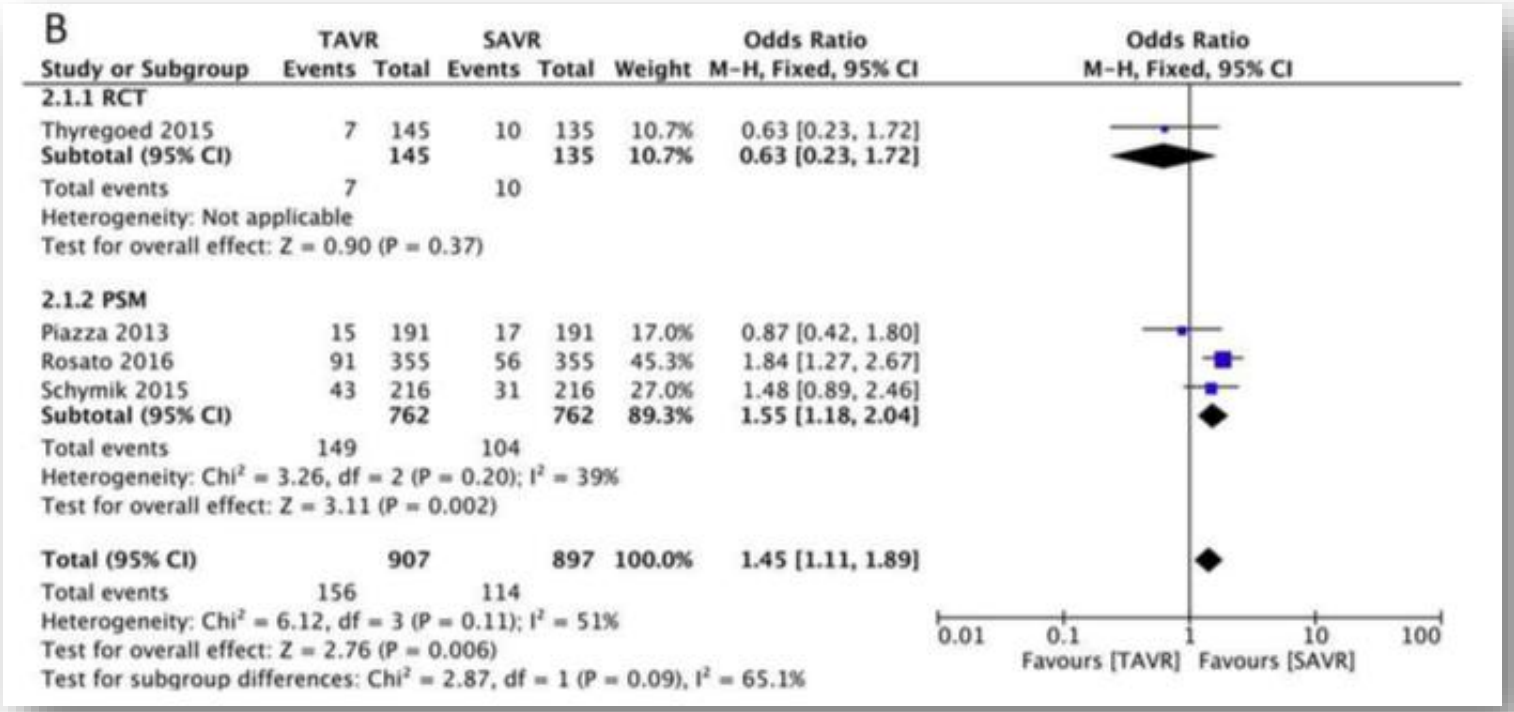



*ACC/AHA guidelines 2017*

# Transcatheter versus surgical aortic valve replacement in patients at low surgical risk: A meta-analysis of randomized trials and propensity score matched observational studies

Guy Witberg, MD[1,2*] | Adi Lador, MD[1,2*] | Dafna Yahav, MD[2,3] | Ran Kornowski, MD[1,2]

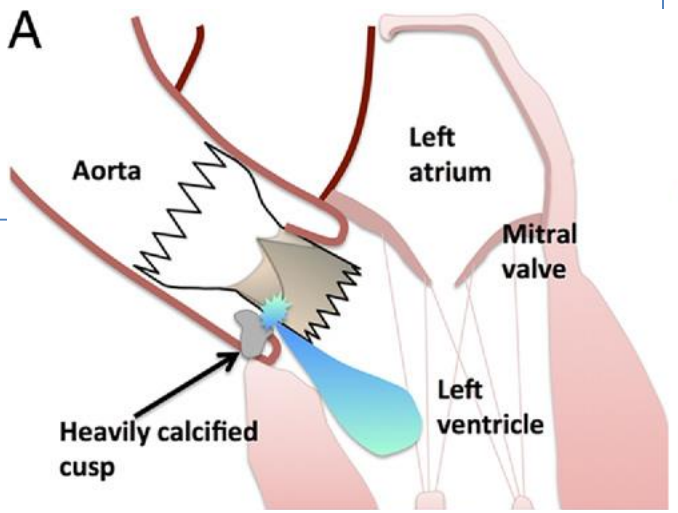
*Cath and Cardiovasc Interv 2018 Feb*




The short-term mortality was similar with either TAVR or SAVR (2.2% for TAVR and 2.6% for SAVR, RR 0.89, 95% CI 0.56–1.41, P =0.62).

TAVR was associated with increased risk for intermediate-term mortality (17.2% for TAVR and 12.7% for SAVR, RR 1.45, 95% CI 1.11–1.89, P =0.006).

