Prothèses valvulaires : des dernières Guidelines ESC 2017 à la prise en charge de leurs complications

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Amicale des Cardiologues de la Côte d'Azur
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Disclosures Dr David Attias

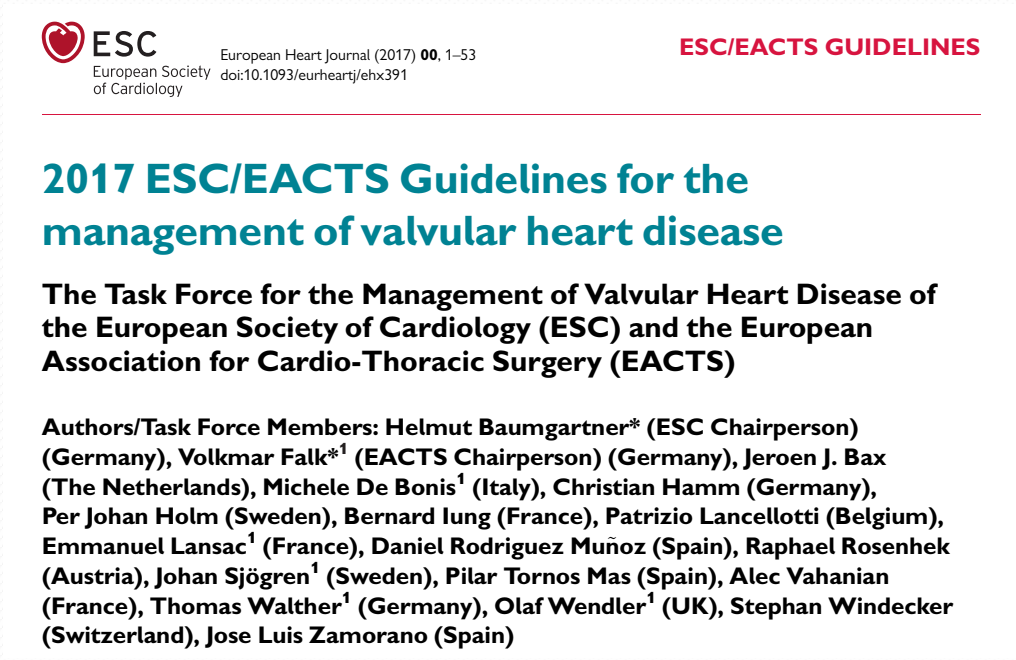
- Exposés scientifiques rémunérés : BMS, Boeringher-Ingelheim, Servier, MSD, Abbott
- Board scientifique : Novartis, BMS
- Proctoring: Abbott
- Consulting: Highlife

Plan de la présentation

- Guidelines ESC 2017
- Fuite para-prothétique
- Dégénérescence de bioprothèse : procédure valve-in-valve ou chirurgie redux
- Augmentation de gradient sur une bioprothèse : conduite à tenir

Quoi de neuf dans les Guidelines ESC 2017?

- Quel type de prothèse valvulaire proposer ?
- Traitement anti-thrombotique
- Dysfonction de prothèse : définitions, prise en charge.
- Place de la technique valve-in-valve



ESC European Society of Cardiology
European Heart Journal (2017) **00**, 1–53
doi:10.1093/eurheartj/ehx391

ESC/EACTS GUIDELINES

2017 ESC/EACTS Guidelines for the management of valvular heart disease

The Task Force for the Management of Valvular Heart Disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)

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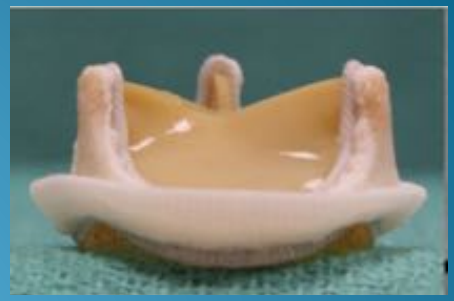
Bioprothèse ou prothèse mécanique ?

Prothèse mécanique:
- **Pas de réintervention**
- **Anticoagulation au long cours par AVK**
- **Risque hémorragique et thrombo-embolique majoré**

Bioprothèse :
- **Évite l'anticoagulation au long cours**
- **Dégénérescence inévitable conduisant à une ré intervention**

Désir du patient après information éclairée, âge, comorbidités, antécédents, désir de grossesse, compliance au traitement



EN FAVEUR D'UNE PROTHÈSE MÉCANIQUE	Class	Level
Désir du patient et absence de CI aux AVK au long cours	I	C
Risque de dégénérescence rapide de bioprothèse : âge < 40 ans, hyperparathyroïdie	I	C
Patient déjà sous anticoagulant pour une autre prothèse mécanique valvulaire.	IIa	C
< 60 ans en position aortique, < 65 ans en position mitrale.	IIa	C
Espérance de vie longue (>10 ans) et chirurgie redux potentiellement à haut risque.	IIa	C
Patient déjà sous anticoagulant pour une autre cause : dysfonction VG sévère, FA, ATCD d'embolies systémiques, état d'hypercoagulabilité.	IIb	C

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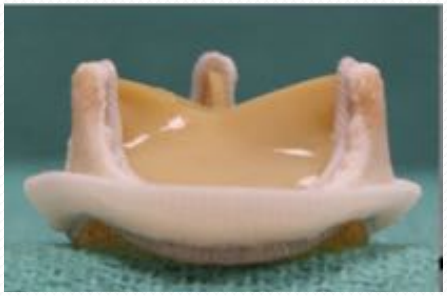
EN FAVEUR D'UNE BIOPROTHÈSE	Class	Level
Désir du patient après information éclairée	I	C
Contre-indications et/ou impossibilité à comprendre et/ou à suivre le traitement par AVK	I	C
Réopération pour thrombose de prothèse mécanique malgré un bon suivi du traitement AVK	I	C
Faible probabilité de chirurgie redux ou chirurgie redux potentiellement à bas risque.	IIa	C
Désir de grossesse	IIa	C
> 65 ans en position aortique, > 70 ans en position mitrale.	IIa	C



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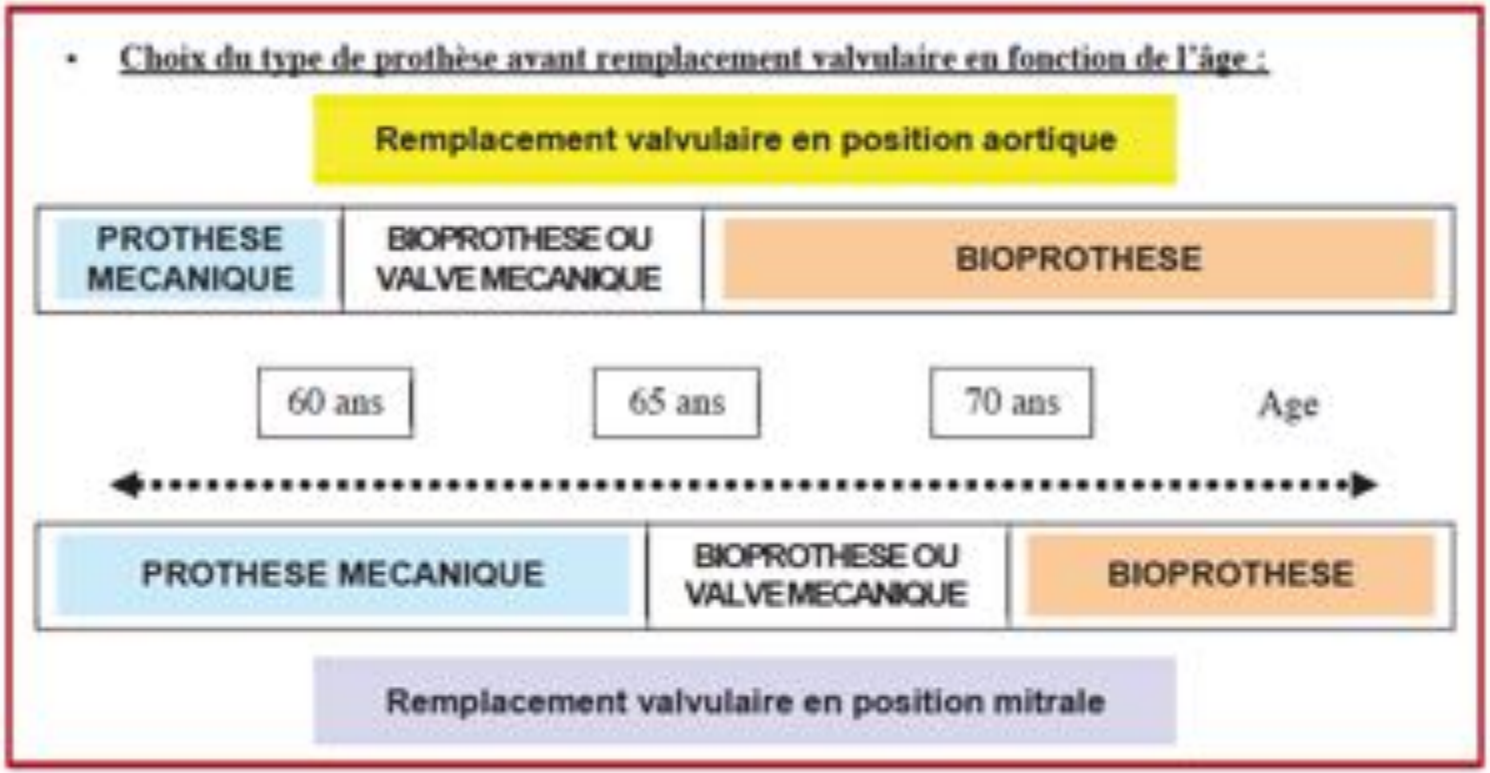

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Traitement anti-thrombotique des patients valvulaires

Recommandations pour l'anticoagulation des patients porteurs d'une PROTHÈSE MÉCANIQUE	**Class**	**Level**
AVK à vie ; intérêt fondamental de l'éducation du patient et de l'auto-management des INR	I	B
AOD contre-indiqués	III	B
En cas d'accident thromboembolique sous AVK bien suivi avec INR adéquat, indication à adjoindre un traitement par aspirine à faible dose (75-100 mg/j)	IIa	C

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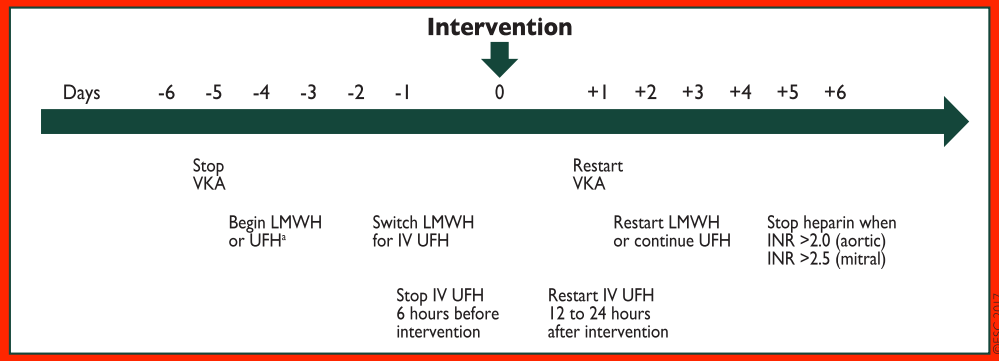
Recommandations pour l'anticoagulation des patients porteurs d'une PROTHÈSE MÉCANIQUE	**Class**	**Level**
En cas de nécessité d'effectuer un relai anticoagulant après arrêt des AVK (chirurgies majeures, à haut risque hémorragique), possibilité d'utiliser l'héparine non fractionnée ou les HBPM à doses curatives	I	C

Pour les chirurgies majeures, à haut risque hémorragique



INR < 1.5 pour l'intervention

Pour les chirurgies à faible risque hémorragique (y compris la cataracte et les extractions dentaires) et les procédures avec possibilité de contrôler un éventuel saignement post-opératoire, pas de nécessité d'arrêter le traitement par AVK.

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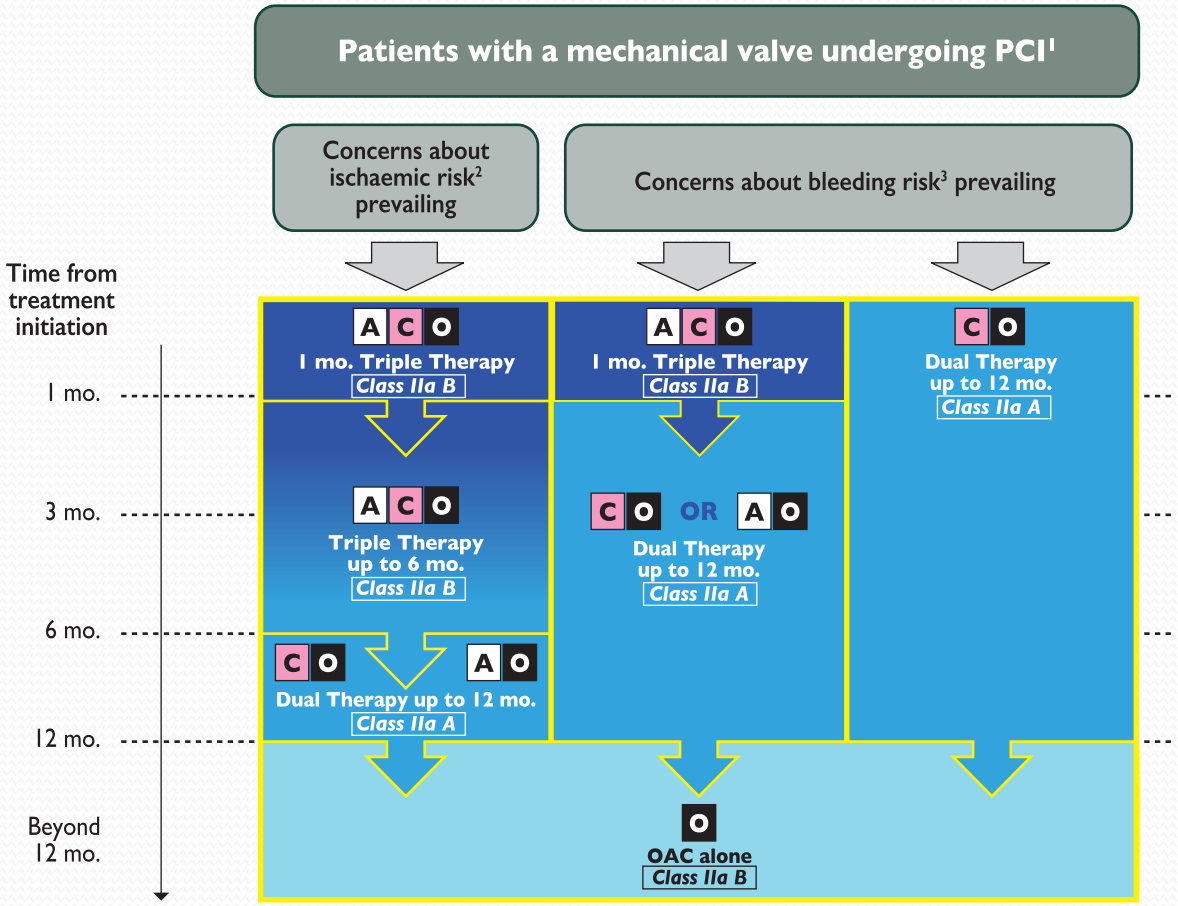
Prothèse mécanique et patient coronarien



1. Periprocedural administration of aspirin and clopidogrel during PCI is recommended irrespective of the treatment strategy.
2. High ischaemic risk is considered as an acute clinical presentation or anatomical/procedural features which might increase the risk for myocardial infarction.
3. Bleeding risk can be estimated by HAS-BLED or ABC score

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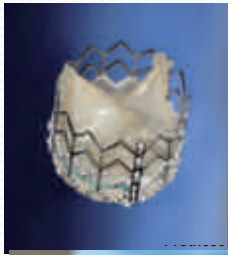
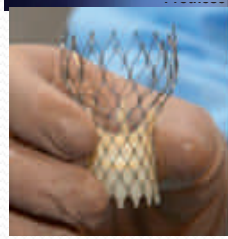
Recommandations pour l'anticoagulation post-opératoire des patients après **BIOPROTHÈSE OU PLASTIE MITRALE.**	Class	Level
Traitement anticoagulant à vie si existence d'une autre indication (que la bioprothèse/plastie) **à un traitement anticoagulant** (FA, MTEV….)	I	C
Après remplacement valvulaire chirurgical par **une bioprothèse mitrale ou tricuspide : AVK pendant 3 mois**	IIa	C
Après plastie mitrale ou tricuspide chirurgicale : **AVK pendant 3 mois**	IIa	C
Après remplacement valvulaire chirurgical par une bioprothèse AORTIQUE ou après intervention type Yacoub ou Tirone-David : aspirine à faible dose (75-100 mg) pendant 3 mois	IIa	C
Après remplacement valvulaire chirurgical par une bioprothèse AORTIQUE : AVK pendant 3 mois.	IIb	C
Après TAVI : Clopidogrel + aspirine pendant 3 à 6 mois puis monothérapie anti-agrégante plaquettaire par la suite (en l'absence d'autre indication à un traitement anticoagulant au long cours).	IIa	C
Après TAVI : monothérapie anti-agrégante plaquettaire seule si risque de saignement élevé.	IIb	C



Recommandations pour l'anticoagulation des patients valvulaires en FA	**Class**	**Level**
Les AOD peuvent être considérés comme une alternative aux AVK chez les patients avec un RAc, une IM, une IA	IIa	B
Les AOD peuvent être considérés comme une alternative aux AVK, <u>après les 3 premiers mois d'anticoagulation post-opératoire</u> par AVK, chez les patients en FA avec une bioprothèse chirurgicale ou un TAVI.	IIa	C
Les AOD sont contre-indiqués chez les patients en FA associée à une sténose mitrale modérée ou sévère.	III	C
Les AOD sont **contre-indiqués** chez les patients porteurs d'une **prothèse mécanique mitrale**	III	C

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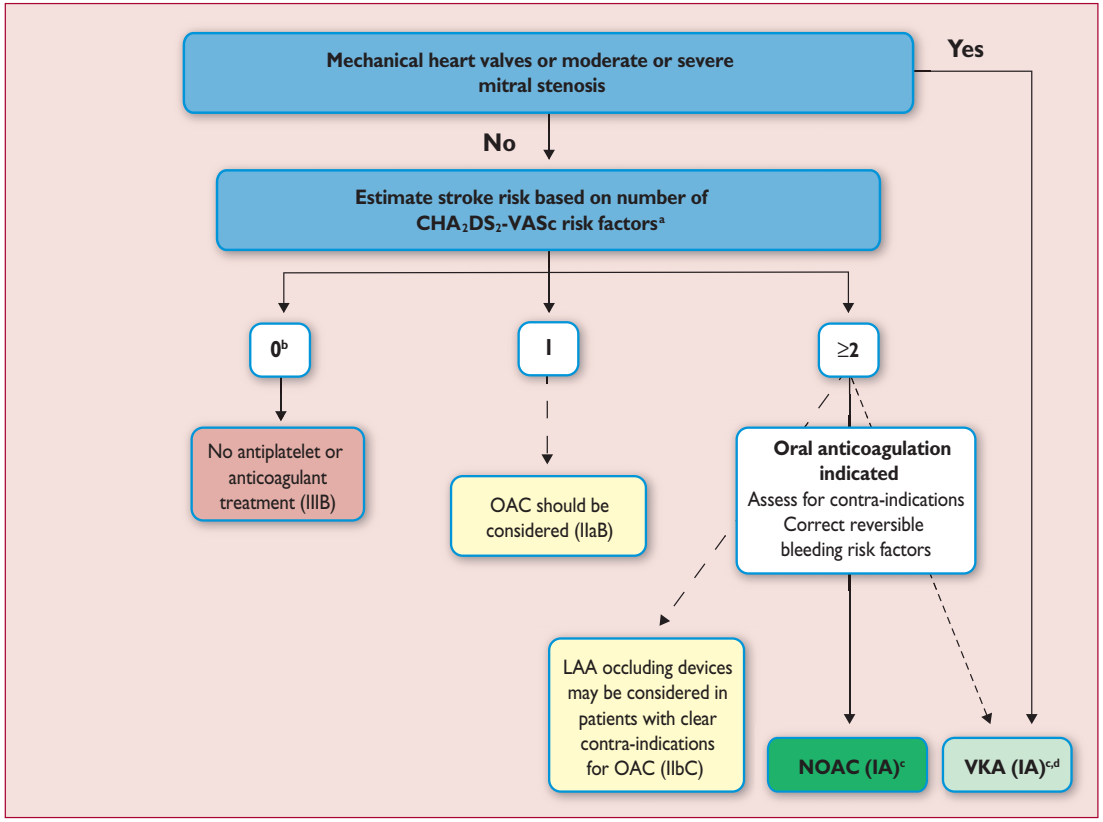
2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS



AF = atrial fibrillation; LAA = left atrial appendage; NOAC = non-vitamin K antagonist oral anticoagulant; OAC = oral anticoagulation; VKA = vitamin K antagonist.
[a]Congestive heart failure, Hypertension, Age ≥75 years (2 points), Diabetes, prior Stroke/TIA/embolus (2 points), Vascular disease, age 65–74 years, female Sex.
[b]Includes women without other stroke risk factors.
[c]IIaB for women with only one additional stroke risk factor.
[d]IB for patients with mechanical heart valves or mitral stenosis.

Figure 8 Stroke prevention in atrial fibrillation.

Suivi

Suivi au long cours des patients porteurs de prothèse

- **Evaluation clinique et échographique (ETT) à J30 post-opératoire**
- **Suivi annuel par le cardiologue** : examen cardiologique, ECG, ETT, bilan biologique (NFS à la recherche d'une anémie).
- **INR tous les mois si prothèse mécanique** (à transmettre au médecin traitant si anormal).
- Suivi par le **médecin traitant** tous les 3-6 mois : examen clinique, suivi des INR ± biologie complémentaire.
- **Consultation ORL et dentiste tous les 6 mois.**

Potentiel thrombogène de la PROTHESE MECANIQUE	Nombre de facteurs de risque de thrombose de prothèse ou d'événements emboliques	
	Aucun	Au moins 1 FdR
Faible = prothèse à doubles ailettes, la plus fréquemment utilisée	2,5	3
Moyen	3	3,5
Elevé (valve de Starr et à disque)	3,5	4

- **Les facteurs de risque (FdR) thrombo-embolique chez les patients porteurs de prothèse mécanique sont :**
  - Remplacement valvulaire mécanique en position MITRALE ou TRICUSPIDE
  - ATCD d'accident thrombo-embolique artériel (AVC, AIT, ischémie aiguë MI, etc.)
  - FA
  - RM associé (quelle que soit la sévérité)
  - FEVG < 35%

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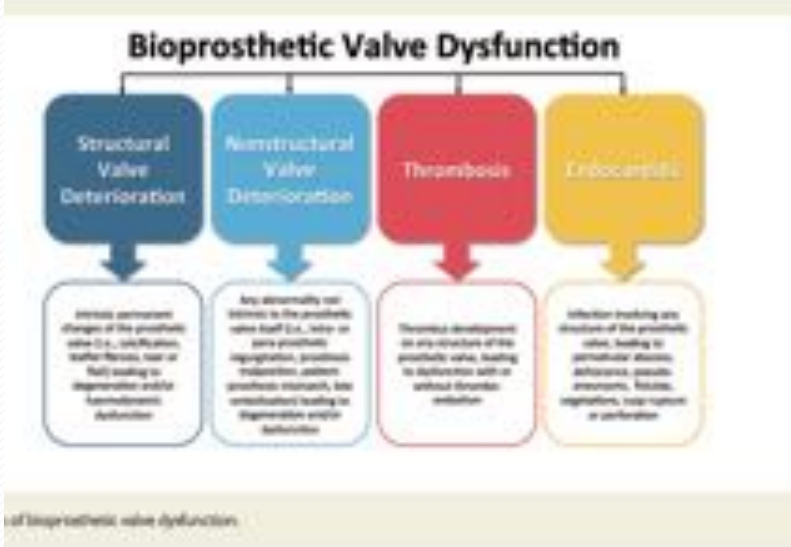
Dysfonction de prothèse valvulaire

SPECIAL ARTICLE

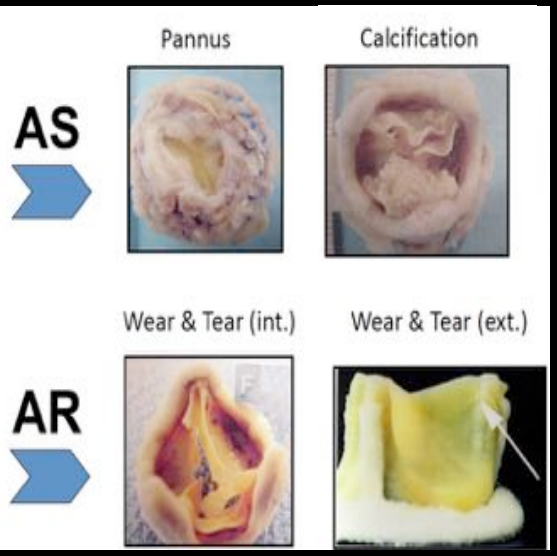
Standardized definitions of structural deterioration and valve failure in assessing long-term durability of transcatheter and surgical aortic bioprosthetic valves: a consensus statement from the European Association of Percutaneous Cardiovascular Interventions (EAPCI) endorsed by the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)

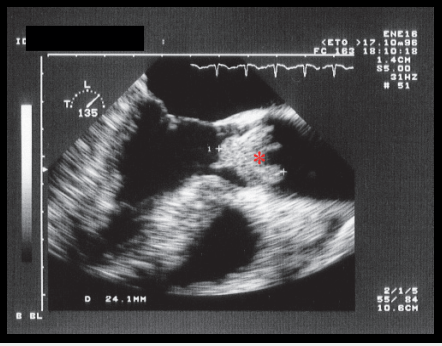


Capodanno et al EHJ 2017

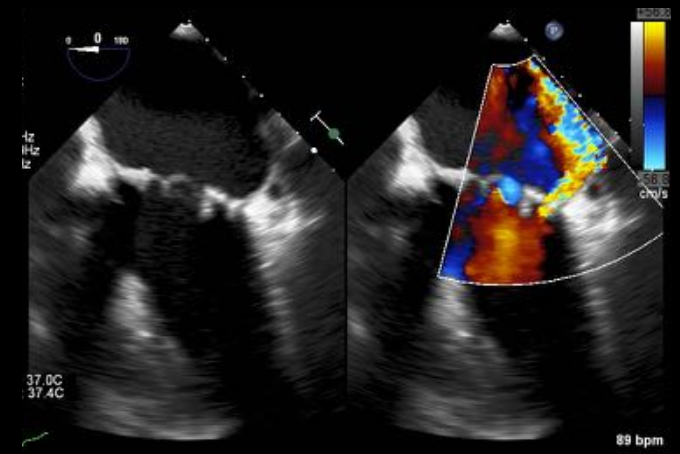
Bioprosthetic Valve Dysfunction

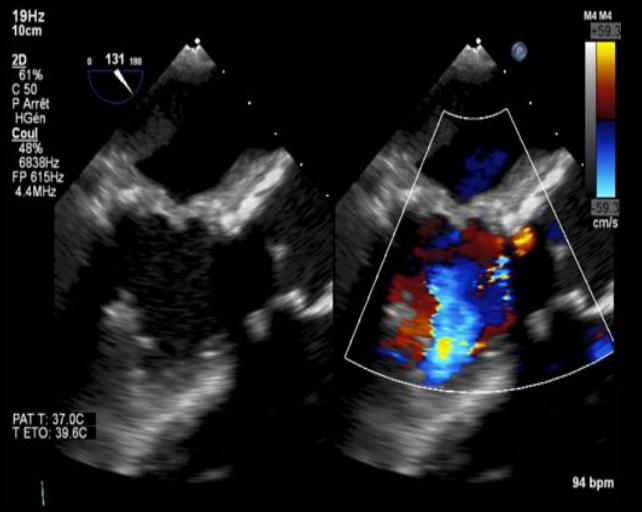
Structural Valve Deterioration	Nonstructural Valve Deterioration	Thrombosis	Endocarditis
Intrinsic permanent changes of the prosthetic valve (i.e., calcification, leaflet fibrosis, tear or flail) leading to degeneration and/or haemodynamic dysfunction	Any abnormality not intrinsic to the prosthetic valve itself (i.e., intra- or para-prosthetic regurgitation, prosthesis malposition, patient-prosthesis mismatch, late embolization) leading to degeneration and/or dysfunction	Thrombus development on any structure of the prosthetic valve, leading to dysfunction with or without thrombo-embolism	Infection involving any structure of the prosthetic valve, leading to perivalvular abscess, dehiscence, pseudo-aneurysms, fistulae, vegetations, cusp rupture or perforation





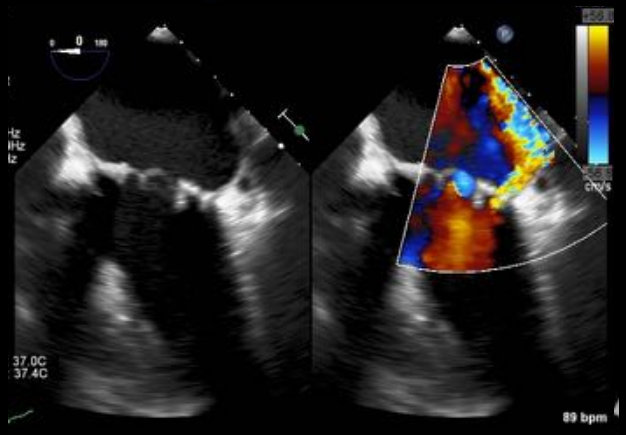
ETO : volumineuse végétation aortique*

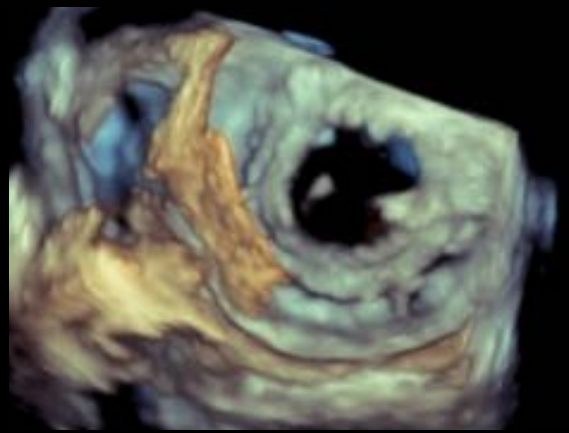


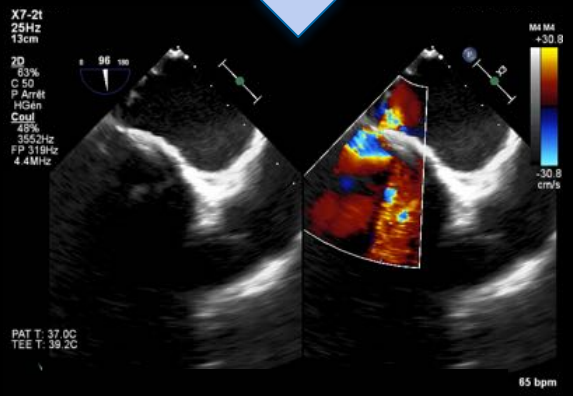


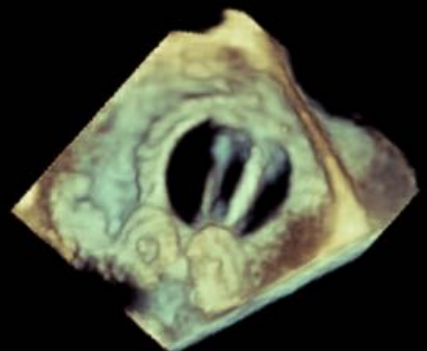
Fuite para-prothétique

Haemolysis and paravalvular leak		
Reoperation is recommended if paravalvular leak is related to endocarditis or causes haemolysis requiring repeated blood transfusions or leading to severe symptoms.	I	C
Transcatheter closure may be considered for para-valvular leaks with clinically significant regurgitation in surgical high-risk patients (Heart Team decision).	IIb	C







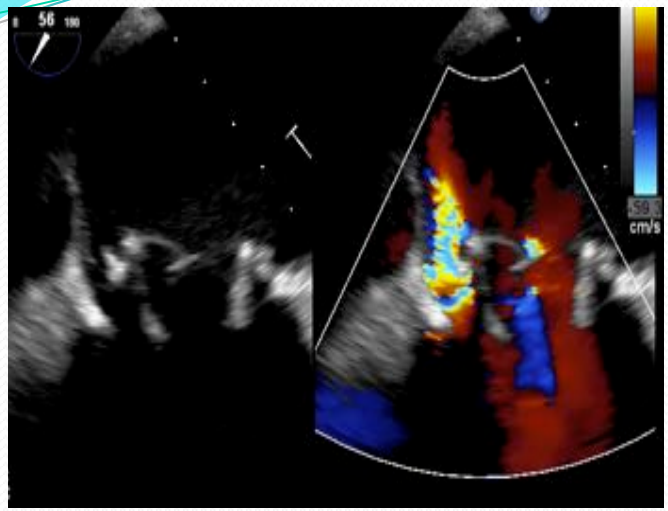


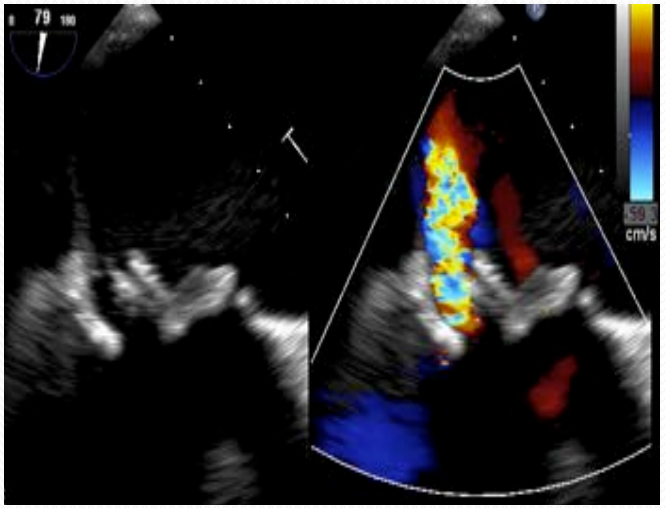
Fuite péri-prothétique

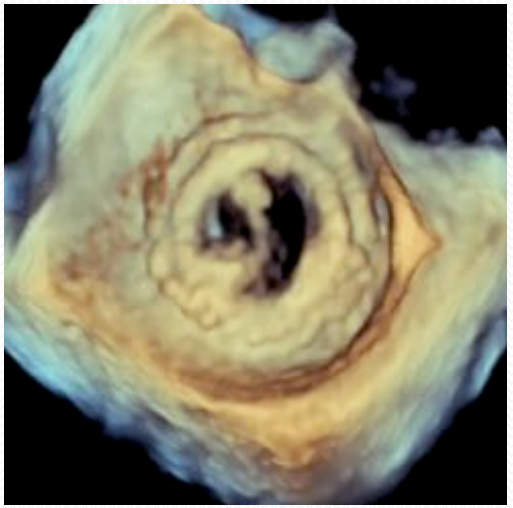
Fuite péri-prothétique

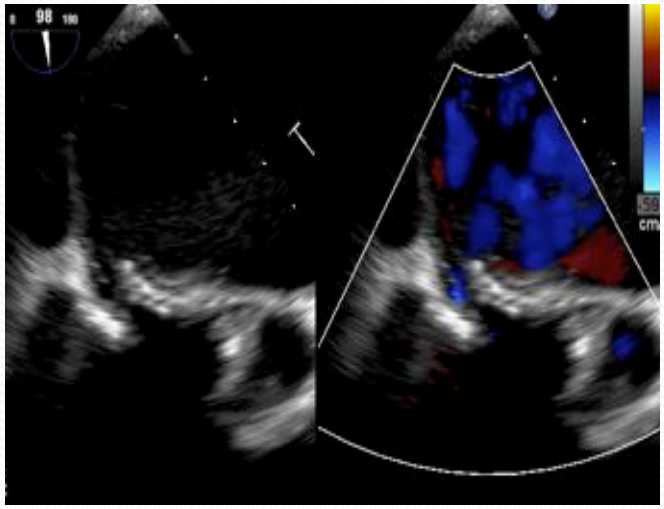
- Patiente de 89 ans
- RVM BIOLOGIQUE EPIC 29 pour IM sévère dégénérative sur anneau mitral sévèrement calcifié de façon circonférentielle 1 an plus tôt
- PM post-opératoire
- Pas d'autre ATCD ou FDRCV
- OAP
- ECG: TSV 110/min
- ETT/ETO: fuite péri-prothétique
- PET-SCAN: pas d'argument pour une endocardite

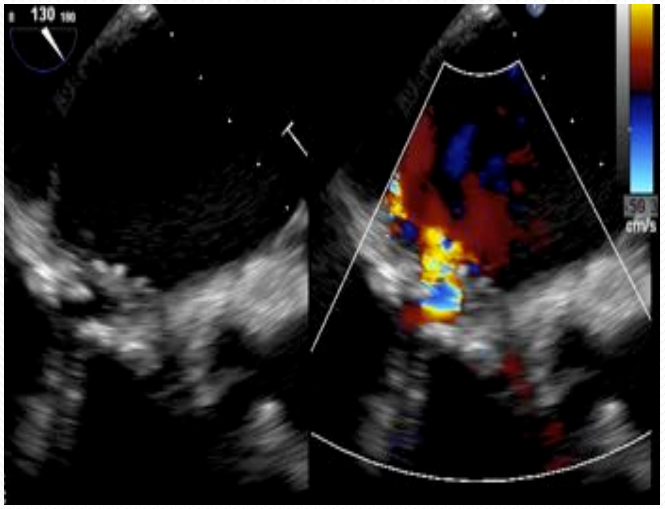
Fuite péri-prothétique

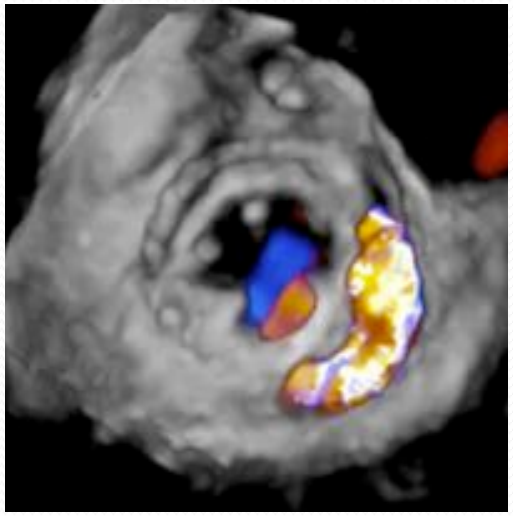












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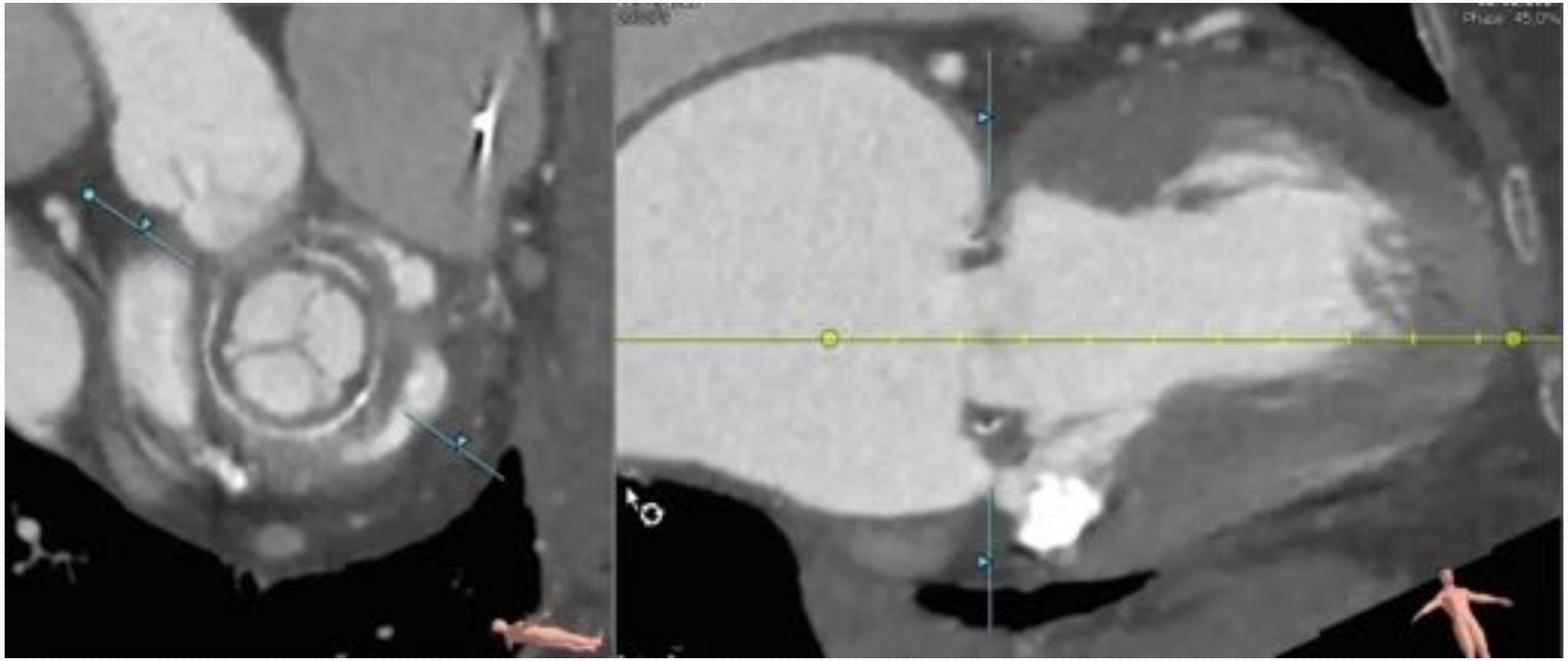

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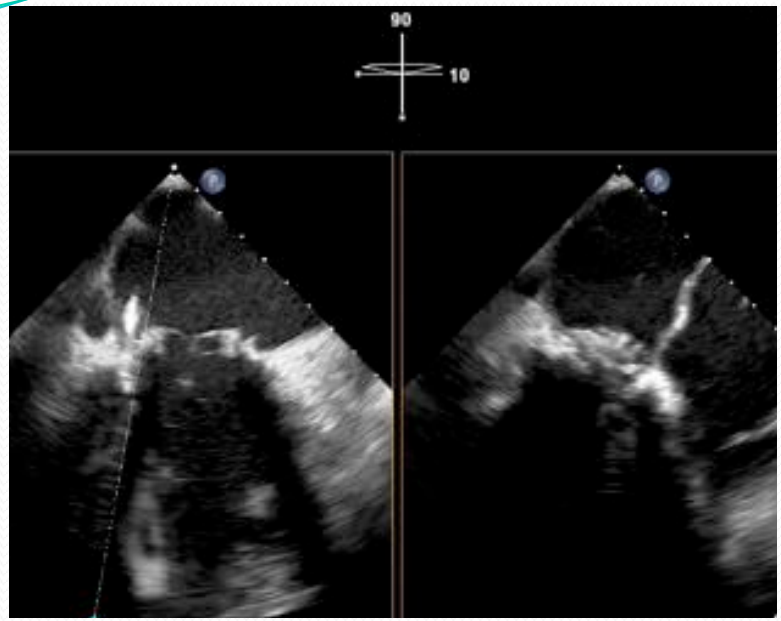

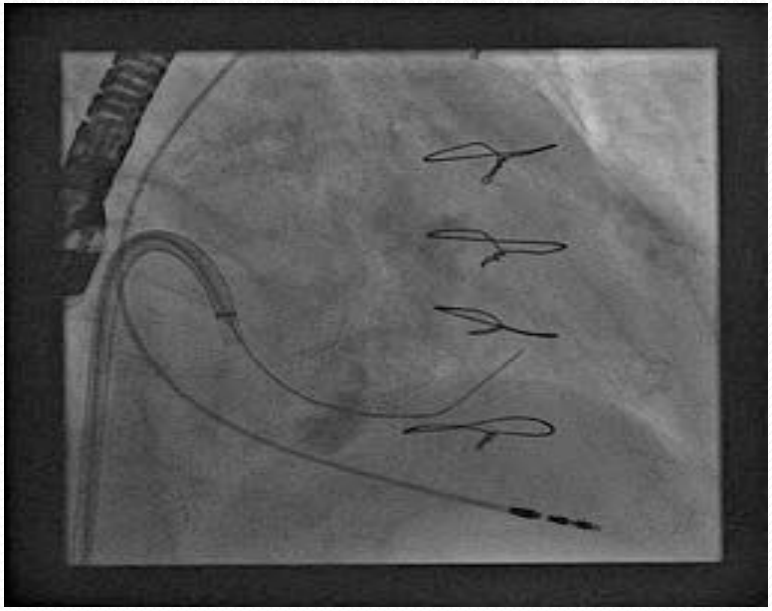

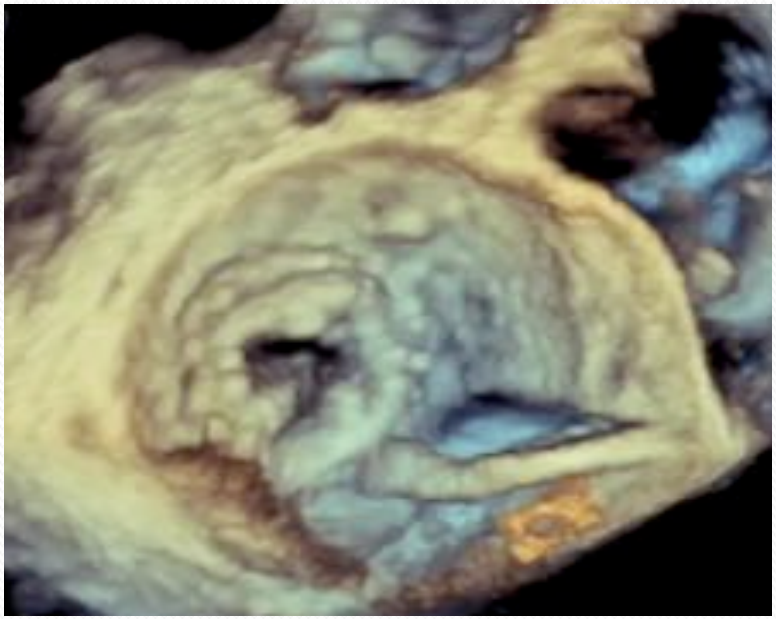

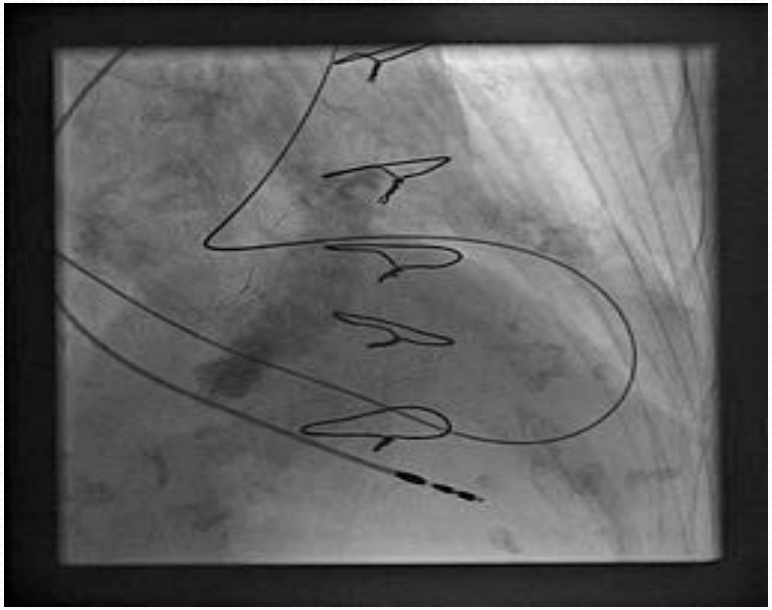

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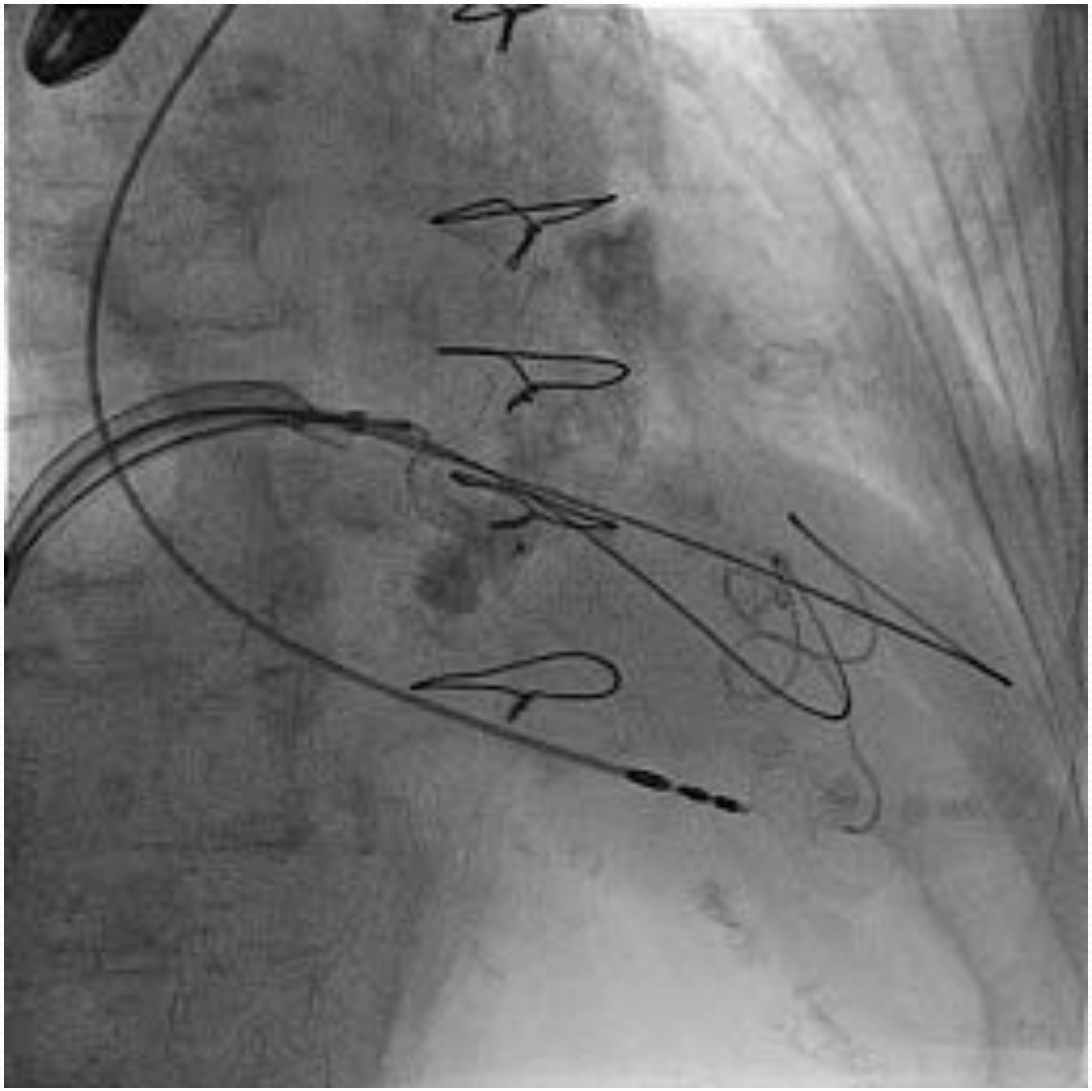

Cardiologue interventionnel : Dr M. Nejjari, CCN

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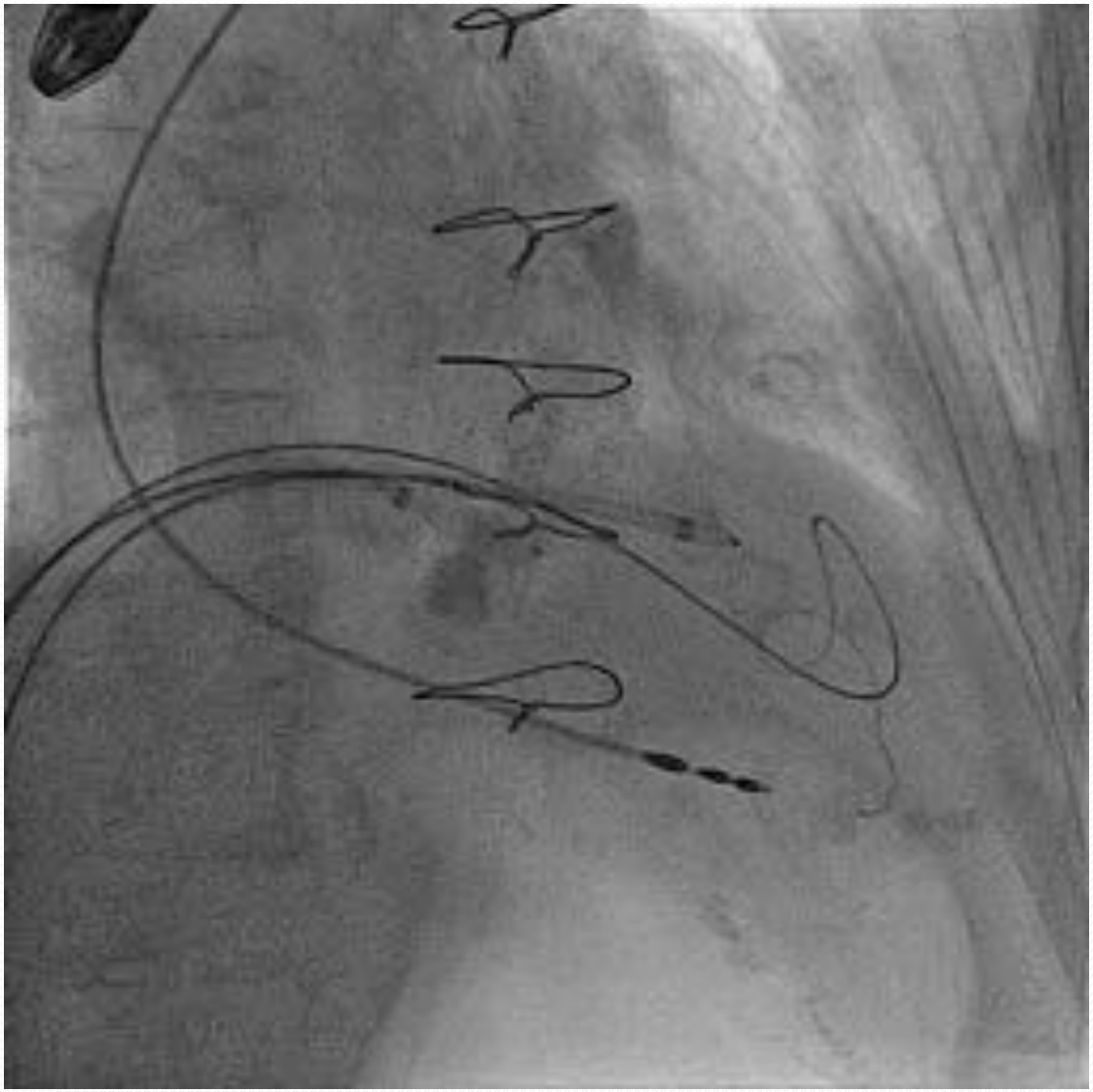

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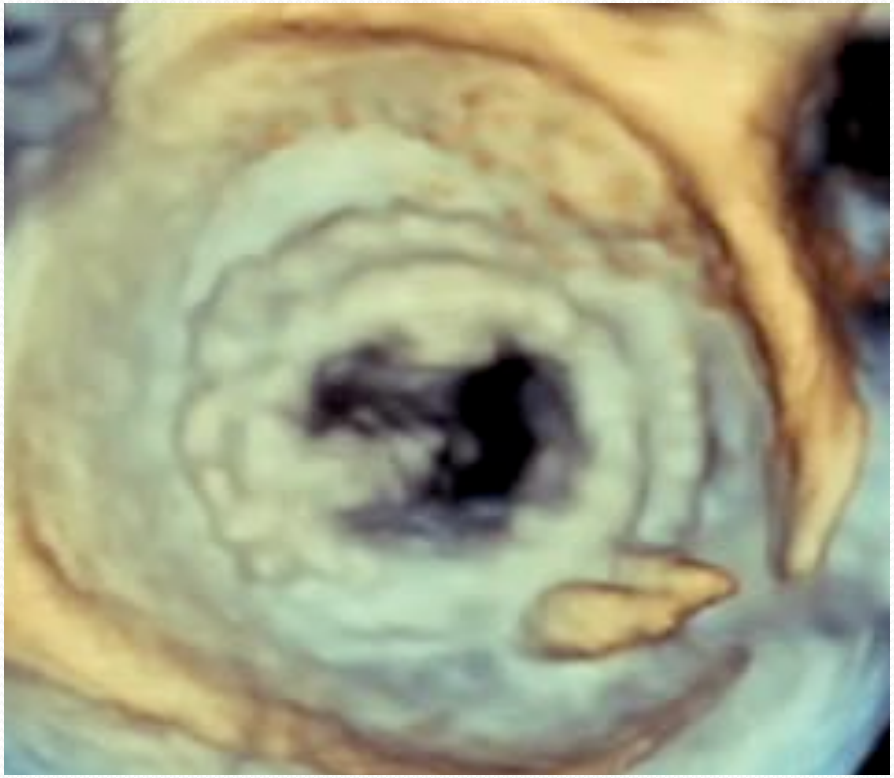

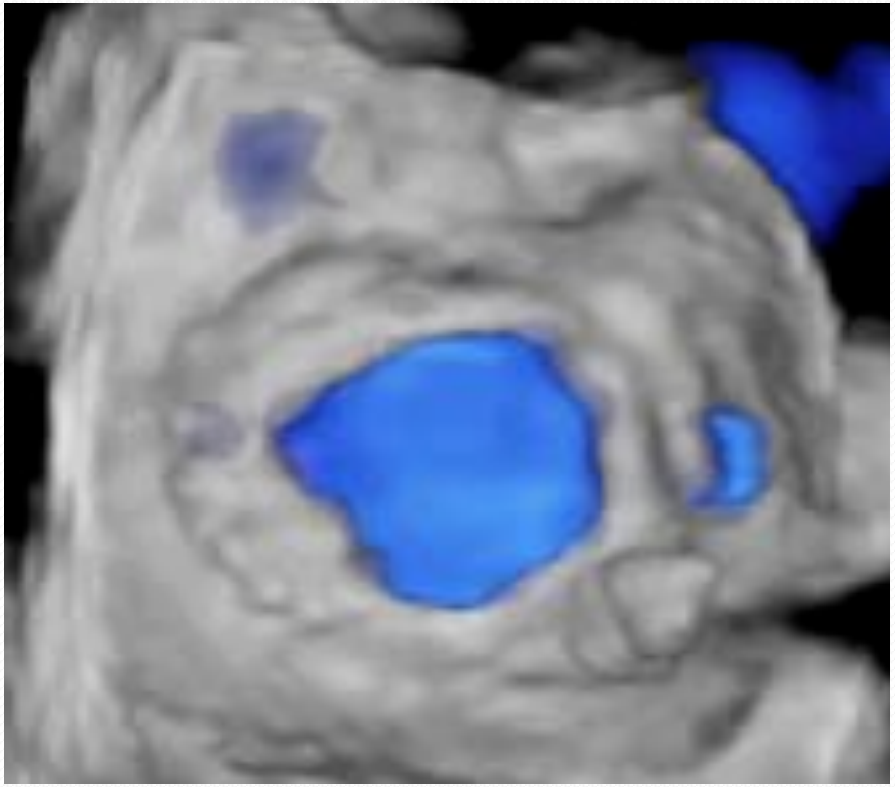

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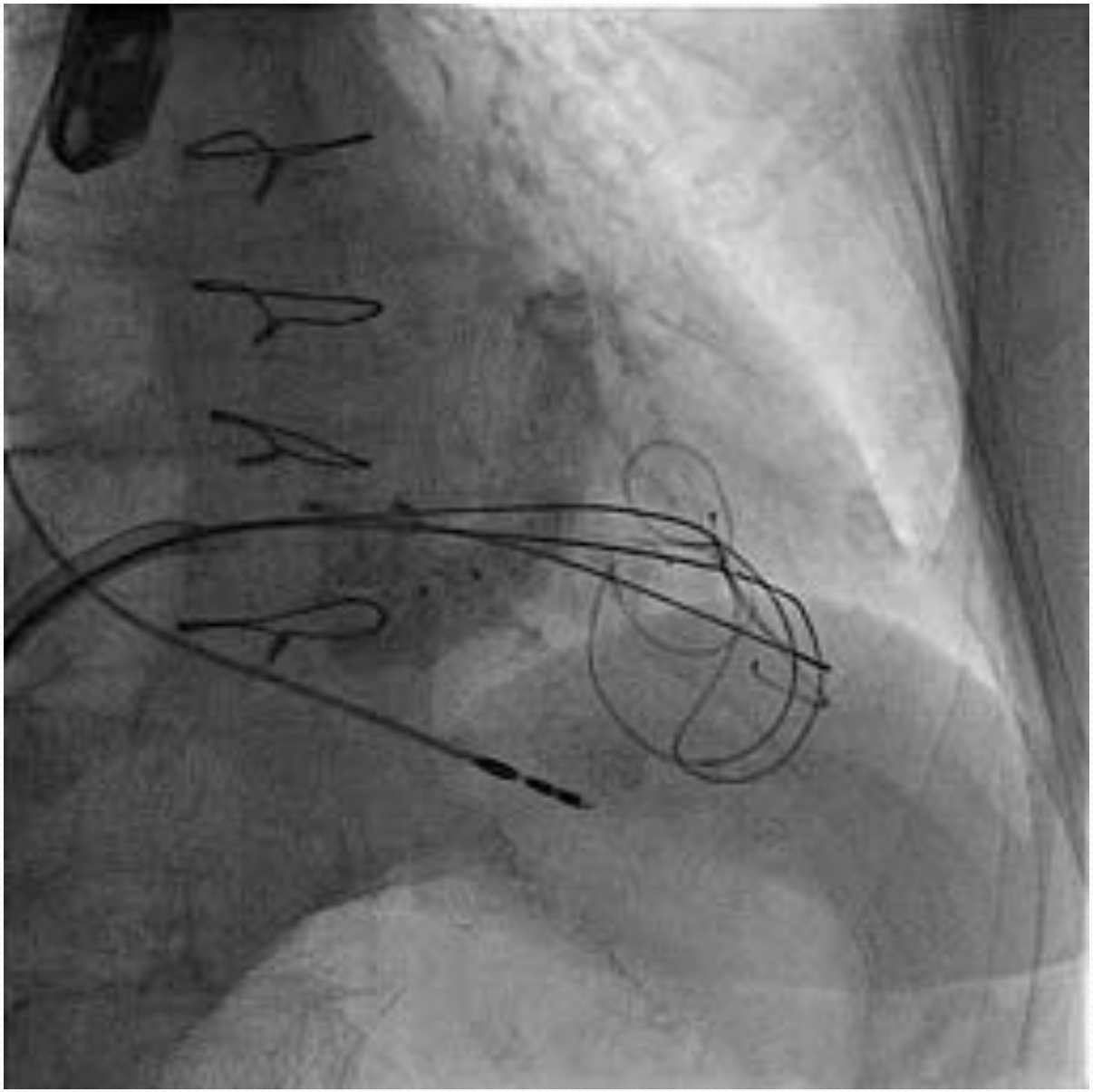

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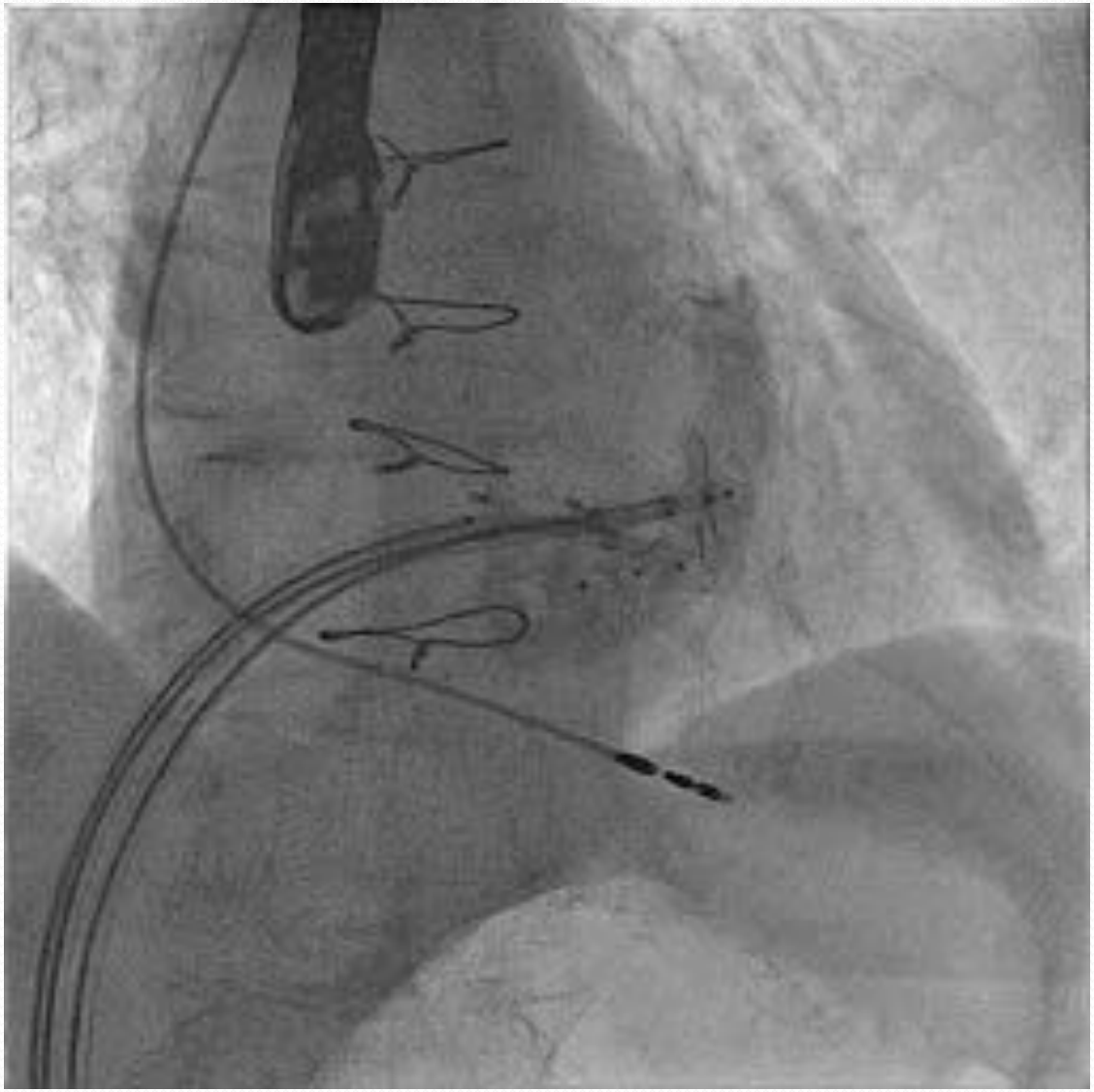
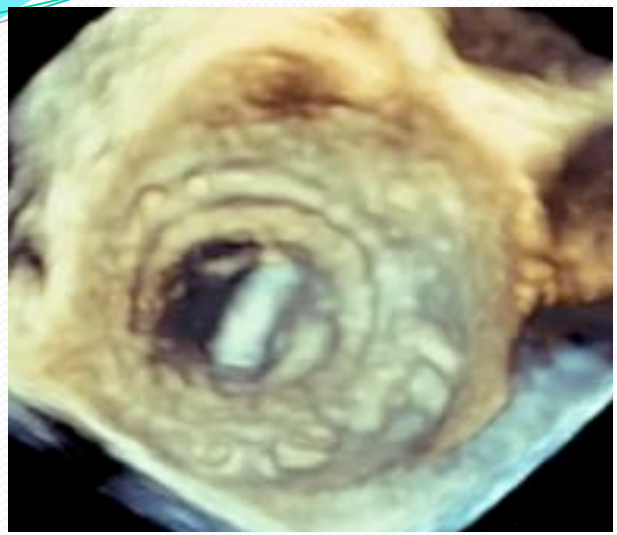
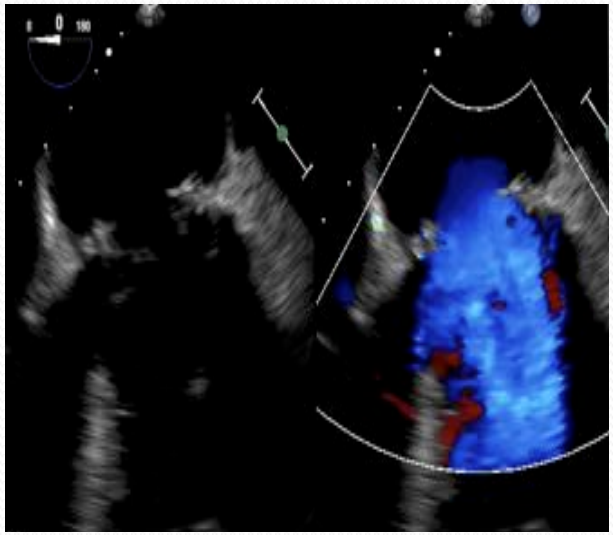
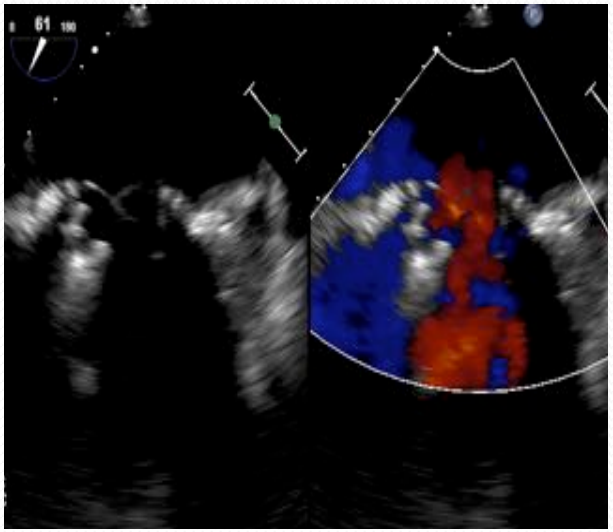


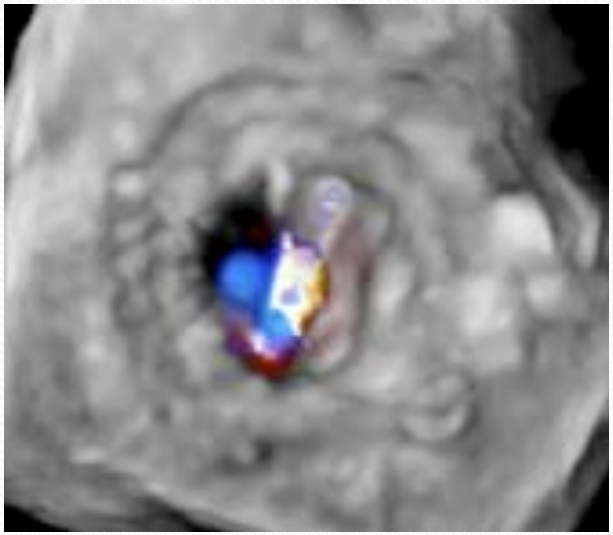
Cardiologue interventionnel : Dr M. Nejjari, CCN

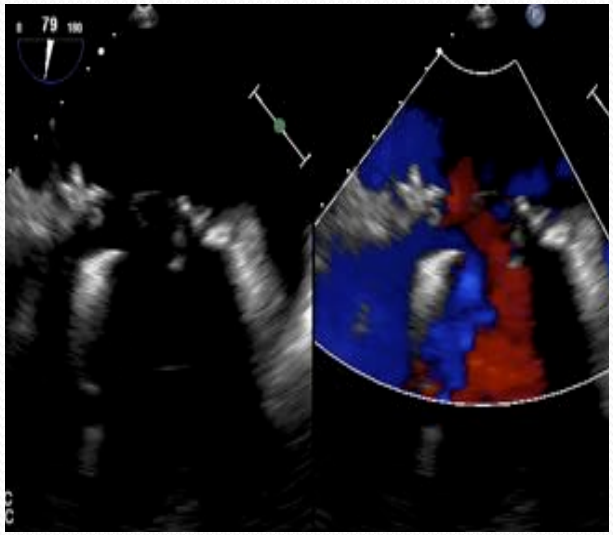
Fuite péri-prothétique

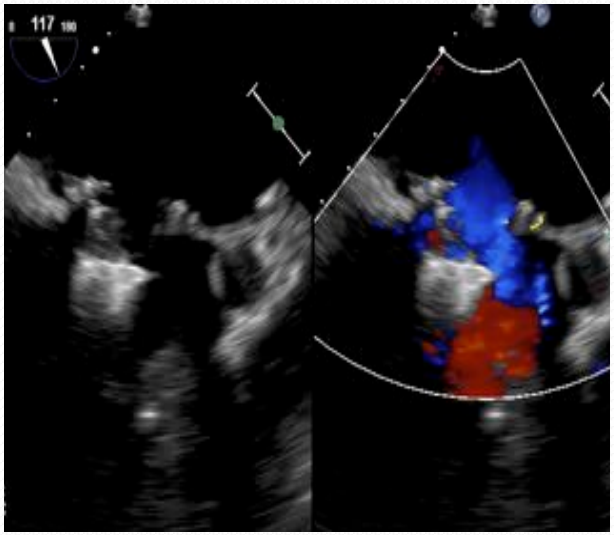












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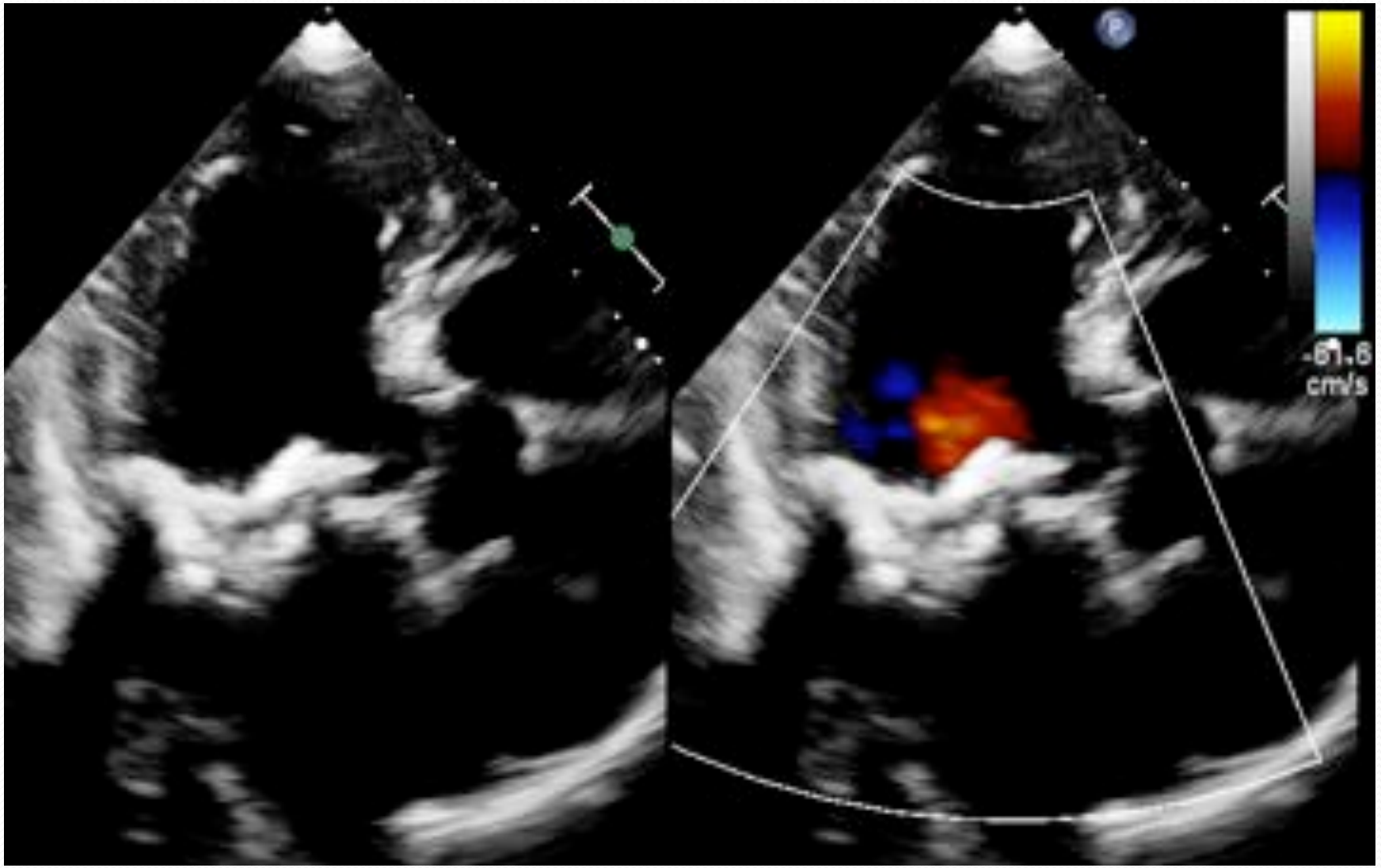
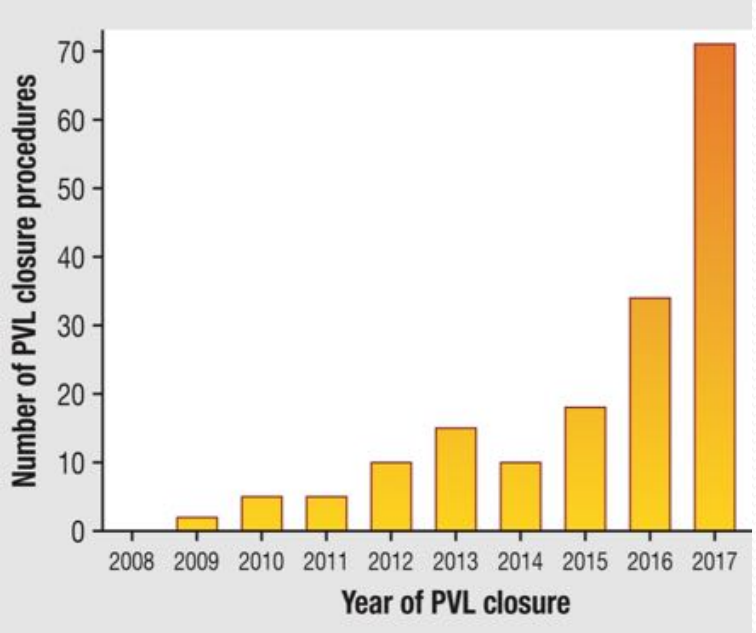


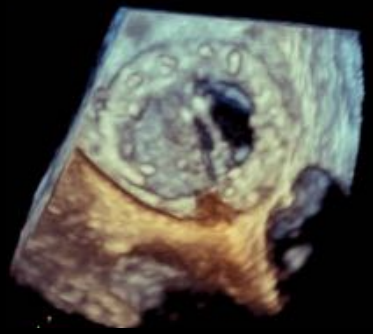
Fuite péri-prothétique

- **Nombre limité de procédures réalisées**
- **Peu d'études / plutôt des cas rapportés**
- **Registre Français en cours**



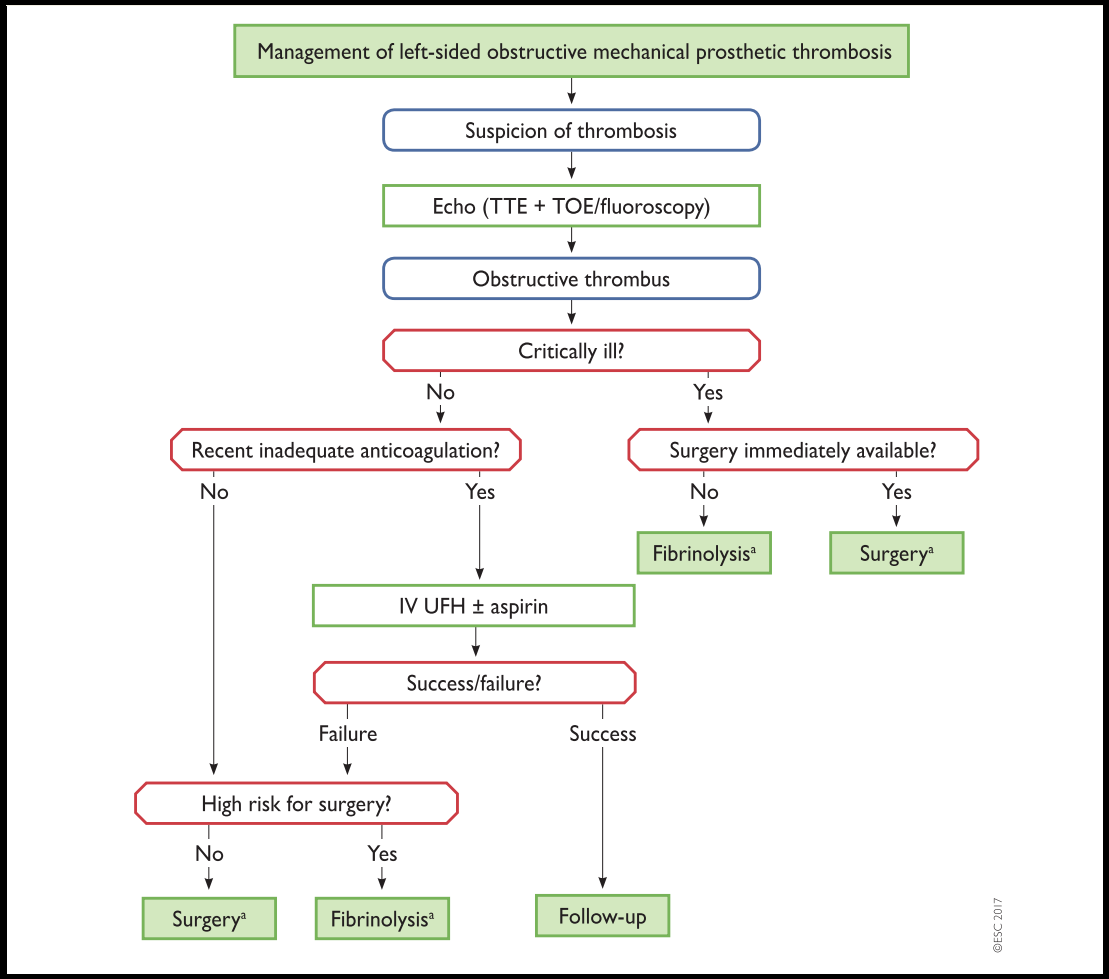
Hascoet S et al, ACVD, 2017

Thrombose obstructive de prothèse mécanique

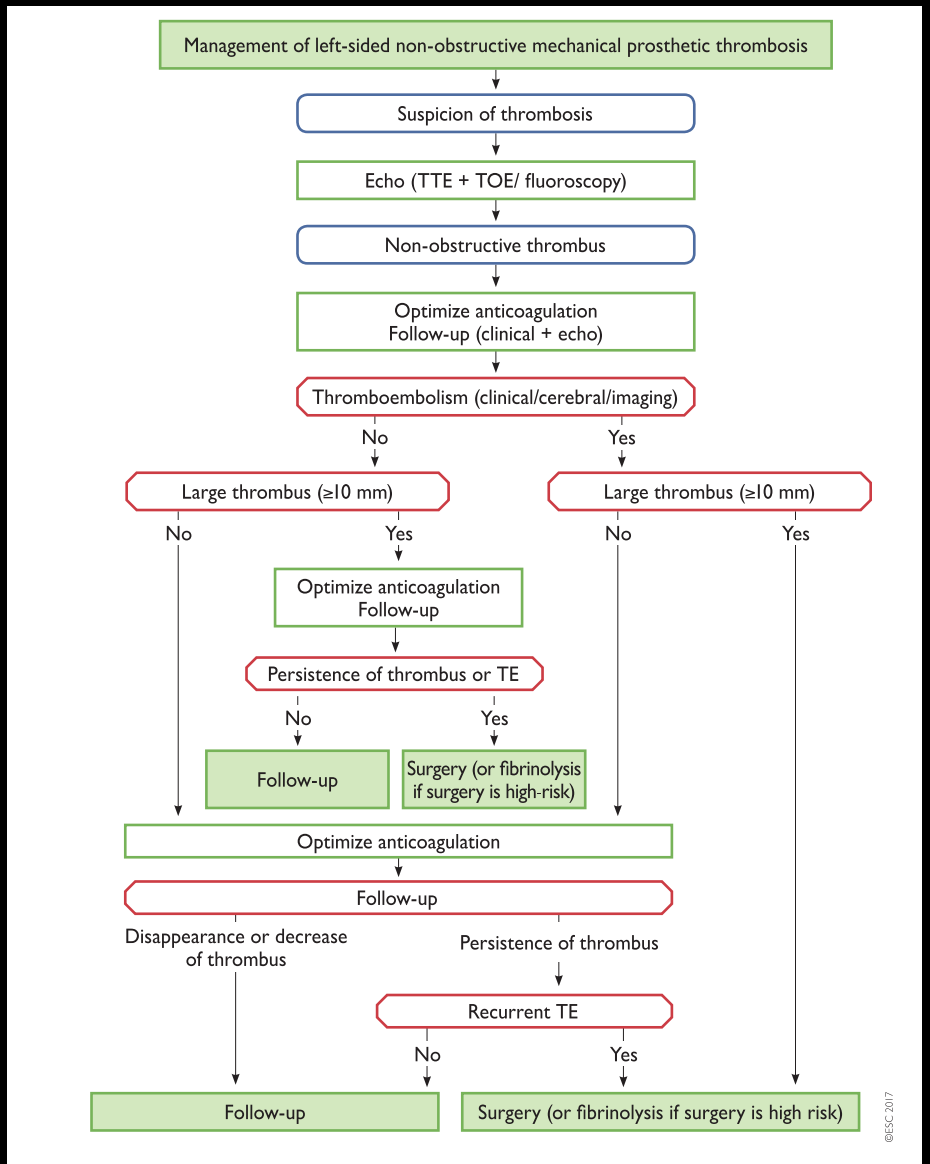


ETO 3D retrouvant l'ailette bloquée en position fermée (*)

Pièce anapath retrouvant un thrombus(*) sur la prothèse mécanique

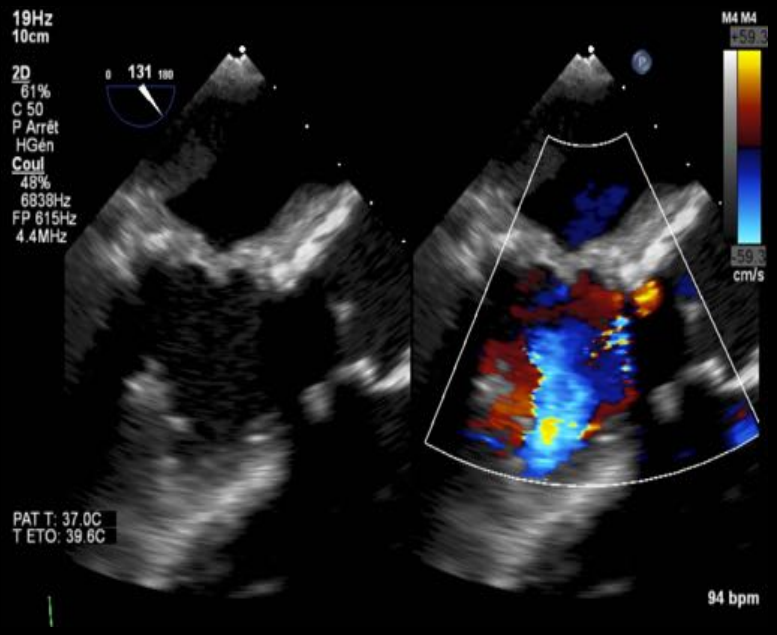


Thrombose non obstructive de prothèse mécanique



Thrombose de bioprothèse

Bioprosthetic thrombosis		
Anticoagulation using a VKA and/or UFH is recommended in bioprosthetic valve thrombosis before considering reintervention.	I	C



Dégénérescence de bioprothèse aortique: TAVI valve-in-valve ou chirurgie redux ?

Le 17 Janvier 2019
JESFC 2019
Filiale valvulopathies de la SFC

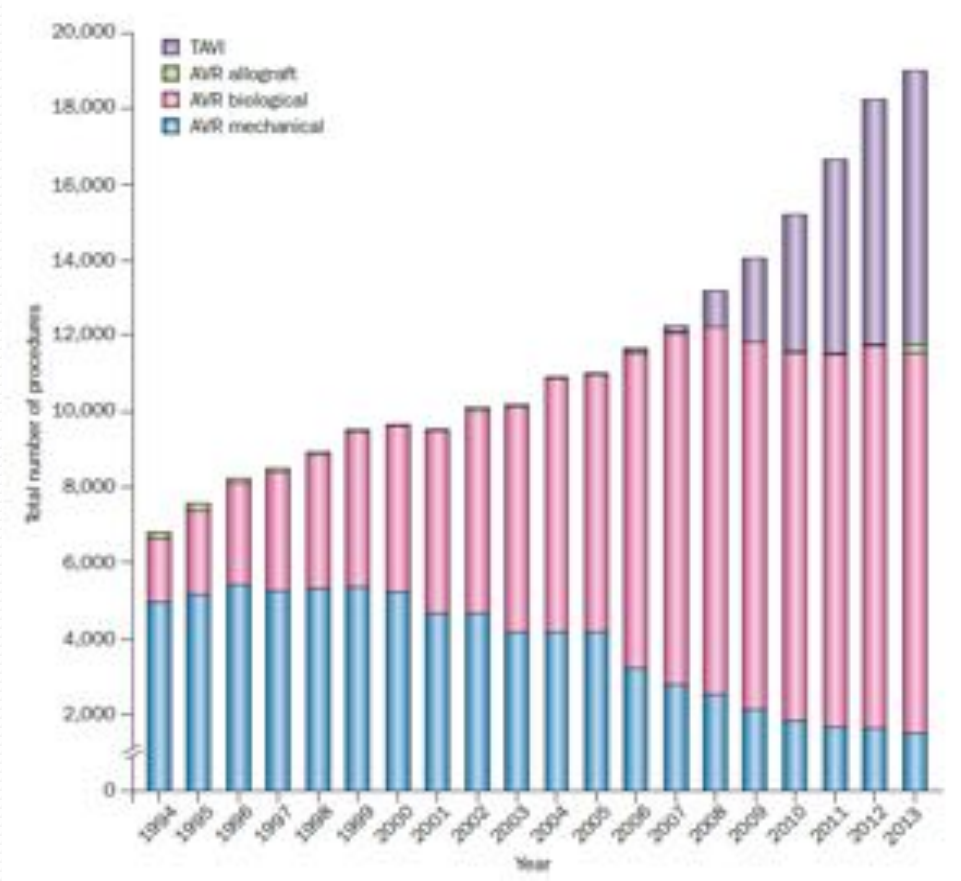
David Attias
Centre Cardiologique du Nord
Saint-Denis

Une question bientôt très fréquente

- De plus en plus de bioprothèses
- Implantés chez des patients de plus en plus jeunes
- Donc de plus en plus de dégénérescences de bioprothèses
- Chez des patients qui vont vivre de plus en plus longtemps
- Avec de plus en plus de comorbidités
- Et la possibilité du TAVI…..(ou de la chirurgie redux !)

Pourquoi de plus en plus de bioprothèses implantées?