# Impact of PVL



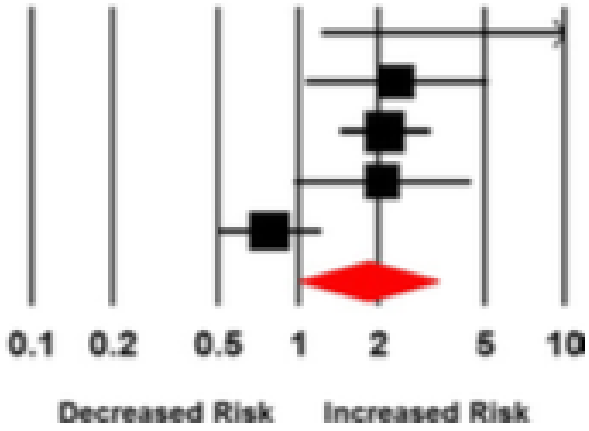

*Sinning, JACC 2012;59:1134-41*

Metanalysis of 45 studies, 12.926 patients

**Even mild, aortic regurgitation has an impact on overall mortality after TAVI**

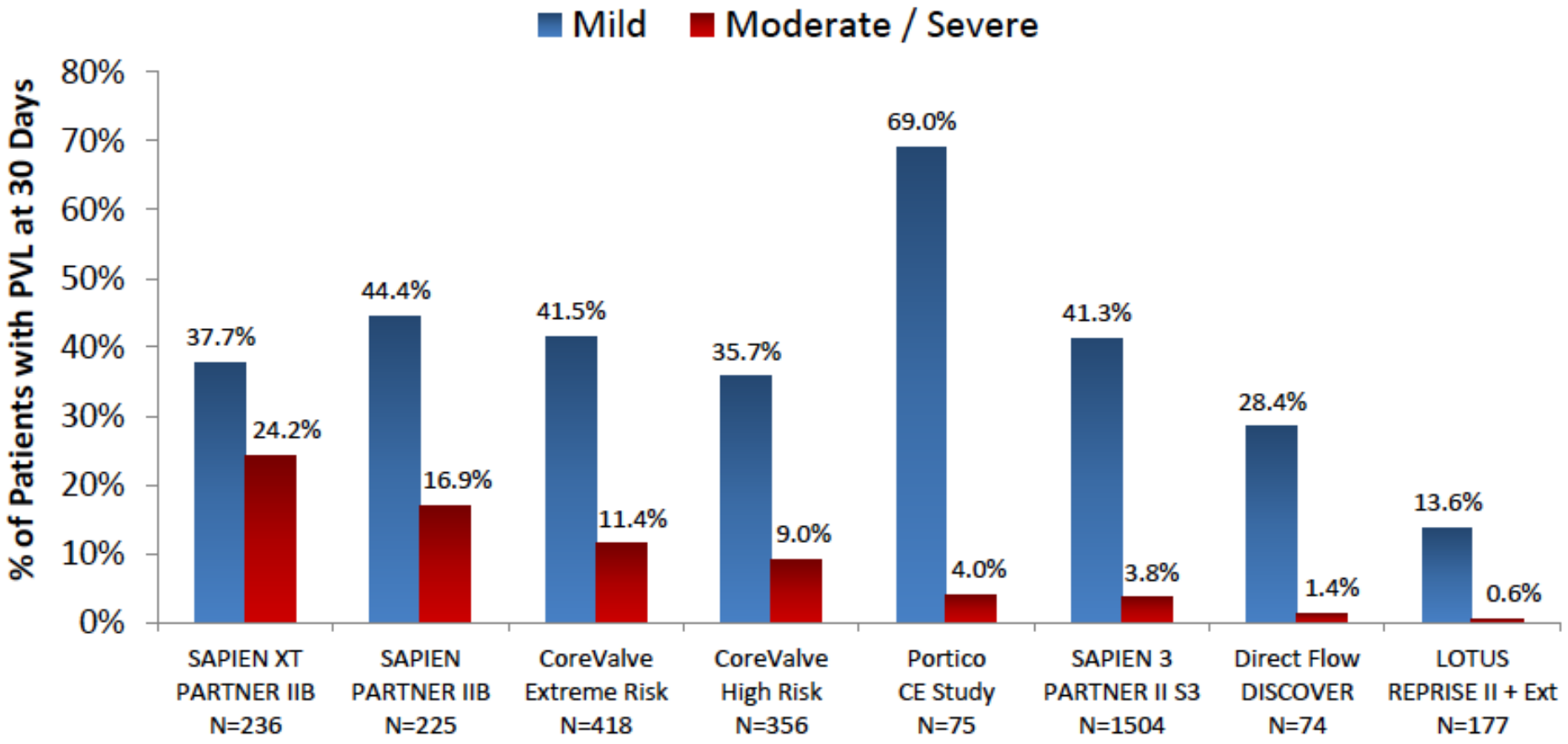
Hazard Ratio of Mild AR on Overall mortality

| Study name | Hazard ratio | Lower limit | Upper limit | Z-Value | p-Value |
|---|---|---|---|---|---|
| Lemos | 10.080 | 1.229 | 82.673 | 2.152 | 0.031 |
| Sinning | 2.342 | 1.066 | 5.145 | 2.119 | 0.034 |
| Kodali | 2.110 | 1.433 | 3.107 | 3.782 | 0.000 |
| Fraccaro | 2.064 | 0.968 | 4.400 | 1.876 | 0.061 |
| Tamburino | 0.780 | 0.499 | 1.218 | -1.092 | 0.275 |
| **All (N=1620)** | **1.829** | **1.005** | **3.329** | **1.975** | **0.048** |




*Athappan et al. JACC 2013;61:1585-1595*

# Paravalvular aortic regurgitation




[1]Leon, et. al. presented at ACC 2013; [2]Popma, et al., *J Am Coll Cardiol* 2014; 63: 1972-81; [3]Adams, et al., *N Engl J Med* 2014; 370: 1790-8; [4]Manoharan, et al., et. al. presented at TCT 2014; [5]Kodali, et al., presented at ACC 2015; [6]Schofer, et al., *J Am Coll Cardiol* 2014; 63: 763-8; [7]Meredith, et al., presented at PCR London Valves 2014

# Transcatheter Versus Surgical Aortic Valve Replacement in Patients With Severe Aortic Valve Stenosis

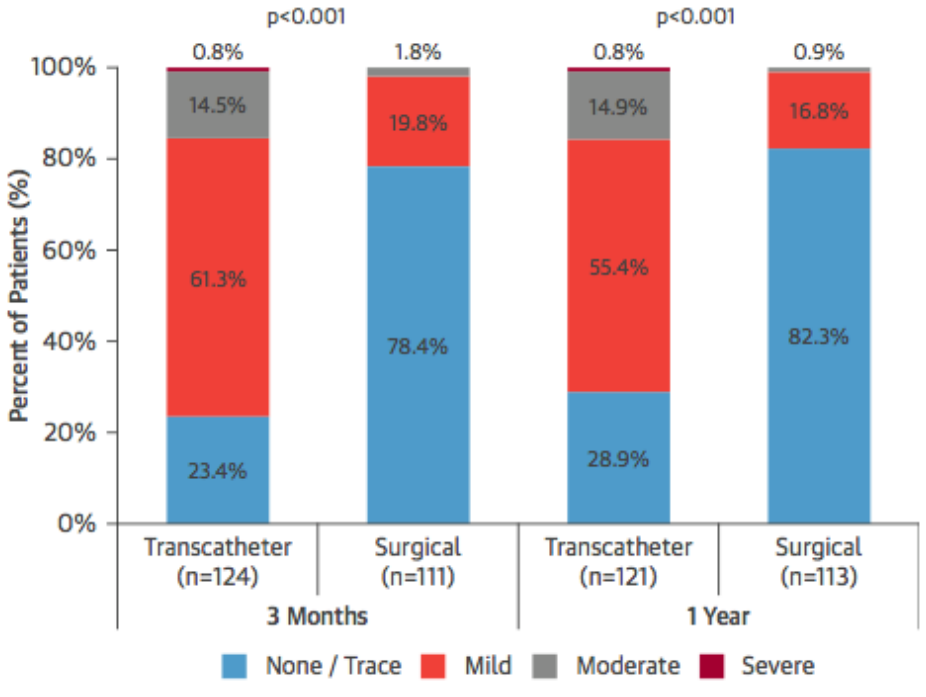
## 1-Year Results From the All-Comers NOTION Randomized Clinical Trial