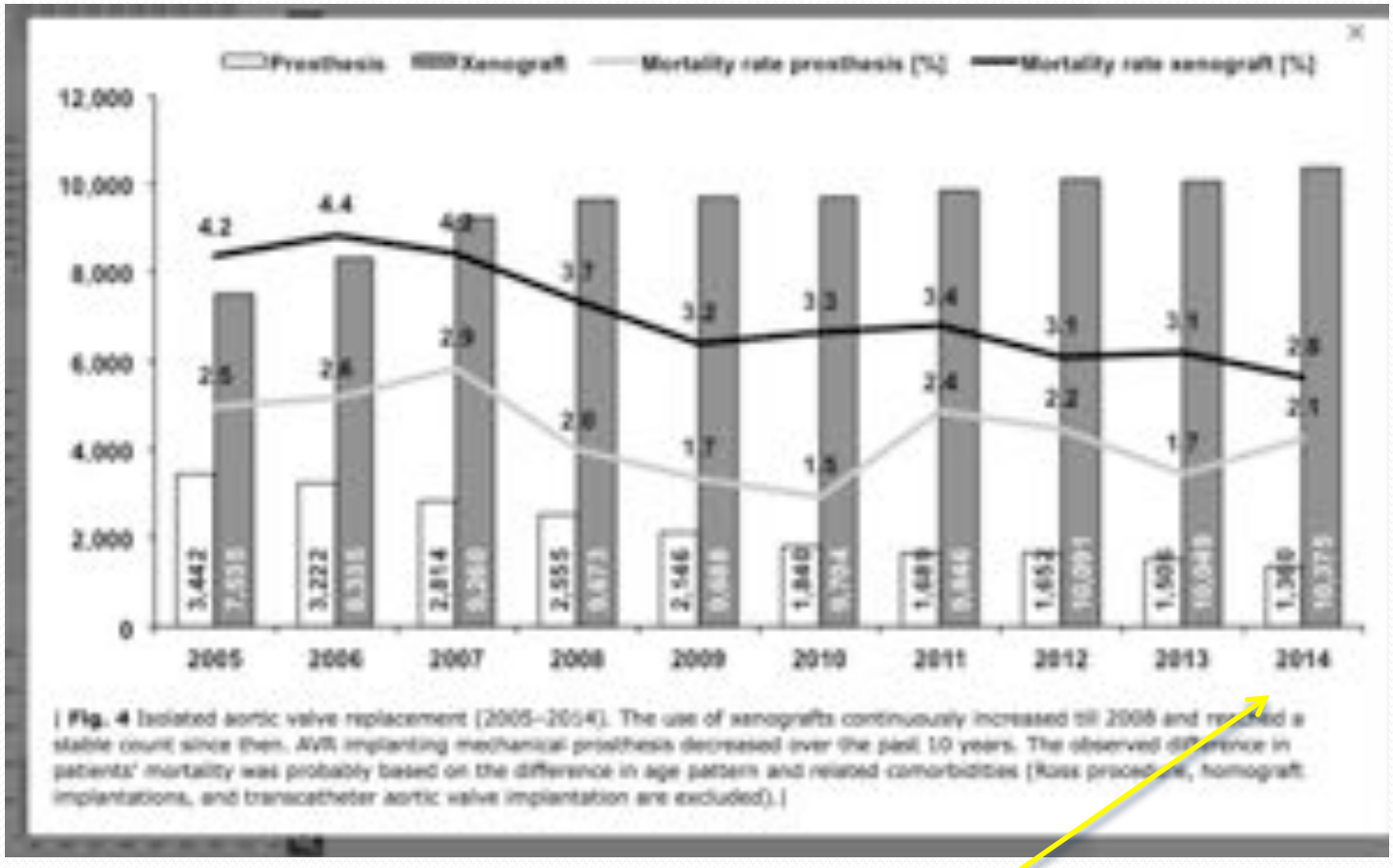
- Moins RAA, plus de valvulopathies dégénératives ++
- Meilleure durabilité des bioprothèses
- TAVI valve in valve en perspective, moins effrayant qu'une chirurgie redux chez l'octogénaire (à tort ou à raison ?)
- Moins d'AVK chez les sujets âgés



Mohr FW et al. *Nat. Rev. Cardiol. 2014*

Cardiac Surgery in Germany during 2014: A Report on Behalf of the German Society for Thoracic and Cardiovascular Surgery.

Beckmann A[1], Funkat AK[2], Lewandowski J[3], Frie M[3], Ernst M[4], Hakmat K[4], Schiller W[4], Gummert JF[1], Cremer J[4]



| **Fig. 4** Isolated aortic valve replacement (2005–2014). The use of xenografts continuously increased till 2008 and reached a stable count since then. AVR implanting mechanical prosthesis decreased over the past 10 years. The observed difference in patients' mortality was probably based on the difference in age pattern and related comorbidities [Ross procedure, homograft implantations, and transcatheter aortic valve implantation are excluded).]

89% des RVAo par BIOPROTHESE en 2014

Réflexions autour d'un cas clinique

Mme J.L.

- Patiente de 81 ans, excellent état cognitif
- **ATCD de RVAo chirurgical par une bioprothèse aortique MitroFlow n°19 en 2009 pour sténose aortique serrée.**
- Endocardite à Streptocoque en mars 2015, avec une porte d'entrée digestive probable sur maladie de Crohn.
- Hospitalisée **pour IC à répétition pour dégénérescence post endocarditique d'une bioprothèse aortique Mitroflow n°19 implantée en 2009**. Cette dégénérescence est fortement sténosante et fuyante (gradient moyen 65mmHg, Vmax 5m/sec, surface 0.5cm²), avec une fuite moyenne (grade ¾), FEVG normale, HTAP à 60 mmHg

Mme J.L.

- **Comorbidités :**
  - ✓ 81 ans
  - ✓ atteinte cutanée thoracique post radique (radiothérapie en 1980 puis en 1988 pour carcinome mammaire bilatéral)
  - ✓ insuffisance rénale chronique sévère (clairance 24 ml/min)
  - ✓ atteinte vestibulaire secondaire au traitement par Aminoside dont elle garde une grande instabilité à la marche.
  - ✓ **EFR** (avril 2016): trouble ventilatoire obstructif modéré stable depuis 2015, VEMS 1.31l soit 63%, Tiffeneau 86%.
  - ✓ Maladie de Crohn avec atteinte iléo colique et anale actuellement sous Metothrexate.
- **Coronarographie**: normale ; axes vasculaires non athéromateux peu tortueux et de bon diamètre.
- **Scanner cardiaque (décembre 2015 – mesures validées par le Dr Sablayrolles)** : anneau aortique 17 x 18mm, surface 2.6cm². Distance anneau – ostia coronaire gauche 9.6mm ; anneau – coronaire droite 10.5mm.
- **Euroscore 1** : 31% (avril 2016).

Quand parle-t-on de dégénérescence structurelle sévère de bioprothèse ?

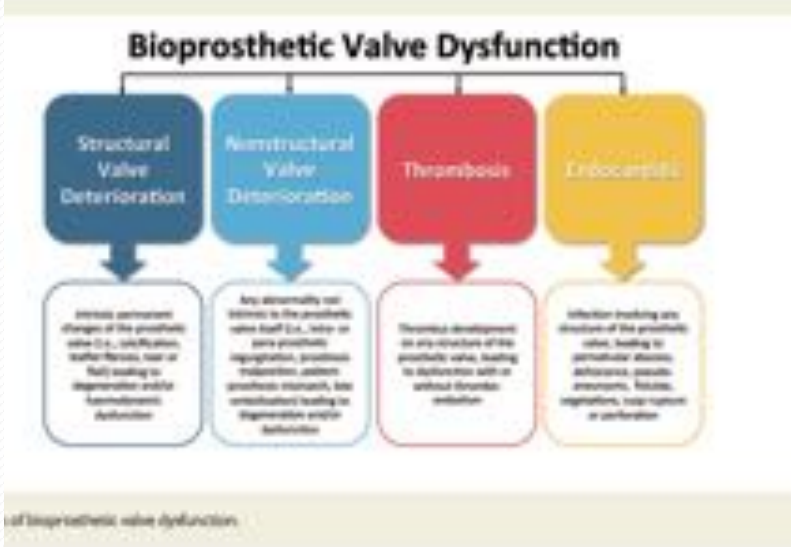
A. Cusps fines et gradient moyen à 30 mmHg
B. Cusps calcifiées, IA ¾, gradient moyen 35 mmHg
C. Déchirure d'une cusp, pas de végétation, IA 4/4
D. Cusps calcifiées, gradient moyen à 50 mmHg
E. Déchirure d'une cusp, présence d'une végétation, IA 4/4

Quand parle-t-on de dégénérescence structurelle sévère de bioprothèse ?

A. ~~Cusps fines et gradient moyen à 30 mmHg~~
   ➔ mismatch patient/prothèse
A. Cusps calcifiées, IA ¾, gradient moyen 35 mmHg
B. Déchirure d'une cusp, pas de végétation, IA 4/4
C. Cusps calcifiées, gradient moyen à 50 mmHg
D. ~~Déchirure d'une cusp, présence d'une végétation, IA 4/4~~
   ➔ endocardite infectieuse

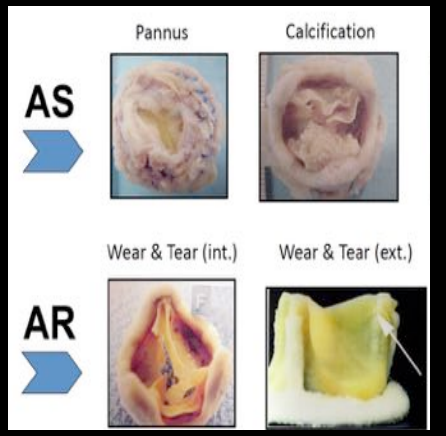
SPECIAL ARTICLE

Standardized definitions of structural deterioration and valve failure in assessing long-term durability of transcatheter and surgical aortic bioprosthetic valves: a consensus statement from the European Association of Percutaneous Cardiovascular Interventions (EAPCI) endorsed by the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)



Capodanno et al EHJ 2017

Dégénérescence structurelle de bioprothèse



- Atteinte morphologique intrinsèque permanente de la valve :
  - Usure
  - Déchirure
  - Prolapsus d'une cusp
  - Calcifications
  - Fibrose
- Entrainant une dégénérescence ou une dysfonction de la prothèse pouvant se manifestant hémodynamiquement par une sténose ou une régurgitation intra-prothétique.

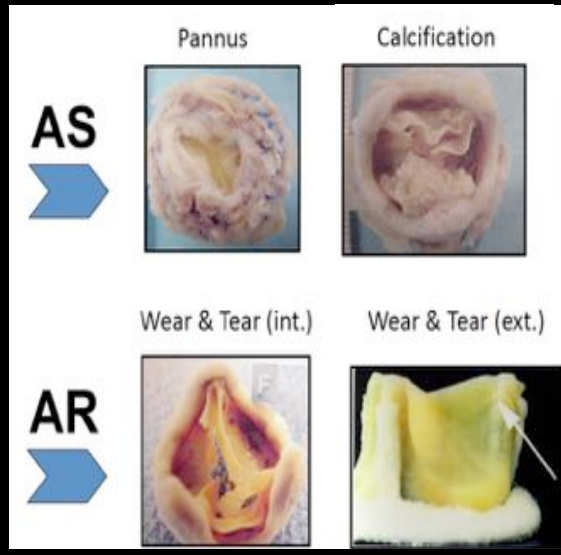
- Dégénérescence structurelle de bioprothèse sévère hémodynamiquement si :
  - ✓ Gradient moyen transprothétique ≥ 40 mmHg
  - ✓ Augmentation du gradient moyen transprothétique ≥ 20 mmHg par rapport au baseline.
  - ✓ Fuite aortique intra-prothétique sévère ; nouvelle ou aggravation d'une fuite intra-prothétique (>2+/4+) par rapport au baseline.
  - ✓ ETT de référence à J30 post-opératoire.

Capodanno et al EHJ 2017

Definition of Structural valve degeneration

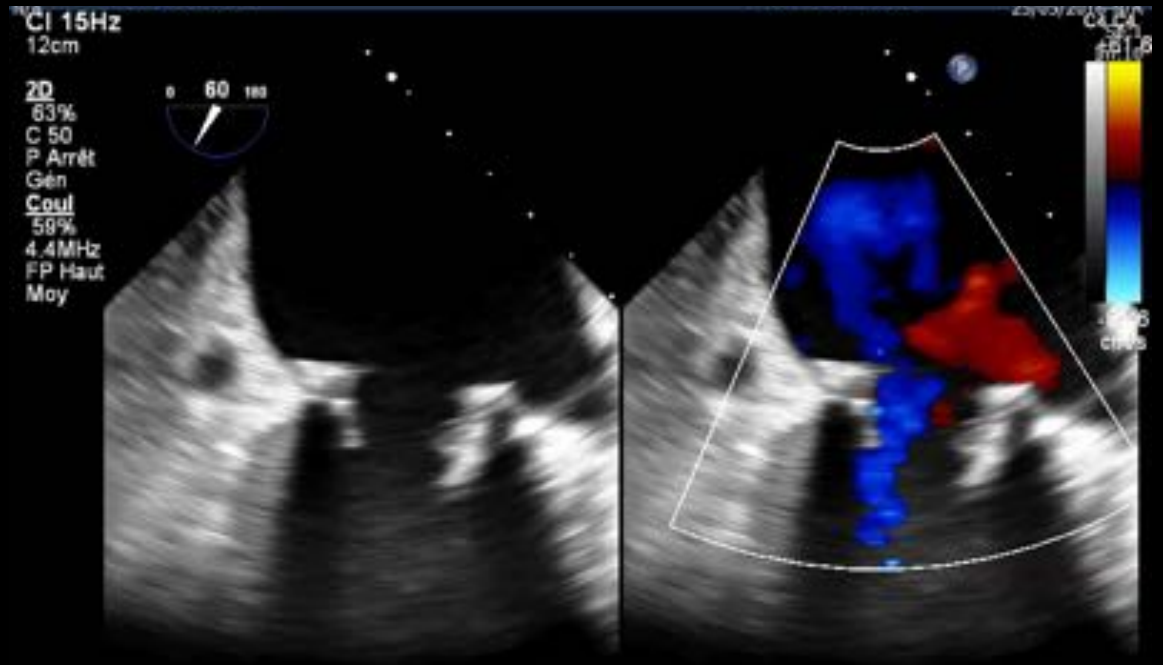
- Severe haemodynamic SVD (any of the following) :
  - ✓ Mean transprosthetic gradient ≥ 40 mmHg
  - ✓ Mean transprosthetic gradient ≥ 20 mmHg change from baseline
  - ✓ Severe intra-prosthetic aortic regurgitation, new or worsening (>2+/4+) from baseline

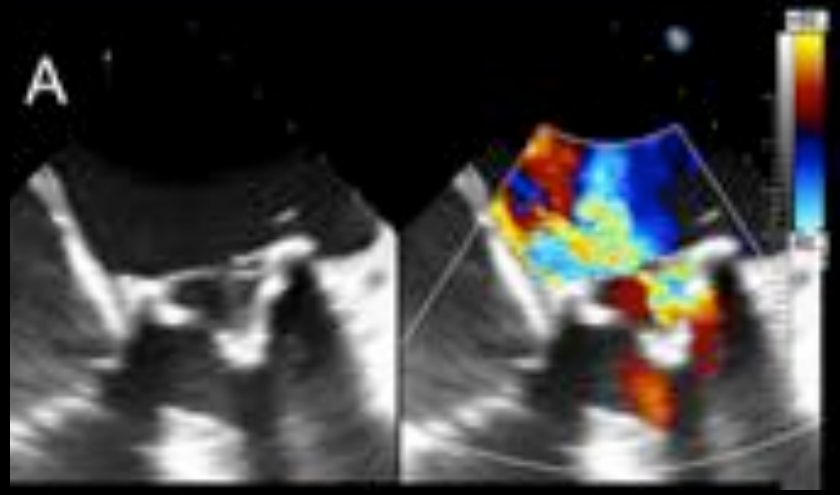
- Morphological SVD (any of the following):
  - ✓ Leaflet integrity abnormality (i.e. torn or flail causing intra-frame regurgitation)
  - ✓ Leaflet structure abnormality (i.e. pathological thickening and/or calcification causing valvular stenosis or central regurgitation)
  - ✓ Leaflet function abnormality (i.e. impaired mobility resulting in stenosis and/or central regurgitation)
  - ✓ Strut/frame abnormality (i.e. fracture)

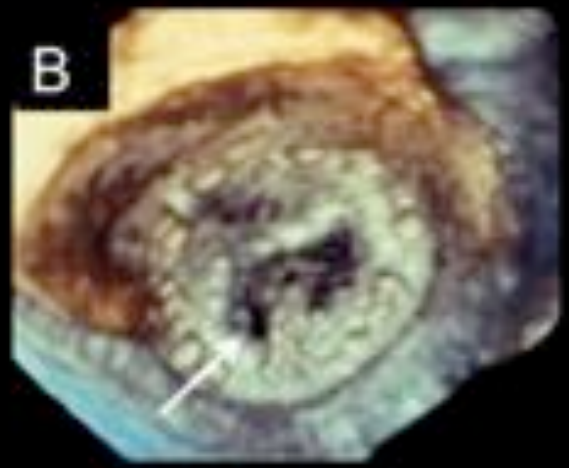


Capodanno et al EHJ 2017

IM intra-prothétique

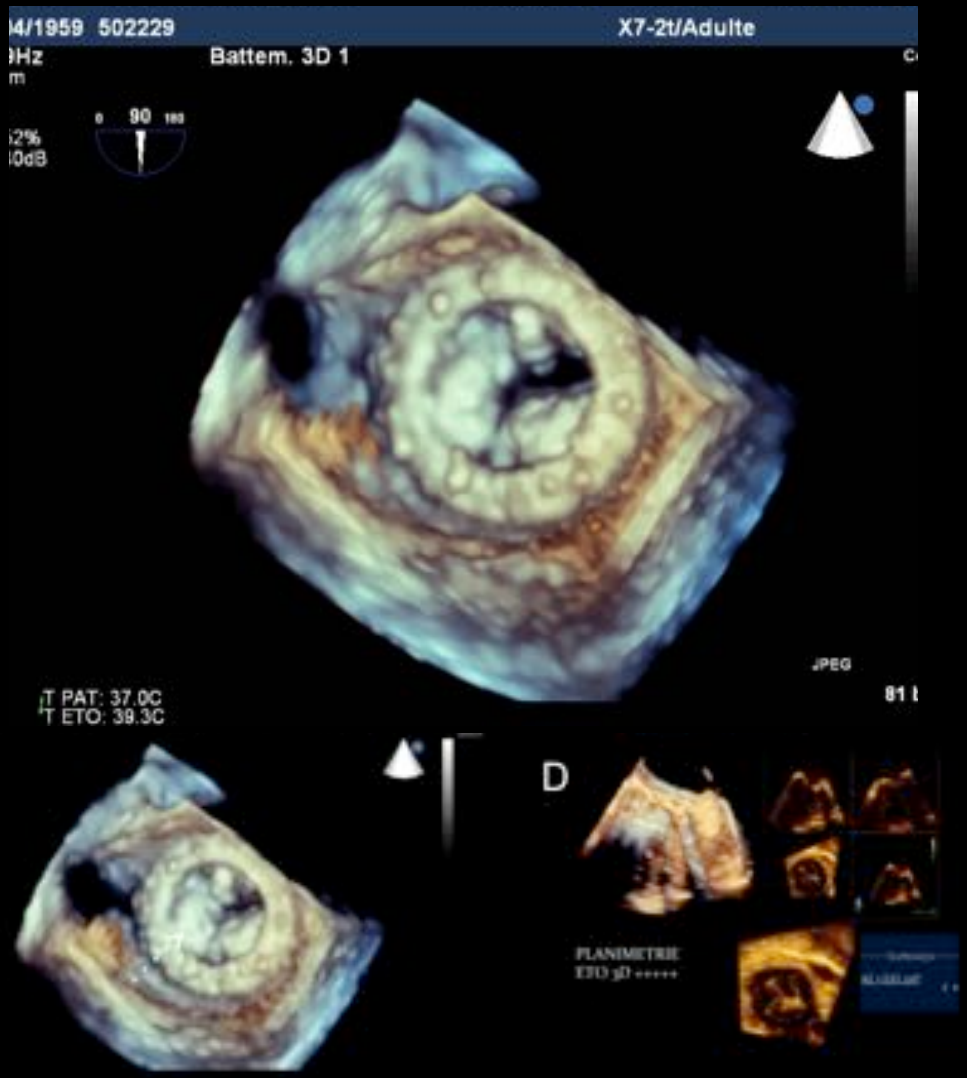




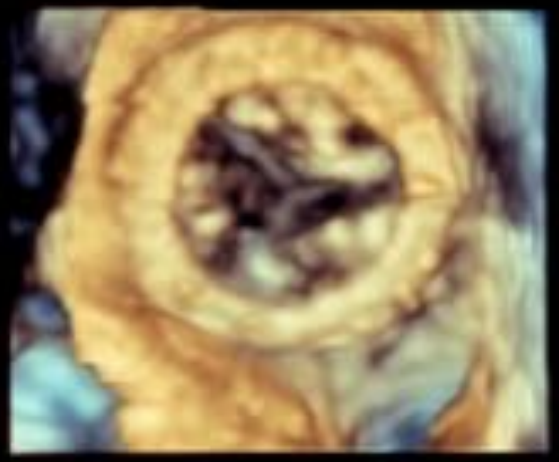


Dégénérescence sténosante de bioprothèse mitrale

MAINTENANT



IL Y A 3 ANS



Nécessité d'un suivi cardiologique annuel avec une ETT annuelle

Durabilité des bioprothèses

TABLE 2 Studies on Surgical Bioprosthesis Durability

First Author, Year (Ref. #)	Valve Type	N	Mean Follow-Up (yrs)	SVD Requiring Reintervention, n (%)	Freedom From SVD (%)
Jamieson et al., 2005 (37)	Carpentier-Edwards SAV	1,823	8 ± 5	132 (7.2)	15 yrs: 74.9 ± 2.3 18 yrs: 64.0 ± 3.6
David et al., 2007 (38)	St Jude Medical Toronto	357	8 ± 3	49 (13.7), 4 were inoperable	10 yrs: 86 ± 3 12 yrs: 69 ± 4
Yankah et al., 2008 (39)	Mitroflow	1,513	4 ± 0.12	64 (4.2)	20 yrs: 62.3 ± 5.0
Mykén and Bech-Hansen, 2009 (40)	St Jude Medical Biocor	1,518	6 ± 5	77 (5)	20 yrs: 61.1 ± 8.5
David et al., 2010 (41)	Hancock II	1,134	12	87 (7.6), 13 were inoperable	5 yrs: 99.7 ± 0.2 10 yrs: 97.6 ± 0.6 15 yrs: 86.6 ± 1.8 20 yrs: 63.4 ± 4.2
Forcillo et al., 2013 (42)	Carpentier-Edwards	2,405	6 ± 9	91 (3.7); 2 refused redo surgery	5 yrs: 98.0 ± 0.2 10 yrs: 96 ± 1 20 yrs: 67 ± 4
Bach and Kon, 2014 (43)	Freestyle	725	8	34 (4.6)	10 yrs: 96.4 ± 1.4 15 yrs: 85.1 ± 4.9
Bourguignon et al., 2015 (16)	Carpentier- Edwards Perimount	373	9 ± 6	78 (20)	10 yrs: 86.8 ± 2.5 15 yrs: 66.8 ± 4.2 20 yrs: 37.2 ± 5.4
Guenzinger et al., 2015 (44)	St Jude Medical Biocor	455	8 ± 6	37 (8.1); 13 were inoperable or refused surgery	5 yrs: 97.9 ± 0.8 10 yrs: 92.1 ± 1.7 15 yrs: 84.8 ± 3.0 20 yrs: 67.0 ± 7.3
Johnston et al., 2015 (45)	Carpentier Edwards Perimount	12,569	6	155 reoperated; 268 SVD without reoperation (3.3)	NR
Christ et al., 2015 (11)	St. Jude Medical Toronto	50	14 ± 6	24 (48)	5 yrs: 97.7 ± 2.2 10 yrs: 76.0 ± 6.7 15 yrs: 44.1 ± 8.9
Repossini et al., 2016 (46)	Freedom Solo	565	7 ± 4	23 (4)	10 yrs: 90.8

NR = not reported; SAV = supra-annular valve; SVD = structural valve deterioration.

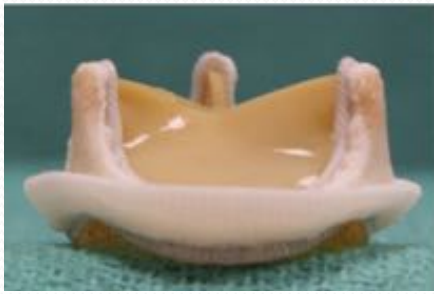
TABLE 4 Predictors of SVD (Aortic Bioprosthesis)

Patient-related factors	
Age	HR: 0.97; 95% CI: 0.96–0.98; p < 0.01 (54)
Cardiovascular risk and comorbid factors	
Smoking	HR: 2.58; 95% CI: 1.85–3.60; p < 0.001 (54)
BMI (per m^2)	HR: 1.84; 95% CI: 1.08–3.16; p = 0.026 (54)
Diabetes mellitus	p = 0.020 (56)
Dyslipidemia	OR: 3.9; p = 0.011 (56)
Renal insufficiency	HR: 1.1; 95% CI: 1.03–1.16; p = 0.047 (55)
Valve-related factors	
Persistent LVH	HR: 2.38; 95% CI: 1.61–3.51; p < 0.001 (54)
Prosthesis size	HR: 0.82; 95% CI: 0.70–0.98; p = 0.010 (54)
PPM	HR: 1.79; 95% CI: 1.11–2.87; p = 0.017 (54)

BMI = body mass index; CI = confidence interval; DM = diabetes mellitus; HR = hazard ratio; LVH = left ventricular hypertrophy; OR = odds ratio; PPM = prosthesis patient mismatch; SVD = structural valve deterioration.

Rodriguez-Gabella et al. JACC 2017

Durabilité des bioprothèses



- From August 1984 to December 2008
- 450 mitral and 2758 aortic Carpentier-Edwards PERIMOUNT® bioprostheses implanted
- Indication for bioprosthesis :

  age ≥ 60 years,

  - or specific conditions (endocarditis, short anticipated life expectancy because of comorbidities, contraindication to oral anticoagulant treatment, informed patient's choice)
- Prospective follow-up
- Yearly clinical questionnaire and echocardiographic study
- 20-year outcomes (definitions according to STS and AATS guidelines).

Bourguignon et al. Annals Of Thoracic Surgery, 2015

Variable	Description	Aortic	≤ 60 years
Aortic Valves (patients)		2'758 (2'659)	383 (373)
Male, n (%)	Freq, (%)	1'886 (68.4%)	312 (81.5%)
Age	Mean, sd [years]	70.7 (10.4)	51.0 (9.2)
	Median, IQR [years]	73.0 [66-78]	54.0 [47-57.5]
	Range, [years]	[16 – 91]	[16 – 60]
Follow Up	Total, patient-year	18'404	3'299
	Mean, sd [years]	6.7 ± 4.8	8.6 ± 5.9
	Range, [years]	[0 – 24.6]	[0 – 24.6]

Aortic cohort: **Follow-up 18'404 valve-years – 97.7% complete**

<60 years: **Follow-up 3'299 valve-years – 95.3% complete**

Bourguignon et al. Annals Of Thoracic Surgery, 2015

AORTIC cohort

AVR : Explant due to SVD/age group

Table 3. Explant due to structural valve deterioration (SVD) by age groups – Competing Risk Estimates

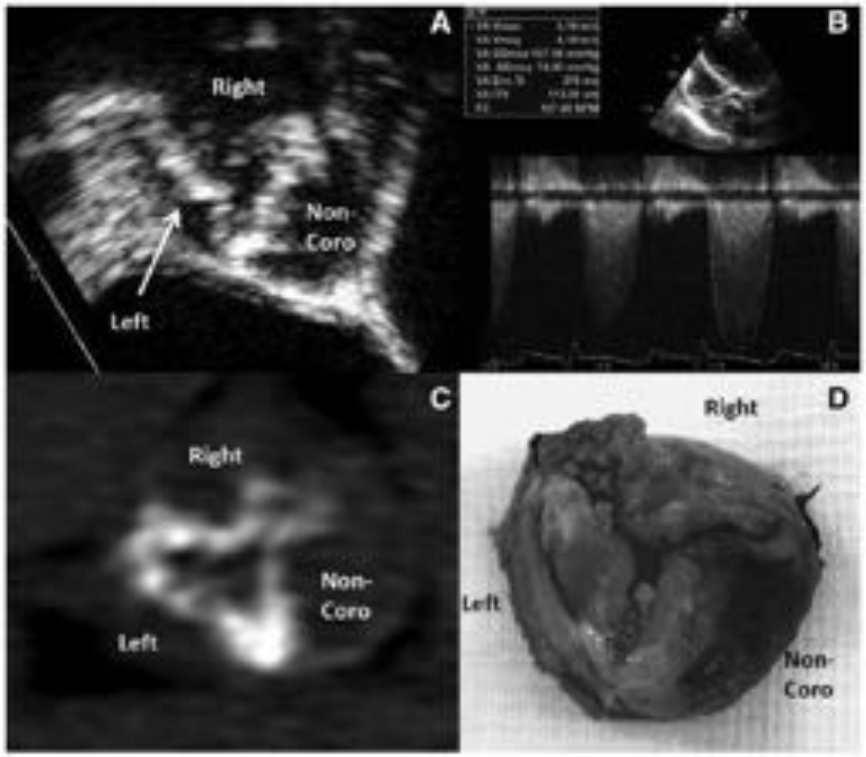
Prob \ Age	50 y	55 y	60 y	65 y	70 y	75 y	80 y
5%	9.2	9.9	11.1	13.1	15.1	17.8	21.6
10%	11.1	13.1	15.1	17.5	21.2	-	-
15%	13.7	15.4	17.9	23.4	-	-	-
20%	15.1	17.8	21.6	-	-	-	-
25%	16.9	19.7	-	-	-	-	-

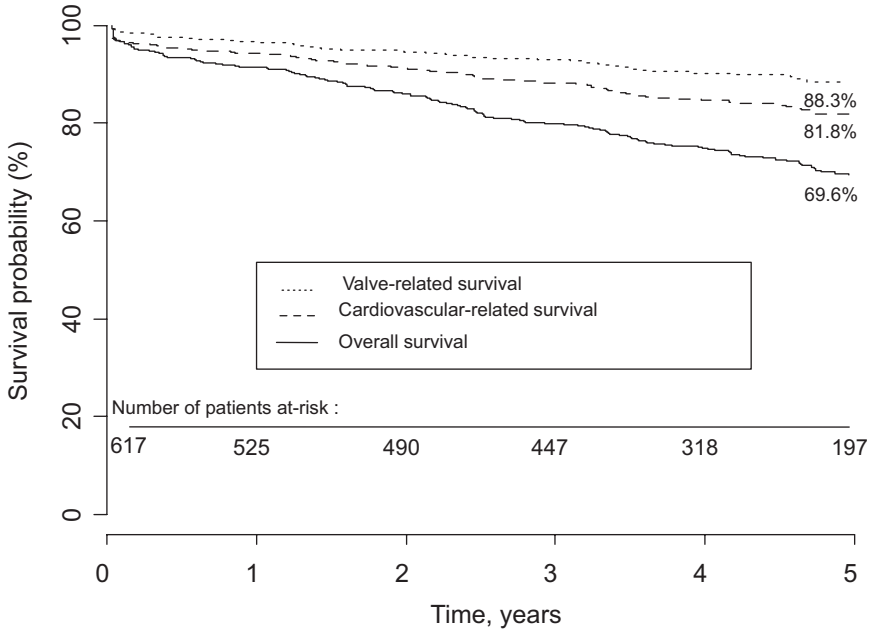
For example, a 60-year-old patient has a 20% probability of being reoperated due to SVD after 21.6 years.

Expected valve durability 19.7 years for the entire cohort

Early Structural Valve Deterioration of Mitroflow Aortic Bioprosthesis

Mode, Incidence, and Impact on Outcome in a Large Cohort of Patients



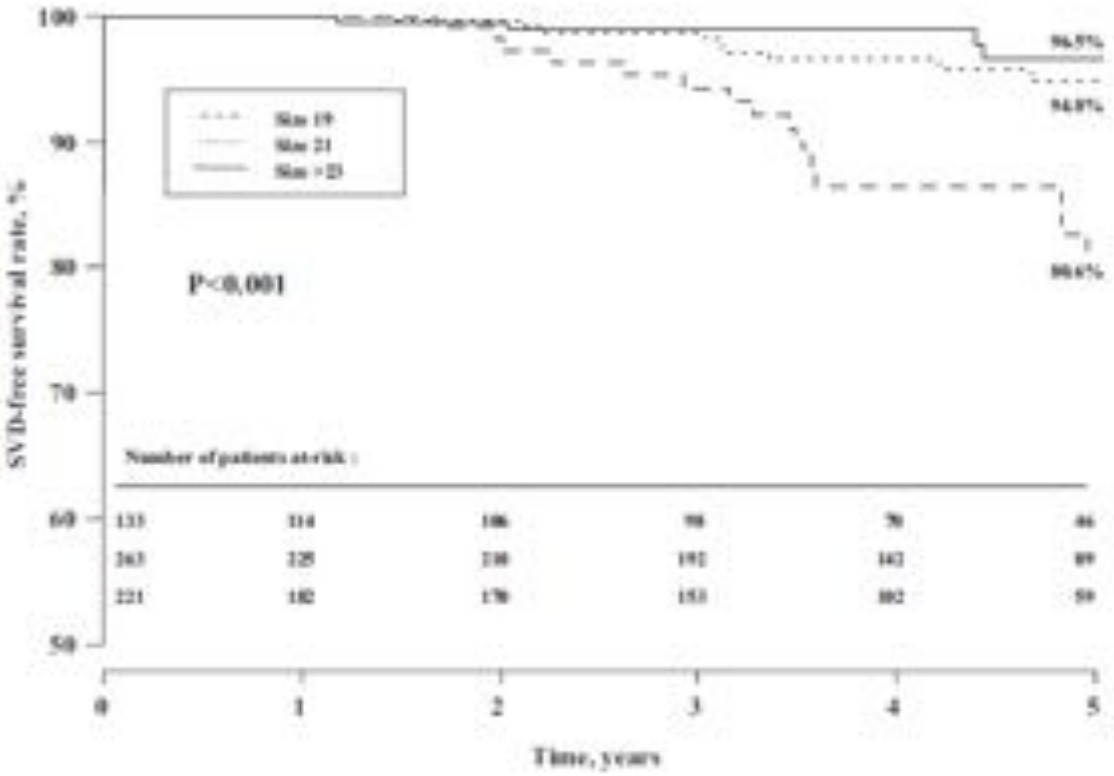


Age moyen : 76 ans

Senage et al. Circulation 2016

Early Structural Valve Deterioration of Mitroflow Aortic Bioprosthesis

Mode, Incidence, and Impact on Outcome in a Large Cohort of Patients



Senage et al. Circulation 2016

Figure 4. Structural valve deterioration (SVD)–free survival curves according to prosthesis size.

Conclusions—Early SVD is frequent in Mitroflow bioprosthesis (models 12A/LX), especially for small sizes (19 and 21 mm), and reduces overall survival. An unpredictable accelerated pattern of SVD constitutes a life-threatening condition. In view of the large number of Mitroflow valves implanted worldwide, one can expect an epidemic of SVD and valve-related deaths, which represents a major public health issue, especially in the elderly. Hence, a close follow-up with yearly echocardiography after Mitroflow implantation is advisable. An urgent reoperation should be discussed in patients with severe SVD even though they are still asymptomatic. (*Circulation*. **2014;130:2012-2020.**)

Eur J Cardiothorac Surg. 2016 Jun;49(6):1705-10. doi: 10.1093/ejcts/ezv432. Epub 2016 Mar 18.

Durability after aortic valve replacement with the Mitroflow versus the Perimount pericardial bioprosthesis: a single-centre experience in 2393 patients.

Nielsen PH[1], Hjortdal V[2], Modrau IS[2], Jensen H[2], Kimose HH[2], Terp K[2], Poulsen SH[2], Smerup M[2], Nielsen SL[3].

Author Information

Abstract

OBJECTIVES: This study compares the durability and risk of reoperation in patients undergoing aortic valve replacement (AVR) with either a Mitroflow or a Carpentier-Edwards (CE) pericardial bioprosthesis. Since AVR with bioprosthetic valves has increased progressively in recent years as compared to mechanical valves, especially in patients aged 60-70 years, there has been renewed interest in the long-term durability of current pericardial bioprostheses.

METHODS: We compared 440 AVR with Mitroflow valves with 1953 AVR with CE pericardial valves implanted from 1999 to 2014 with regard to reoperation, reoperation for structural valve deterioration (SVD) and all-cause mortality.

RESULTS: Ten-
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CONCLUSIONS
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Eur J Cardiothorac Surg. 2016 Jan 1;53(1):136-142. doi: 10.1093/ejcts/ezv321.

Structural valve deterioration in the Mitroflow biological heart valve prosthesis.

Issa R[1], Poulsen SH[2], Weyel E[2], Tvrz Pedersen C[3], Nielsen PH[4], Riber L[5], Dahl JS[1], Seggaard E[3], Nørgaard MA[5], Møller JE[1].

Author Information

Abstract

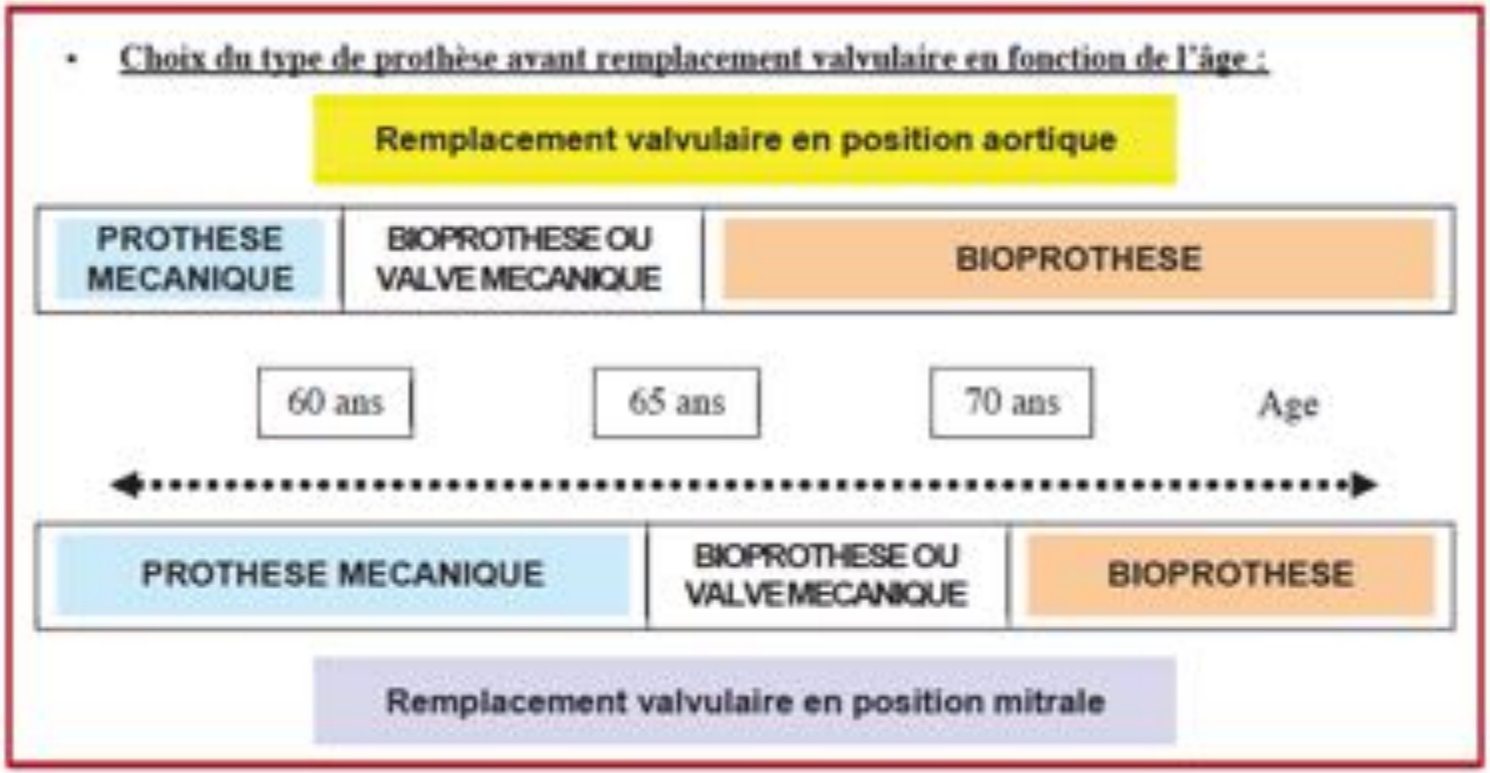
OBJECTIVES: Concern has been raised regarding the long-term durability of the Mitroflow biological heart valve prosthesis. Our aim was to assess the incidence of structural valve degeneration (SVD) for the Mitroflow bioprosthesis in a nationwide study in Denmark including all patients alive in Denmark who had received a Mitroflow aortic bioprosthesis since 2000.

METHODS: Patients alive in Denmark with a Mitroflow bioprosthesis implanted since January 2000 were invited to participate in a nationwide cross-sectional study with a predefined definition of SVD. Of 1552 patients, 861 patients had died and 47 patients had been reoperated with 40 reoperations due to SVD. The remaining 644 patients were invited for evaluation; 574 patients accepted and were evaluated for SVD. The incidence of SVD was calculated using competing risk regression analysis with death as the competing event.

RESULTS: A total of 173 patients were diagnosed with SVD by echocardiography. Of these, 64 (11%) patients had severe SVD and 109 (19%) patients moderate SVD. Severe SVD was associated with the age of the prosthesis and small prosthesis size [Size 21: hazard ratio (95% confidence interval, CI) 2.72 (0.97-8.56), P = 0.06; Size 19: 6.26 (1.63-24.06), P = 0.008]. The cumulative incidences of reoperation or severe SVD at Year 9 were 12.5% for Size 19, 7.6% for Size 21 and 3.1 (1.2-6.4)% for Size 23. Median survival in patients with prosthesis Sizes 23-29 was 6.4 (95% CI 5.7-7.0) years, with Size 21 it was 6.5 (95% CI 5.9-7.1) years and with Size 19 it

CONCLUSIONS: The incidence of undetected severe SVD was as high as the incidence of operated SVD. The overall risk for SVD is high for the Mitroflow bioprosthesis, especially if the prosthesis is small and older than 5 years.

Guidelines



ESC Guidelines 2017

Choice of the aortic/mitral prosthesis in favour of a mechanical prosthesis; the decision is based on the integration of several of the following factors

Recommendations	Class[a]	Level[b]
A mechanical prosthesis is recommended according to the desire of the informed patient and if there are no contraindications to long-term anticoagulation.[c]	I	C
A mechanical prosthesis is recommended in patients at risk of accelerated structural valve deterioration.[d]	I	C
A mechanical prosthesis should be considered in patients already on anticoagulation because of a mechanical prosthesis in another valve position.	IIa	C
A mechanical prosthesis should be considered in patients <60 years of age for prostheses in the aortic position and <65 years of age for prostheses in the mitral position.[e]	IIa	C
A mechanical prosthesis should be considered in patients with a reasonable life expectancy[f] for whom future redo valve surgery would be at high risk.	IIa	C
A mechanical prosthesis may be considered in patients already on long-term anticoagulation due to the high risk for thromboembolism.[g]	IIb	C

Encore valable avec l'émergence du TAVI Valve-in-Valve ???

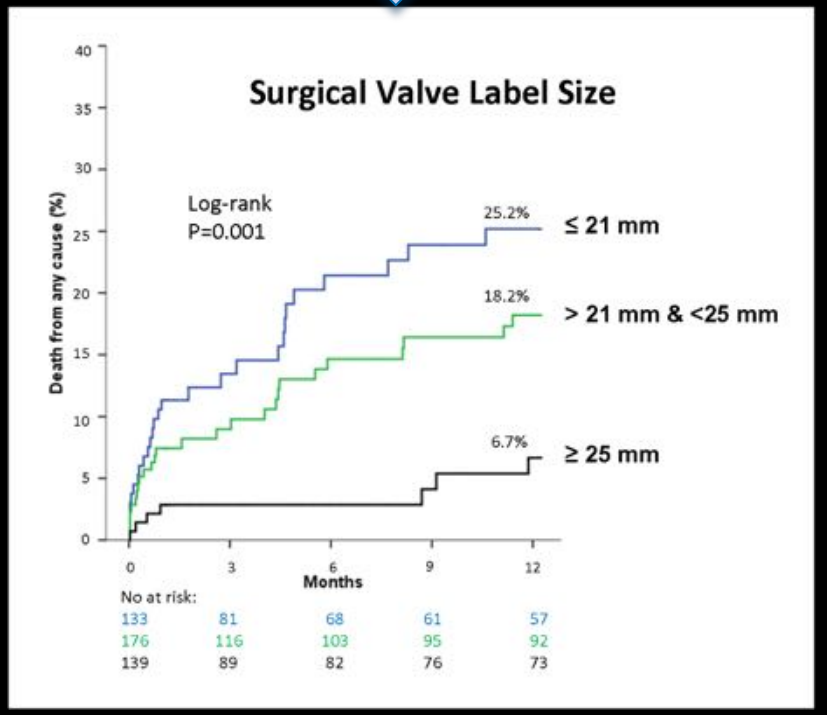
Choice of the aortic/mitral prosthesis in favour of a bioprosthesis; the decision is based on the integration of several of the following factors

Recommendations	Class[a]	Level[b]
A bioprosthesis is recommended according to the desire of the informed patient.	I	C
A bioprosthesis is recommended when good-quality anticoagulation is unlikely (compliance problems, not readily available) or contraindicated because of high bleeding risk (previous major bleed, comorbidities, unwillingness, compliance problems, lifestyle, occupation).	I	C
A bioprosthesis is recommended for reoperation for mechanical valve thrombosis despite good long-term anticoagulant control.	I	C
A bioprosthesis should be considered in patients for whom there is a low likelihood and/or a low operative risk of future redo valve surgery.	IIa	C
A bioprosthesis should be considered in young women contemplating pregnancy.	IIa	C
A bioprosthesis should be considered in patients >65 years of age for a prosthesis in the aortic position or > 70 years of age in a mitral position or those with a life expectancy[c] lower than the presumed durability of the bioprosthesis.[d]	IIa	C

ESC Guidelines 2017

Bioprosthetic failure		
Reoperation is recommended in symptomatic patients with a significant increase in transprosthetic gradient (after exclusion of valve thrombosis) or severe regurgitation.	I	C
Reoperation should be considered in asymptomatic patients with significant prosthetic dysfunction if reop-eration is at low risk.	IIa	C
Transcatheter valve-in-valve implantation in the aortic position should be considered by the Heart Team depending on the risk of reoperation and the type and size of prosthesis.	IIa	C

- Transcatheter valve-in-valve implantation:
  - ✓ an option for treating degenerated bioprostheses in patients with increased surgical risk».
  - ✓ experience mostly for bioprostheses in the aortic position
  - ✓ remains limited in the mitral position and even more so in the tricuspid position».
- « Valve-in-valve and valve-in-ring procedures may be reasonable alternatives if the patient is at increased surgical risk, but it is necessary that the multidisciplinary Heart Team discusses every patient and chooses the best indivualized approach ».



Dvir et al. JAMA 2014

2017 AHA/ACC Focused Update of the 2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease

A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines

Developed in Collaboration With the American Association for Thoracic Surgery, American Society of Echocardiography, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Anesthesiologists, and Society of Thoracic Surgeons

« The availability of transcatheter valve-in-valve replacement is changing the dynamics of the discussion of the trade-offs between mechanical and bioprosthetic valves,
but extensive long-term follow-up of transcatheter valves is not yet available, and not all bioprostheses are suitable for a future valve-in-valve procedure (152-154).
A valve-in-valve procedure will always require insertion of a valve smaller than the original bioprosthesis, and patient–prosthesis mismatch is a potential problem, depending on the size of the initial prosthesis. »

2017 AHA/ACC Focused Update of the 2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease

11.1. Evaluation and Selection of Prosthetic Valves

11.1.2. Intervention: Recommendations

Recommendations for Intervention of Prosthetic Valves

COR	LOE	Recommendations	Comment/Rationale
I	C-LD	**The choice of type of prosthetic heart valve should be a shared decision-making process that accounts for the patient's values and preferences and includes discussion of the indications for and risks of anticoagulant therapy and the potential need for and risk associated with reintervention (141-146).**	MODIFIED: **LOE updated from C to C-LD.** In choosing the type of prosthetic valve, the potential need for and risk of "reoperation" was updated to risk associated with "reintervention." The use of a transcatheter valve-in-valve procedure may be considered for decision making on the type of valve, but long-term follow-up is not yet available, and some bioprosthetic valves, particularly the smaller-sized valves, will not be suitable for a valve-in-valve replacement. Multiple other factors to be considered in the choice of type of valve for an individual patient; these factors are outlined in the text. More emphasis has been placed on shared decision making between the caregiver and patient.
See Online Data Supplement 20 (Updated From 2014 VHD Guideline)			

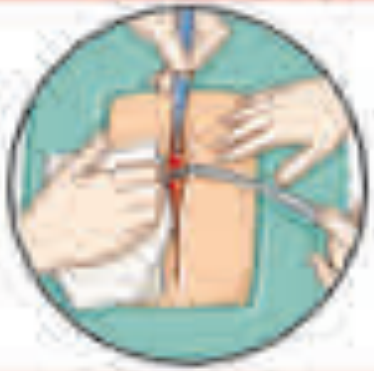
2017 AHA/ACC Focused Update of the 2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease

I	C	**A bioprosthesis is recommended in patients of any age for whom anticoagulant therapy is contraindicated, cannot be managed appropriately, or is not desired.**	2014 recommendation remains current.
IIa	B-NR	**An aortic or mitral mechanical prosthesis is reasonable for patients less than 50 years of age who do not have a contraindication to anticoagulation (141,149,151,155-157).**	**MODIFIED: LOE updated from B to B-NR.** The age limit for mechanical prosthesis was lowered from 60 to 50 years of age.
See Online Data Supplement 20 (Updated From 2014 VHD Guideline)			

IIa	B-NR	**For patients between 50 and 70 years of age, it is reasonable to individualize the choice of either a mechanical or bioprosthetic valve prosthesis on the basis of individual patient factors and preferences, after full discussion of the trade-offs involved (141-145,157-160).**	**MODIFIED:** Uncertainty exists about the optimum type of prosthesis (mechanical or bioprosthetic) for patients 50 to 70 years of age. There are conflicting data on survival benefit of mechanical versus bioprosthetic valves in this age group, with equivalent stroke and thromboembolic outcomes. Patients receiving a mechanical valve incur greater risk of
See Online Data Supplement 20 (Updated From 2014 VHD Guideline)			

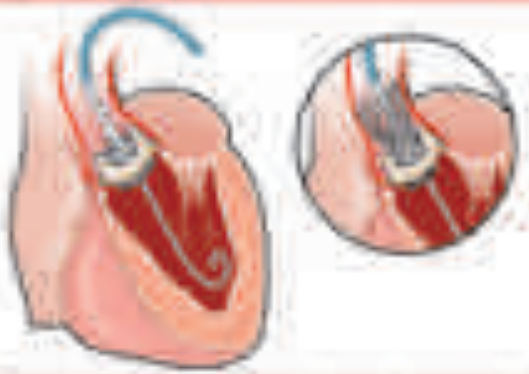
Severe symptomatic structural valve deterioration of surgical aortic bioprosthesis

2 complementary therapeutic options for the Heart Team



Redo aortic valve surgery

or



Transcatheter valve-in-valve implantation

Chirurgie redux


EuroSCORE (European System for Cardiac Operative Risk Evaluation)

Variables (aide)	Valeurs	Bêta (Logistic EuroSCORE)	Points (EuroSCORE)
Age (années)	80 Valider		0
Sexe féminin		0	0
Urgence		0	0
Créatininémie > 200 µmol/ L		0	0
Fraction d'Ejection VG		0	0
BPCO		0	0
Chirurgie de l'aorte thoracique		0	0
Artériopathie périphérique		0	0
Troubles neurologiques		0	0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Chirurgie de l'aorte thoracique		0	0
Artériopathie périphérique		0	0
Troubles neurologiques		0	0

Patient related factors			Cardiac related factors		
Age [1] (years)	80	0.60	NYHA	III	0958358
Gender	male	0	CCS class 4 angina [8]	no	0
Renal impairment [2] See calculator below for creatinine clearance	moderate (CC >50 & <85)	.303553	LV function	select	0
Extracardiac arteriopathy [3]	no	0	Recent MI [9]	no	0
Poor mobility [4]	no	0	Pulmonary hypertension [10]	no	0
Previous cardiac surgery	yes	1.159099	**Operation related factors**		
Chronic lung disease [5]	no	0	Urgency [11]	elective	0
Active endocarditis [6]	no	0	Weight of the intervention [12]	single non CABG	.0952118
Critical preoperative state [7]	no	0	Surgery on thoracic aorta	no	0
Diabetes on insulin	no	0			

EuroSCORE II **EuroSCORE II** 4.74 %

Note: This is the 2011 EuroSCORE II

Calculate Clear

Patient related factors			Cardiac related factors		
Previous cardiac surgery	no	0	**Operation related factors**		
Chronic lung disease [5]	no	0	Urgency [11]	elective	0
Active endocarditis [6]	no	0	Weight of the intervention [12]	single non CABG	.0952118
Critical preoperative state [7]	no	0	Surgery on thoracic aorta	no	0
Diabetes on insulin	no	0			

EuroSCORE II **EuroSCORE II** 1.60 %

Note: This is the 2011 EuroSCORE II

Calculate Clear

Quelle est la mortalité de la chirurgie redux ?

Risques de la chirurgie redux de RVAo

Par rapport à un RVAo chirurgical « de premières mains»:

- Cicatrices, adhérences
- Risque iatrogène sur les structures adjacentes
- Risque de pace maker plus important
- Clampage aortique et temps de CEC plus long
- Plus de risques de saignement et donc de transfusion
- Mortalité plus élevée.

Furukawa H, et al.

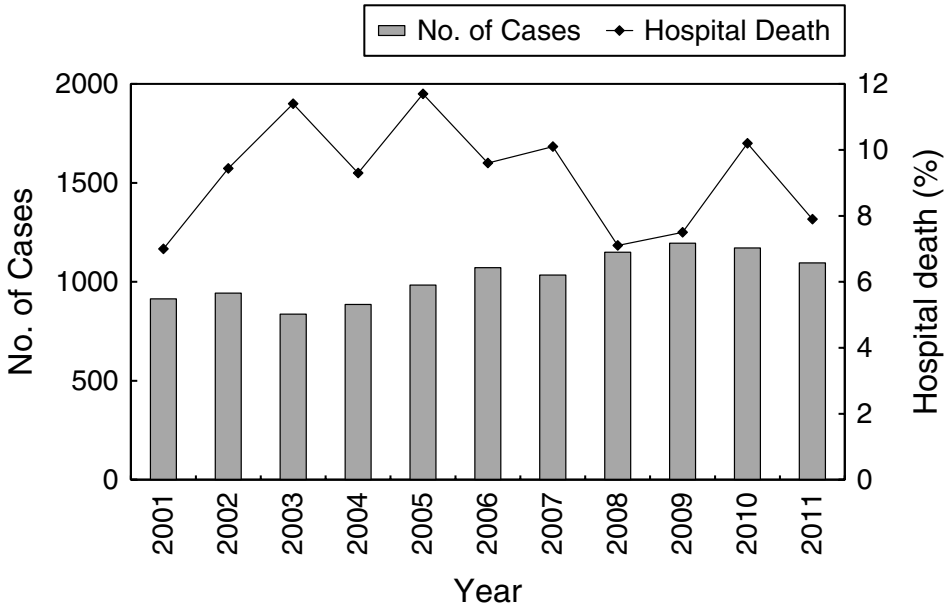


Fig. 1 Prevalence and mortality of redo valve surgery in Japan. This figure was edited by the annual report by the Japanese association for thoracic surgery from 2001 to 2011.[3–13)]

Quelle mortalité après chirurgie RVAo redux ?

- Très variable selon les séries publiées, le plus souvent monocentrique: de 1% à 12% de mortalité
- Profil de patients différents : endocardite ≠ dégénérescence de bioprothèse
- Niveau du chirurgien
- Volume du centre
- Peu d'études sur le suivi à long terme

Mid-term results of aortic valve surgery in redo scenarios in the current practice: results from the multicentre European RECORD (REdo Cardiac Operation Research Database) initiative†

- 711 patients, opérés de 2003 à 2013
- 68 ± 13 ans (34% > 75 ans), 35% de femmes
- EuroSCORE 10%
- Intervalle entre 1ère chirurgie et chir. Redux: 12,5 ans

Previous CABG	232 (32.6)
Previous valve surgery	453 (63.7)
Previous AVR	324 (71.5)
Previous mitral surgery	126 (27.8)
Mitral valve repair	88 (69.8)
Mitral valve replacement	38 (30.2)
Other valve procedures	3 (0.7)
Previous aortic surgery	46 (6.5)

Table 2: Operative characteristics

Number of reintervention	
1st	626 (88.0)
2nd	62 (8.7)
3rd	20 (2.8)
4th	3 (0.4)
Type of intervention	
RAVR	512 (72.0)
RAVR + CABG	57 (8.0)
RAVR + mitral surgery	77 (10.8)
RAVR + other	65 (9.1)
Type of prosthesis	
Biological	390 (54.9)
Mechanical	294 (41.4)
Homograft	8 (1.1)
Sutureless	19 (2.7)

- Mortalité hospitalière : 5.1%
- Mortalité hospitalière d'un RVA redux simple : 4,1%

Onorati et al. EJCTS 2015

Table 2: Publication overview: redo SAVR (with SAVR as first cardiac surgery)

Authors	Year of publication	Time span	Number of patients	Mean age (years)	Proportion of patients non-eligible for TVIV[a] (%)	Proportion of SVD (%)	30-Day mortality (%)
Jones *et al.* [13]	2001	1969–1998	187	54.7	NA	NA	6.4
Jamieson *et al.* [14]	2003	1975–1999	322	NA	0%	100%	6.8
Potter *et al.* [15]	2005	1993–2001	162	64	56.5 (13% IE)	43.5%	5
Eitz *et al.* [16]	2006	1991–2004	71	All ≥80 years	23.9 (11.3% IE)	76.1%	16.4
Davierwala *et al.* [17]	2006	1990–2002	216	59	10 (7.9% IE)	NA	4.6
Leontyev *et al.* [18]	2011	1994–2008	155	58.1	45.2 (27.1% IE)	23.8%	3.5
Chan *et al.* [19]	2012	1971–2008	437	58.6	NA	NA	6
Ruggieri *et al.* [20]	2013	1975–2011	164	67.8	42.7%	57.3%	10.6
Onorati *et al.* [21]	2015	2003–2013	324	31.2% >75 years	33% IE	55.2%	7.7
Kaneko et al. [8]	2015	2011–2013	3380	66	13.1% IE	NA	4.6
Naji *et al.* [22]	2015	2000–2012	276 (stenotic bioprosthesis)	64	5% IE 0.5% thrombosis	95% (47% with size ≤21 mm	2.5

[a]IE, paraprosthetic leaks, thrombosis.

IE: infective endocarditis; SAVR: surgical aortic valve replacement; SVD: structural valve deterioration; TVIV: transcatheter valve-in-valve.

Attias et al. EJCTS 2018

Facteurs de risque de mortalité de la chirurgie redux de RVAo

- FEVG préopératoire < 30% : OR à 8
- NYHA III-IV : OR à 4
- Endocardite infectieuse ++
- Age > 75 ans
- +/- autres comorbidités: I. rénale, I. respiratoire.....

Onorati et al. EJCTS 2015
Balsam et al. Ann Thorac Surg 2010

Morbidité de la chirurgie redux

- Mortalité acceptable mais morbidité lourde:
- transfusions liées à des plaies vasculaires lors de la dissection (complication catastrophique augmentant la mortalité x 21)
- Instabilité hémodynamique
- Insuffisance rénale aigue
- Intubation prolongée
- Temps de CEC long

Multiple reoperations on the aortic valve: outcomes and implications for future potential valve-in-valve strategy

Yashutosh Joshi, Paul Achouh, Philippe Menasché, Jean-Noel Fabiani, Alain Berrebi, Alain Carpentier, Christian Latremouille, Jérôme Jouan ✉

European Journal of Cardio-Thoracic Surgery, Volume 53, Issue 6, 1 June 2018, Pages 1251–1257, https://doi.org/10.1093/ejcts/ezx469

Published: 26 December 2017 **Article history ▾**

OBJECTIVES

Surgical mortality and long-term outcomes are important considerations when determining strategies for multiple reoperations on the aortic valve (AV). With the rise of percutaneous valve-in-valve, we sought to evaluate the current outcomes of conventional surgery for AV reoperation, focusing first on the effect of the number of previous AV interventions with a subsequent analysis of the risk factors for adverse outcomes.

METHODS

From January 2007 to December 2016, 316 consecutive patients underwent an open redo operation (replacement) on their AV at a single centre. It was the first AV reintervention in 263 patients (Group 1), second in 42 patients (Group 2) and third or more in 11 patients (Group 3).

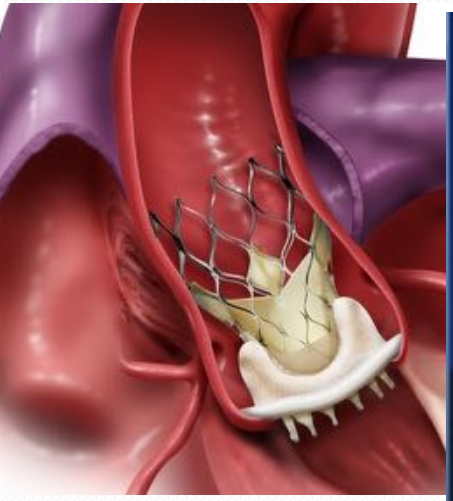
RESULTS

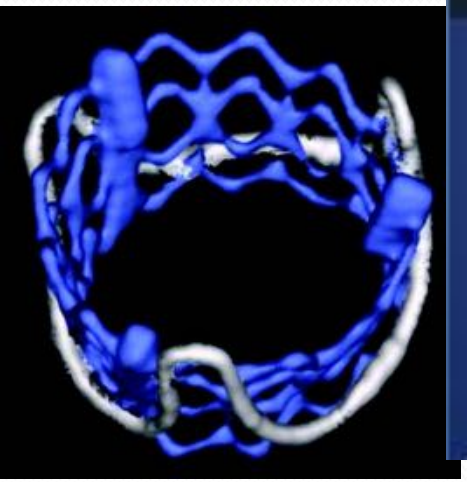
There were 230 men and 86 women, with a median age of 58 (Q1–Q3: 46–70) years. Structural valve deterioration (SVD) of the bioprosthesis ($n = 136$, 44%), endocarditis ($n = 57$, 18%) and prosthetic valve dehiscence ($n = 41$, 13%) were the most common reasons for reintervention. Overall, in-hospital mortality was 7.3%: 7.2% in Group 1, 4.76% in Group 2 and 18.2% in Group 3 ($P = 0.233$) and ranged from 3.7% for SVD to 14.0% when endocarditis was the reason for reintervention. Higher preoperative New York Heart Association (NYHA) class (III/IV) [odds ratio (OR) 15.9, $P = 0.011$], injury during re-entry (OR 16.9, $P = 0.015$), endocarditis (OR 3.7, $P = 0.038$) and concomitant mitral valve replacement (OR 5.6, $P = 0.006$) were independent risk factors for in-hospital mortality. Survival at 8 years was 79.0 ± 3.0% for the entire cohort and 88.4 ± 3.2% for re-replacement after SVD.

CONCLUSIONS

Multiple AV reoperations carry an acceptable risk of early postoperative mortality, particularly for isolated valve replacements of SVD.

Aortic transcatheter valve-in-valve procedure





Global Valve in Valve Registry

Patients undergoing VIV procedures in 63 sites in *Europe, North-America, Australia, New Zealand, South Africa, South America and the Middle-East*
(n=681)

After Data Lock April 2013 (n=88)

Isolated Mitral VIV / VIR
Isolated Tricuspid VIV / VIR
(n=134)

Aortic VIV procedures*
(n=459)

Stenosis (n=181)

Combined** (n=139)

Regurgitation (n=139)

Dvir et al. JAMA 2014

Table 2. Surgical Valve Characteristics at the Time of Valve-in-Valve Procedure

Characteristics	All (n = 459)	Mechanism of Surgical Valve Failure				Device Used		
		Stenosis (n = 181)	Regurgitation (n = 139)	Combined (n = 139)	*P* Value	Self-Expandable (n = 213)	Balloon-Expandable (n = 246)	*P* Value
Time since last SAVR, median (IQR), y[a]	9 (6-12)	8 (5-11)	10(7-14)	10 (7-14)	.04	9 (7-13)	9 (6-12)	.08
Type, No. (%)					<.001			<.001
Stented	366 (79.7)	173 (95.6)	84 (60.4)	109 (78.4)		152 (71.4)	214 (87)	
Stentless	93 (20.3)	8 (4.4)	55 (29.6)	30 (21.6)		61 (28.6)	32 (13)	
Label size, No. (%)								
≤21 mm	133 (29)	67 (37)	29 (20.9)	37 (26.6)	.005	68 (31.9)	65 (26.4)	.19
>21 mm and <25 mm	176 (38.3)	74 (40.9)	43 (30.9)	59 (42.4)	.09	83 (39)	93 (37.8)	.80
≥25 mm	139 (30.3)	34 (18.8)	65 (46.8)	40 (28.8)	<.001	53 (24.9)	86 (35)	.02
Unknown	11 (2.4)	6 (3.3)	2 (1.4)	3 (2.2)	.54	9 (4.2)	2 (0.8)	.02
Internal diameter, No. (%)								
<20 mm	126 (27.5)	53 (29.3)	32 (23)	41 (41.7)	.37	66 (31)	60 (24.4)	.11
≥20 mm and <23 mm	230 (50.1)	102 (56.4)	64 (34.5)	64 (46)	.10	100 (46.5)	130 (52.8)	.21
≥23 mm	103 (22.4)	26 (14.4)	43 (30.9)	34 (24.5)	.002	46 (21.6)	57 (23.2)	.69
AV area, mean (SD), cm^2	0.95 (0.48)	0.69 (0.21)	1.48 (0.6)	0.91 (0.31)	<.001	0.99 (0.49)	0.91 (0.46)	.04
AV index, mean (SD), cm^2/m^2[b]	0.51 (0.28)	0.38(0.13)	0.83 (0.37)	0.51(0.19)	<.001	0.55 (0.31)	0.49 (0.25)	.05
AV maximum gradient, mean (SD), mm Hg	60.8 (27.4)	75.2 (23.1)	34.3 (17.7)	64.6 (22.8)	<.001	59.7 (27.2)	61.8 (27.6)	.44
AV gradient, mean (SD), mm Hg	36.2 (18.4)	46.4 (16.1)	18.0 (10.1)	37.6 (14.9)	<.001	35 (18.5)	37.3 (18.3)	.21
AV regurgitation of at least moderate degree, No. (%)[c]	296 (64.5)	22 (12.2)	139 (100)	135 (97.1)	<.001	143 (67.1)	153 (63)	.27

Abbreviations: AV, aortic valve; IQR, interquartile range; SAVR, surgical aortic valve replacement.

[a] Time interval between last SAVR and valve-in-valve procedure.

[b] AV index = AV area (cm^2)/patient body surface area (m^2).

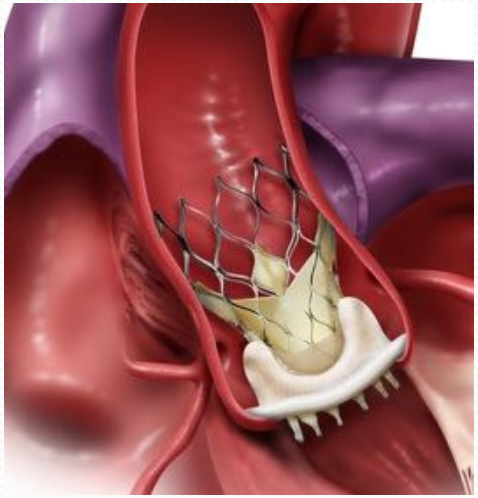
[c] Evaluated according to the criteria of the American Society of Echocardiography.[18]

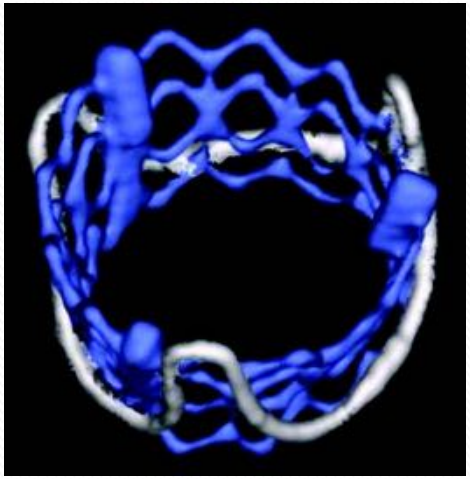
Original Investigation

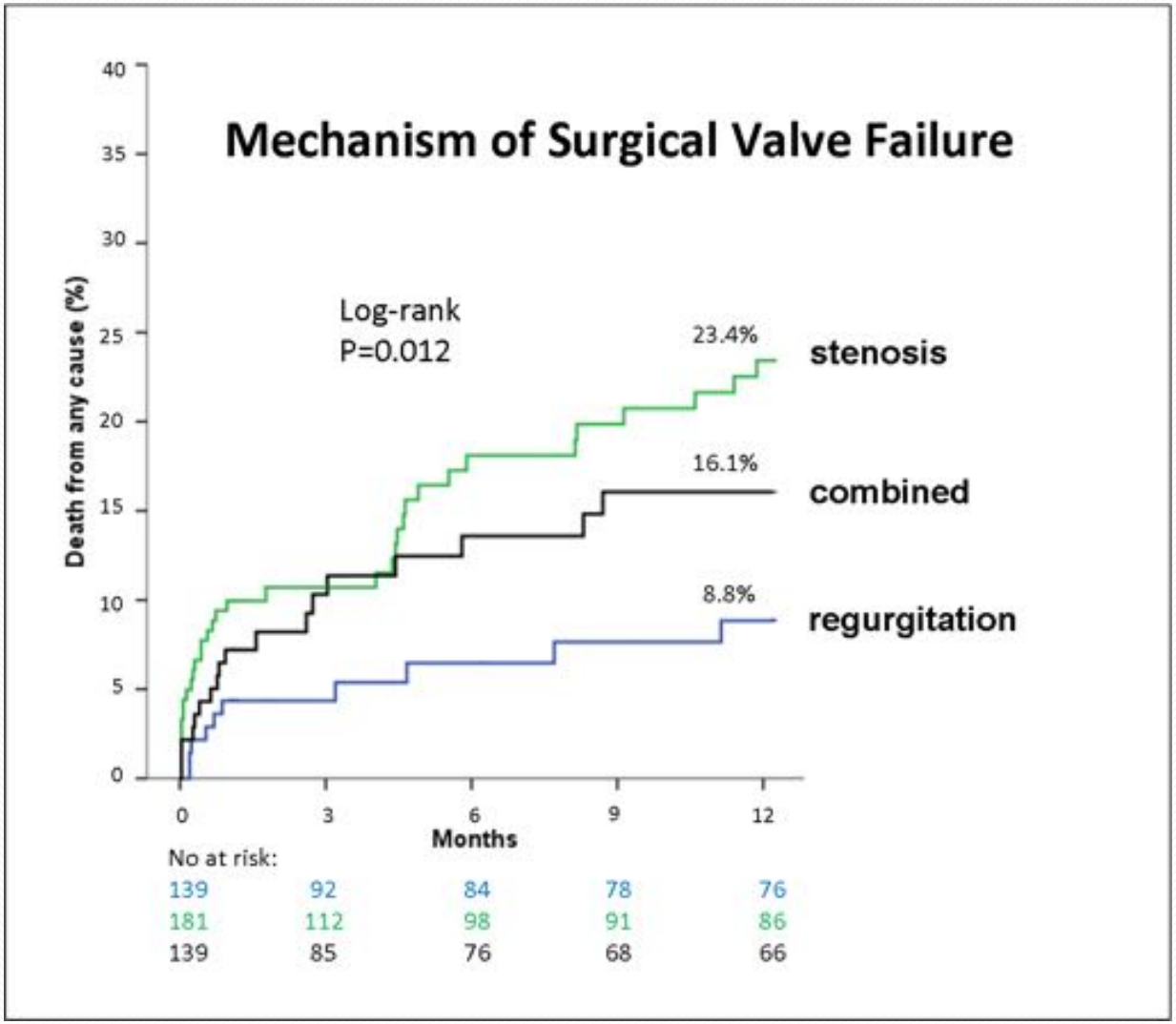
Transcatheter Aortic Valve Implantation in Failed Bioprosthetic Surgical Valves

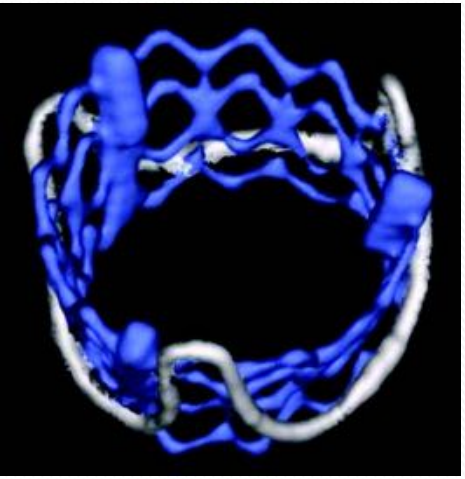
- 459 patients
- Age moyen 77 ans, 56% hommes
- Logistic EuroSCORE 29%, STS 10%
- FEVG 50%
- Mortalité à J30 : 7.6 %
- Mortalité à 1 an: 16.8%
- Gradient moyen post-procédure ViV : 18 mmHg for stenosis Vs 12 mmHg for regurgitation ($p<0.001$)
- 5% fuite para-prothétique ViV

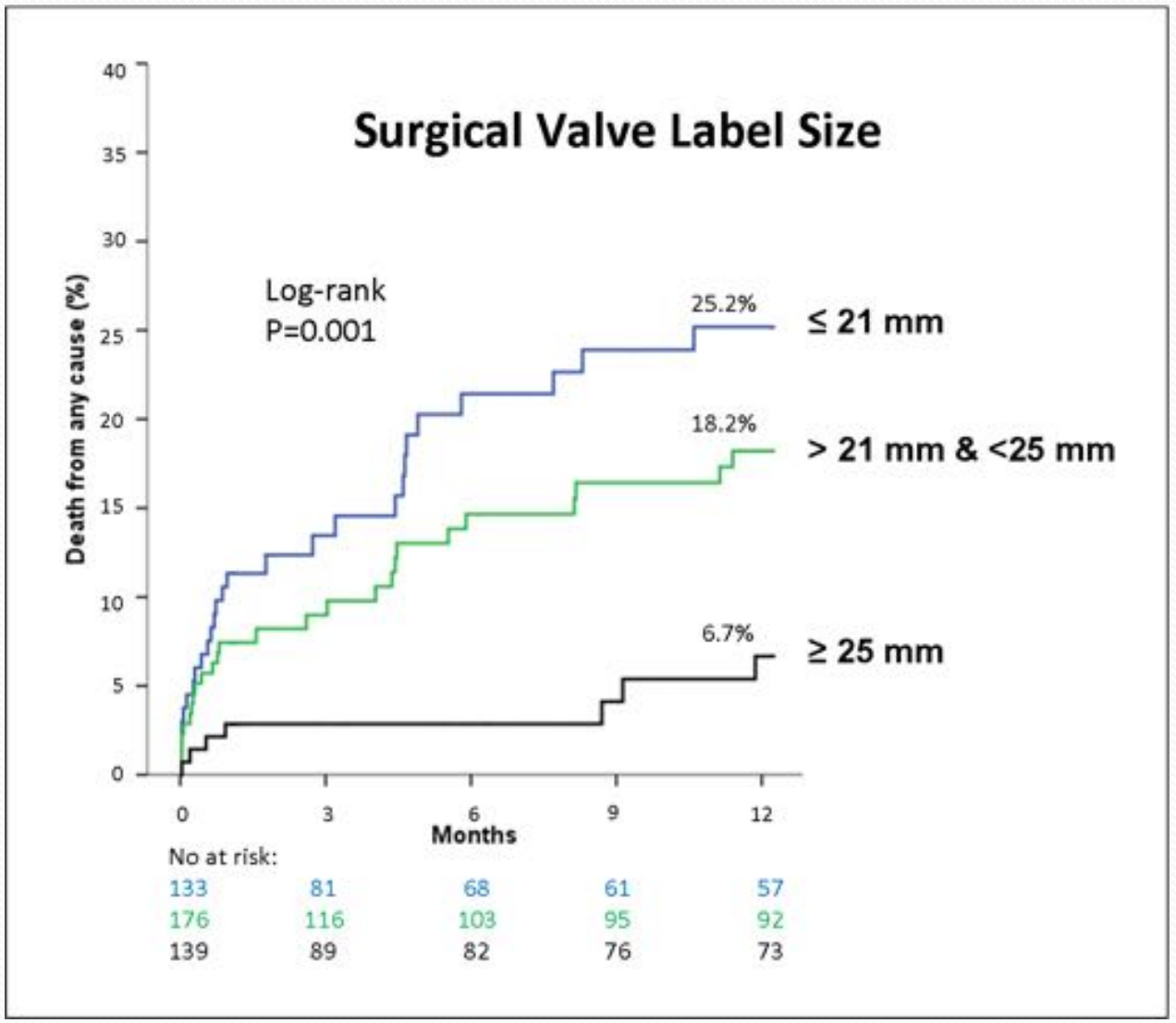
Dvir et al. JAMA 2014

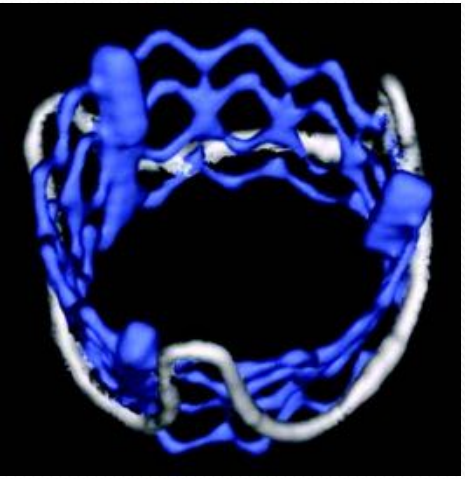




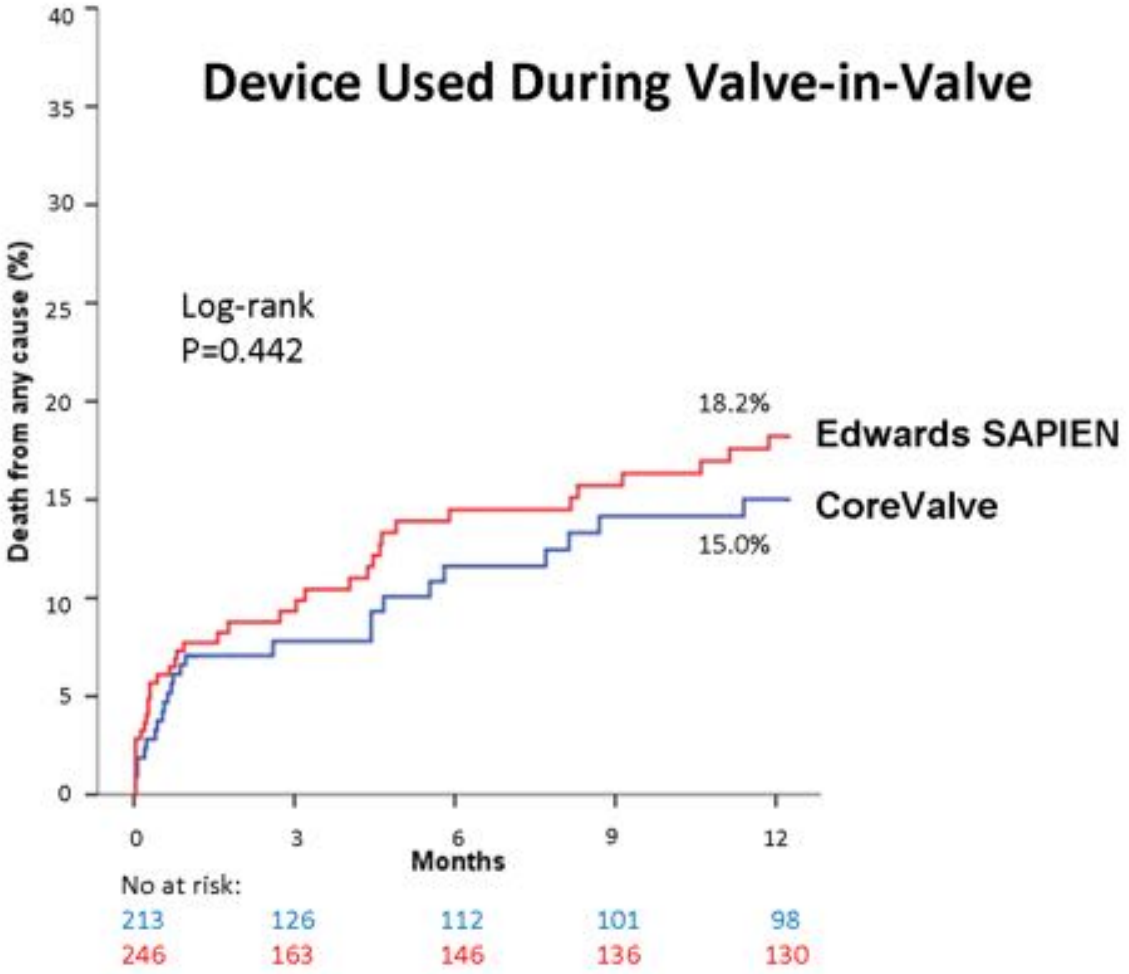

Mechanism of Surgical Valve Failure
Log-rank
P=0.012
23.4%
stenosis
16.1%
combined
8.8%
regurgitation
Death from any cause (%)
40
35
30
25
20
15
10
5
0
0
3
6
9
12
Months
No at risk:
139 92 84 78 76
181 112 98 91 86
139 85 76 68 66



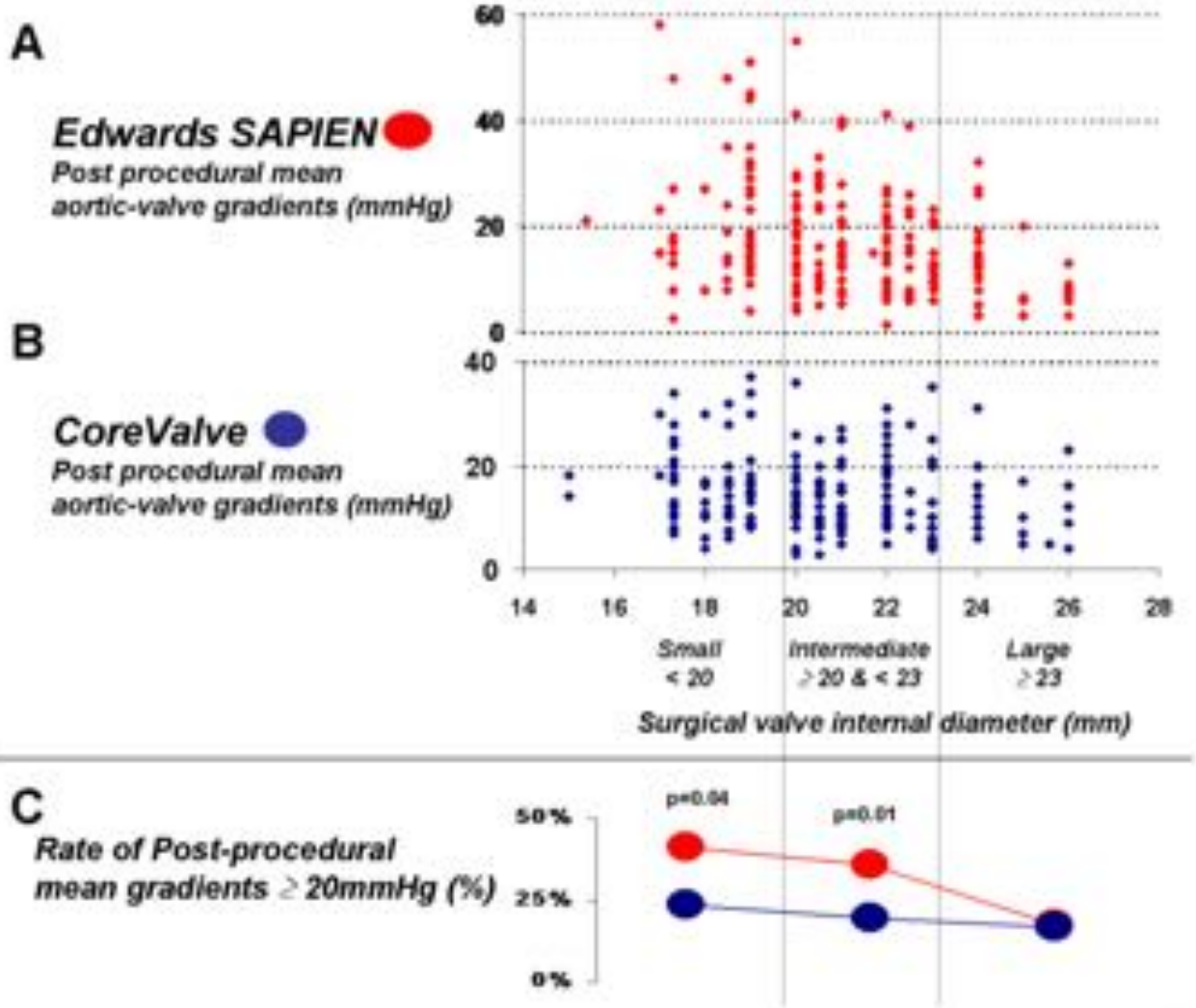

Surgical Valve Label Size
Death from any cause (%)
40
35
30
25
20
15
10
5
0
Log-rank
P=0.001
25.2%
≤ 21 mm
18.2%
> 21 mm & <25 mm
6.7%
≥ 25 mm
0
3
6
9
12
Months
No at risk:
133 81 68 61 57
176 116 103 95 92
139 89 82 76 73



Device Used During Valve-in-Valve



Residual stenosis:
the "Achilles' heel" of VinV procedures



Transcatheter Aortic Valve Implantation Within Degenerated Aortic Surgical Bioprostheses

PARTNER 2 Valve-in-Valve Registry

John G. Webb, MD,[a] Michael J. Mack, MD,[b] Jonathon M. White, MD,[c] Danny Dvir, MD,[d] Philipp Blanke, MD,[e] Howard C. Herrmann, MD,[f] Jonathon Leipsic, MD,[e] Susheel K. Kodali, MD,[g] Raj Makkar, MD,[h] D. Craig Miller, MD,[i] Philippe Pibarot, DVM, PhD,[j] Augusto Pichard, MD,[k] Lowell F. Satler, MD,[k] Lars Svensson, MD, PhD,[l] Maria C. Alu, MS,[g] Rakesh M. Suri, MD, DPhil,[m] Martin B. Leon, MD[g]

ABSTRACT

BACKGROUND Early experience with transcatheter aortic valve replacement (TAVR) within failed bioprosthetic surgical aortic valves has shown that valve-in-valve (VIV) TAVR is a feasible therapeutic option with acceptable acute procedural results.

OBJECTIVES The authors examined 30-day and 1-year outcomes in a large cohort of high-risk patients undergoing VIV TAVR.

METHODS Patients with symptomatic degeneration of surgical aortic bioprostheses at high risk (≥50% major morbidity or mortality) for reoperative surgery were prospectively enrolled in the multicenter PARTNER (Placement of Aortic Transcatheter Valves) 2 VIV trial and continued access registries.

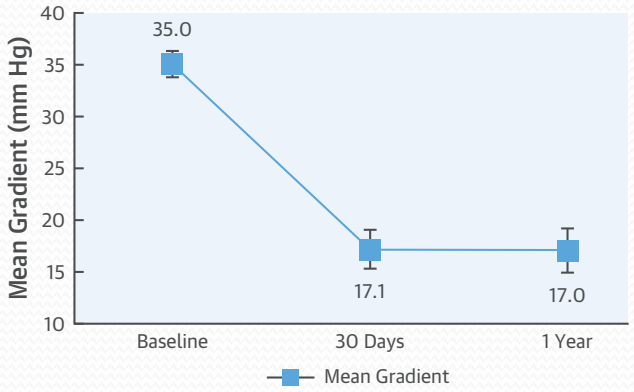
RESULTS Valve-in-valve procedures were performed in 365 patients (96 initial registry, 269 continued access patients). Mean age was 78.9 ± 10.2 years, and mean Society of Thoracic Surgeons score was 9.1 ± 4.7%. At 30 days, all-cause mortality was 2.7%, stroke was 2.7%, major vascular complication was 4.1%, conversion to surgery was 0.6%, coronary occlusion was 0.8%, and new pacemaker insertion was 1.9%. One-year all-cause mortality was 12.4%. Mortality fell from the initial registry to the subsequent continued access registry, both at 30 days (8.2% vs. 0.7%, respectively; $p = 0.0001$) and at 1 year (19.7% vs. 9.8%, respectively; $p = 0.006$). At 1 year, mean gradient was 17.6 mm Hg, and effective orifice area was 1.16 cm^2, with greater than mild paravalvular regurgitation of 1.9%. Left ventricular ejection fraction increased (50.6% to 54.2%), and mass index decreased (135.7 to 117.6 g/m^2), with reductions in both mitral (34.9% vs. 12.7%) and tricuspid (31.8% vs. 21.2%) moderate or severe regurgitation (all $p < 0.0001$). Kansas City Cardiomyopathy Questionnaire score increased (mean: 43.1 to 77.0) and 6-min walk test distance results increased (mean: 163.6 to 252.3 m; both $p < 0.0001$).

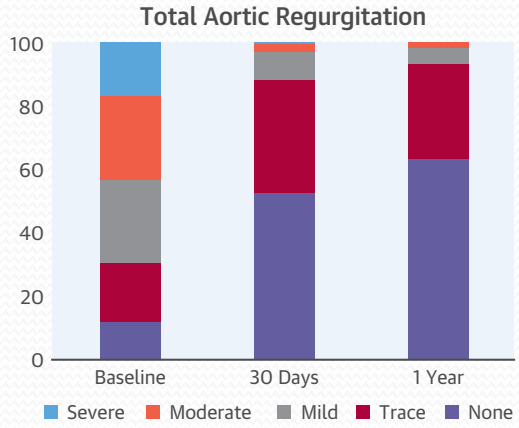
CONCLUSIONS In high-risk patients, TAVR for bioprosthetic aortic valve failure is associated with relatively low mortality and complication rates, improved hemodynamics, and excellent functional and quality-of-life outcomes at 1 year. (The PARTNER II Trial: Placement of AoRTic TraNscathetER Valves [PARTNER II]; NCT01314313)
(J Am Coll Cardiol 2017;69:2253–62)

- 365 patients
- Age moyen 79 ans
- STS 9.1%
- Mortalité à J30 : 2.7 %
- Mortalité à 1 an: 12.4%
- Learning curve ++

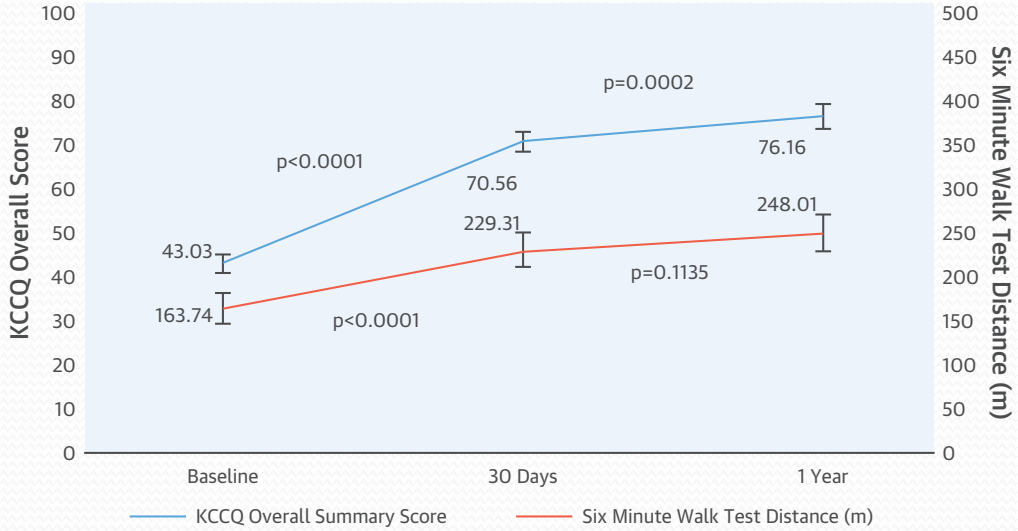
CENTRAL ILLUSTRATION Transcatheter VIV Implantation

A. Changes in hemodynamics





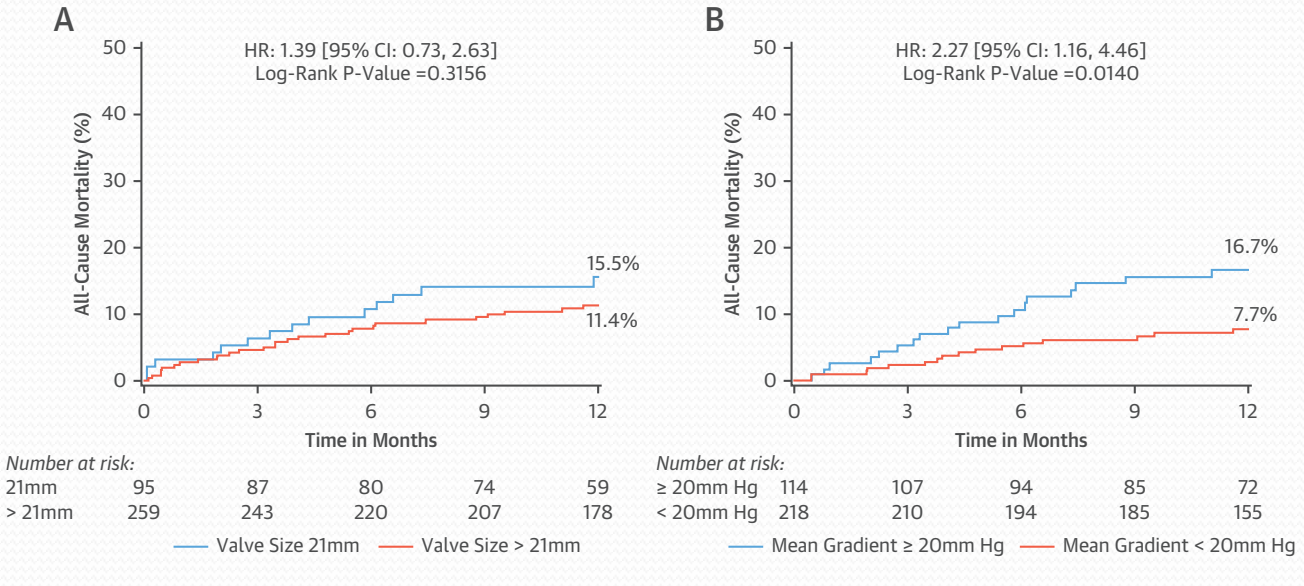
B. Changes in function and quality of life



Webb, J.G. et al. J Am Coll Cardiol. 2017;69(18):2253-62.