*Thyregod et al. J Am Coll Cardiol 2015;65:2184-94*

**TABLE 1 Baseline Characteristics**

| | TAVR* (n = 145) | SAVR* (n = 135) |
|---|---|---|
| Age, yrs | 79.2 ± 4.9 | 79.0 ± 4.7 |
| Male | 78/145 (53.8) | 71/135 (52.6) |
| NYHA functional classification | | |
| I | 7/144 (4.9) | 3/134 (2.2) |
| II | 67/144 (46.5) | 70/134 (52.2) |
| III | 67/144 (46.5) | 57/134 (42.5) |
| IV | 3/144 (2.1) | 4/134 (3.0) |
| STS-PROM score, % | 2.9 ± 1.6 | 3.1 ± 1.7 |
| Logistic EuroSCORE, % | 8.4 ± 4.0 | 8.9 ± 5.5 |
| Logistic EuroSCORE II, % | 1.9 ± 1.2 | 2.0 ± 1.3 |

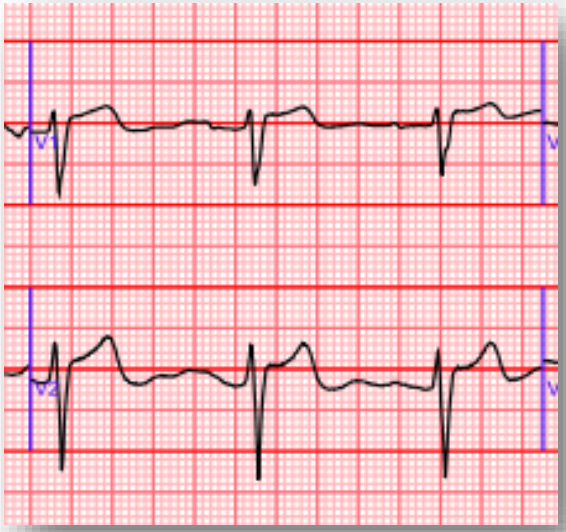
**FIGURE 4 Total Aortic Valve Regurgitation**

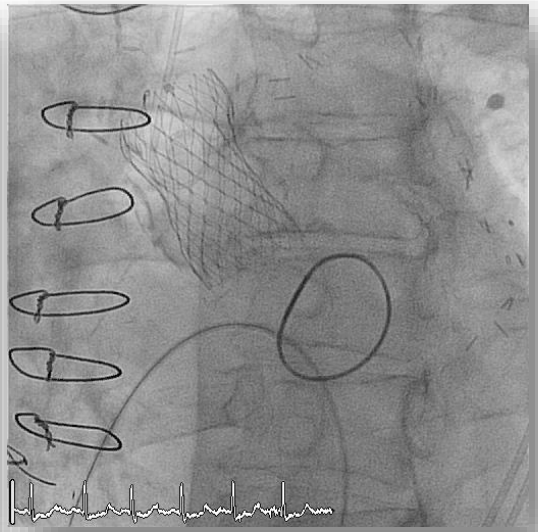


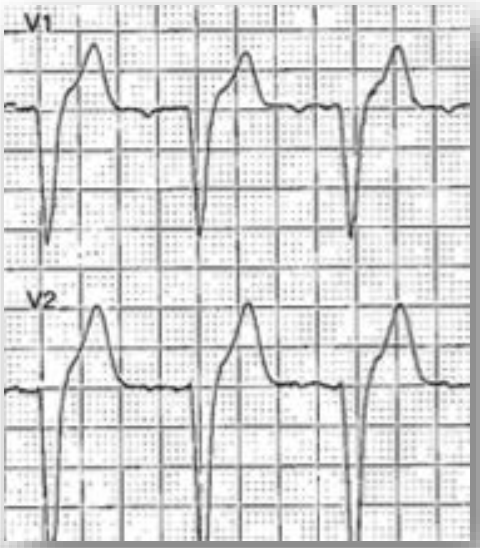

> 50% of patients had mild aortic regurgitation @ 1yr after TAVI

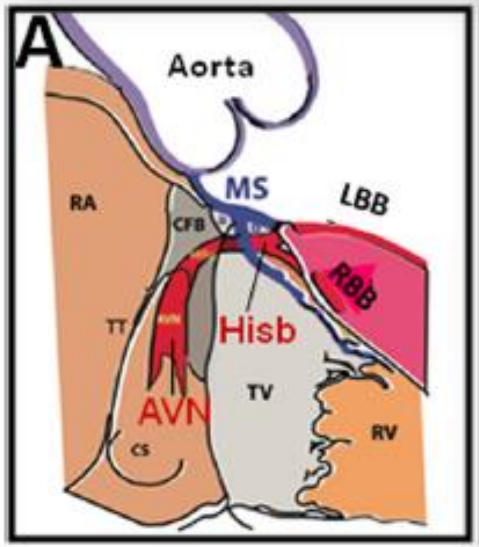
# Anatomical interaction :

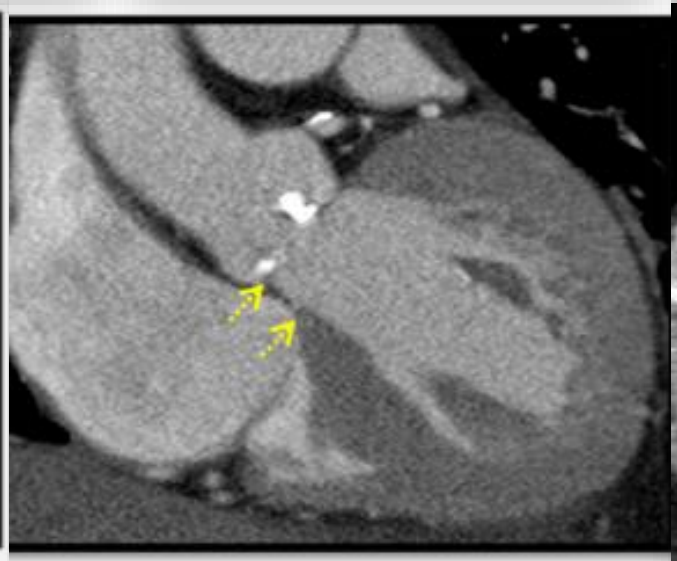
the stent frame of the TAVI prosthesis may exerce a mechanical stress on the LV wall, septum and conduction system, leading to complete AV-block and new LBBB.