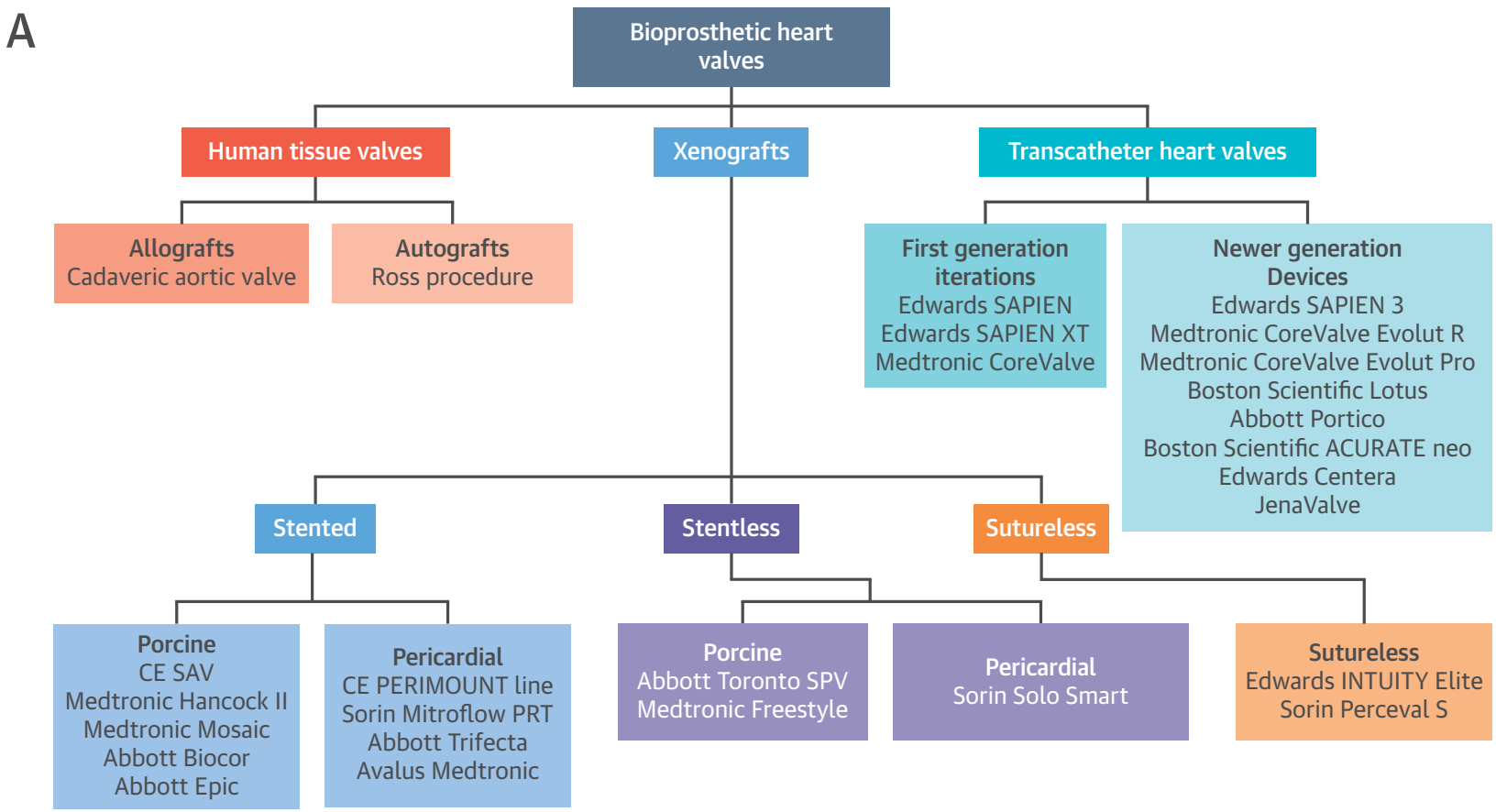
We evaluated 30-day and 1-year outcomes of high-risk patients undergoing VIV transcatheter aortic valve replacement in failed bioprosthetic surgical aortic valves. At both time points, significant improvements were seen in **(A)** hemodynamic measurements of mean gradient and aortic regurgitation, as well as **(B)** quality of life and function as seen in KCCQ scores and 6-min walk test distances. KCCQ = Kansas City Cardiomyopathy Questionnaire; VIV = valve-in-valve.

FIGURE 2 Stratified All-Cause Mortality Curves



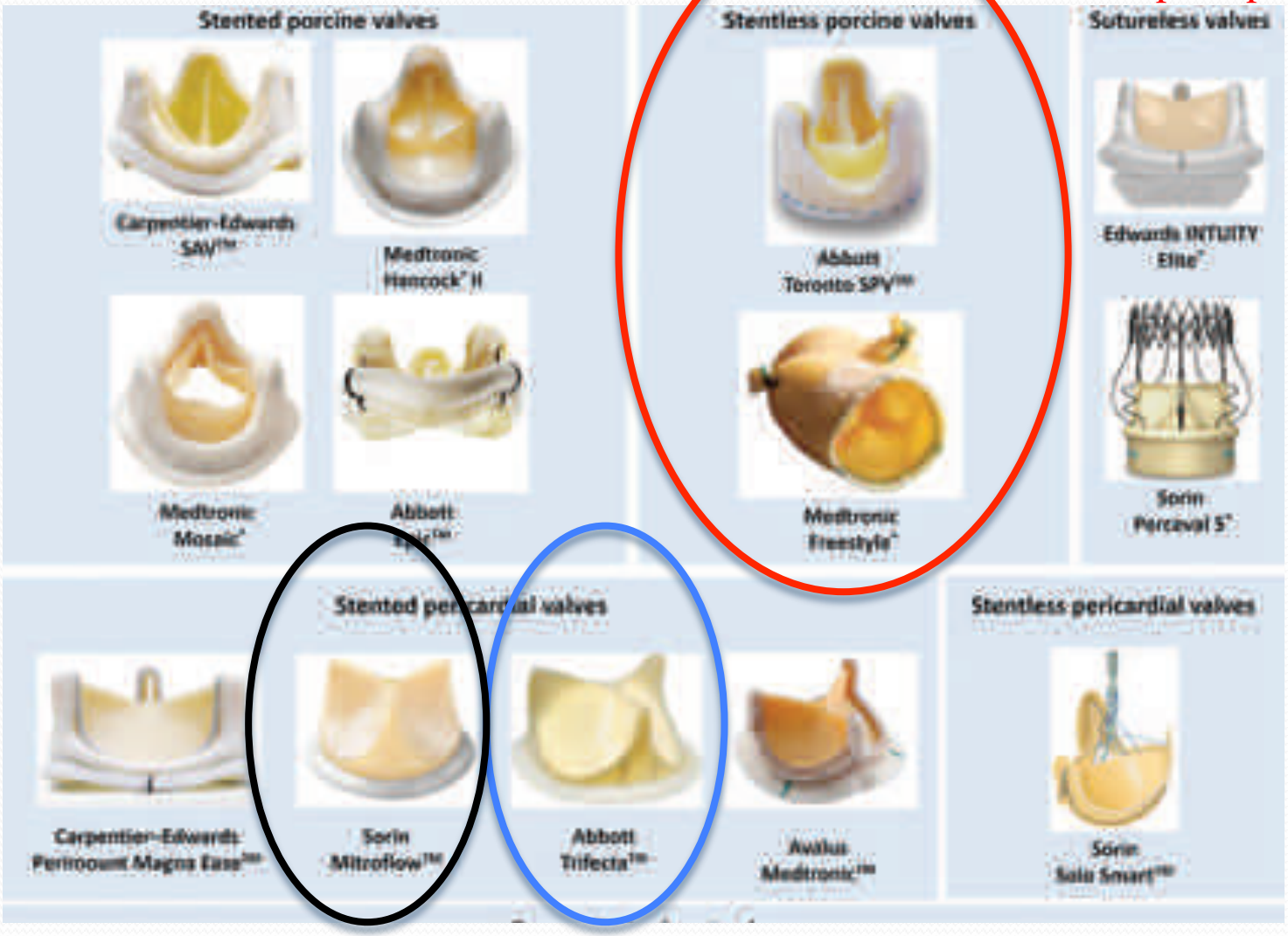
Webb et al. JACC 2017

FIGURE 1 Main Surgical and Transcatheter Aortic Bioprostheses



Rodriguez Cabella et al. JACC 2017

Pas de repère pour le TVIV

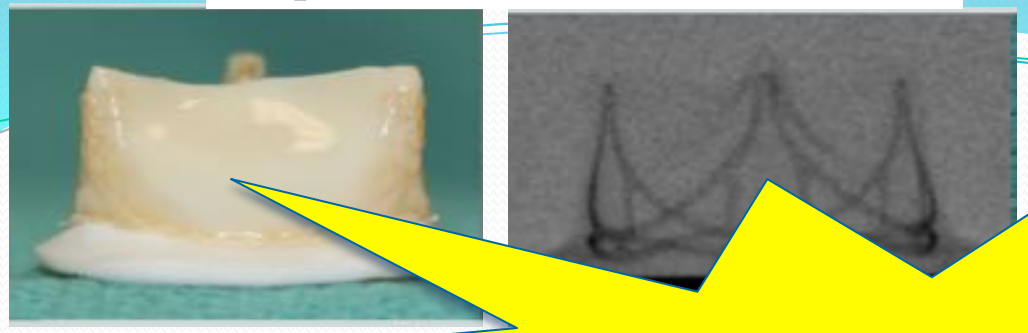


SVD précoce +++

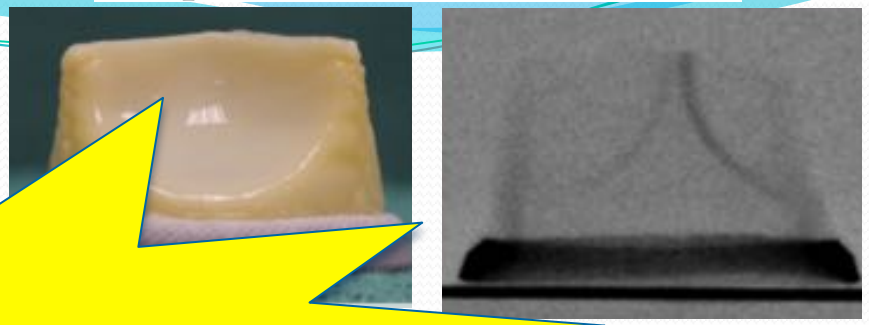
Cusps cousues à l'extérieur de la bioprothèse
➔ risque d'obstruction coronaire pendant TVIV

Rodriguez Cabella et al. JACC 2017

Bioprothèse Saint-Jude Trifecta

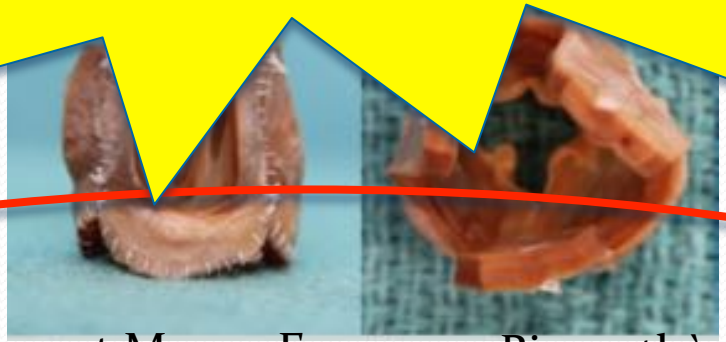


Bioprothèse Sorin Mitroflow

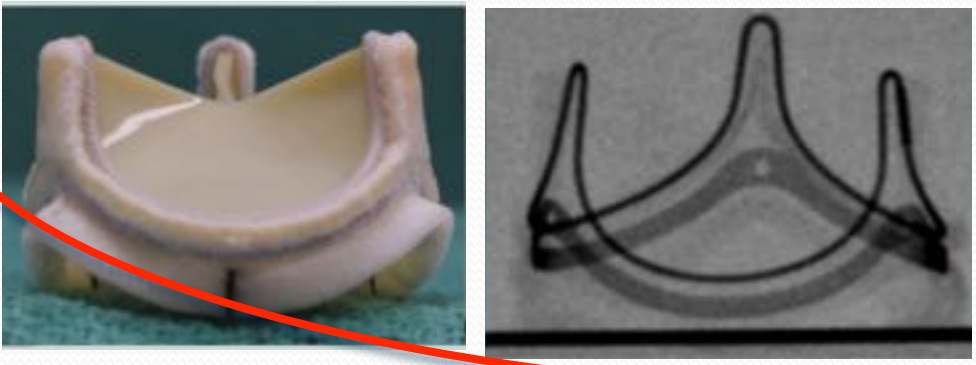


Dangereuse ou moins aisée pour TAVI valve-in-valve

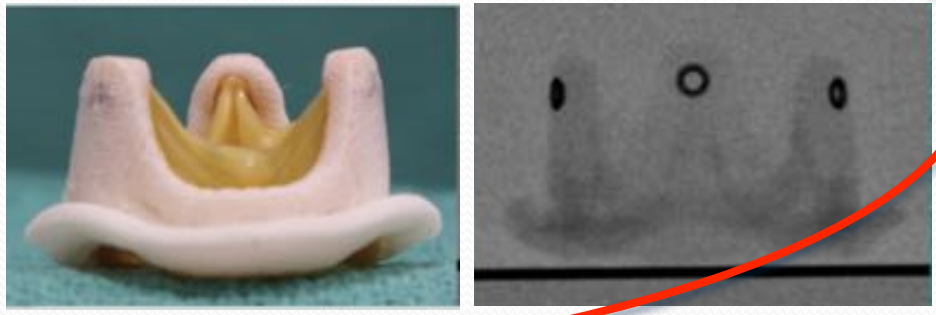
Prothèse st
Cryolife O'Brien



Bioprothèse Edwards Perimount Magna Ease

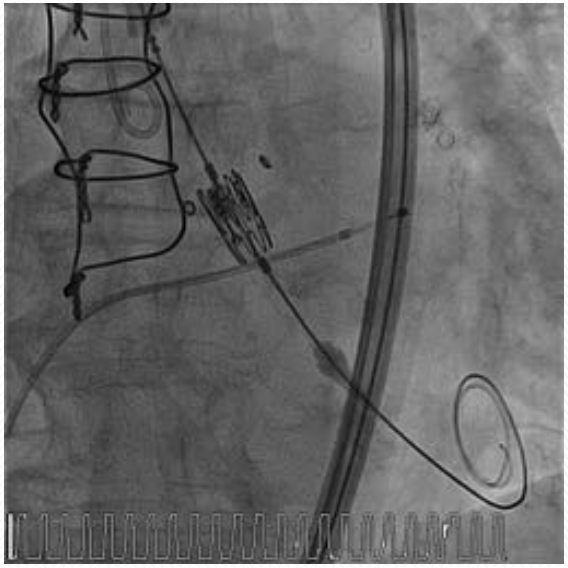


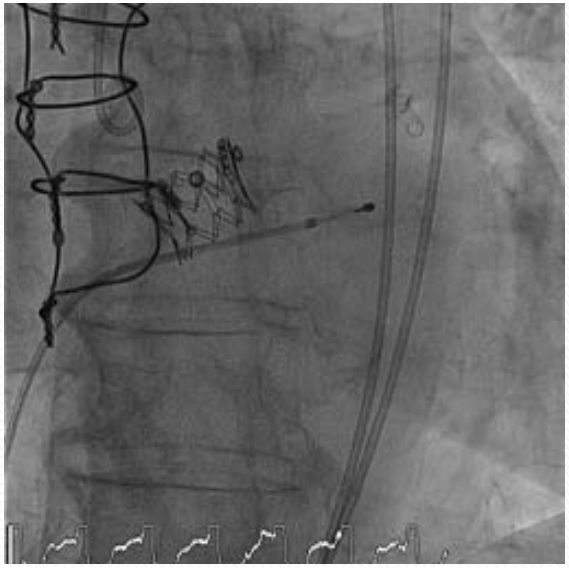
Bioprothèse Mosaic Medtronic



TAVI valve-in-valve aortique en salle de KT

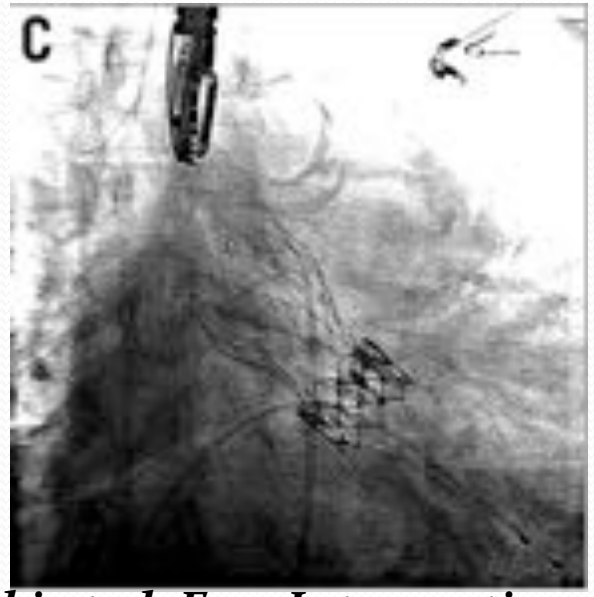
- Pas de pré-dilatation
- Risque d'obstruction coronaire plus élevé avec Mitroflow et prothèse Stentless ➔ protection du TC ou de la CD par un guide avec un stent prêt à être largué.....
- Plutôt prothèse self-expandable que Sapien
- Intérêt majeur du scanner ++++ pour la mesure du diamètre interne de la bioprothèse, à corréler aux abaques





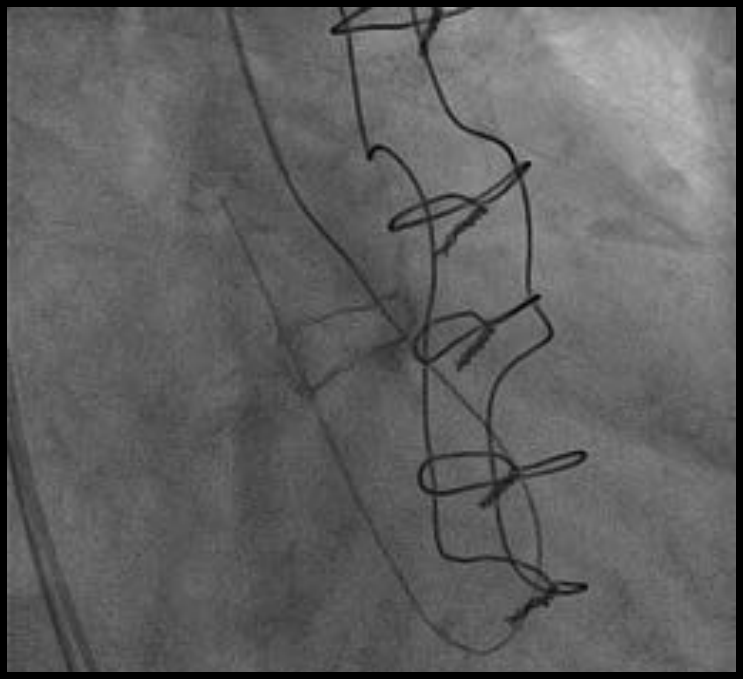
Après le TAVI valve-in-valve….

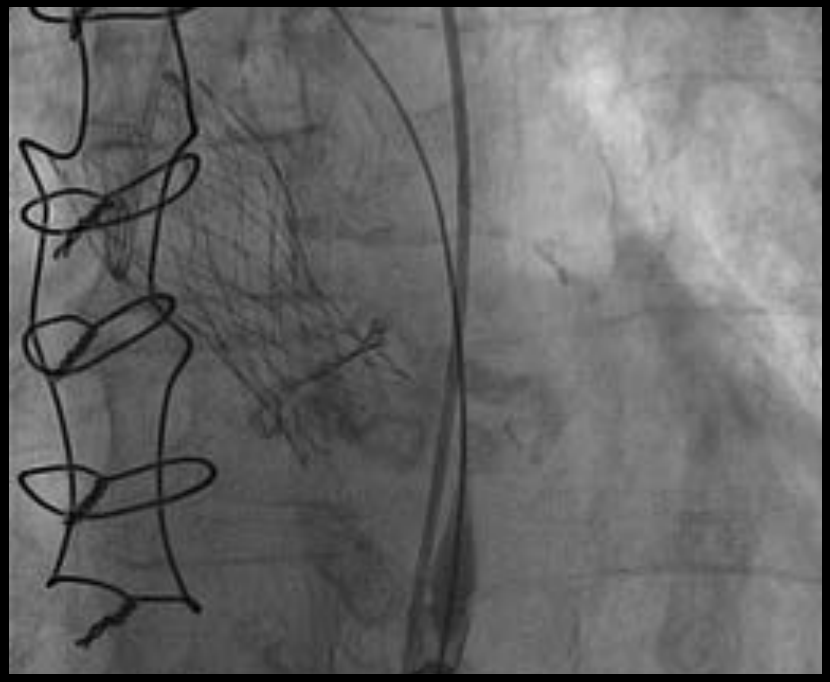
- Données limitées sur la longévité des TAVI et notamment des TAVI valve-in-valve
- Thrombose de TAVI ?
- Dégénérescence plus précoce ? sur les plus petites prothèses ? ⇨ vigilance
- TAVI Valve in valve in valve…….



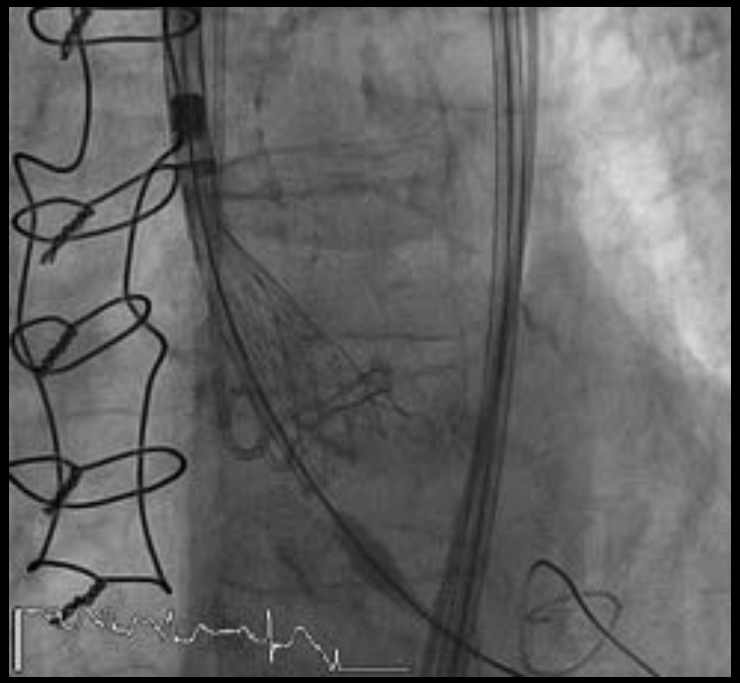
Kornowski et al. EuroIntervention 2014

Revenons à notre patiente: Décision de TAVI VIV CoreValve-in-Mitroflow





TAVI Corevalve Evolute R n°23 "valve-in- valve" dans bioprothèse Mitroflow n°19 dégénérée le 26/5/2016



ETT à la sortie

- Bon résultat du TAVI valve-in-valve:
  - ✓ gradient moyen à 8mmHg
  - ✓ micro-fuite péri-prothétique (entre les deux prothèses) de localisation antérieure
- FEVG normale, PAPs normale

Cardiologue interventionnel : Dr Philippe Guyon

TAVI Aortique valve-in-valve vs. Chirurgie redux

Les études publiées

Table 3: Publication overview: TVIV implantation versus rAVR

Authors	Year of publication	Time span	Number of patients (TVIV vs rAVR)	Mean age (years)	Post-procedure mean gradient (mmHg) (TVIV vs rAVR	30-Day mortality (%) (TVIV vs rAVR)
Erlebach *et al.* [23]	2015	2001–2014	50 TVIV vs 52 rAVR	TVIV 78.1 rAVR 66.2	18.8 ± 8.7 vs 13.8 ± 5.4, *P* = 0.00	4% vs 0%, *P* = 0.24
Silaschi *et al.* [24]	2016	2002–2015	71 TVIV vs 59 rAVR	TVIV 78.6 rAVR 72.9	19.7 ± 7.7 vs 12.2 ± 5.7, *P* < 0.01	4.2% vs 5.1%, *P* = 1
Gozdek *et al.* [25]	2017	NA	176 TVIV vs 166 rAVR	TVIV 75.3 rAVR 69	No significant difference	5.4% vs 4.6%, *P* = NS
Spaziano *et al.* [26]	2017	2007–2015	78 TVIV vs 78 rAVR	TVIV 77.4 rAVR 78	18.1 ± 7.4 vs 14.3 ± 6.2, *P* = 0.01	3.9% vs 6.4%, *P* = 0.49

rAVR: redo aortic valve replacement; TVIV: transcatheter valve-in-valve.

Attias et al. EJCTS 2018

Original Article on TAVI

Redo aortic valve surgery versus transcatheter valve-in-valve implantation for failing surgical bioprosthetic valves: consecutive patients in a single-center setting

Magdalena Erlebach[1], Michael Wottke[1], Marcus-André Deutsch[1], M:
Ruediger Lange[1], Sabine Bleiziffer[1]

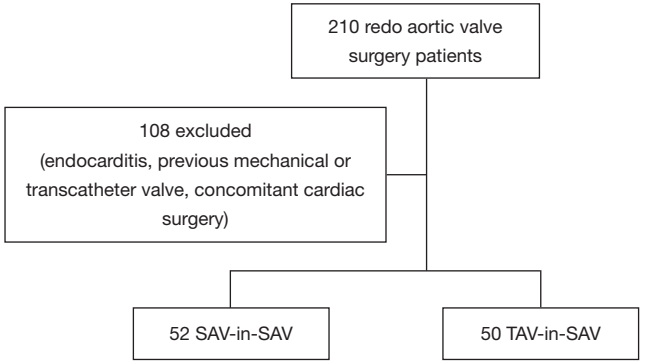


Figure 1 Patient selection. TAV-in-SAV, transcatheter aortic valve-in-surgical aortic valve; SAV-in-SAV, surgical aortic valve redo-operation.

Table 1 Baseline and operative characteristics

Characteristics	TAV–in–SAV (n=50) [%]	SAV–in–SAV (n=52) [%]	P value
Age, years (mean)	78.1 (±6.7)	66.2 (±13.1)	<0.001
Male, n	27 [54]	38 [73]	0.064
Log EuroSCORE	27.4±18.7	14.4±10	<0.001
LV ejection fraction (%)	49.8 (±13.1)	56.7 (±15.8)	0.019

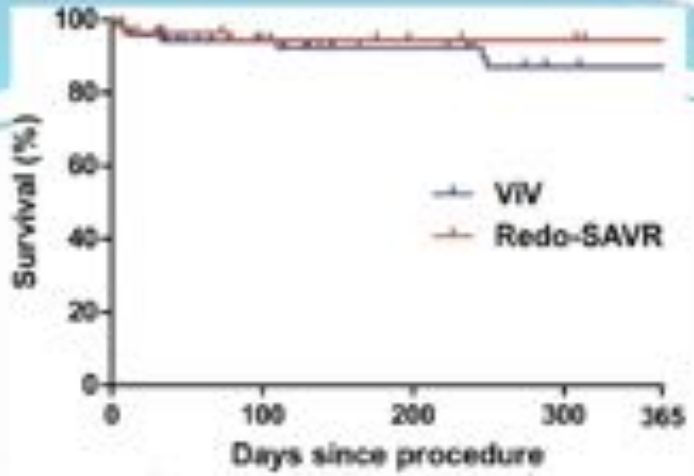
Table 3 Postoperative outcomes

Characteristics	TAV-in-SAV (n=50) [%]	SAV-in-SAV (n=52) [%]	P value
30-day all-cause mortality	2 [4]	0	0.238
KM 1-year survival	[83]	[96]	<0.001
Stroke	2 [4]	1 [2]	0.614
Myocardial infarction	1 [2]	1 [2]	0.490
Aortic regurgitation[4]	10 [20]	3 [6]	0.614
Paravalvular leak	9	0	
Missing values	5	21	
Mean AV gradient (mmHg)	18.8±8.7	13.8±5.4	0.008
Missing values	9	23	

Transcatheter valve-in-valve implantation versus redo surgical aortic valve replacement in patients with failed aortic bioprostheses†

Baseline characteristics	ViV (*n* = 71)	Redo-SAVR (*n* = 59)	*P*-value
Age, mean ± SD	78.6 ± 7.5	72.9 ± 6.6	<0.01
Men, no. (%)	41 (57.7)	36 (61.0)	0.72
Logistic EuroSCORE I, %, mean ± SD	25.1 ± 18.9	16.8 ± 9.3	<0.01
Previous procedure, no. (%)			0.12
SAVR	44 (62.0)	46 (78.0)	
SAVR + CABG	23 (32.4)	10 (16.9)	
SAVR + other	4 (5.6)	3 (5.1)	
Mode of deterioration, no. (%)			0.73
Stenosis	32 (45.1)	24 (40.7)	
Regurgitation	27 (38.0)	21 (35.6)	
Mixed	12 (16.9)	13 (22.0)	
Unknown	0	1 (1.7)	

Silaschi et al. ICVTS 2016



5% de mortalité à J30 dans les 2 groupes

CONCLUSIONS: Despite a higher risk profile in the ViV group, early mortality rates were not different compared with those of surgery. Although ViV resulted in elevated transvalvular gradients and therefore a lower rate of device success, mortality rates were similar to those with redo-SAVR. At present, both techniques serve as complementary approaches, and allow individualized patient care with excellent outcomes.

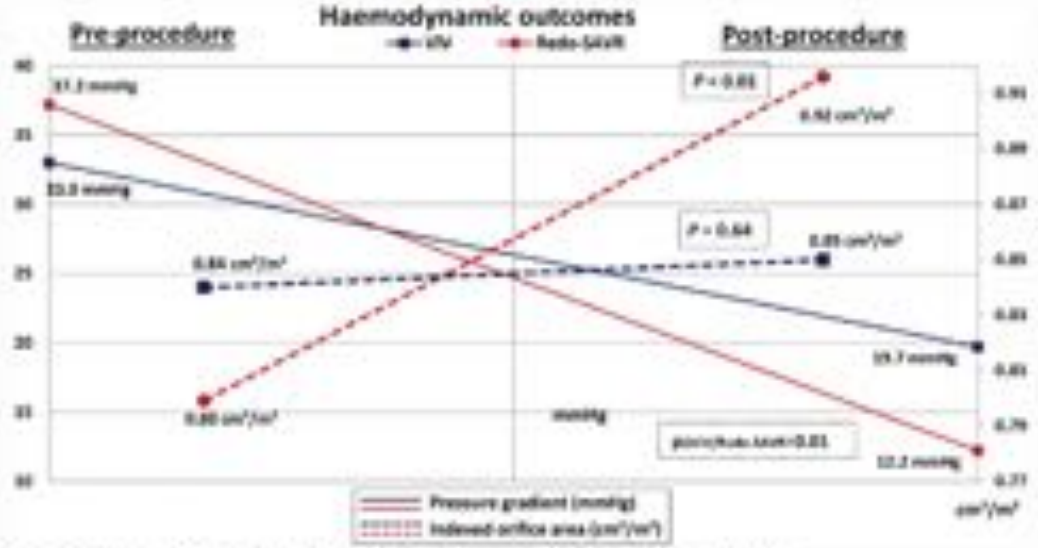


Figure 2: Haemodynamic outcomes after either valve-in-valve (ViV) or redo surgical aortic valve replacement (SAVR).

Silaschi et al. ICVTS 2016

TAVI valve-in-valve
vs.
Chirurgie redux AORTIQUE

La synthèse

European Journal of Cardio-Thoracic Surgery 0 (2018) 1–9
doi:10.1093/ejcts/ezy204

REVIEW

Cite this article as: Attias D, Nejjari M, Nappi F, Dreyfus J, Eleid MF, Rihal CS. How to treat severe symptomatic structural valve deterioration of aortic surgical bioprosthesis: transcatheter valve-in-valve implantation or redo valve surgery? Eur J Cardiothorac Surg 2018; doi:10.1093/ejcts/ezy204.

How to treat severe symptomatic structural valve deterioration of aortic surgical bioprosthesis: transcatheter valve-in-valve implantation or redo valve surgery?

David Attias[a,*], Mohammed Nejjari[a], Francesco Nappi[b], Julien Dreyfus[a], Mackram F. Eleid[c] and Charanjit S. Rihal[c]

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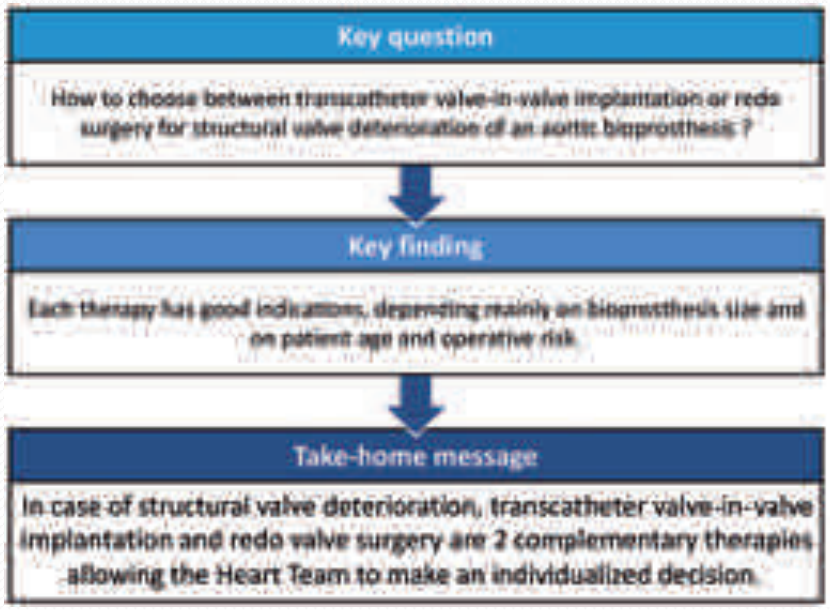
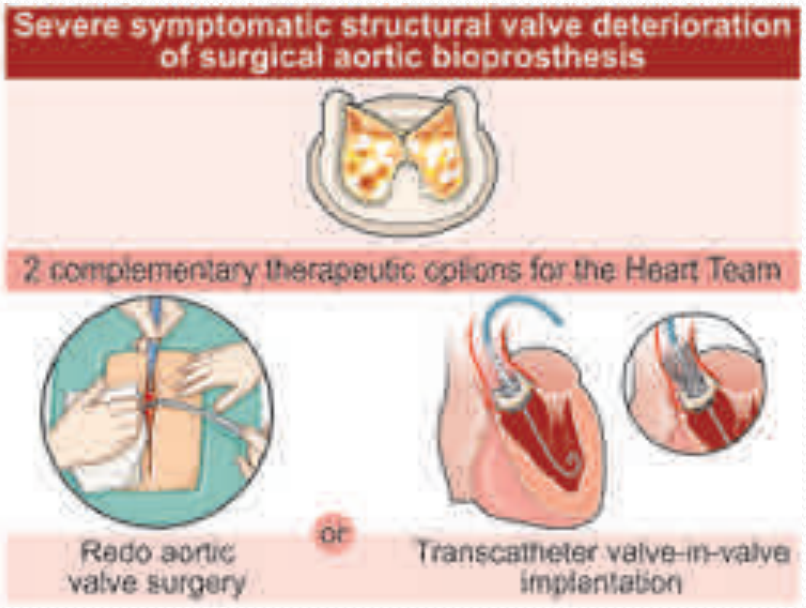
[c] Department of Cardiovascular Diseases and Cardiovascular Surgery, Mayo Clinic, Rochester, MN, USA





	Transcatheter valve-in-valve	Chirurgie redux
Avantages	- Pas d'intubation - Moins invasif - Moins de temps en réanimation et en hospitalisation - Moins de pace-maker post-procédure	- Mortalité moins élevée que crainte au départ - Si mismatch patient-prothèse déjà présent avec la bioprothèse ➔ nécessité d'élargir chirurgicalement l'anneau aortique.
Inconvénients	- Pas nul en termes de mortalité péri-procédure et de gradient post-procédure…	- Morbidité bcp plus lourde que le TAVI valve in valve

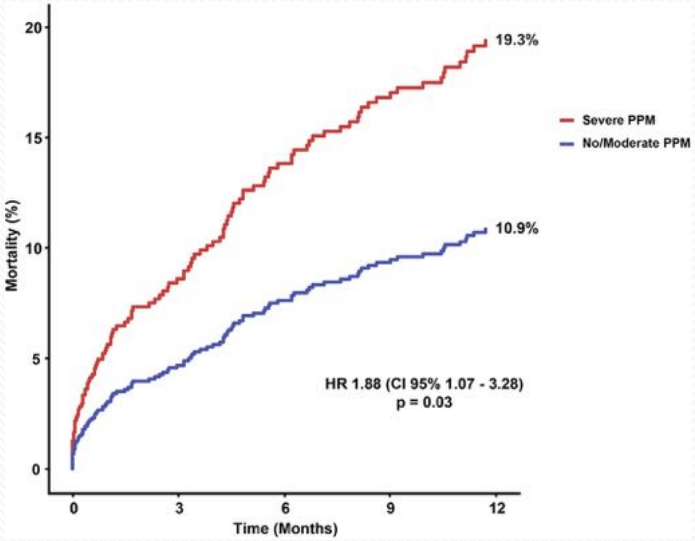
JACC: CARDIOVASCULAR INTERVENTIONS
VOL. 11, NO. 2, 2018

PUBLISHED BY ELSEVIER

Impact of Pre-Existing Prosthesis-Patient Mismatch on Survival Following Aortic Valve-in-Valve Procedures

Philippe Pibarot, DVM, PHD,[a] Matheus Simonato,[b] Marco Barbanti, MD,[c] Axel Linke, MD,[d] Ran Kornowski, MD,[e] Tanja Rudolph, MD,[f] Mark Spence, MB, BCH,[g] Neil Moat, MBBS, MS,[h] Gabriel Aldea, MD,[i] Marco Mennuni, MD,[j] Alessandro Iadanza, MD,[k] Hafid Amrane, MD,[l] Diego Gaia, MD, PHD,[b] Won-Keun Kim, MD,[m] Massimo Napodano, MD,[n] Hardy Baumbach, MD,[o] Ariel Finkelstein, MD,[p] Junjiro Kobayashi, MD, PHD,[q] Stephen Brecker, MD,[r] Creighton Don, MD, PHD,[i] Alfredo Cerillo, MD,[s] Axel Unbehaun, MD,[t] David Attias, MD,[u] Mohammed Nejjari, MD,[u] Noah Jones, MD,[v] Claudia Fiorina, MD,[w] Didier Tchetche, MD,[x] Raphael Philippart, MD,[x] Konstantinos Spargias, MD,[y] Jose-Maria Hernandez, MD, PHD,[z] Azeem Latib, MD,[aa] Danny Dvir, MD[i]

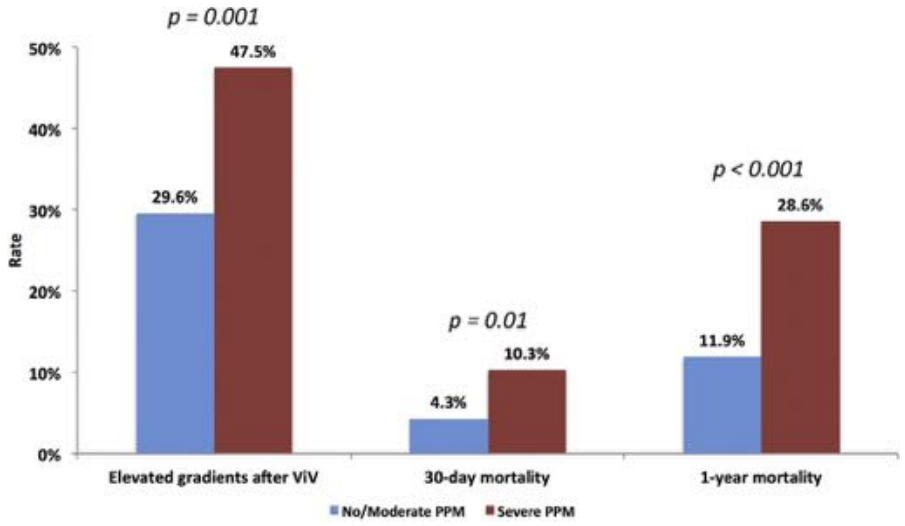
FIGURE 3 Adjusted 1-Year Mortality Rate According to Pre-Existing Severe Prosthesis-Patient Mismatch



Cox proportional hazards regression curves showing the adjusted cumulative hazard of death from any cause according to the presence or absence of pre-existing severe prosthesis-patient mismatch (PPM).

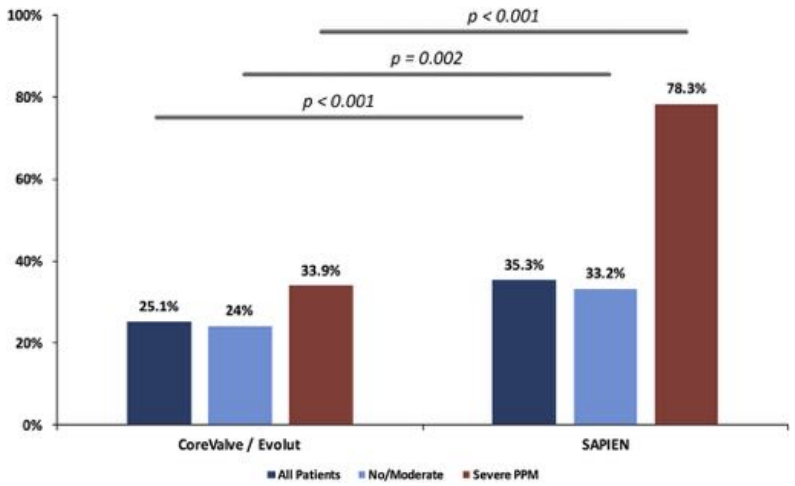
- Pre-existing PPM of the surgical valve was determined using a reference value of effective orifice area for each given model and size of implanted prosthetic valve indexed for body surface area.
- Severe PPM if indexed effective orifice area <0.65 cm2/m2 if body mass index is <30 kg/m2 and <0.6 cm2/m2 if BMI is $30 kg/m2.

FIGURE 1 Rates of Elevated Post-Procedural Transvalvular Gradients and 30-Day and 1-Year Mortality According to Pre-Existing Severe Prosthesis-Patient Mismatch



Rates of elevated (≥20 mm Hg) post-procedural gradients, 30-day mortality, and unadjusted 1-year mortality according to presence or absence of pre-existing severe prosthesis-patient mismatch (PPM).

FIGURE 2 Rates of Elevated Post-Procedural Transvalvular Gradient According to Pre-Existing Severe Prosthesis-Patient Mismatch and Type of Transcatheter Heart Valve Used for Valve-in-Valve Implantation



Rates of elevated (≥20 mm Hg) post-procedural gradients, 30-day mortality, and 1-year mortality according to presence or absence of pre-existing severe prosthesis-patient mismatch (PPM) and to the type of transcatheter heart valve (i.e., self-expanding CoreValve or Evolut vs. balloon-expandable SAPIEN) used for valve-in-valve implantation.

Pibarot et al. JACC Interv 2018

Quels éléments sont à prendre en compte AVANT de retenir l'indication de TVIV?

A. Age
B. Comorbidités, risque opératoire
C. Taille de la bioprothèse dégénérée
D. Existence d'un mismatch patient-bioprothèse lors de la première intervention
E. Type de la bioprothèse dégénérée
F. Type de dégénérescence (sténosante, fuyante, mixte)

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E. Existence d'un mismatch patient-bioprothèse lors de la première intervention
F. Type de la bioprothèse dégénérée

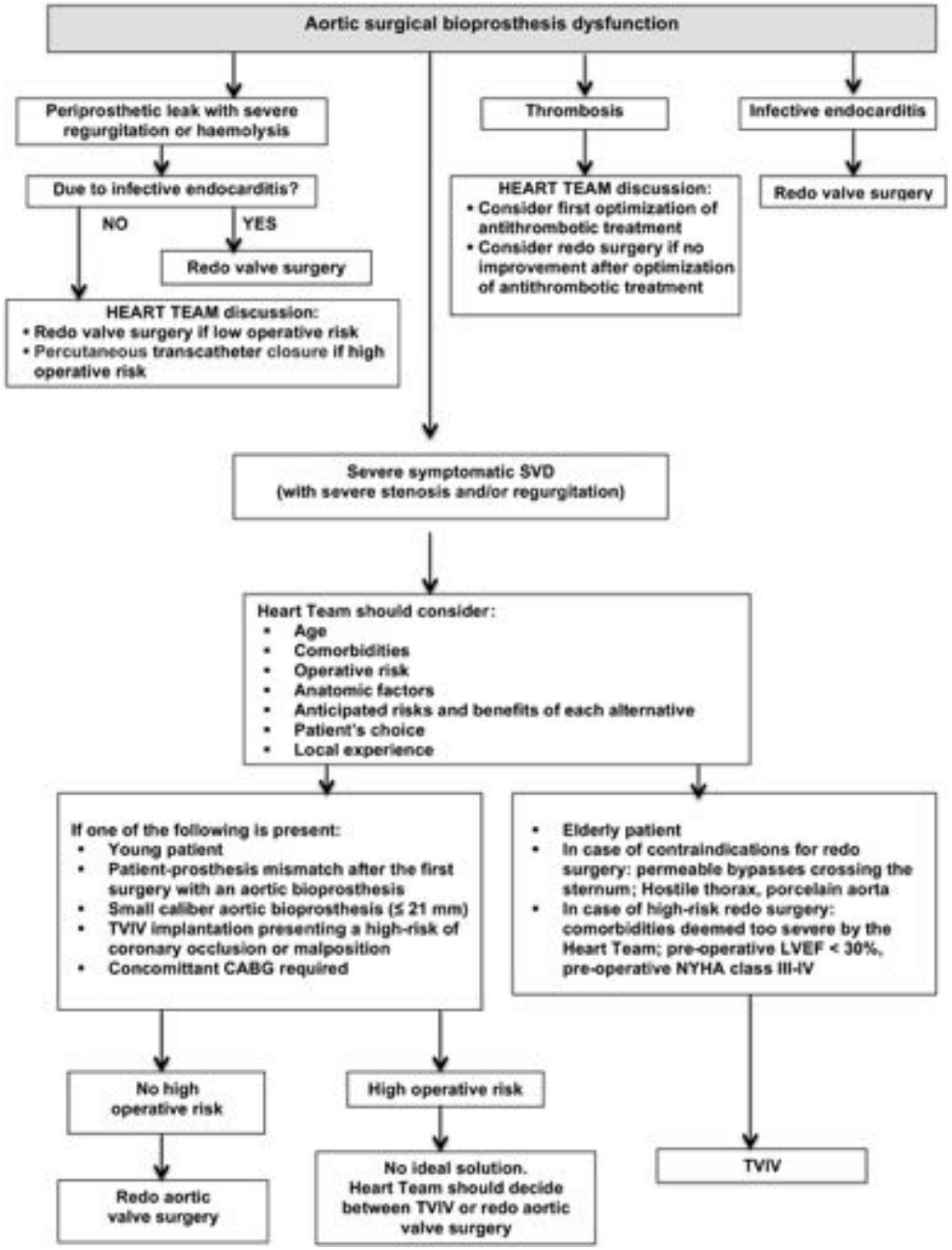


Figure 4: Algorithm to guide clinical decision-making for patients presenting with aortic surgical bioprosthesis dysfunction.

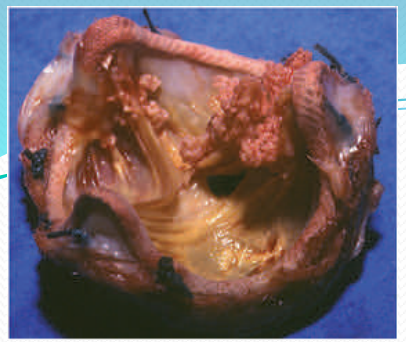


Figure 1: Explanted aortic bioprosthesis for stenosis-type structural valve deterioration. Presence of severe calcification of the leaflets.

TVIV for symptomatic structural valve deterioration

Good indication of TVIV

Bad indication of TVIV

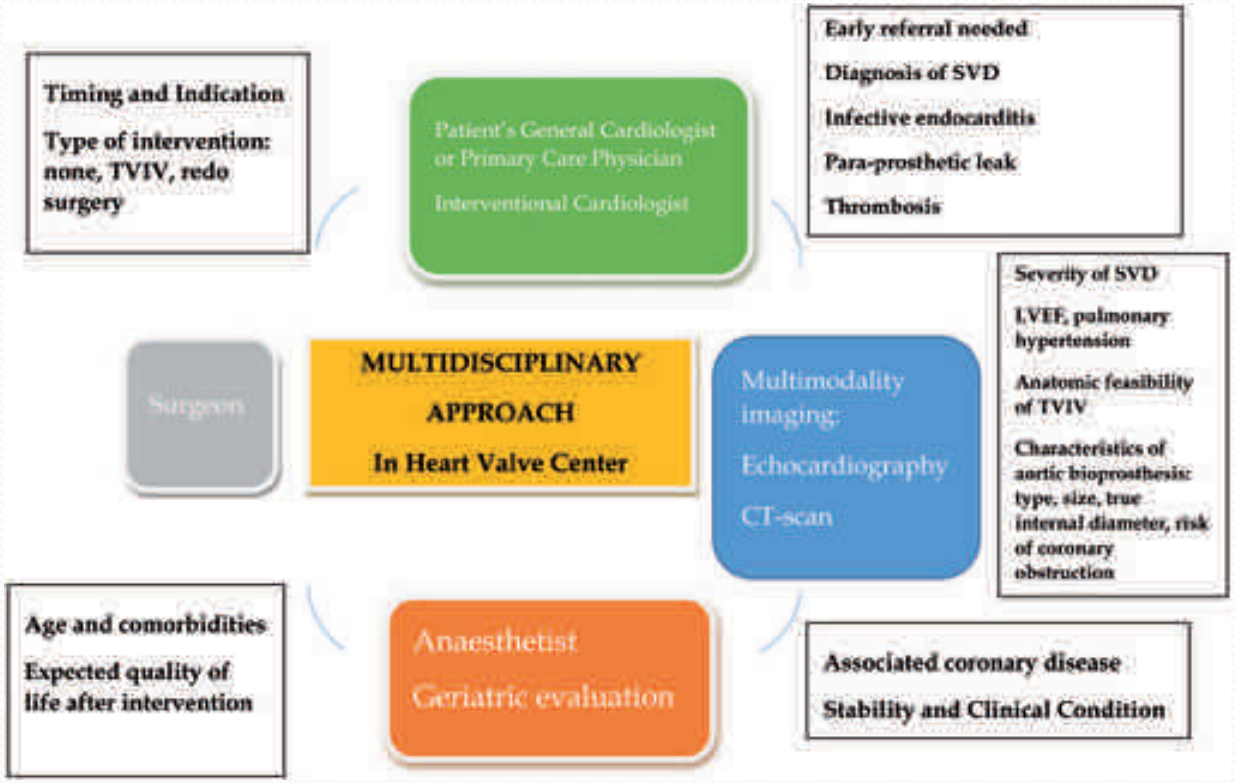


Figure 3: Clinical perspective and take-home messages. The need for a multidisciplinary management is shown: a process of shared decision-making including the patient, cardiologists, imaging specialists, specialist in geriatrics, anaesthetist and cardiac surgeon. The role played by the patient's primary care physician allows for a comprehensive knowledge of patient's background and life style that can, therefore, help in understanding the risk profile and the level of care potentially needed after procedure. We, therefore, believe that implementing a systematic approach based on a multidisciplinary team effort is crucial in the management of these patients. A multidisciplinary approach, involving different professionals contributing with their expertise to the decision-making, should converge towards an early referral of the patient to specialized centres with the aim of performing surgery or TVIV at an early stage according to the patient's condition. CT: computed tomography; SVD: structural valve deterioration; TVIV: transcatheter valve-in-valve.

Conclusion

- Le TVIV est une excellente alternative à la chirurgie valvulaire aortique redux car il permet de traiter avec succès des patients à très haut risque, de manière mini invasive, le plus souvent sous anesthésie locale, permettant une récupération rapide

- Bien que le TVIV permette de passer le cap opératoire, il peut entrainer par la suite un gradient moyen aortique post-TVIV élevé (surtout pour les TVIV dans les petites bioprothèses) dont l'impact au long cours est méconnu.

- Au sein d'une Heart team, ces deux méthodes doivent être considérées comme complémentaires et non comme concurrentes car elles ne s'adressent pas forcément aux mêmes patients.

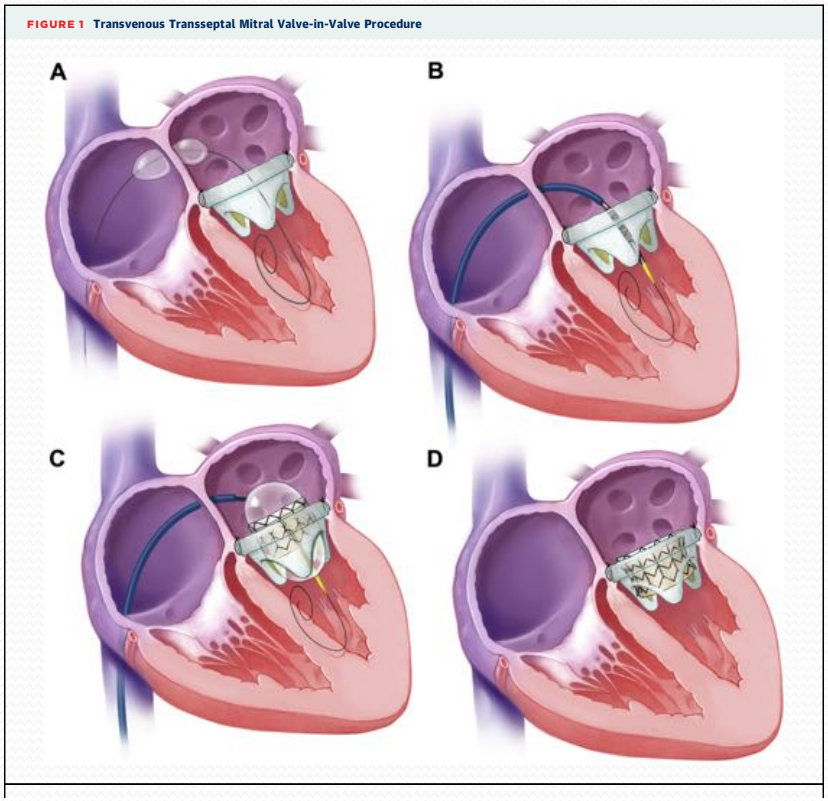
- Il faut encourager les chirurgiens cardiaques à implanter des bioprothèses de la plus grande taille possible pour favoriser par la suite un TVIV avec le meilleur pronostic.

- Intérêt de bioprothèse type INSPIRIS à évaluer.

TAVI valve-in-valve vs. Chirurgie redux .....

pour les bioprothèses MITRALES dégénérées

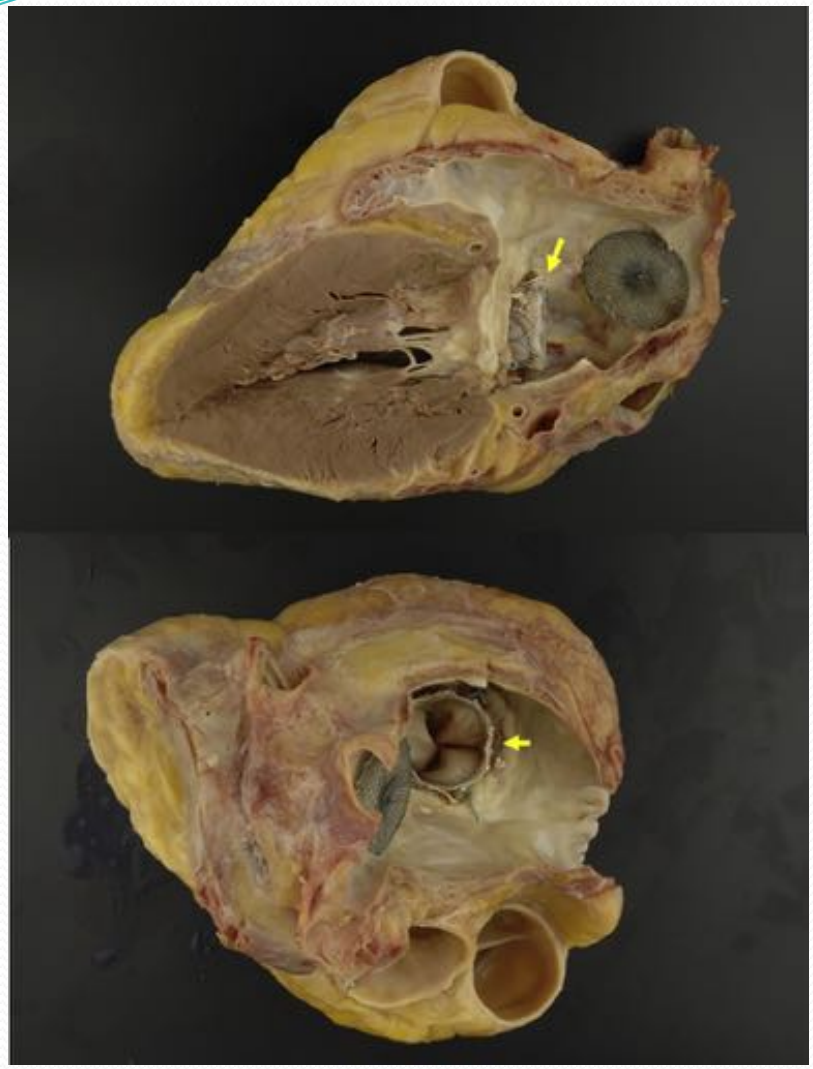
Percutaneous Transvenous Transseptal Transcatheter Valve Implantation in Failed Bioprosthetic Mitral Valves, Ring Annuloplasty, and Severe Mitral Annular Calcification



Eleid et al JACC Cardiovasc Interventions 2016

- 48 patients, Mean age 76 years.
- Degenerated mitral bioprosthesis (n=33),
- Previous ring annuloplasty (n=9), and severe MAC (n=6).
- STS Score : 13.2%
- Acute procedural success was achieved in 42 of 48 patients (88%) in the overall group and 31 of 33 (94%) in the failed bioprosthetic mitral valve group.
- After successful procedure, no patients had > mild residual mitral prosthetic or periprosthetic regurgitation; mean transvalvular gradients were 6 mm Hg.
- Thirty-day survival free of death and cardiovascular surgery was 85% in the overall group and 91% in the failed bioprosthetic mitral valve subgroup.

FIGURE 7 Cardiac Autopsy Following Transseptal Mitral Valve Implantation



Eleid et al JACC Cardiovasc Interventions 2016

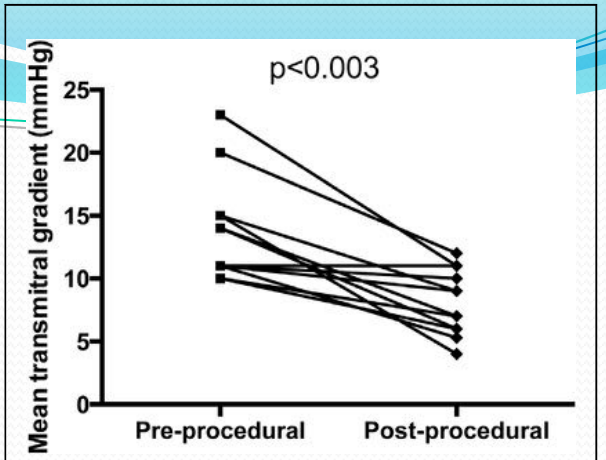


FIGURE 3 Mean Transmitral Gradient Before and After THV Implantation in the Mitral Position Among the 12 Patients With Mitral Stenotic Failure

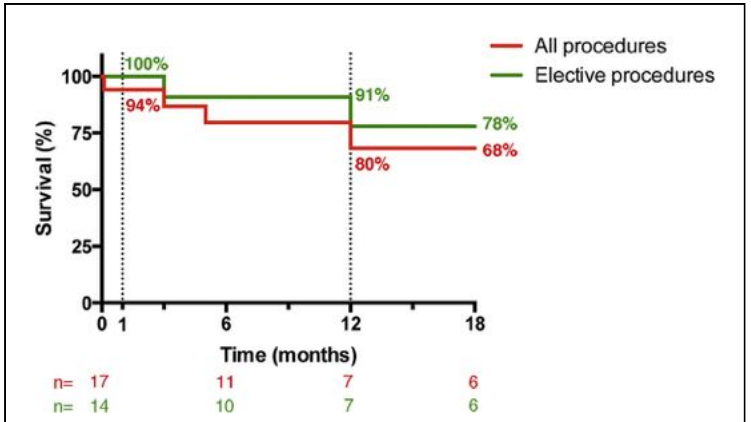


FIGURE 5 Survival of the Overall Population (n = 17) and of the Patients Who Underwent an Elective Procedure (n = 14)

Survival at 30 days, 1 year, and 18 months after transcatheter heart valve implantation in the mitral position.

Bouleti et al JACC Cardiovasc Interventions 2015

Early Outcomes of Percutaneous Transvenous Transseptal Transcatheter Valve Implantation in Failed Bioprosthetic Mitral Valves, Ring Annuloplasty, and Severe Mitral Annular Calcification

Mackram F. Eleid, MD,[a] Brian K. Whisenant, MD,[b] Allison K. Cabalka, MD,[a] Mathew R. Williams, MD,[c] Mohammed Nejjari, MD,[d] David Attias, MD,[d] Neil Fam, MD,[e] Nicholas Amoroso, MD,[c] Thomas A. Foley, MD,[a] Peter M. Pollak, MD,[a] Oluseun O. Alli, MD,[f] Sorin V. Pislaru, MD,[a] Sameh M. Said, MD,[g] Joseph A. Dearani, MD,[g] Charanjit S. Rihal, MD, MBA[a]

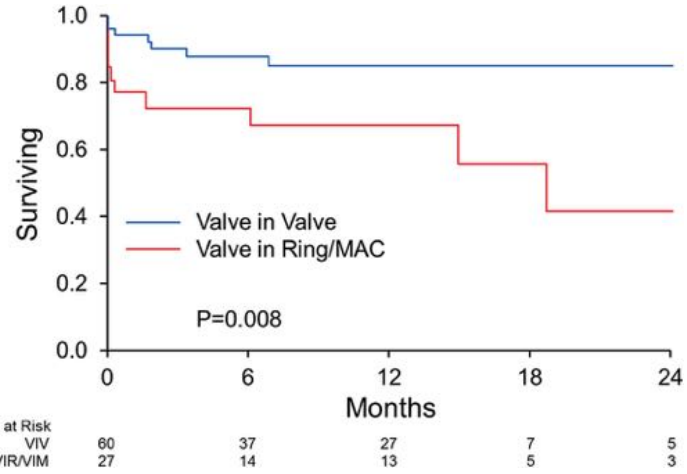
TABLE 4 Clinical Outcomes According to Procedure

	Total (N = 87)	Mitral VIV (n = 60)	Mitral VIR (n = 15)	Mitral VIM (n = 12)	p Value
Procedural success	78 (90)	58 (97)	11 (73)	9 (75)	0.03
Periprocedural mortality	5 (5)	2 (3)	0 (0)	2 (17)	0.13
Major bleeding	9 (10)	4 (7)	2 (13)	3 (25)	0.17
Left ventricular outflow tract obstruction	8 (9)	3 (5)	3 (20)	2 (17)	0.20
Second valve required	5 (6)	1 (2)	2 (13)	2 (17)	0.02
Cardiac surgery	5 (6)	1 (2)	3 (20)	1 (8)	0.03
Prosthetic valve thrombosis	2 (2)	1 (2)	1 (7)	0 (0)	0.31
30-day survival	82 (94)	57 (95)	15 (100)	10 (83)	0.19

Values are n (%).

VIM = valve in mitral annular calcification; VIR = valve-in-ring; VIV = valve in valve.

FIGURE 3 Survival Free of Death or Cardiovascular Surgery



Survival free of death or cardiovascular surgery was significantly better with mitral valve in valve (VIV) compared with valve in ring (VIR) or valve in mitral annular calcification (VIM). MAC = mitral annular calcification.

Early Outcomes of Percutaneous Transvenous Transseptal Transcatheter Valve Implantation in Failed Bioprosthetic Mitral Valves, Ring Annuloplasty, and Severe Mitral Annular Calcification

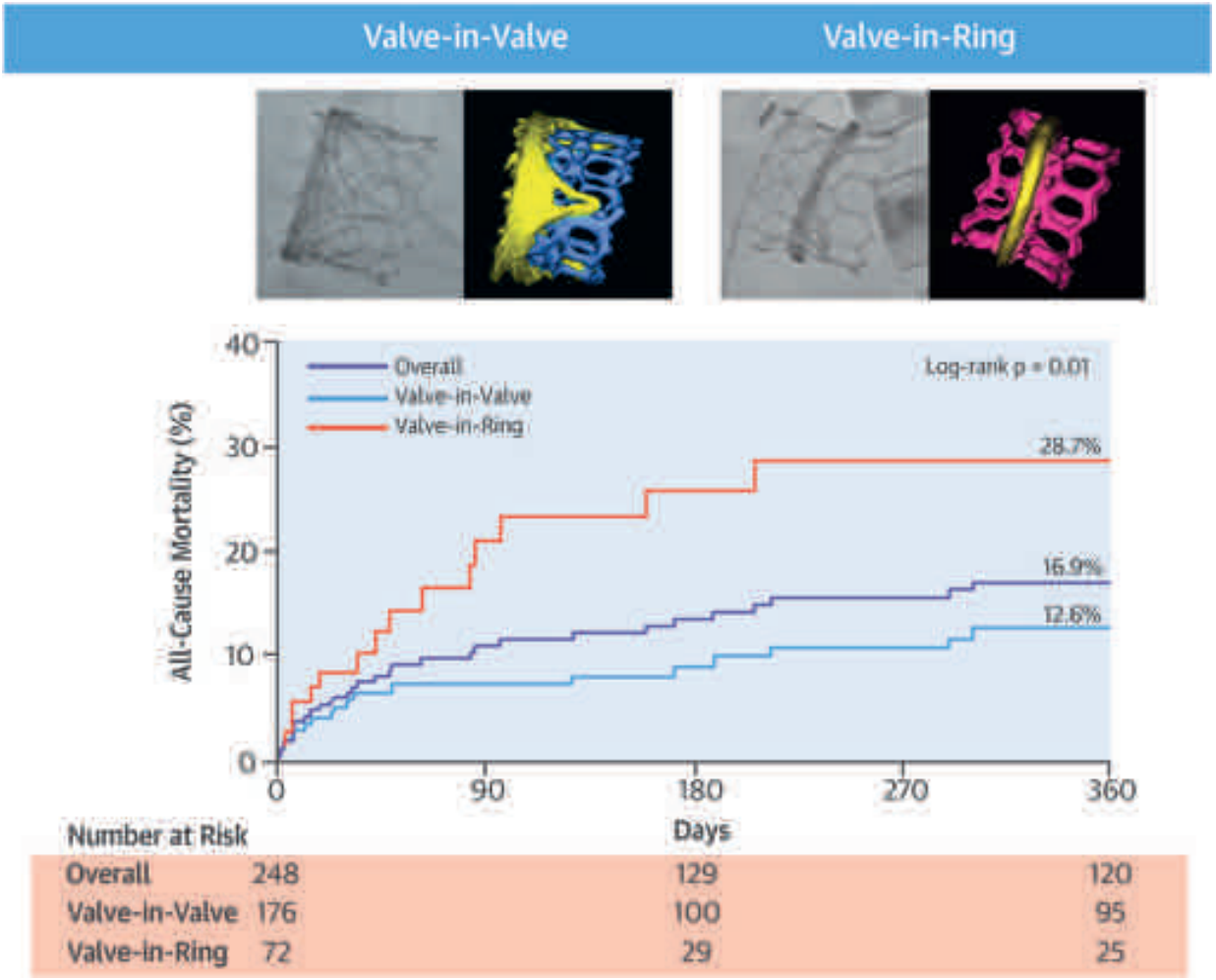
Mackram F. Eleid, MD,[a] Brian K. Whisenant, MD,[b] Allison K. Cabalka, MD,[a] Mathew R. Williams, MD,[c] Mohammed Nejjari, MD,[d] David Attias, MD,[d] Neil Fam, MD,[e] Nicholas Amoroso, MD,[c] Thomas A. Foley, MD,[a] Peter M. Pollak, MD,[a] Oluseun O. Alli, MD,[f] Sorin V. Pislaru, MD,[a] Sameh M. Said, MD,[g] Joseph A. Dearani, MD,[g] Charanjit S. Rihal, MD, MBA[a]

METHODS Percutaneous transseptal implantation of balloon-expandable transcatheter heart valves was performed in 87 patients with degenerated mitral bioprostheses (valve in valve [VIV]) (n = 60), previous ring annuloplasty (valve in ring) (n = 15), and severe MAC (valve in MAC) (n = 12).

RESULTS The mean Society of Thoracic Surgeons risk score was 13 ± 8%, and the mean age was 75 ± 11 years. Acute procedural success was achieved in 78 of 87 patients (90%) in the overall group and 58 of 60 (97%) in the VIV group, with a success rate of 20 of 27 (74%) in the valve in ring/valve in MAC group. Thirty-day survival free of death and cardiovascular surgery was 95% (95% confidence interval [CI]: 92% to 97%) in the VIV subgroup and 78% (95% CI: 70% to 86%) in the valve in ring/valve in MAC group (p = 0.008). One-year survival free of death and cardiovascular surgery was 86% (95% CI: 81% to 91%) in the VIV group compared with 68% (95% CI: 58% to 78%) (p = 0.008). At 1 year, 36 of 40 patients (90%) had New York Heart Association functional class I or II symptoms, no patients had more than mild residual mitral prosthetic or periprosthetic regurgitation, and the mean transvalvular gradient was 7 ± 3 mm Hg.

CONCLUSIONS One-year outcomes following successful transseptal balloon-expandable transcatheter heart valve implantation in high-risk patients with degenerated mitral bioprostheses are excellent, characterized by durable symptom relief and prosthesis function. Although mitral valve in ring and valve in MAC have higher operative morbidity and mortality, 1-year outcomes after an initially successful procedure are favorable in carefully selected patients. (J Am Coll Cardiol Intv 2017;10:1932–42)

CENTRAL ILLUSTRATION **Kaplan-Meier Curves for Mortality After Mitral Valve-in-Valve and Valve-in-Ring**

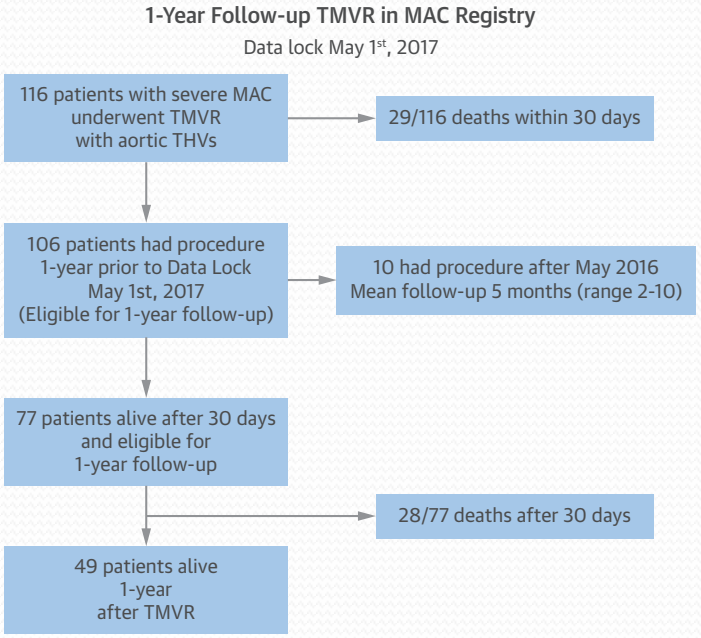


Yoon, S.-H. et al. J Am Coll Cardiol. 2017;70(9):1121-31.

Procedural and post-procedural computed tomography images of mitral valve-in-valve and valve-in-ring are shown **(upper panel)**. The cumulative all-cause mortality rates of the overall cohort **(purple line)**, patients undergoing mitral valve-in-valve **(orange line)**, and valve-in-ring **(blue line)** are shown **(lower panel)**.

1-Year Outcomes of Transcatheter Mitral Valve Replacement in Patients With Severe Mitral Annular Calcification

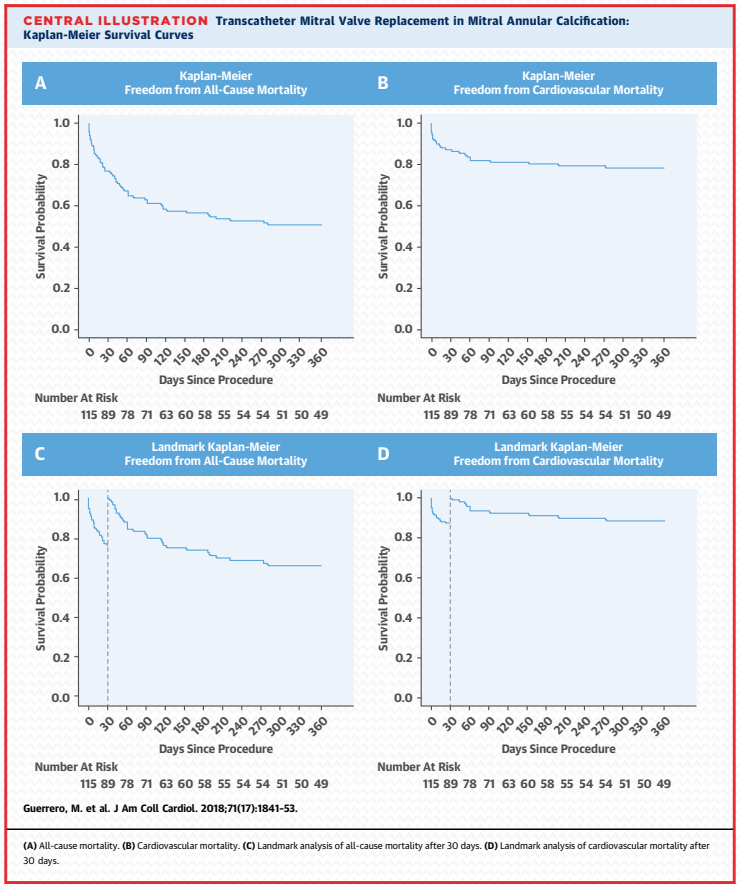
FIGURE 1 Summary of Patient Flow



A total of 116 patients were included in the analysis; 10 of them were not eligible for 1-year follow-up due to a procedure date <1 year from data-lock of this analysis (May 1, 2017). A total of 106 patients were accounted for in the analysis of 1-year outcomes. MAC = mitral annular calcification; THV = transcatheter heart valve; TMVR = transcatheter mitral valve replacement.

Guerrero et al. JACC 2018

1-Year Outcomes of Transcatheter Mitral Valve Replacement in Patients With Severe Mitral Annular Calcification



Guerrero et al. JACC 2018

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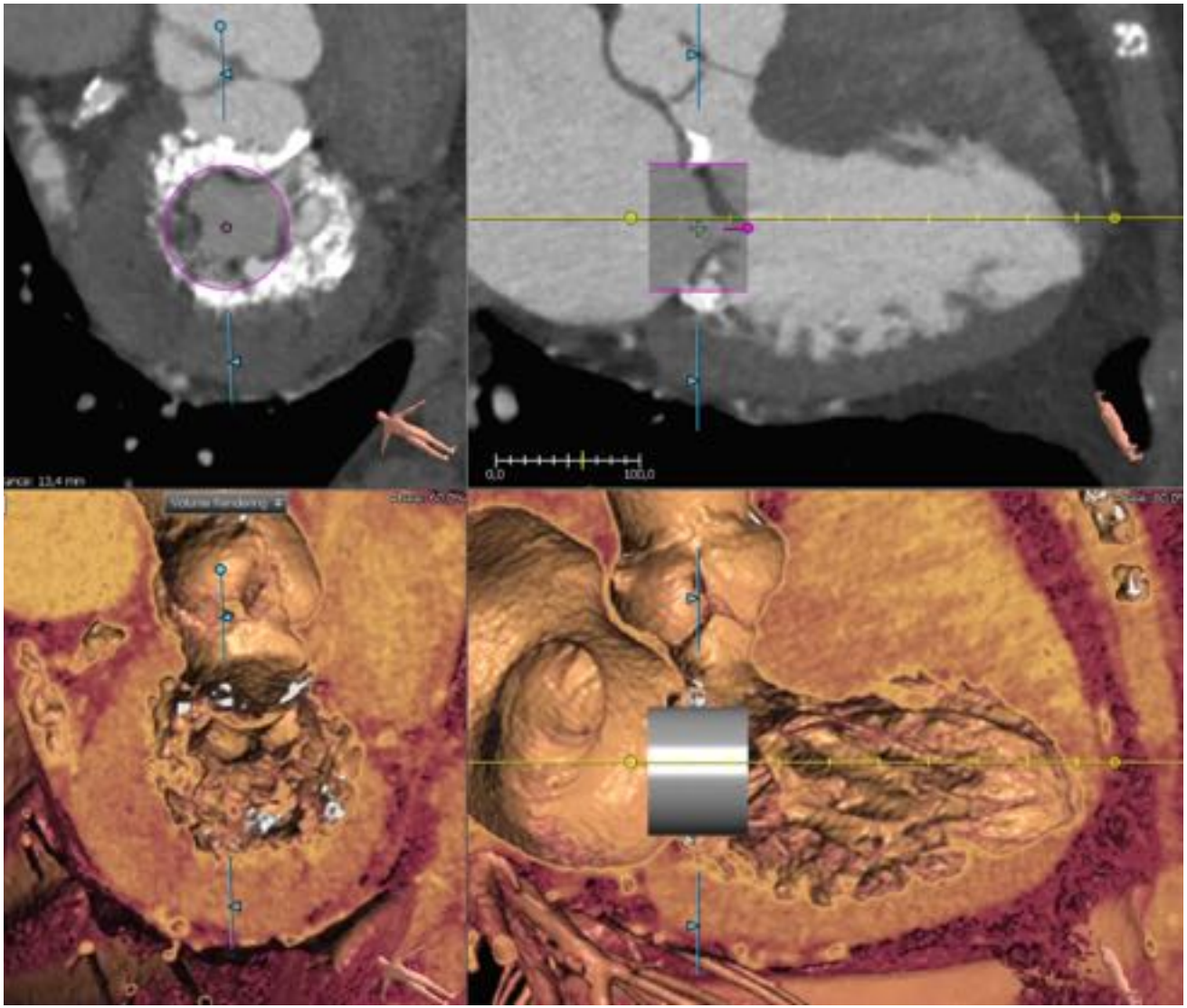

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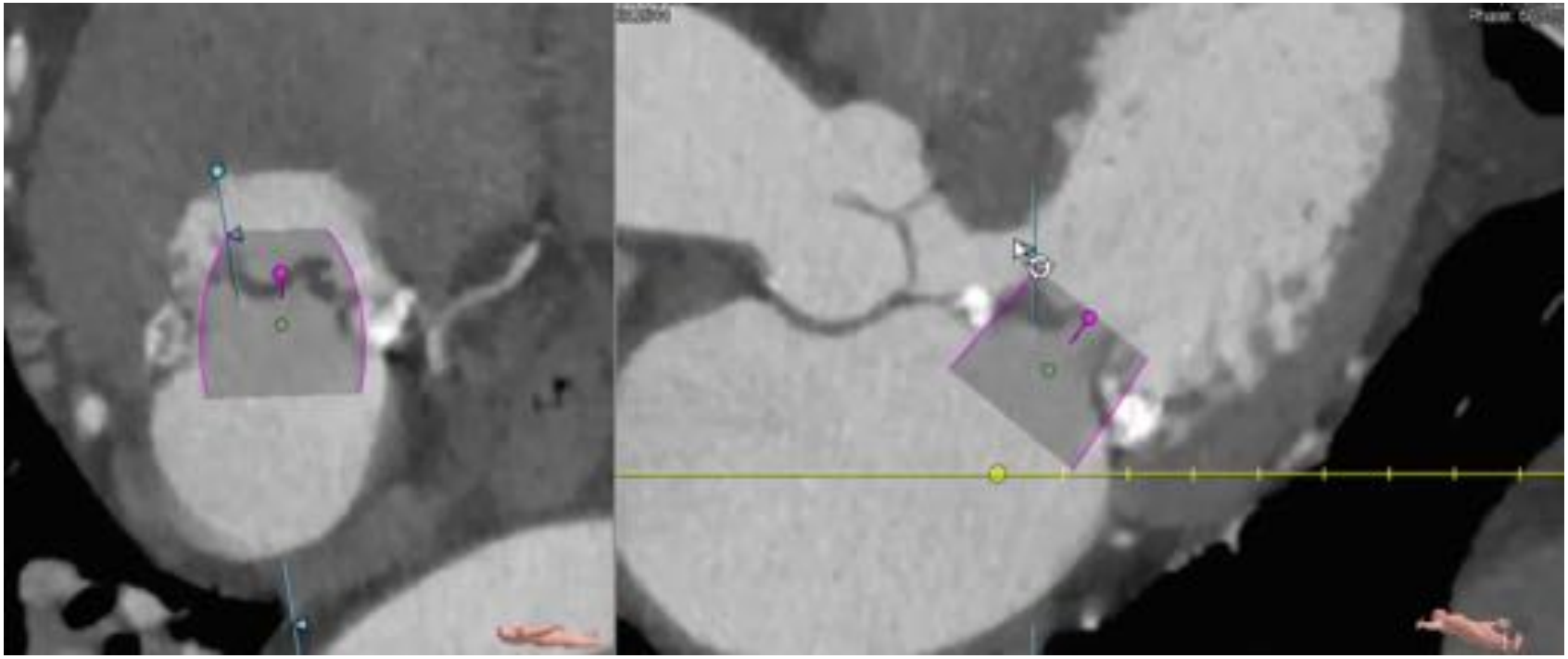

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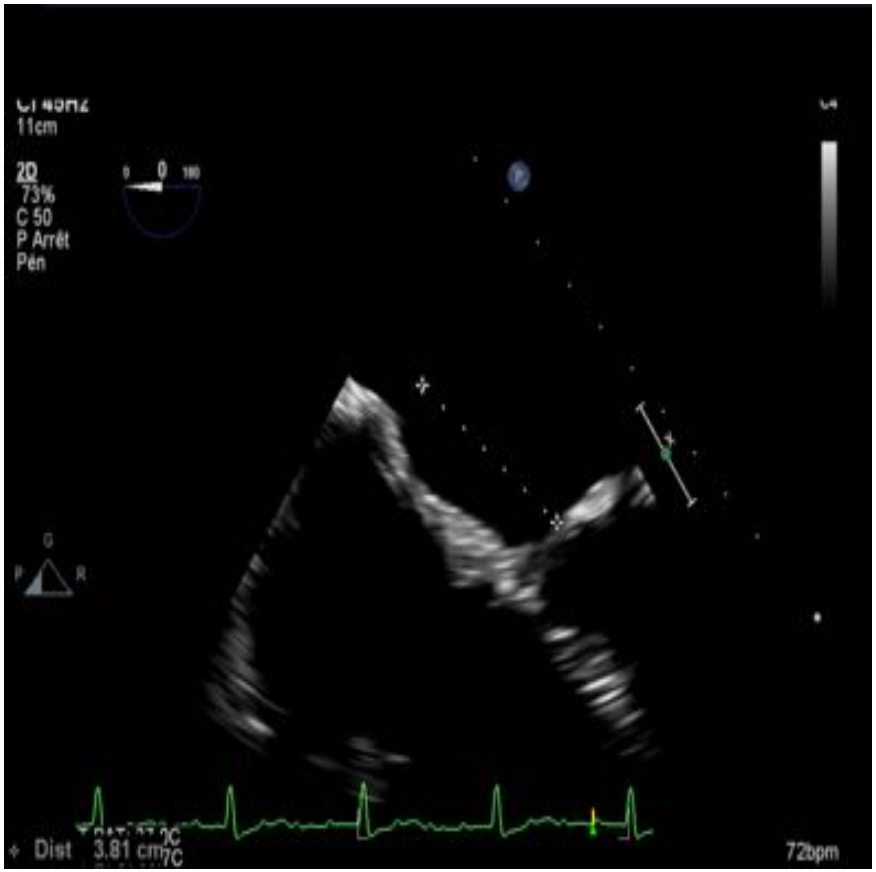

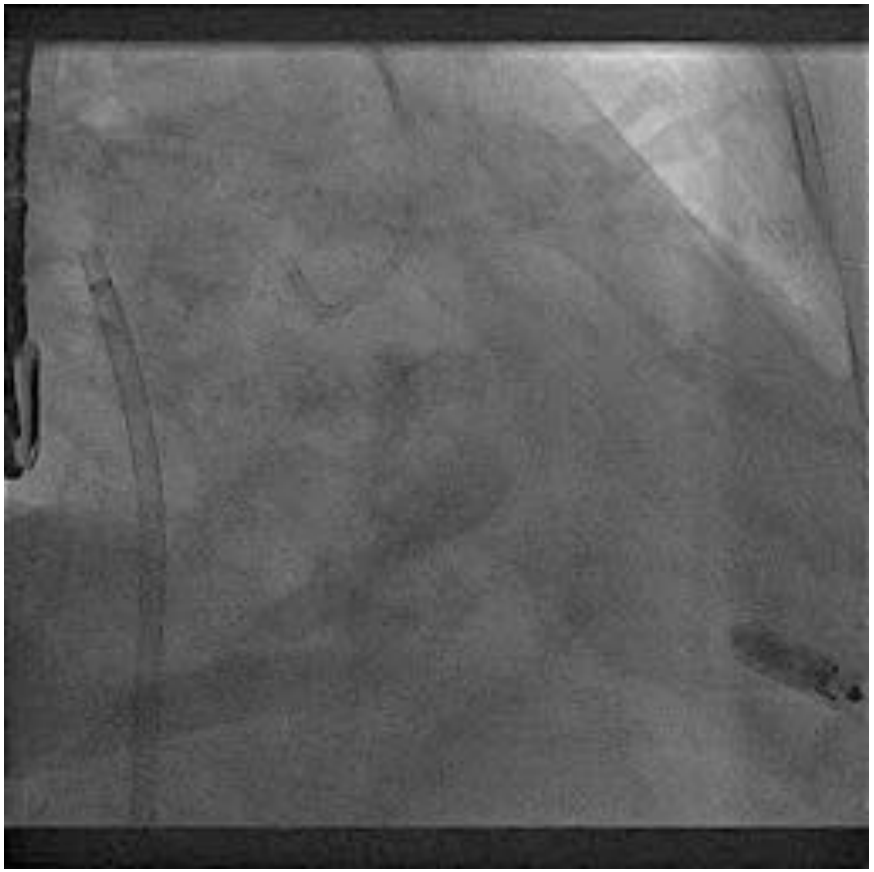

Cardiologue interventionnel : Dr M. Nejjari, CCN

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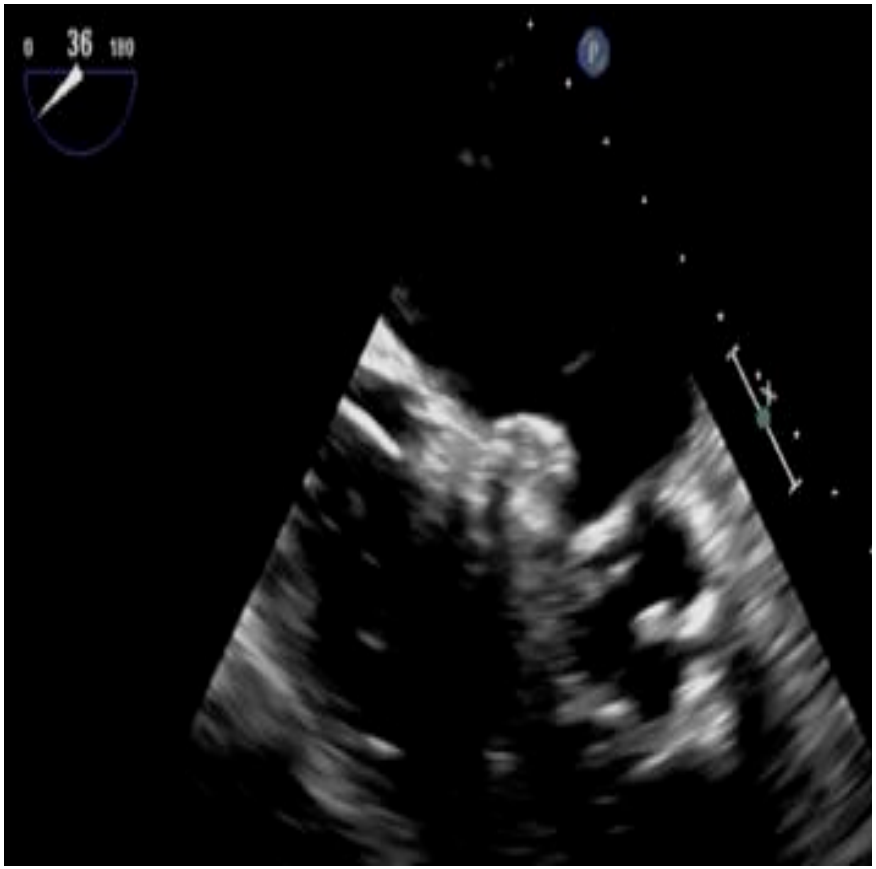

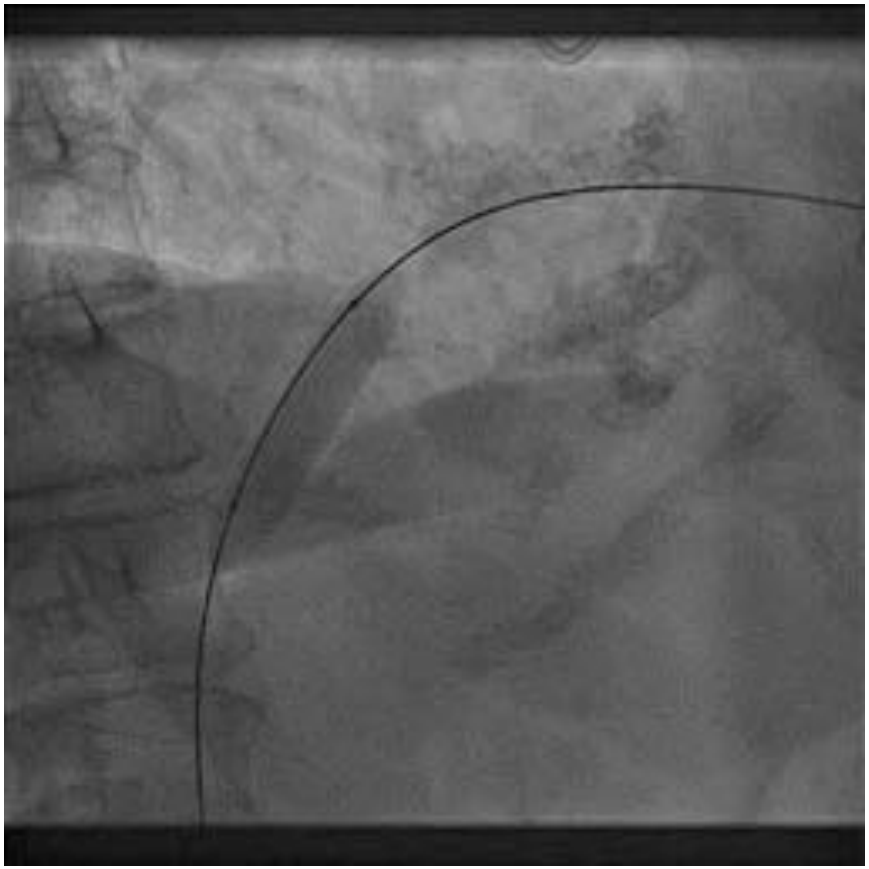

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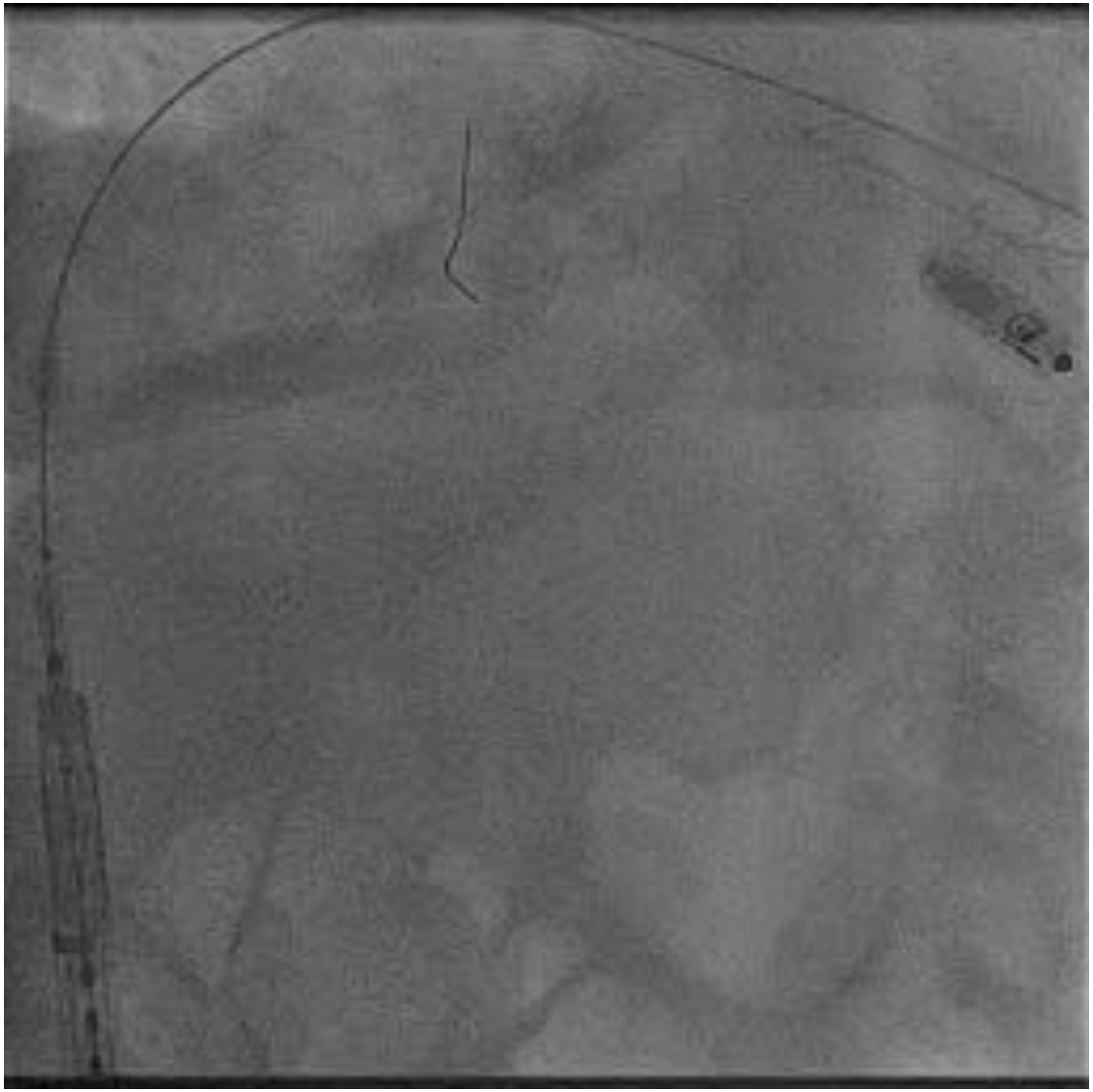