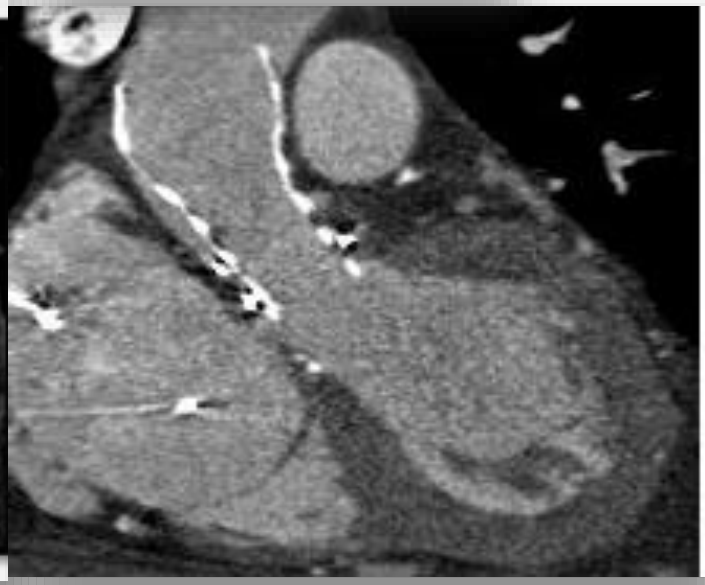








# LBBB post TAVR: A predictor of SCD!

## Late Cardiac Death in Patients Undergoing Transcatheter Aortic Valve Replacement

### Incidence and Predictors of Advanced Heart Failure and Sudden Cardiac Death

- ✓ **3.729** patients who underwent TAVR (balloon 57% - self ex-pandable 43%)
- ✓ F-up 22 ± 18 months

- ✓ Endpoint: **SCD**

- ✓ 3 groups: NO NOP-LBBB, NOP-LBBB (12.6%), NOP-LBBB + PMK (2.5%)

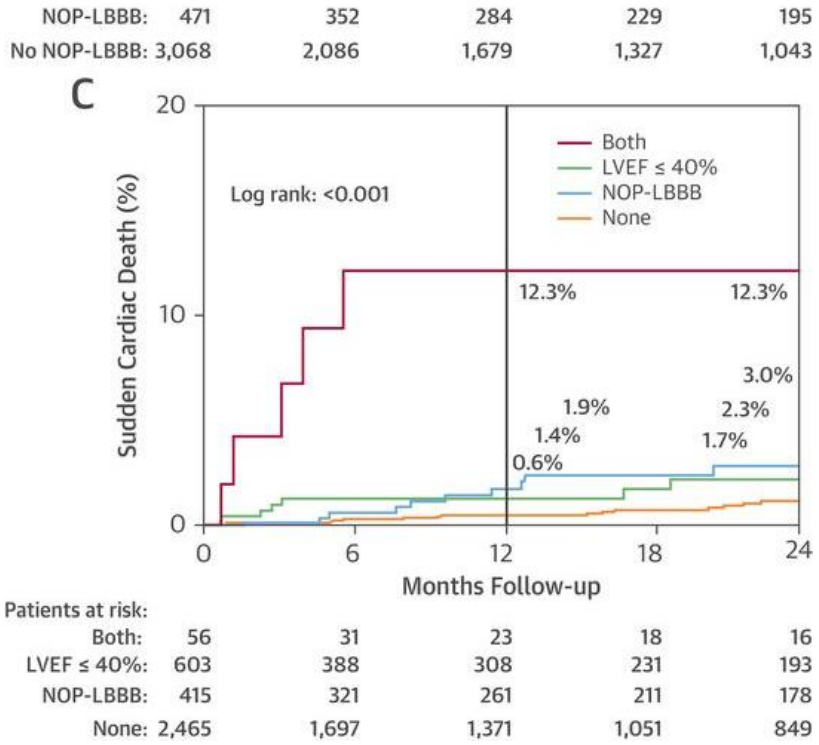
→ New-onset persistent LBBB following TAVR (RR of SCD x2.5)
→ New-onset persistent LBBB and a QRS duration >160 ms (RR of SCD x5!!!)

Marina Urena et al. JACC 2015

# LBBB post TAVR: A predictor of SCD!

## Late Cardiac Death in Patients Undergoing Transcatheter Aortic Valve Replacement

### Incidence and Predictors of Advanced Heart Failure and Sudden Cardiac Death



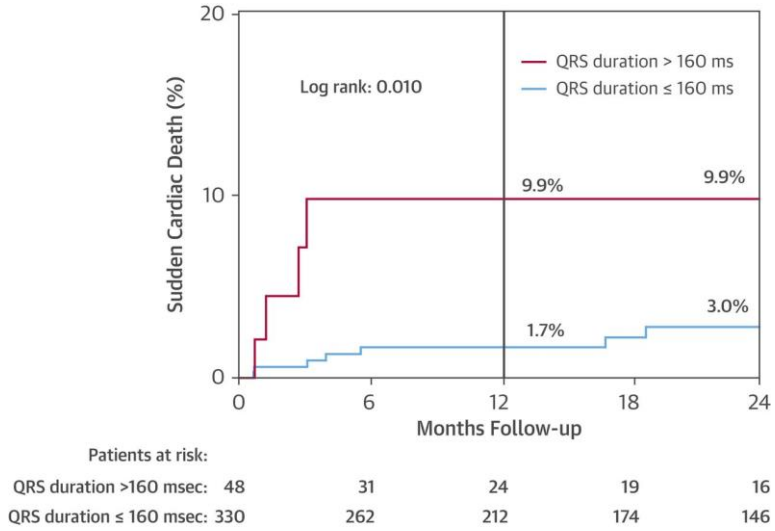




**TABLE 6** Electrocardiographic Predictors of Sudden Cardiac Death in Patients With New-Onset Persistent Left Bundle-Branch Block Following TAVR (n = 471)

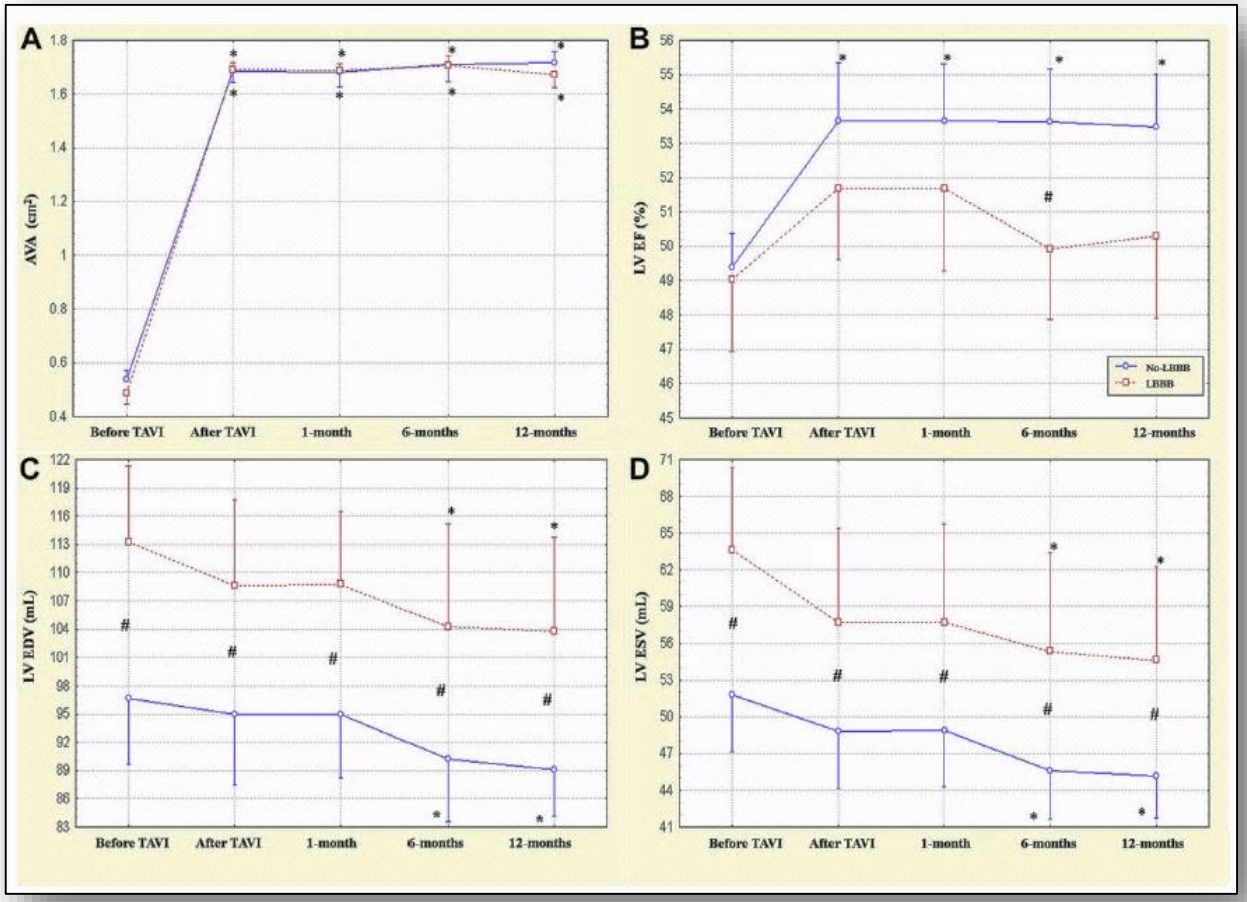
| | Univariate HR (95% CI) | p Value |
|---|---|---|
| Baseline | | |
| QRS duration | 1.01 (0.98–1.04) | 0.551 |
| PR >200 ms | – | – |
| Discharge | | |
| QRS duration | 1.02 (0.99–1.05) | 0.162 |
| QRS >160 ms | 4.78 (1.56–14.63) | 0.006 |
| PR >200 ms | 0.26 (0.03–2.20) | 0.218 |

Marina Urena et al. JACC 2015

# Impact on Left Ventricular Function and Remodeling and on 1-Year Outcome in Patients With Left Bundle Branch Block After Transcatheter Aortic Valve Implantation

Nazario Carrabba, MD*, Renato Valenti, MD, Angela Migliorini, MD, Marco Marrani, MD, Giulia Cantini, MD, Guido Parodi, MD, PhD, Emilio Vincenzo Dovellini, MD, and David Antoniucci, MD

LBBB : less reverse remodeling, less recovery of LV systolic function, higher rate of PCMK



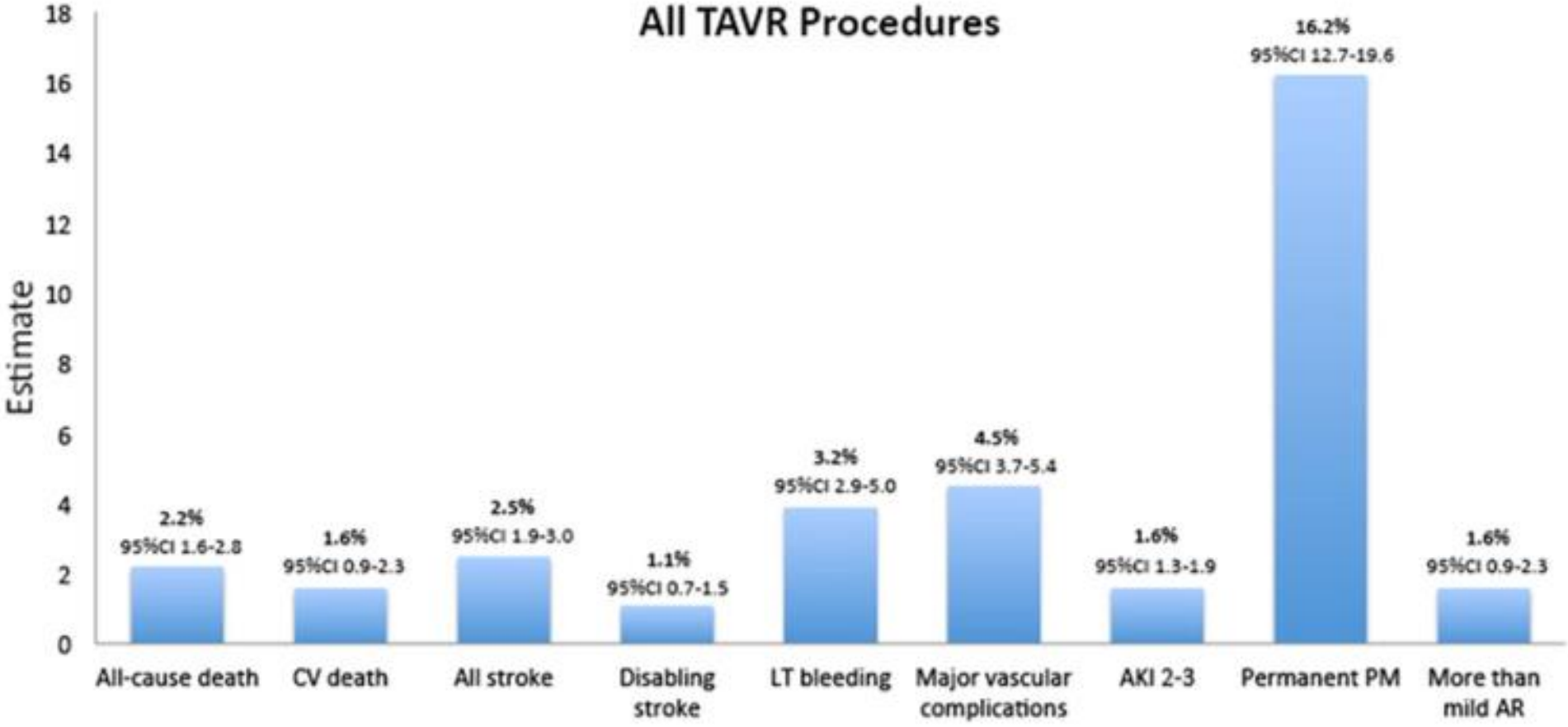

(Am J Cardiol 2015;116:125–131)

# Transcatheter aortic valve replacement with new-generation devices: A systematic review and meta-analysis

Marco Barbanti [a,*], Sergio Buccheri [a], Josep Rodés-Cabau [b], Simona Gulino [a], Philippe Généreux [c], Gerlando Pilato [a], Danny Dvir [d], Andrea Picci [a], Giuliano Costa [a], Corrado Tamburino [a], Martin B. Leon [e], John G. Webb [d]

*Int J Cardiol 2017;245:83-89*

SAPIEN 3 (n = 5423, 45.9%), Lotus Valve (n = 3007, %), Portico (n = 130, 1.1%), JenaValve (n = 345, 2.9%), Symetis Acurate (n = 1314, 11,1%), and Evolut R (n = 1603, 13.6%).



Heart. 2015 Oct;101(20):1665-71. doi: 10.1136/heartjnl-2015-307666. Epub 2015 Aug 10.