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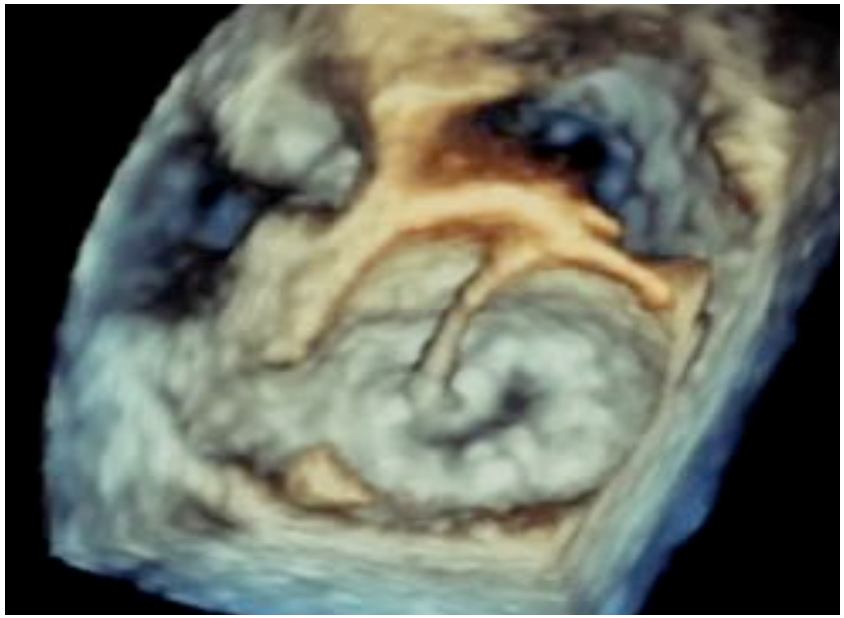

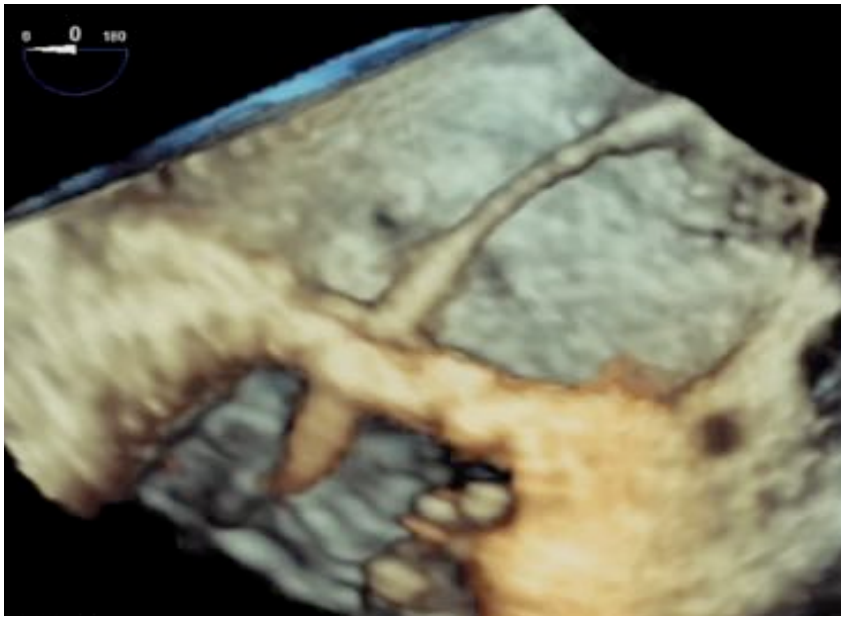

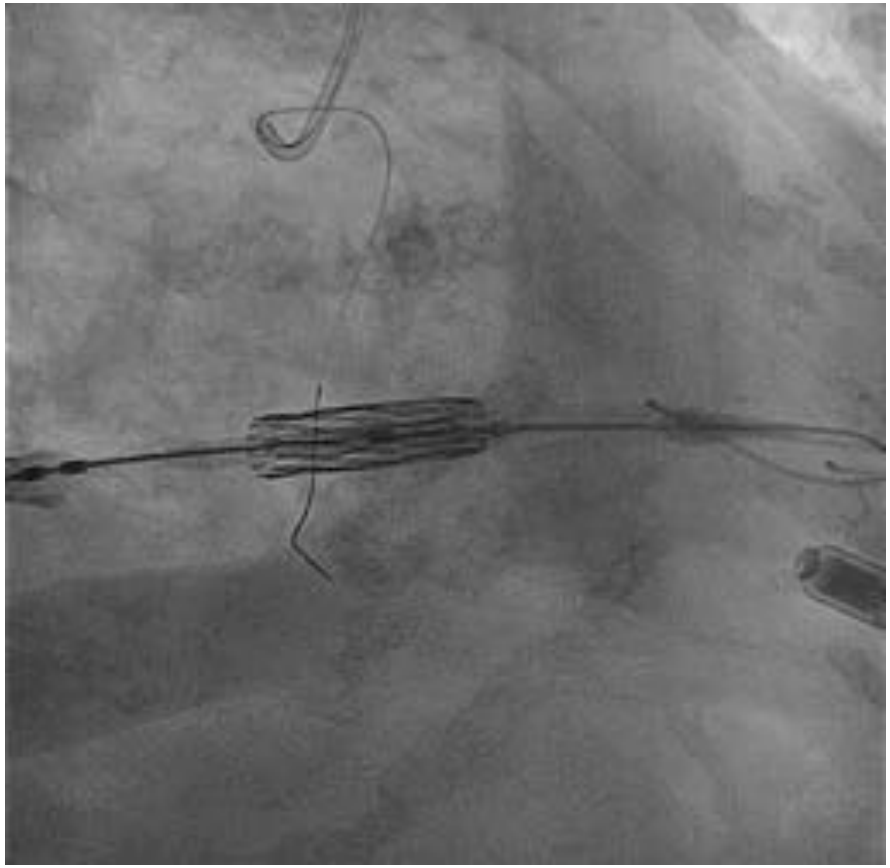

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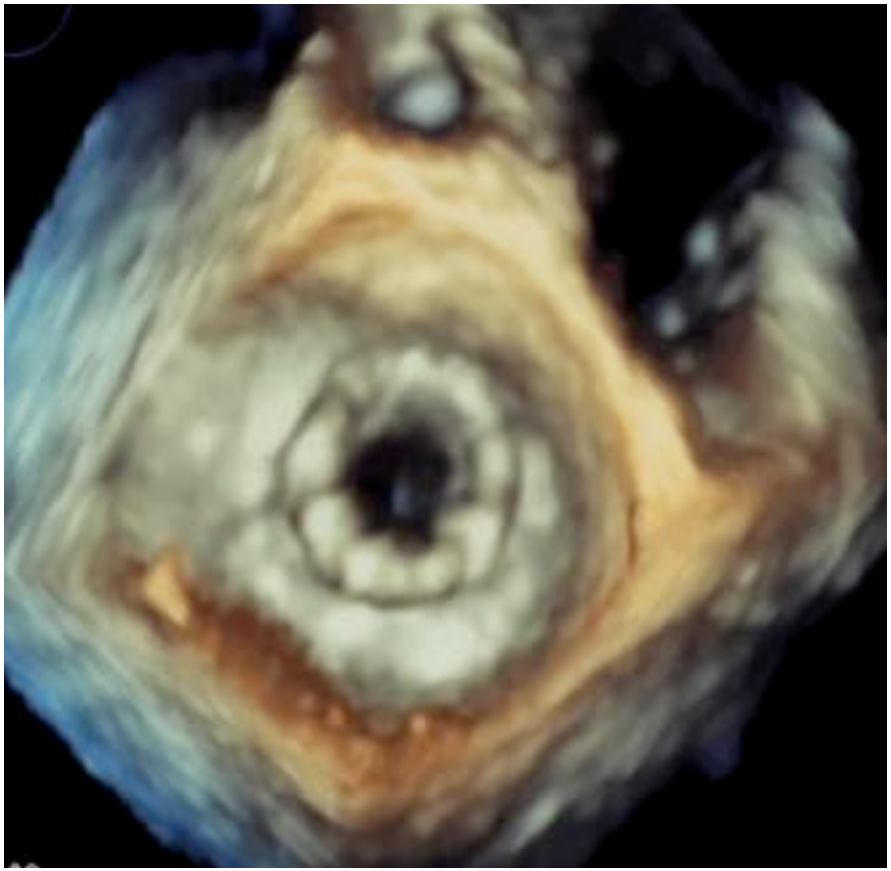

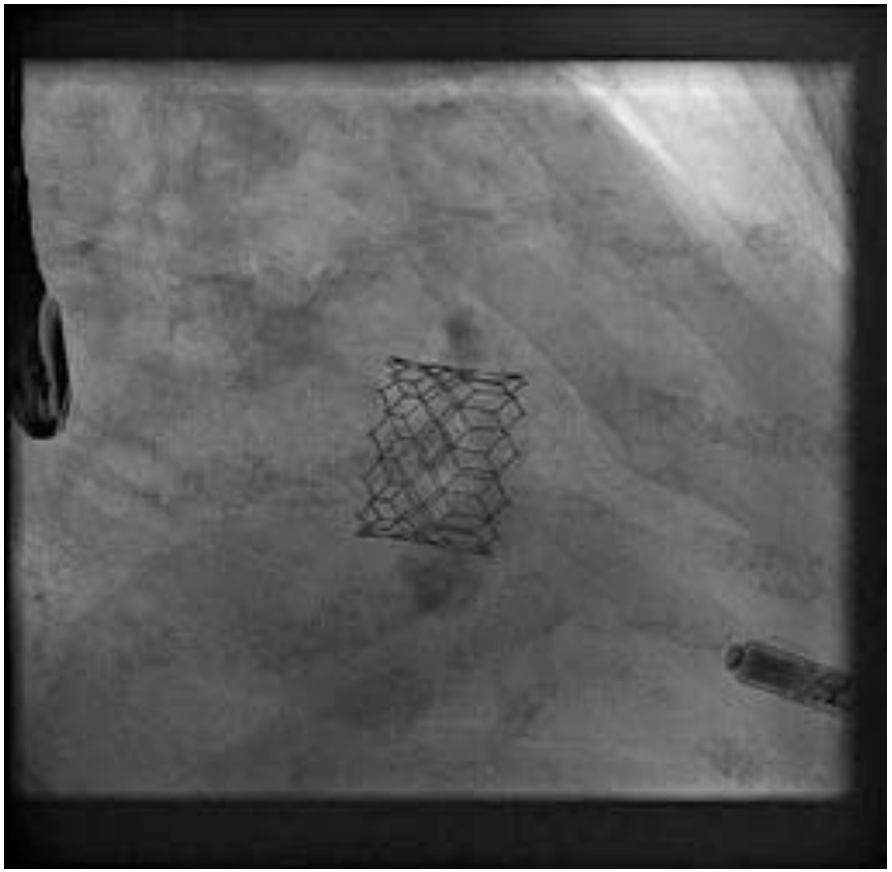

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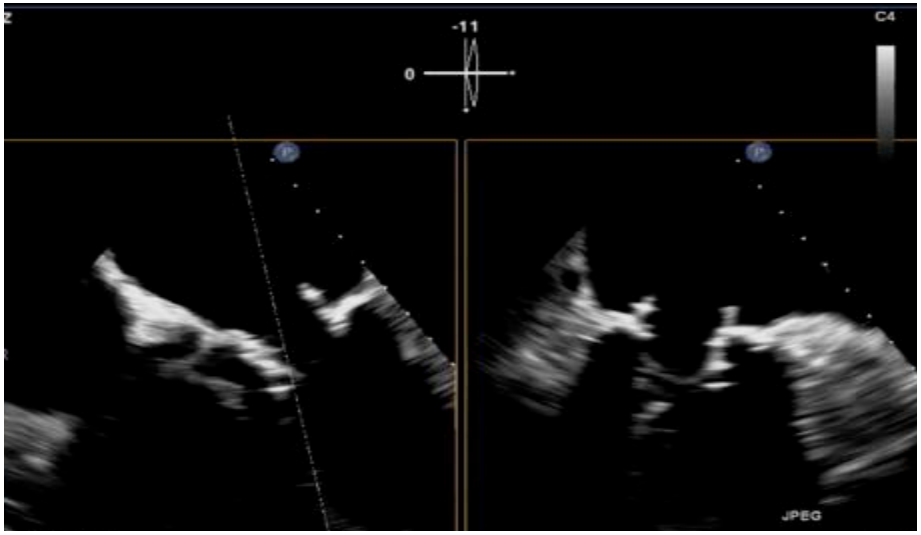

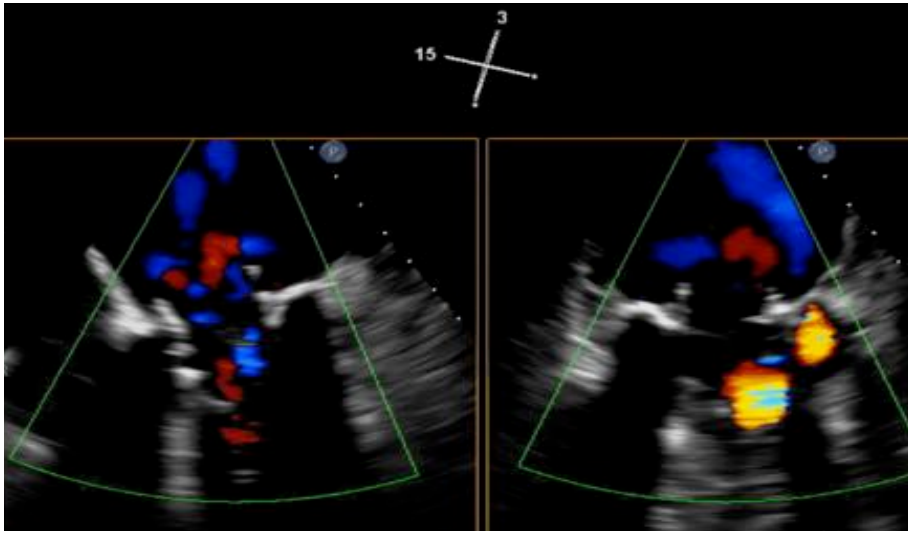

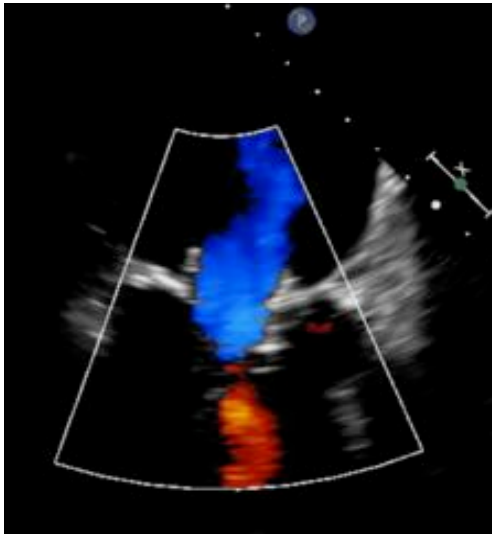

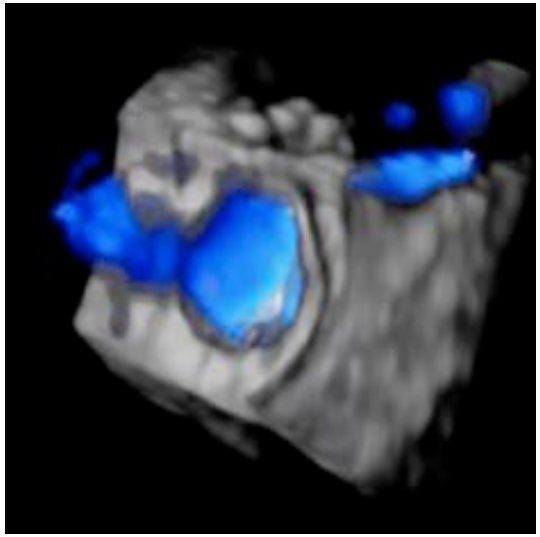

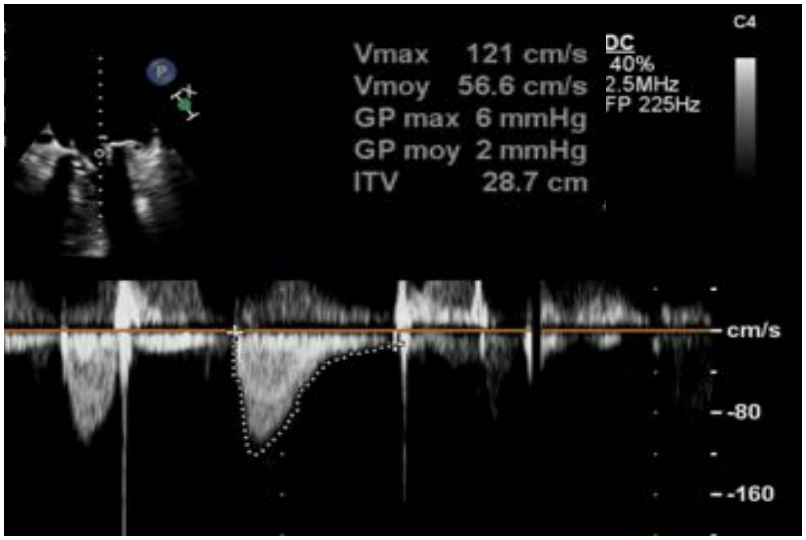

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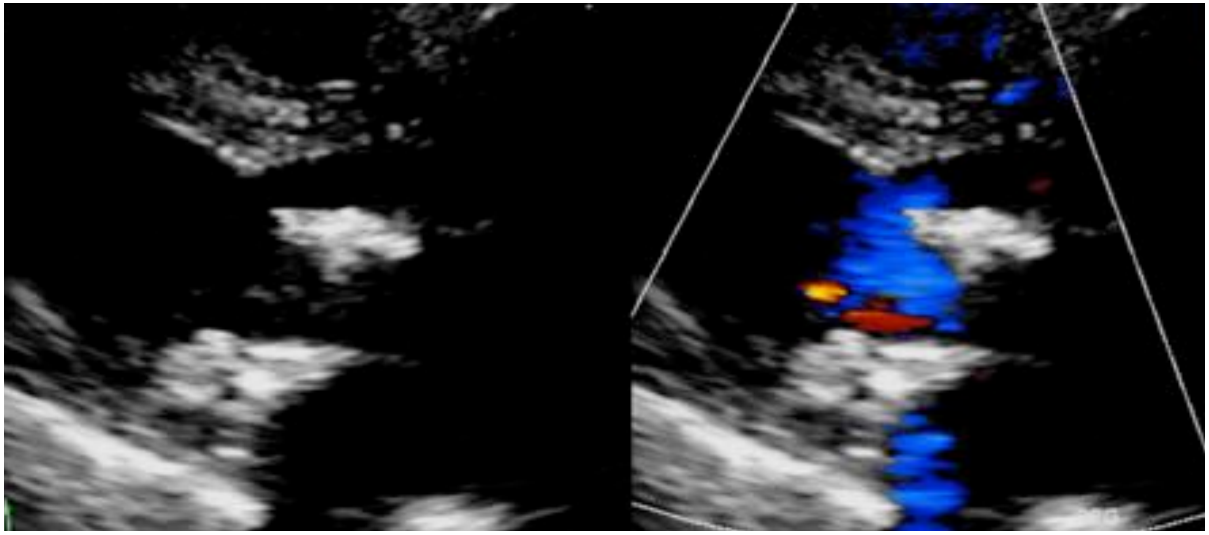

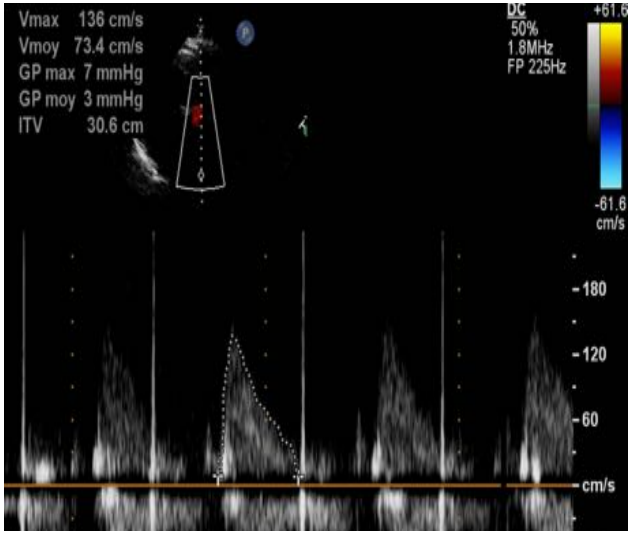

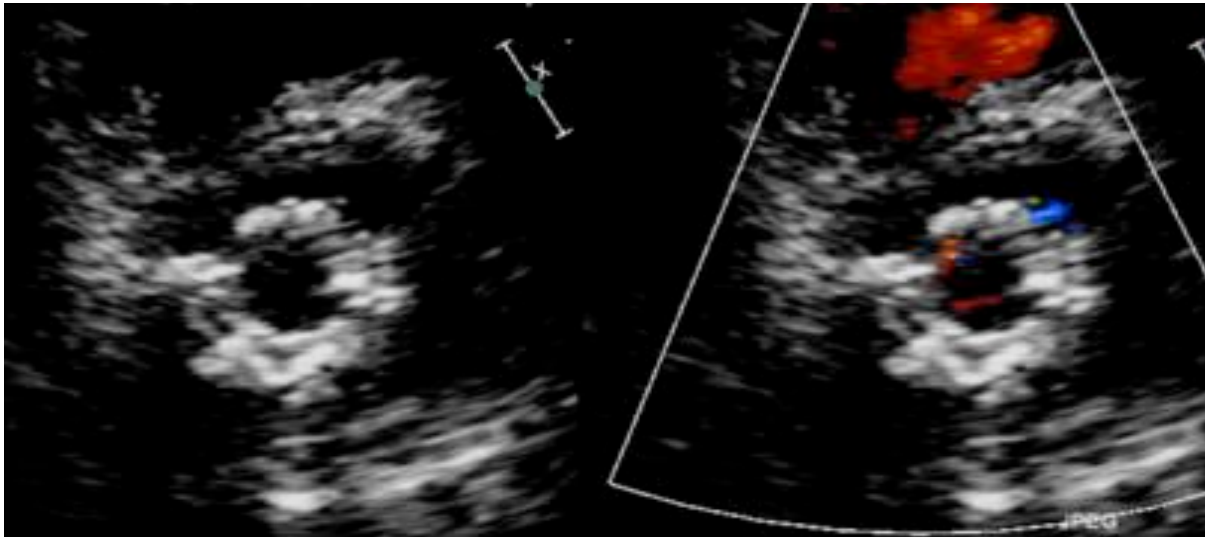

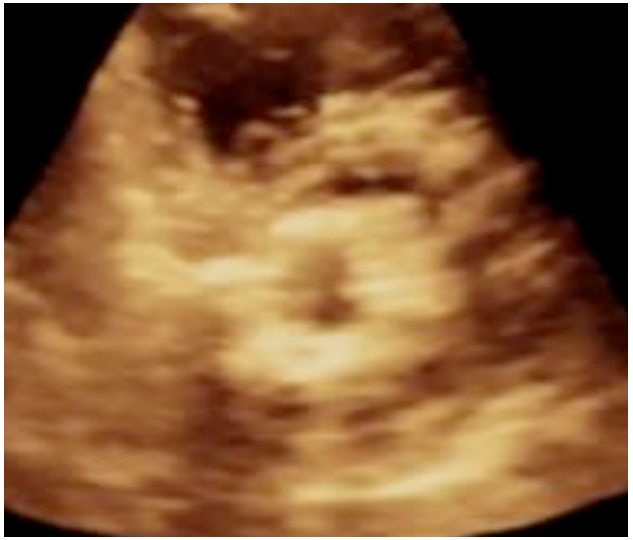

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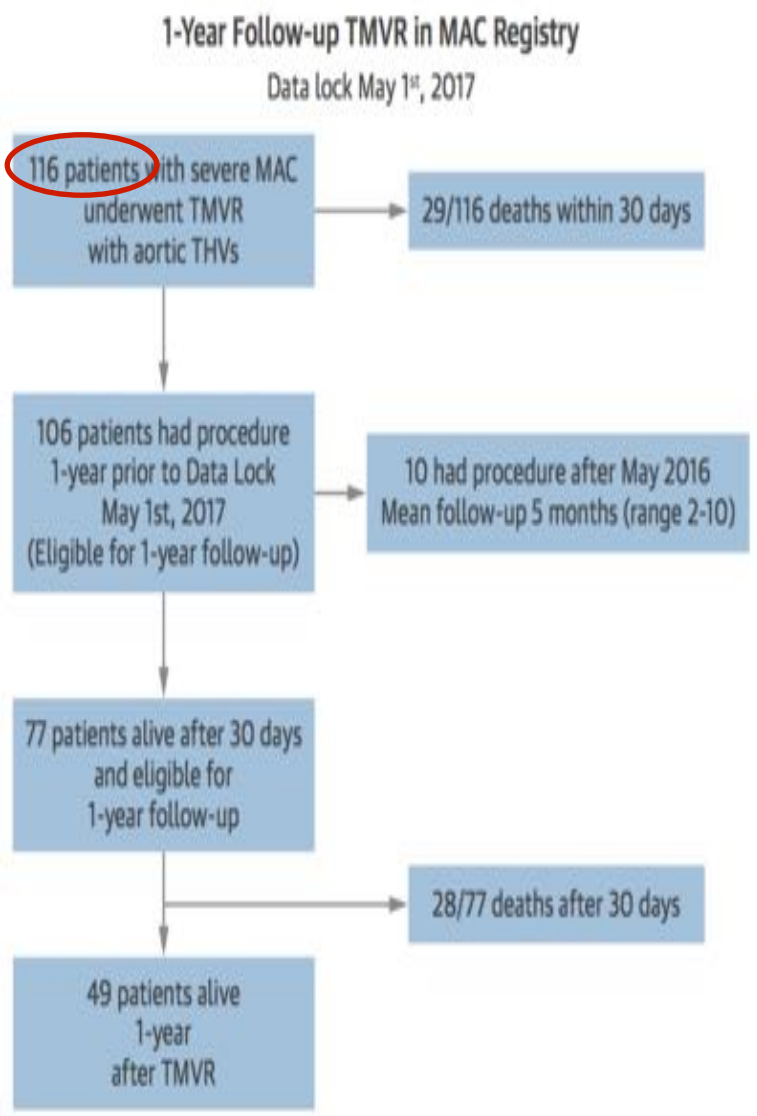
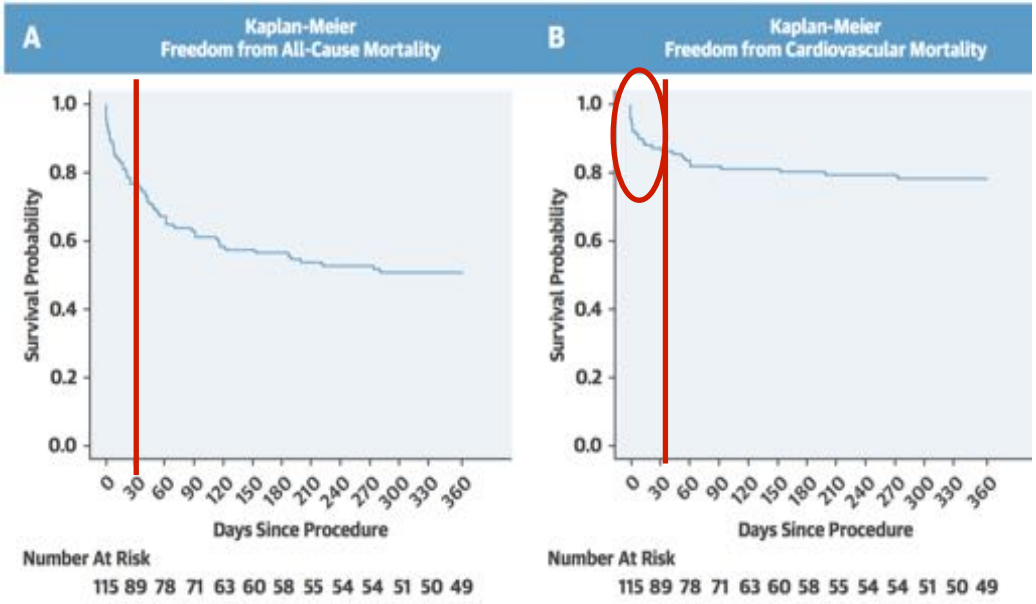


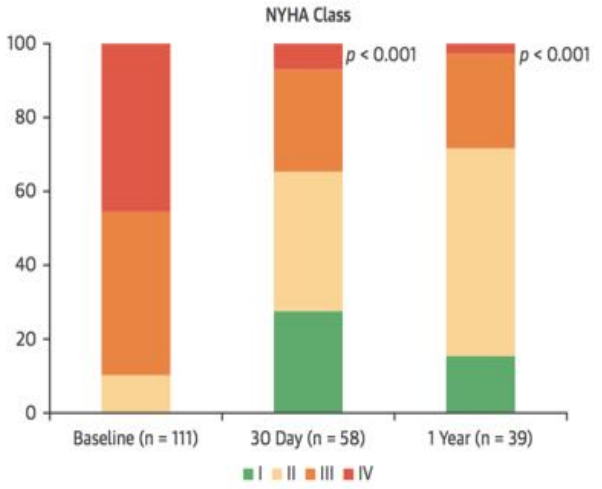


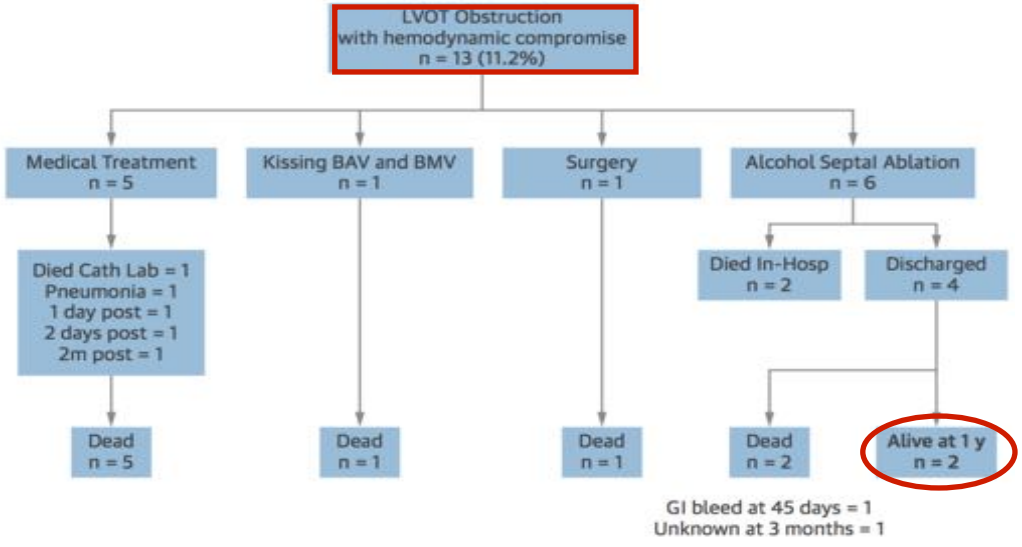
	First Half (n = 58)	Second Half (n = 58)	p Value*
Technical success	41 (70.7)	48 (82.8)	0.12
30-day mortality	18 (31.0)	11 (19.0)	0.07
Complications			
Valve embolization	4 (7.3)	1 (2.0)	0.11
LVOT obstruction	6 (12.8)	7 (13.2)	0.47
Need for second valve	11 (19.0)	6 (10.3)	0.09
Cardiac perforation	2 (3.6)	0 (0)	0.17
Conversion to surgery	4 (7.6)	0 (0)	0.04

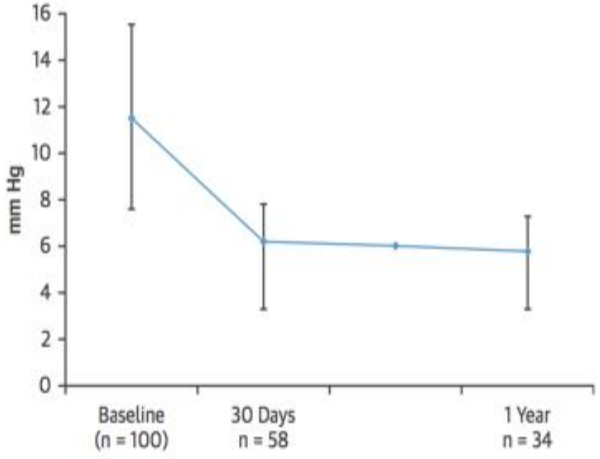
Guerrero M et al, JACC, 2018

RM dégénératif

	Univariate (Cox Regression)	
	HR (95% CI)	p Value
Age (1-yr increase)	1.03 (1.01-1.06)	0.028
Female	0.82 (0.48-1.42)	0.479
Chronic renal failure	1.51 (0.88-2.57)	0.131
Home oxygen	1.05 (0.52-2.09)	0.893
STS score (1-U increase)	1.02 (0.99-1.05)	0.062
NYHA functional class III–IV vs. I–II	3.98 (1.24-12.75)	0.019
Technical success (yes vs. no)	0.23 (0.12-0.44)	<0.0001
LVOT obstruction	3.56 (1.81-7.01)	0.0002
Valve embolization	2.93 (1.16-7.42)	0.023
Conversion to surgery	3.31 (1.18-9.27)	0.022
Residual MR ≥3 (+)	1.91 (0.59-6.14)	0.276
Need for second valve	1.34 (0.68-2.66)	0.393







Guerrero M et al, JACC, 2018

TAVI valve-in-valve
vs.
Chirurgie redux .....
pour les bioprothèses MITRALES ET AORTIQUES dégénérées en même temps....

Interactive CardioVascular and Thoracic Surgery Advance Access published May 30, 2016

First-in-man full percutaneous transfemoral valve-in-valve implantations using Edwards SAPIEN 3 prostheses to treat a patient with degenerated mitral and aortic bioprostheses

Mohammed Nejjari[a], Dominique Himbert[b], Eric Brochet[b] and David Attias[a,*]

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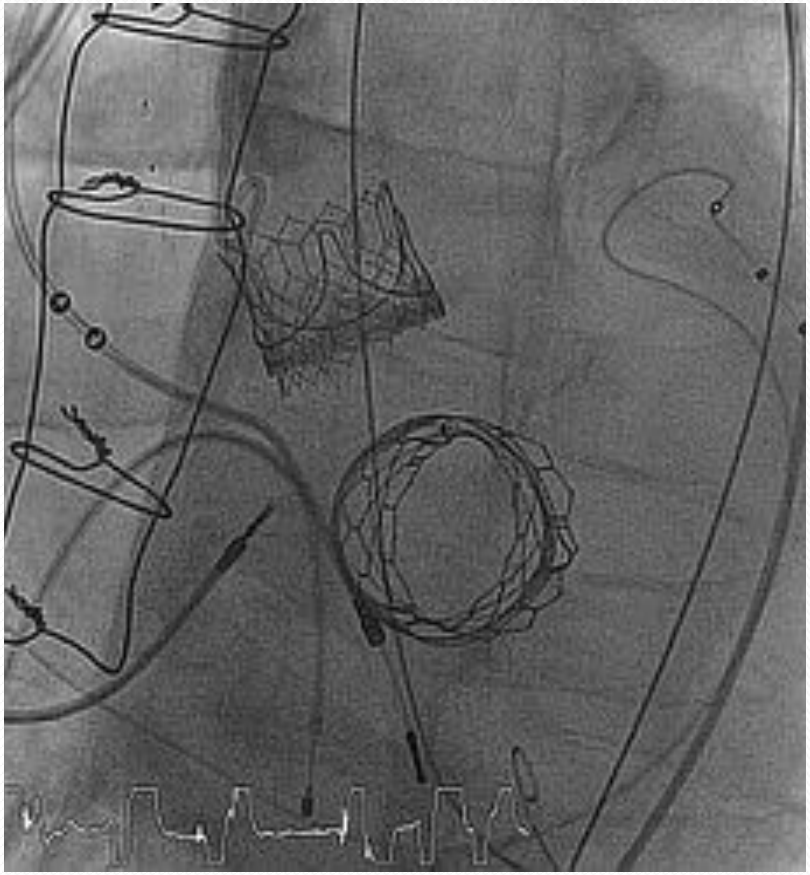

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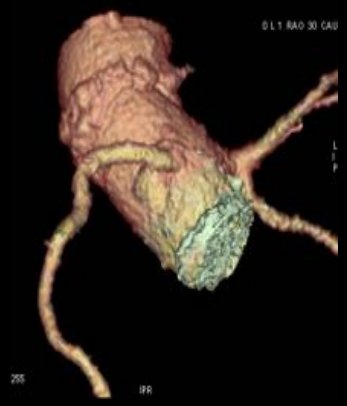
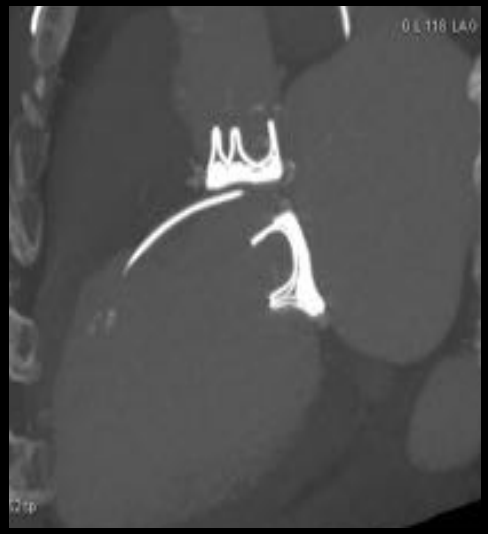
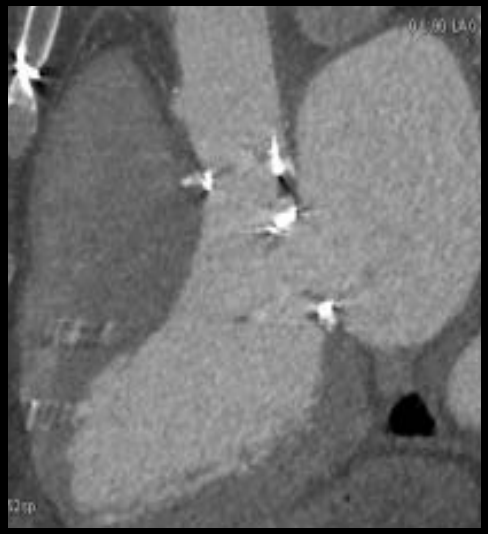
SCANNER PRE TAVI

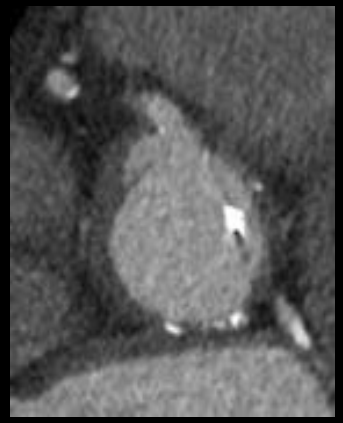


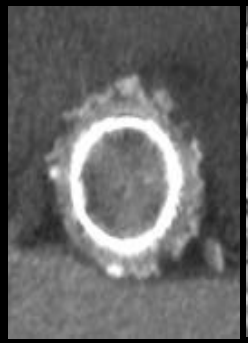


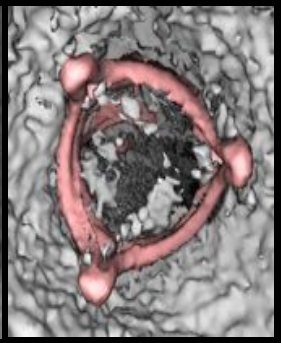
Bioprothèse aortique

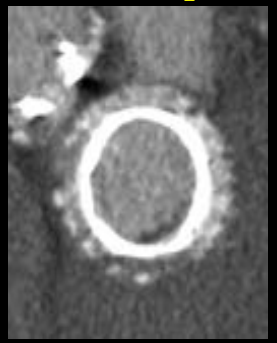


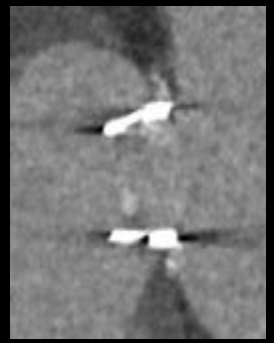
Bioprothèse mitrale

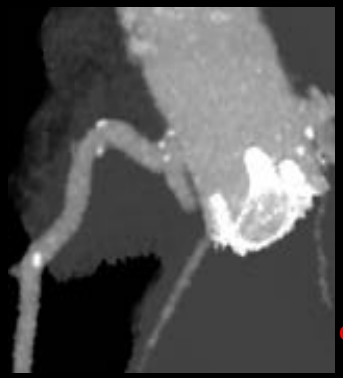


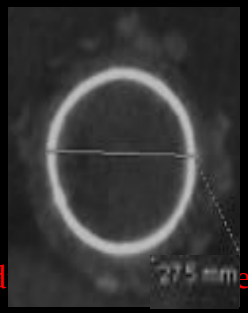












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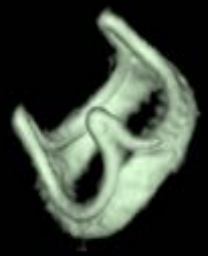
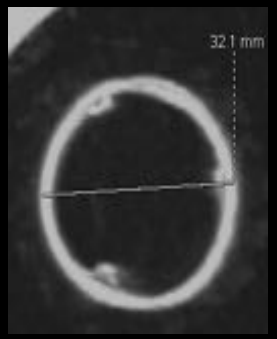
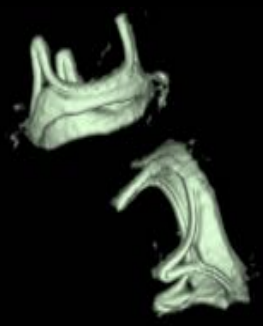
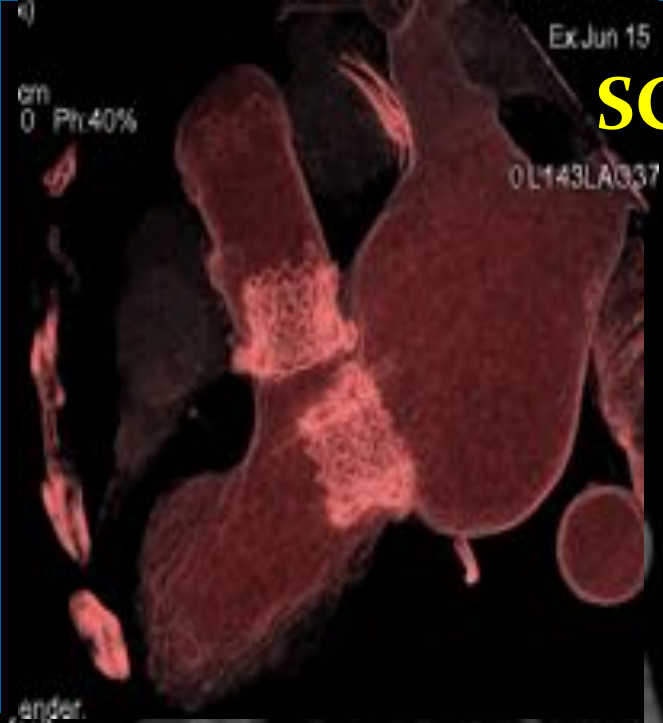
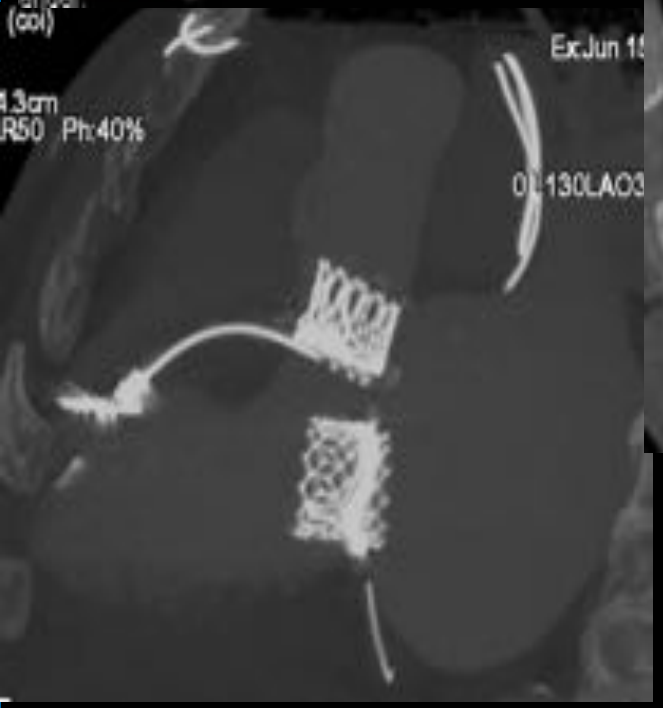