BMJ Full Text

# Chronic pacing and adverse outcomes after transcatheter aortic valve implantation.

Dizon JM[1], Nazif TM[1], Hess PL[2], Biviano A[1], Garan H[3], Douglas PS[2], Kapadia S[4], Babaliaros V[5], Herrmann HC[6], Szeto WY[6], Jilaihawi H[7], Fearon WF[8], Tuzcu EM[4], Pichard AD[9], Makkar R[7], Williams M[10], Hahn RT[1], Xu K[11], Smith CR[1], Leon MB[1], Kodali SK[1]; PARTNER Publications Office.

## Author information

## Abstract

**OBJECTIVE:** Many patients undergoing transcatheter aortic valve implantation (**TAVI**) have a pre-existing, permanent pacemaker (PPM) or receive one as a consequence of the procedure. We hypothesised that chronic **pacing** may have adverse effects on **TAVI** outcomes.

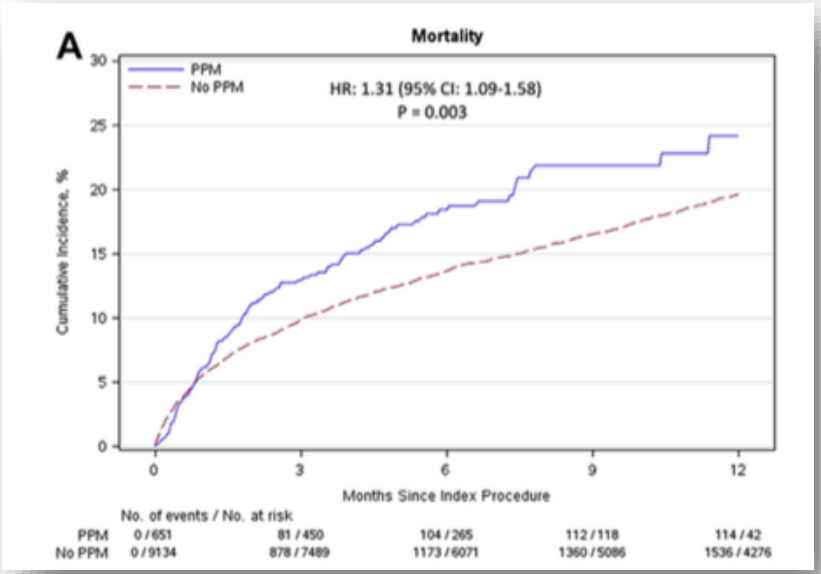
**METHODS AND RESULTS:** Four groups of patients undergoing **TAVI** in the Placement of Aortic Transcatheter Valves (PARTNER) trial and registries were compared: prior PPM (n=586), new PPM (n=173), no PPM (n=1612), and left bundle branch block (LBBB)/no PPM (n=160). At 1 year, prior PPM, new PPM and LBBB/no PPM had higher all-cause mortality than no PPM (27.4%, 26.3%, 27.7% and 20.0%, p<0.05), and prior PPM or new PPM had higher rehospitalisation or mortality/rehospitalisation (p<0.04). By Cox regression analysis, new PPM (HR 1.38, 1.00 to 1.89, p=0.05) and prior PPM (HR 1.31, 1.08 to 1.60, p=0.006) were independently associated with 1-year mortality. Surviving prior PPM, new PPM and LBBB/no PPM patients had lower LVEF at 1 year relative to no PPM (50.5%, 55.4%, 48.9% and 57.6%, p<0.01). Prior PPM had worsened recovery of LVEF **after TAVI** (Δ=10.0 prior vs 19.7% no PPM for baseline LVEF <35%, p<0.0001; Δ=4.1 prior vs 7.4% no PPM for baseline LVEF 35-50%, p=0.006). Paced ECGs displayed a high prevalence of RV **pacing** (>88%).

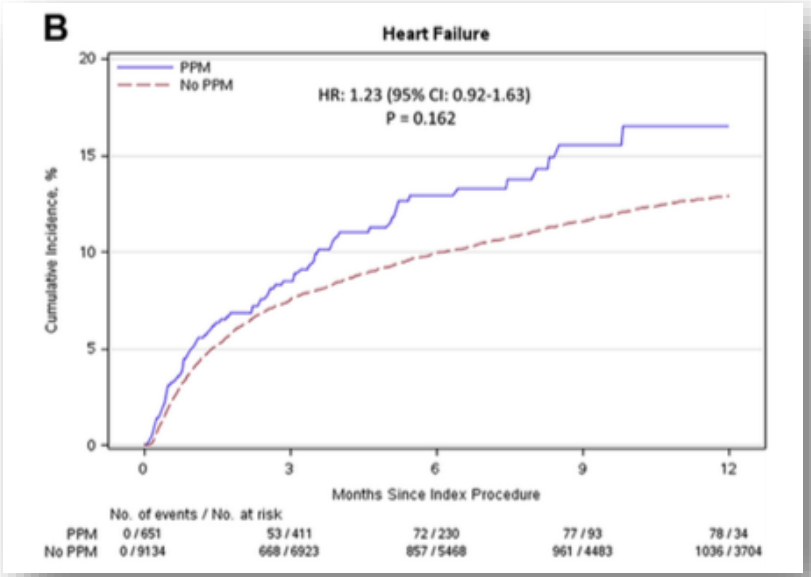
**CONCLUSIONS:** In the PARTNER trial, prior PPM, along with new PPM and chronic LBBB patients, had worsened clinical and echocardiographic outcomes relative to no PPM patients, and the presence of a PPM was independently associated with 1-year mortality. Ventricular dyssynchrony due to chronic RV **pacing** may be mechanistically responsible for these findings.

# Incidence, Predictors, and Outcomes of Permanent Pacemaker Implantation Following Transcatheter Aortic Valve Replacement

## Analysis From the U.S. Society of Thoracic Surgeons/ American College of Cardiology TVT Registry

*Fadahunsi et al. JACCIntv 2016;9:2189-99*

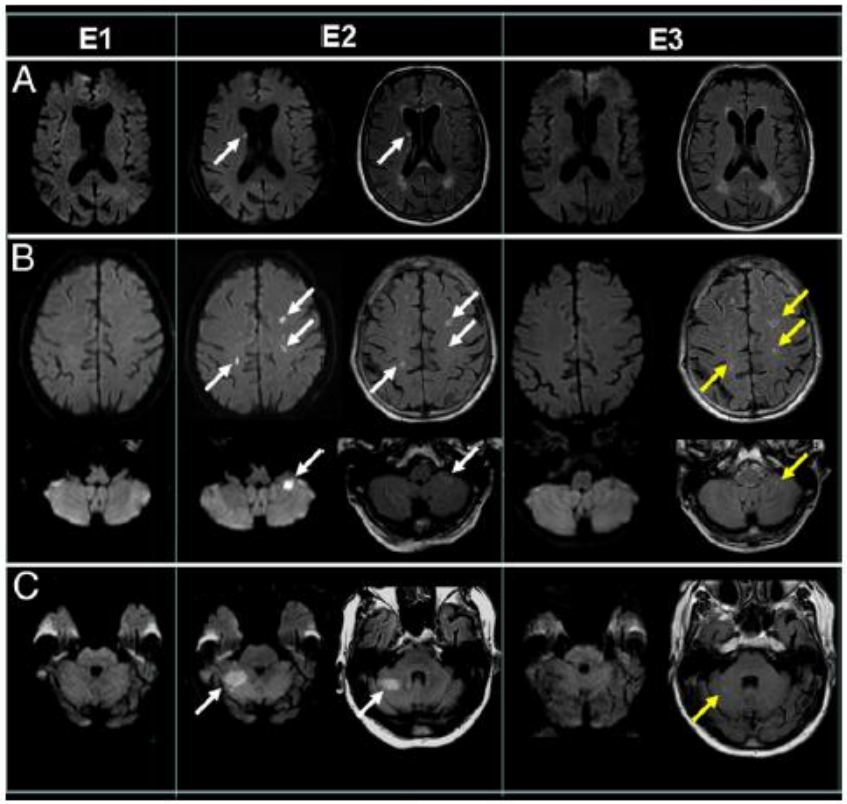



Early PPM implantation is a common complication following TAVR, and it is associated with higher mortality and a composite of mortality or heart failure admission at 1 year.

# TAVI-related stroke and cerebral embolism

*Ghanem et al, J Am Coll Cardiol 2010;55:1427-32*




73% of patients had new DW-MRI lesions
3.6 % of patients had stroke

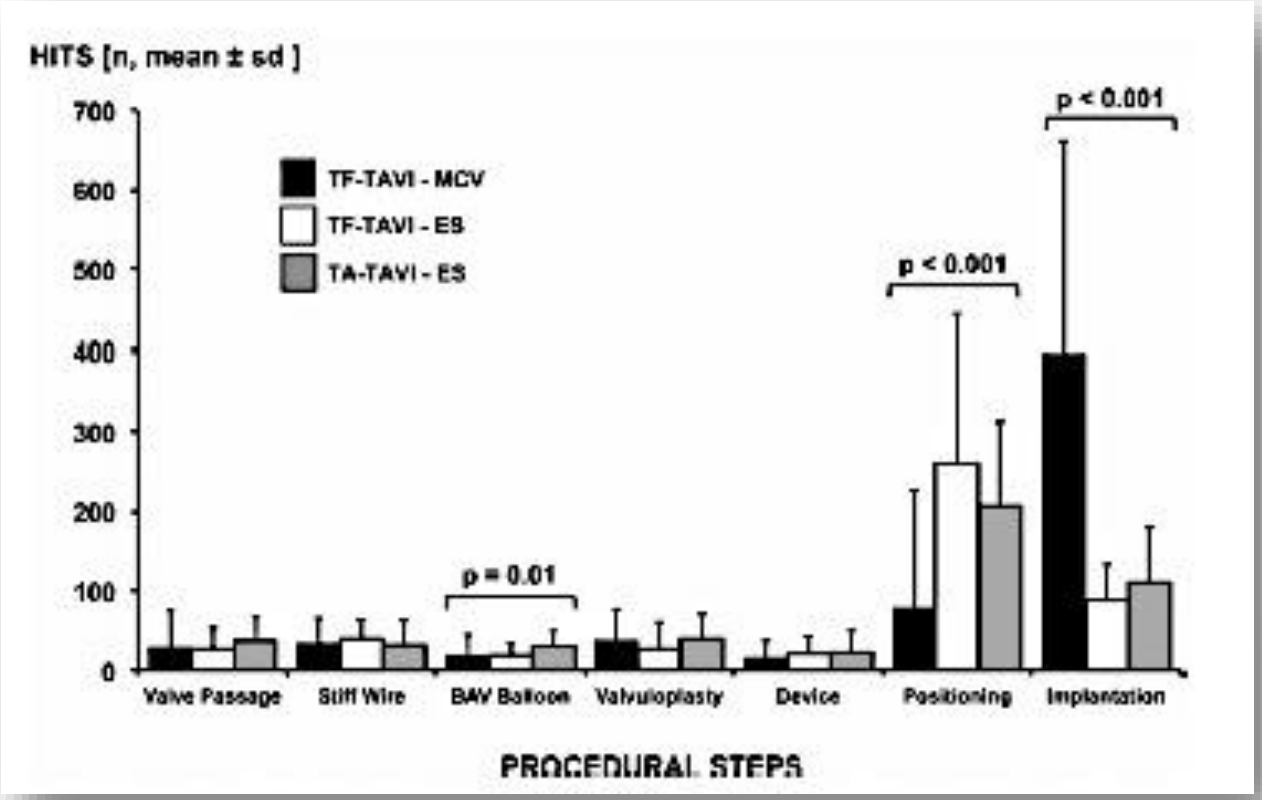
**Figure 2** **TAVI-Related Cerebral Embolism**

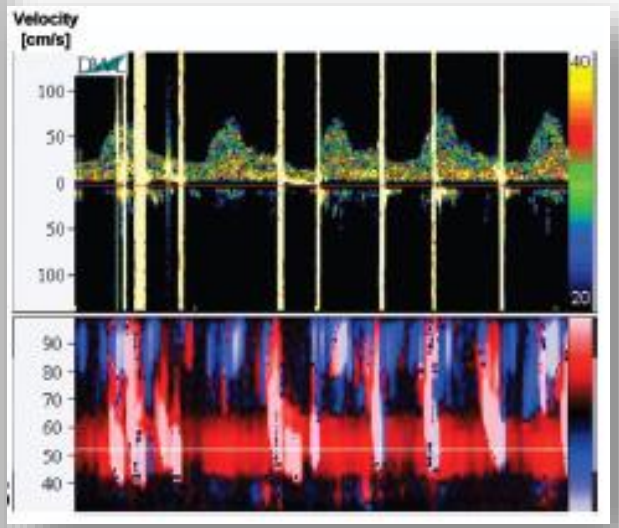
**(A)** Images obtained in an 83-year-old man show 1 ischemic lesion **(arrow)**. The patient had no clinically apparent focal neurological deficits after TAVI (NIHSS: 0). **(B)** A DW-MRI in a 73-year-old man demonstrates multiple, bilateral embolism of the cerebrum and cerebellum **(arrows)**. Selected emboli demonstrate signal intensity in the fluid-attenuated inversion recovery sequence as sign of neuronal repair **(yellow arrows)**. The patient had no clinically apparent focal neurological deficits after TAVI (NIHSS: 0). **(C)** Images obtained in an 84-year-old man show 1 ischemic lesion in the right cerebellum **(arrow)**. The patient demonstrated transient ataxia (NIHSS: 4). Abbreviations as in Figure 1.

# Cerebral Embolization During Transcatheter Aortic Valve Implantation

## A Transcranial Doppler Study

HITS occured during positionning and implantation of the TAVI device (Sapien and Corevalve)




*Khalert et al, Circ 2012:126:1245-55*

# Filter-based cerebral embolic protection with transcatheter aortic valve implantation: the randomised MISTRAL-C trial

Published on 20 July 2016



Nicolas M. Van Mieghem[1]*, MD, PhD; Lennart van Gils[1], MD; Habib Ahmad[2], MD; Floortje van Kesteren[3], MD; Hendrik W. van der Werf[4], MD; Guus Brueren[5], MD, PhD; Michiel Storm[6], MSc; Mattie Lenzen[1], PhD; Joost Daemen[1], MD, PhD; Ad F.M. van den Heuvel[4], MD, PhD; Pim Tonino[5], MD, PhD; Jan Baan[3], MD, PhD; Peter J. Koudstaal[6], MD, PhD; Marguerite E.I. Schipper[7], MD, PhD; Aad van der Lugt[2], MD, PhD; Peter P.T. de Jaegere[1], MD, PhD

**KEYWORDS**

- aortic stenosis
- transcatheter aortic valv
implantation (TAVI)

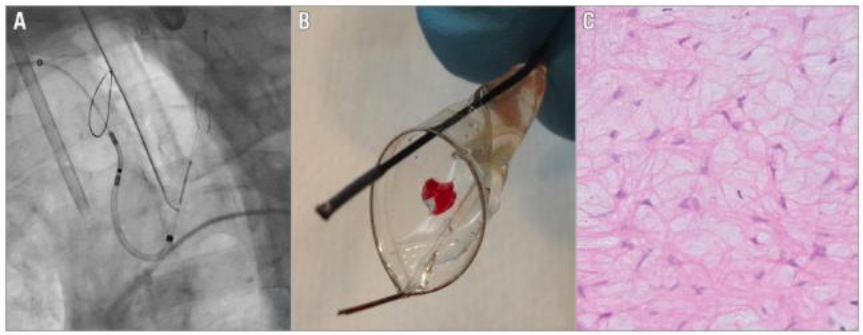



**Figure 1.** Sentinel dual filter system. A) Fluoroscopic image of the Sentinel CPS after deployment in the brachiocephalic trunk and left common carotid artery. B) Photograph of a retrieved filter containing embolic debris. C) Microscopic image showing the lamina spongiosa of the aortic valve (H&E staining, magnified ×20).

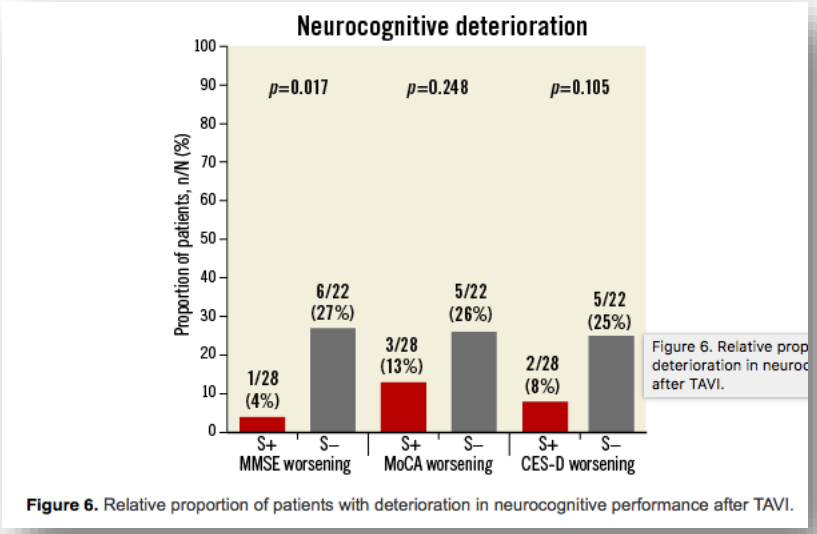



**Figure 6.** Relative proportion of patients with deterioration in neurocognitive performance after TAVI.

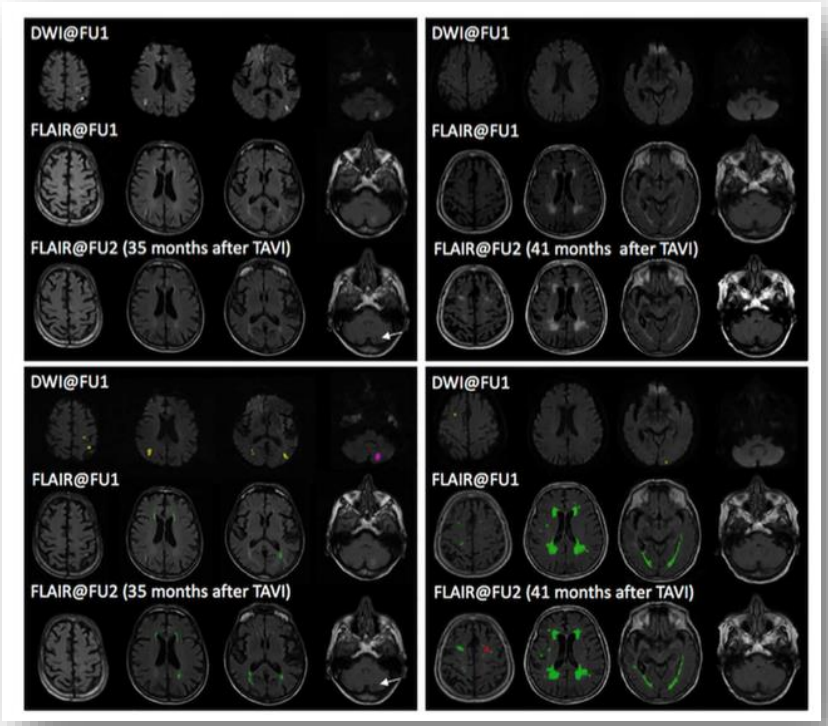
Filter-based embolic protection captures debris *en route* to the brain in all patients undergoing TAVI. This study suggests that its use can lead to fewer and overall smaller new brain lesions, as assessed by MRI, and preservation of neurocognitive performance early after TAVI.

RESEARCH ARTICLE

# Subacute Subclinical Brain Infarctions after Transcatheter Aortic Valve Implantation Negatively Impact Cognitive Function in Long-Term Follow-Up

*PlosOne 2017 Feb*

**Alexander Ghanem[1,2☯]*, Jonas Dörner[3,4☯], Leonie Schulze-Hagen[2], Andreas Müller[4], Marius Wilsing[2], Jan-Malte Sinning[2], Julian Lütkens[4], Christian Frerker[1], Karl-Heinz Kuck[1], Ingo Gräff[5], Hans Schild[4], Nikos Werner[2], Eberhard Grube[2], Georg Nickenig[2]***




Acute CVEs did not impact the trajectory of late silent brain infarctions (SBI), white-matter hyperintensities, and cerebral atrophy.
Functionally, early CVEs did not affect cognitive function.
In contrast, patients with “new” SBIs after TAVI had a trend to cognitive deterioration in long-term follow-up

# Conclusions : TAVI in a low risk patient

- ✓ Induces more aortic regurgitation than SAVR
- ✓ Induces more new LBBB and need for permanent PCMK than SAVR
- ✓ AR (even mild), LBBB and PCMK could have a negative impact on the outcome
- ✓ Generates new silent brain infarct potentially related with neurocognitive dysfunction
- ✓ Durability is not confirmed in large series
- ✓ Need for the results of large RCT (PARTNER 3, NOTION 2)