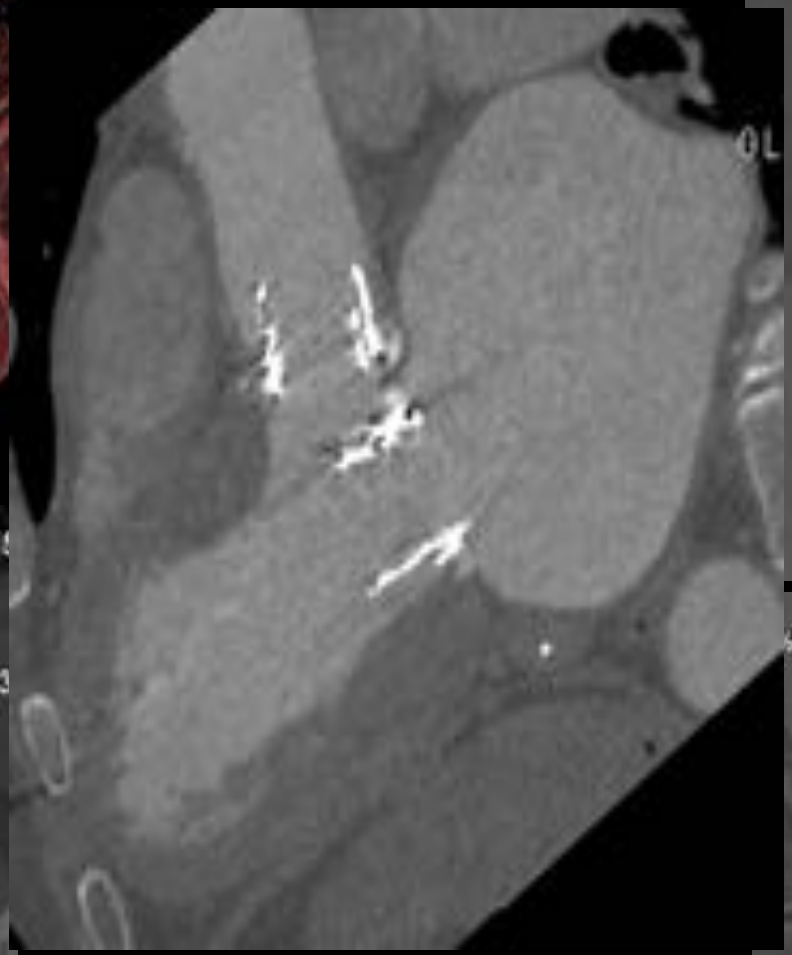


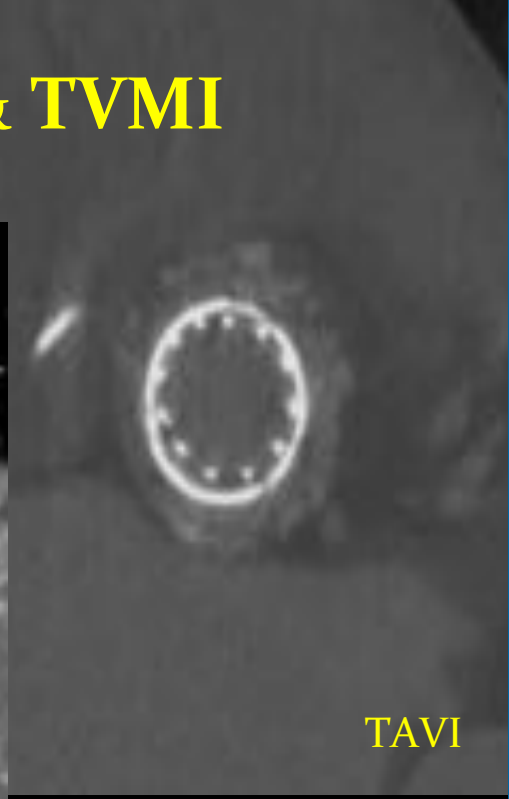


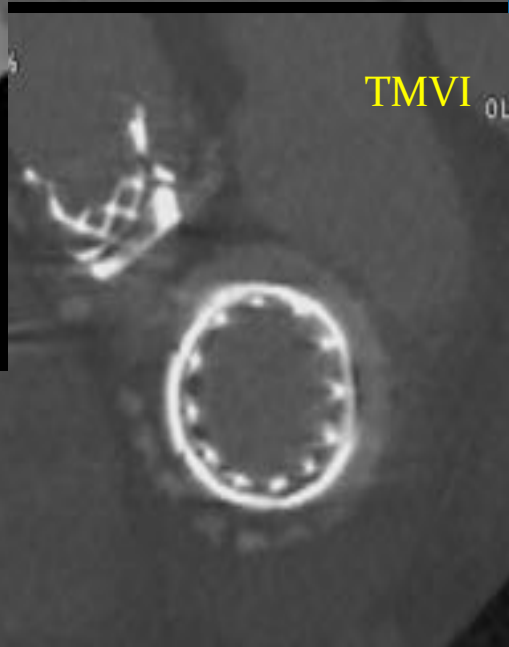
SCANNER POST TAVI & TVMI



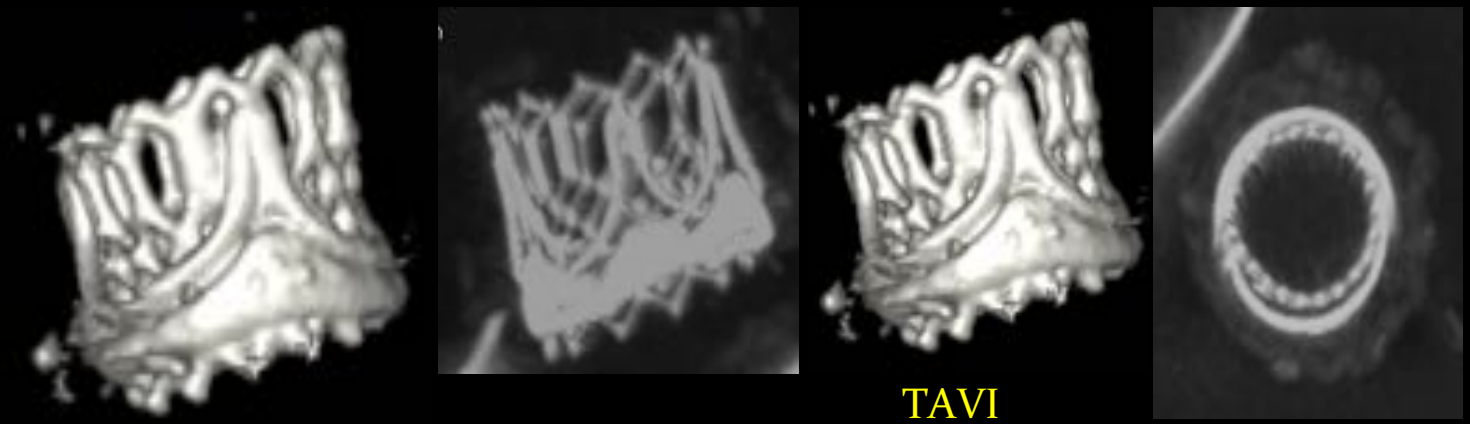






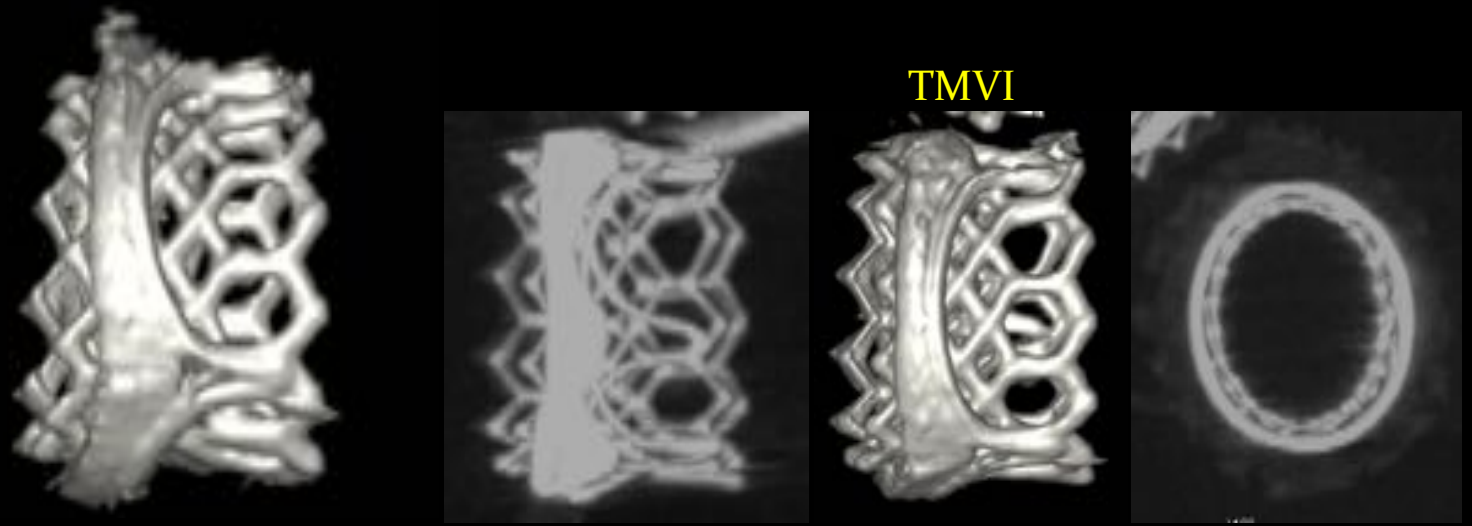


SCANNER POST TAVI & TVMI



TAVI

TMVI



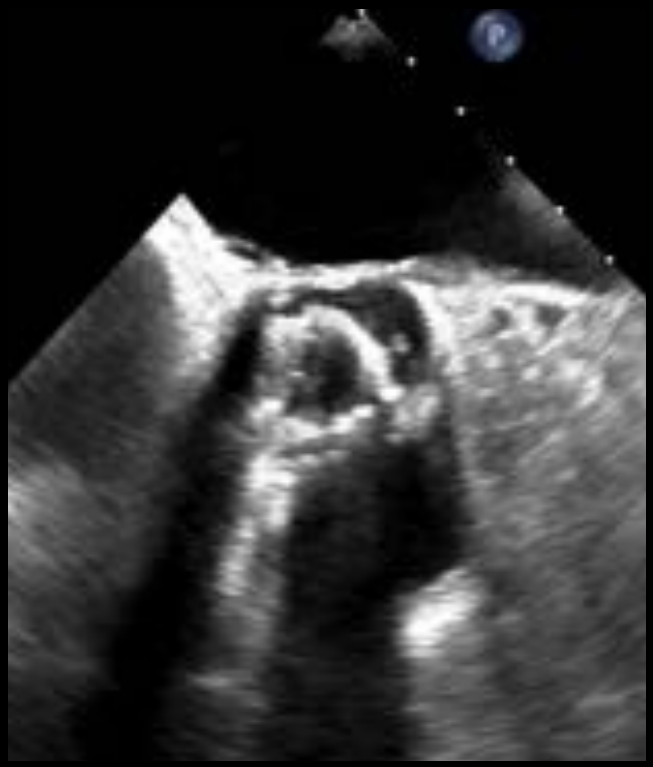
Des nouvelles de notre patiente ….

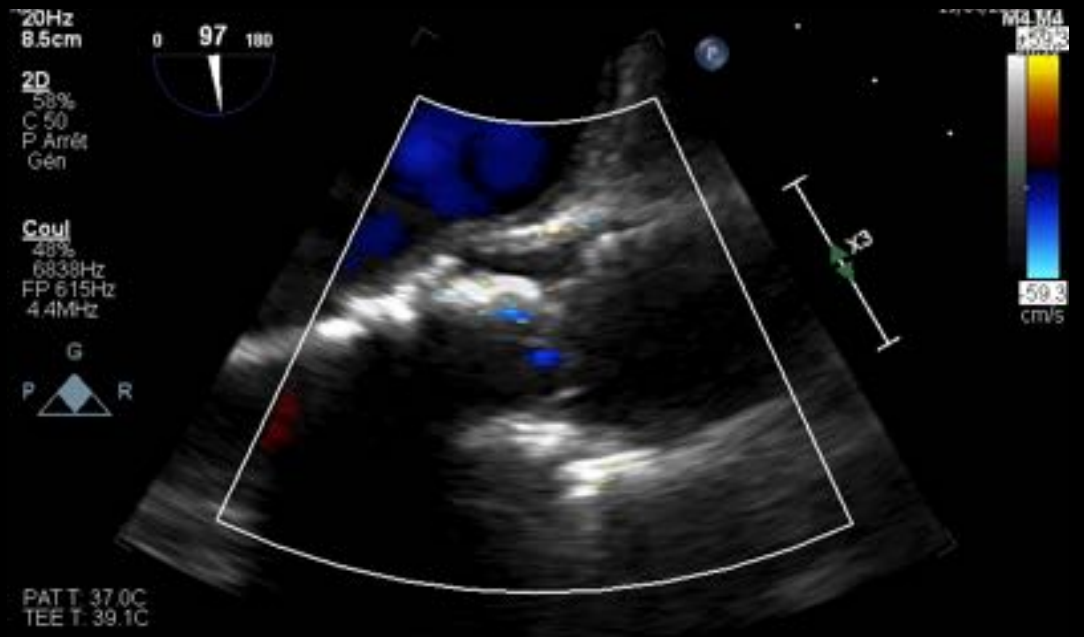
Suivi 2 ans plus tard, dyspnée d'effort NYHA II

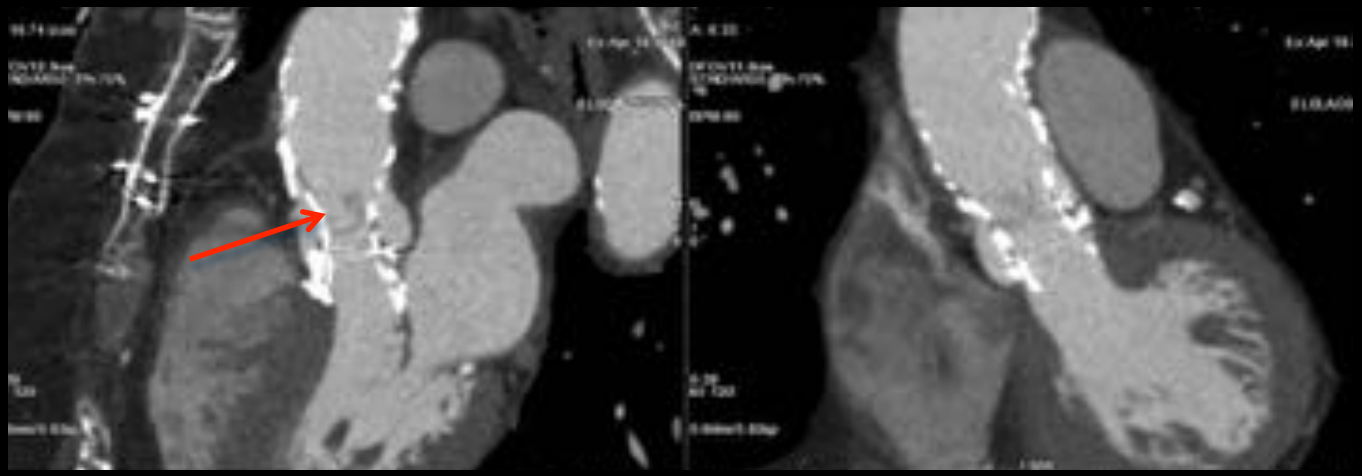
ETT :

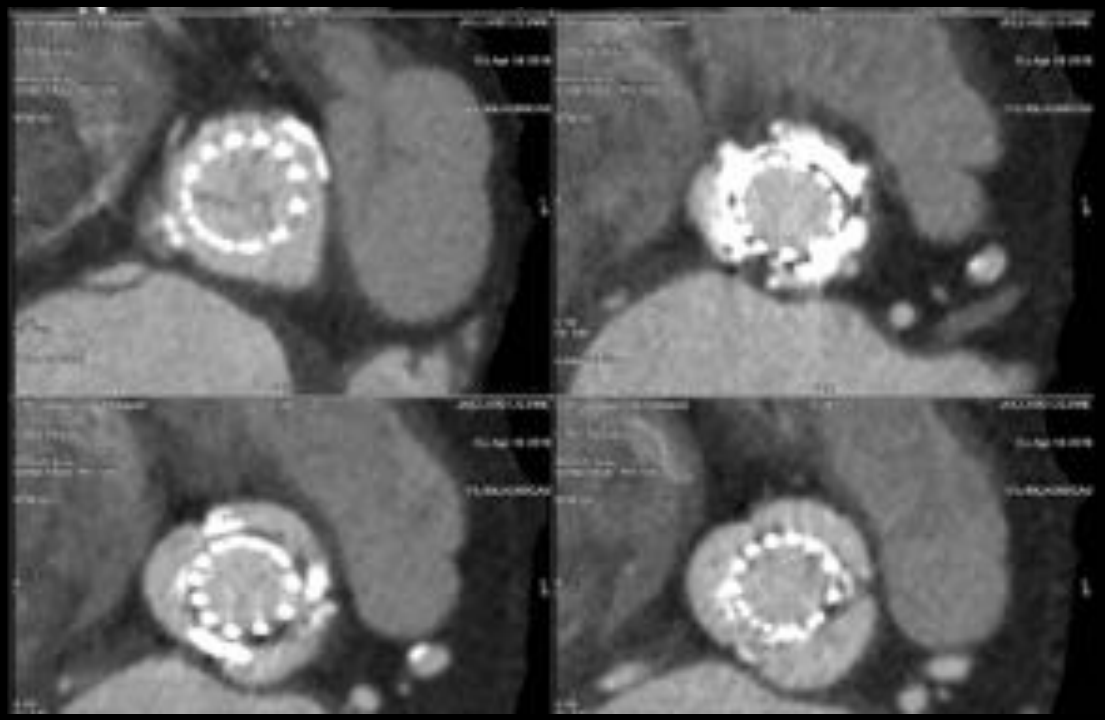
- TAVI valve-in-valve, dont le gradient moyen s'est élevé / 2017, actuellement à 38 mmHg versus 8 mmHg
- Pas de fuite visible.
- Pas de masse visualisée sur les valves.
- FEVG normale, PAPs à 37 mmHg

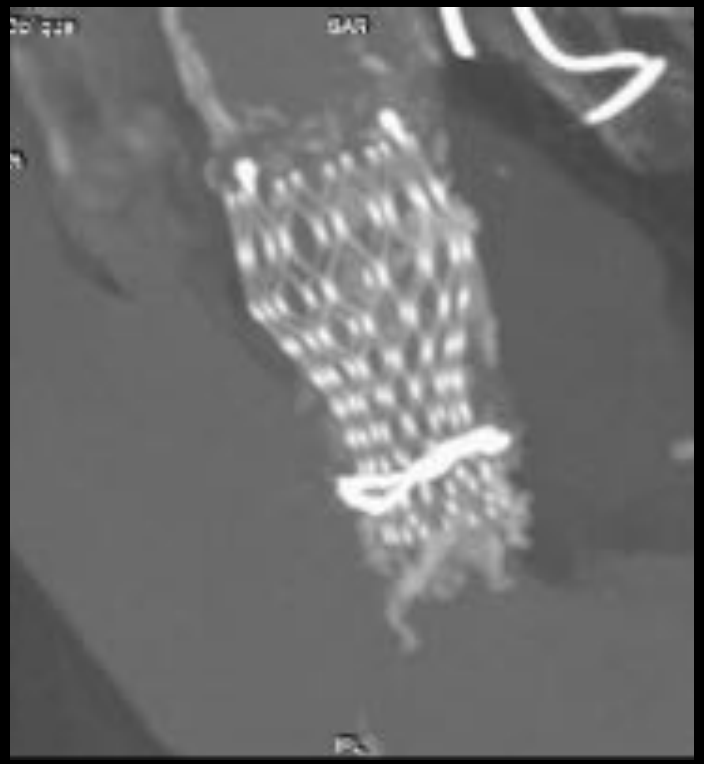
ETO











Suivi post-TAVI

Patient vu à 6 mois post-TAVI: augmentation du gradient moyen significative par rapport à l'ETT de référence post-TAVI. Quelles hypothèses évoquer ?

A. Anémie
B. Hypovolémie
C. Hyperthyroïdie
D. Thrombose TAVI
E. Dégénérescence précoce TAVI
F. Endocardite infectieuse

Patient vu à 6 mois post-TAVI: augmentation du gradient moyen significative par rapport à l'ETT de référence post-TAVI. Quelles hypothèses évoquer ?

A. Anémie
B. Hypovolémie
C. Hyperthyroïdie

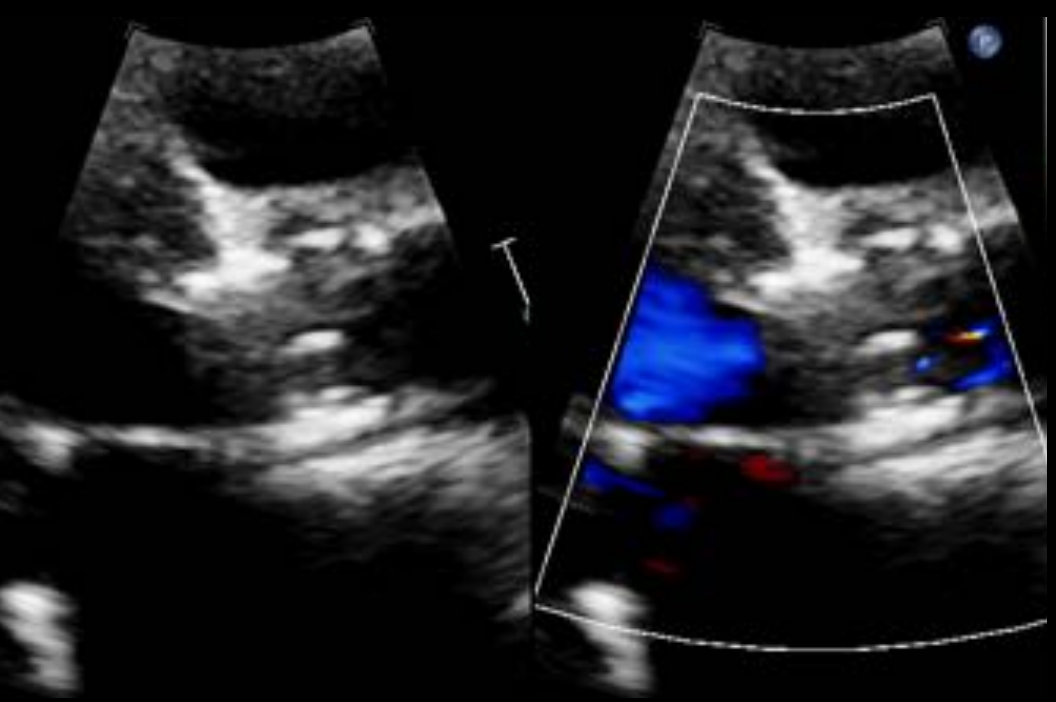
} « Etiologies fonctionnelles »

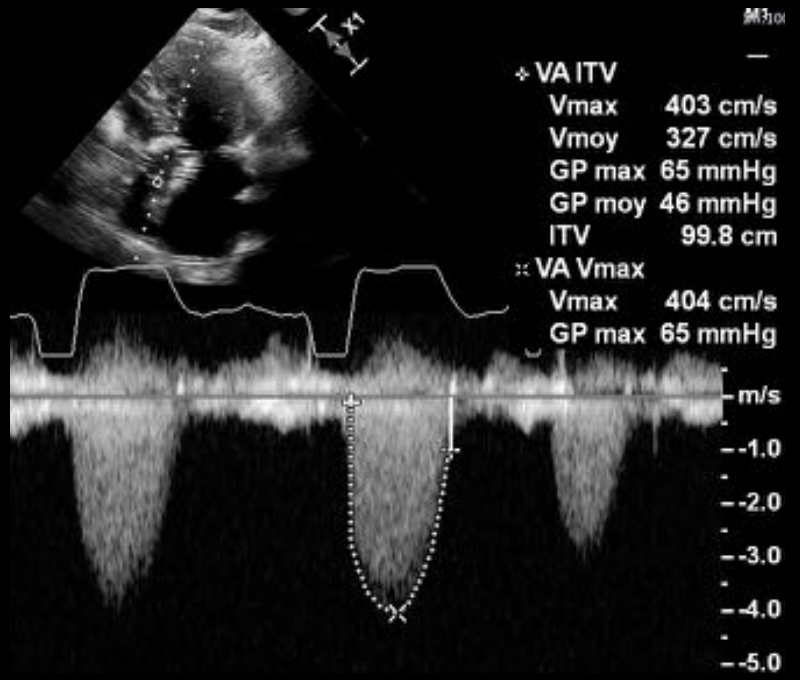
D. Thrombose TAVI
E. Dégénérescence précoce TAVI
F. Endocardite infectieuse

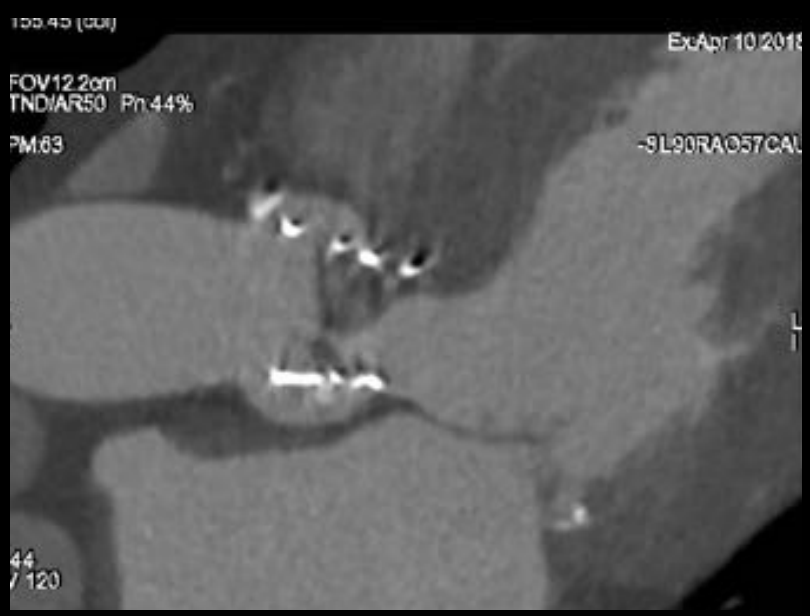
} « Etiologies organiques »

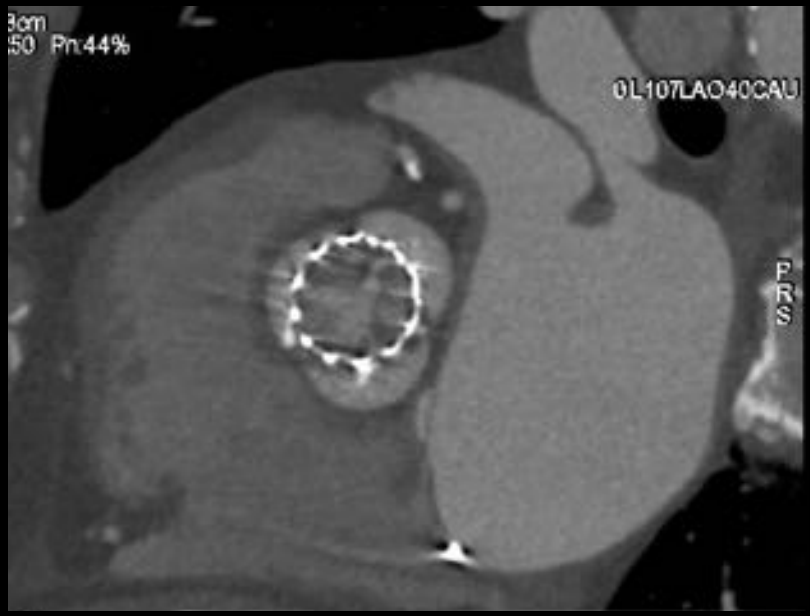
Look at the cusps !

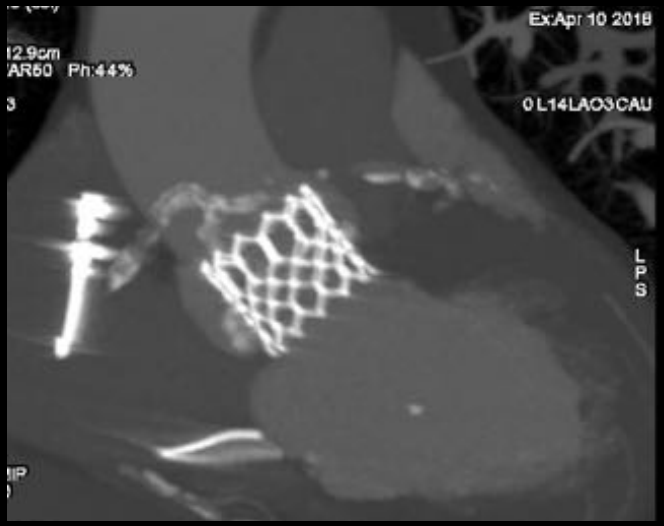
- Patient 83 ans
- TAVI Sapien Edwards S3 26 mm le 04/09/2017 ; gradient moyen à 11 mmHg à la sortie
- 04/2018 : Dyspnée d'effort depuis 2 mois
- Augmentation du gradient moyen à 46 mmHg, FEVG normale

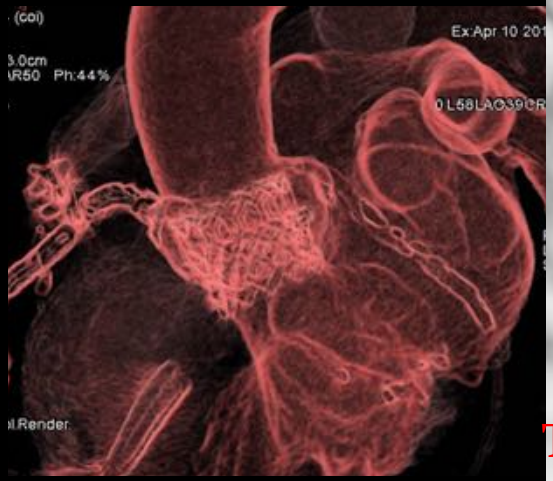


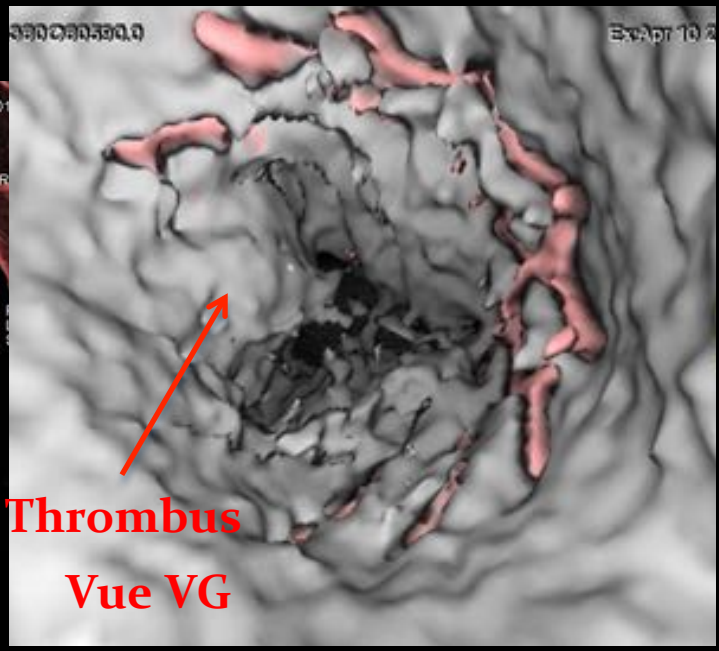



FOV12.2cm
TND/AR50 Ph:44%
PM:63
44
/ 120

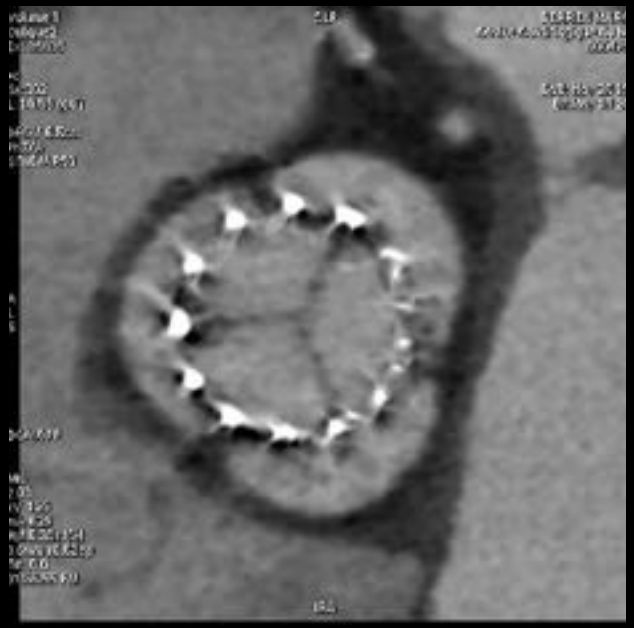

Ph:44%
0 L107LAO40CAU
R
S

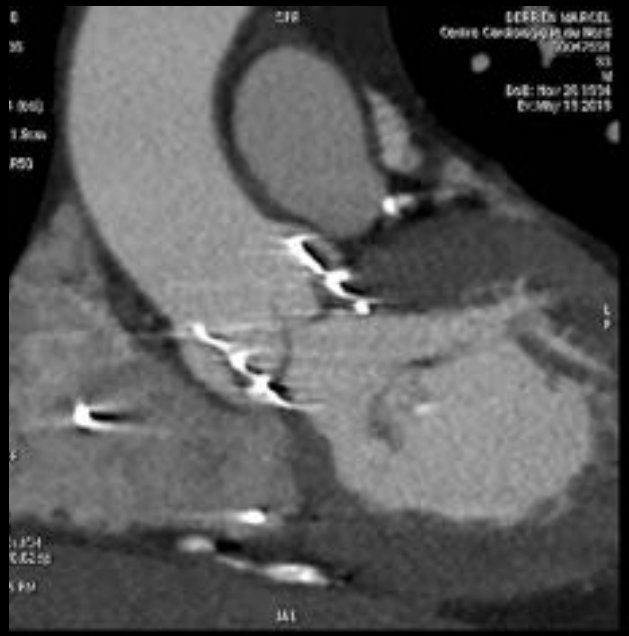

Ex:Apr 10 2018
Ph:44%
0 L14LAO3CAU
L
P
S


Ex:Apr 10 201
Ph:44%


Thrombus
Vue VG

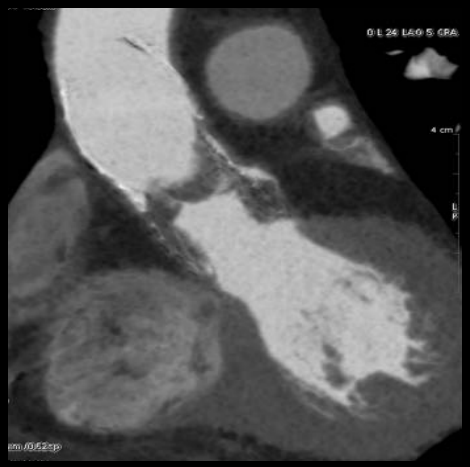
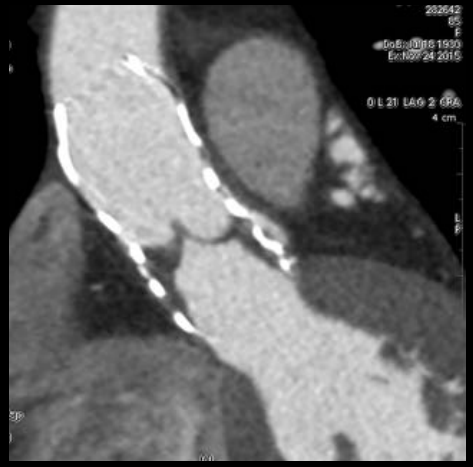
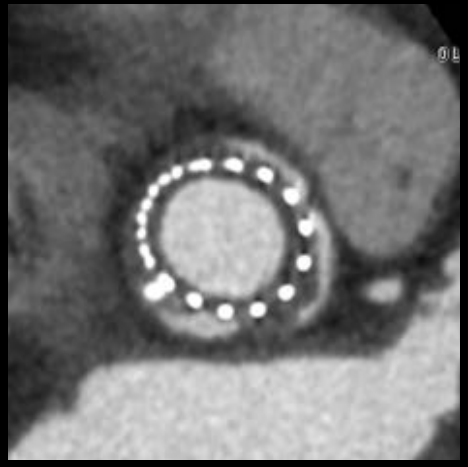
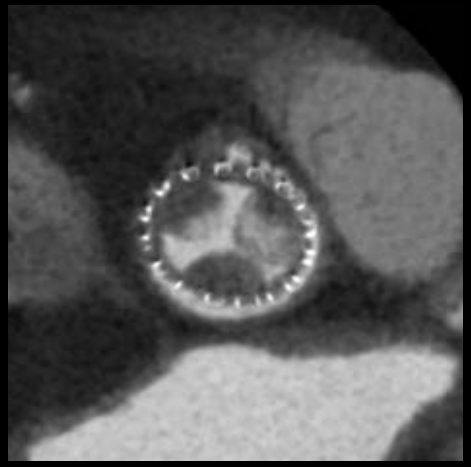
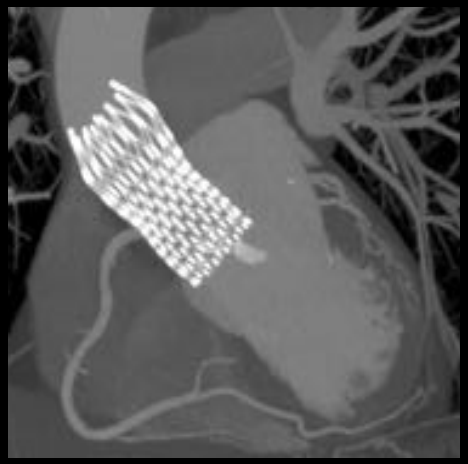
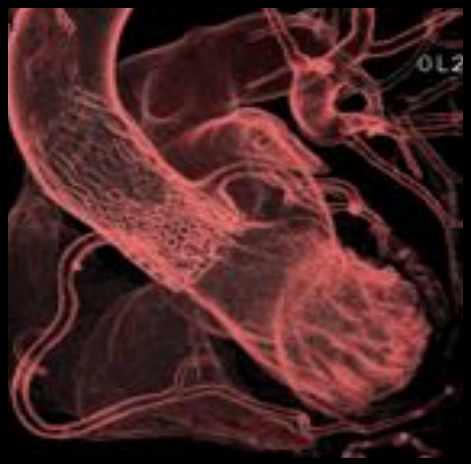
- Après 1 mois d'anticoagulant:
- Normalisation du gradient moyen à 12 mmHg
- Disparition du thrombus au scanner



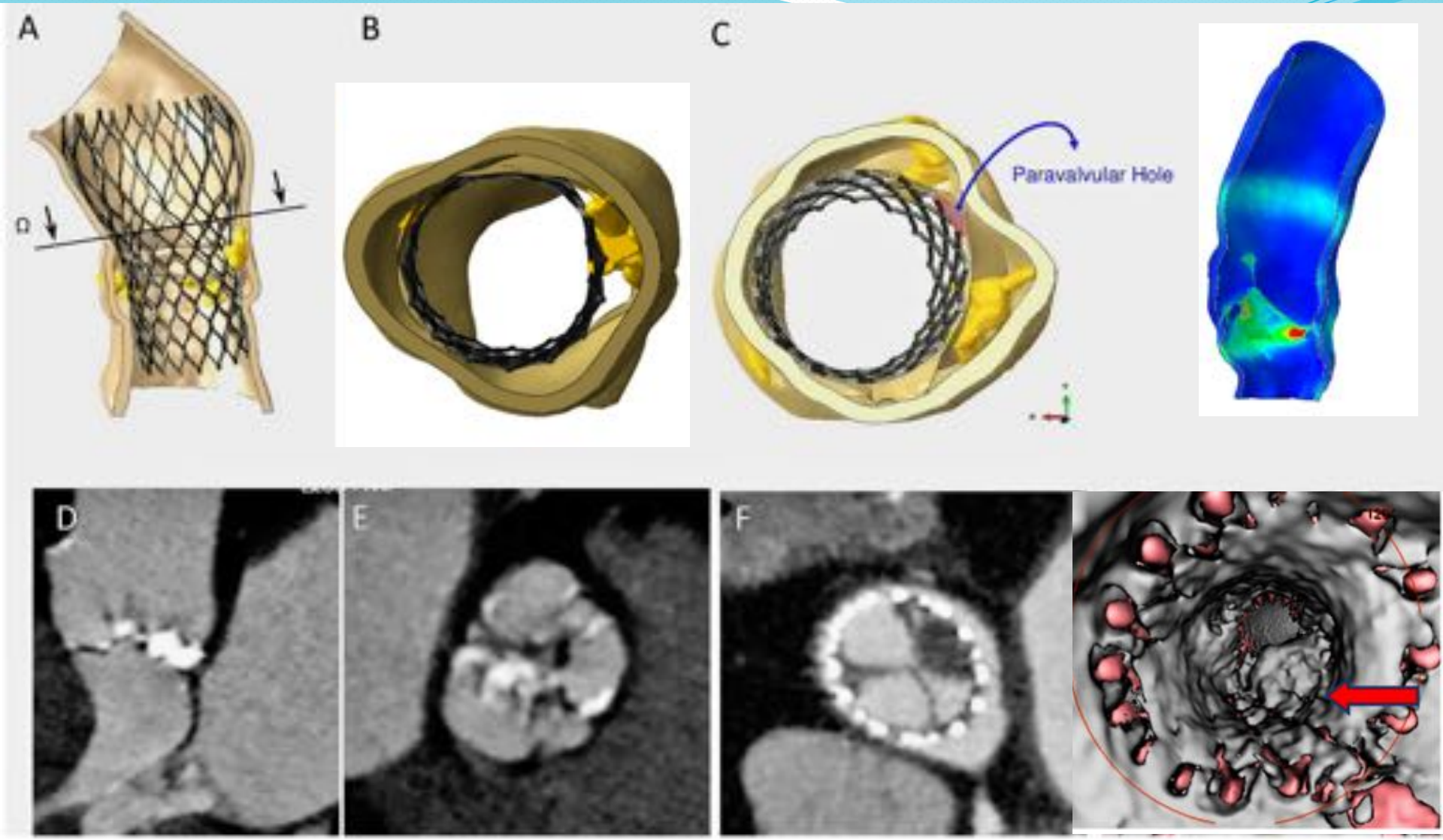


- **<u>Thrombose modérément obstructive de TAVI</u>**

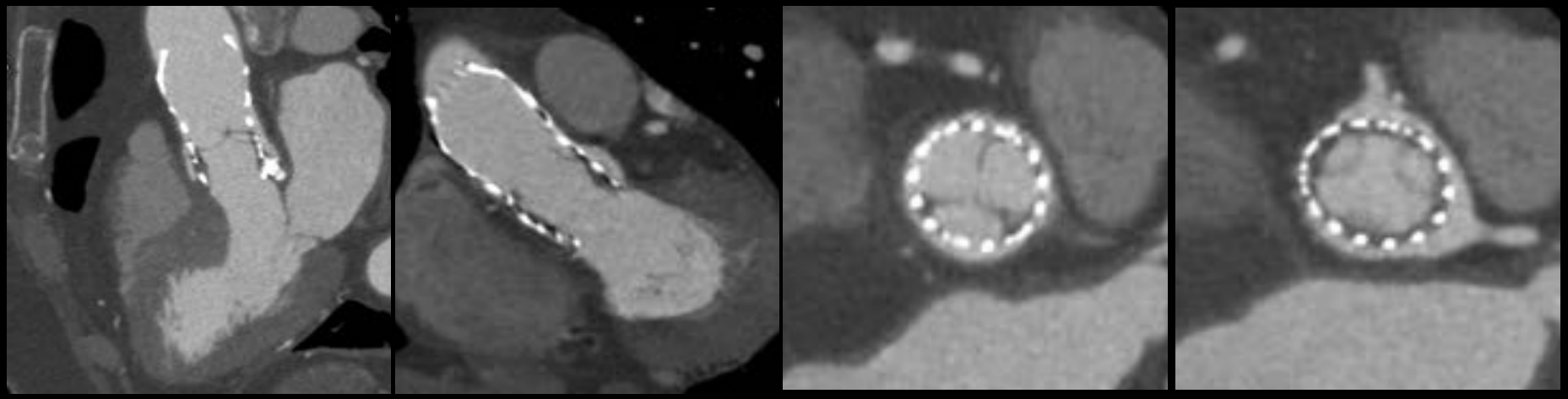
- **<u>Scanner cardiaque</u>:** Confirme la présence de thrombus tapissant la face interne de la Corevalve ainsi que les 3 cusps

- Patiente 85 ans Mme Rosset
- TAVI CoreValve 26 en novembre 2014 ; gradient moyen à 8 mmHg à la sortie
- Novembre 2015 : Dyspnée d'effort depuis 2 mois
- Augmentation du gradient moyen à 18 mmHg, FEVG normale


A
B
C
Paravalvular Hole
D
E
F

<u>Scanner 2 mois plus tard</u>: franche diminution du thrombus, qui a quasiment disparu aux niveau des cusps de la bioprothèse, alors qu'il persiste encore au niveau de la face interne de la Corevalve, notamment en sous-valvulaire



<u>+ normalisation du gradient moyen à 4 mmHg en ETT.</u>

ORIGINAL ARTICLE

Possible Subclinical Leaflet Thrombosis in Bioprosthetic Aortic Valves

R.R. Makkar, G. Fontana, H. Jilaihawi, T. Chakravarty, K.F. Kofoed, O. De Backer, F.M. Asch, C.E. Ruiz, N.T. Olsen, A. Trento, J. Friedman, D. Berman, W. Cheng, M. Kashif, V. Jelnin, C.A. Kliger, H. Guo, A.D. Pichard, N.J. Weissman, S. Kapadia, E. Manasse, D.L. Bhatt, M.B. Leon, and L. Søndergaard

« Reduced leaflet motion was noted on CT in 22 of 55 patients (40%) in the clinical trial and in 17 of 132 patients (13%) in the two registries. Reduced leaflet motion was detected among patients with multiple bioprosthesis types, including trans- catheter and surgical bioprostheses. »

CONCLUSIONS

Reduced aortic-valve leaflet motion was shown in patients with bioprosthetic aortic valves. The condition resolved with therapeutic anticoagulation. The effect of this finding on clinical outcomes including stroke needs further investigation.

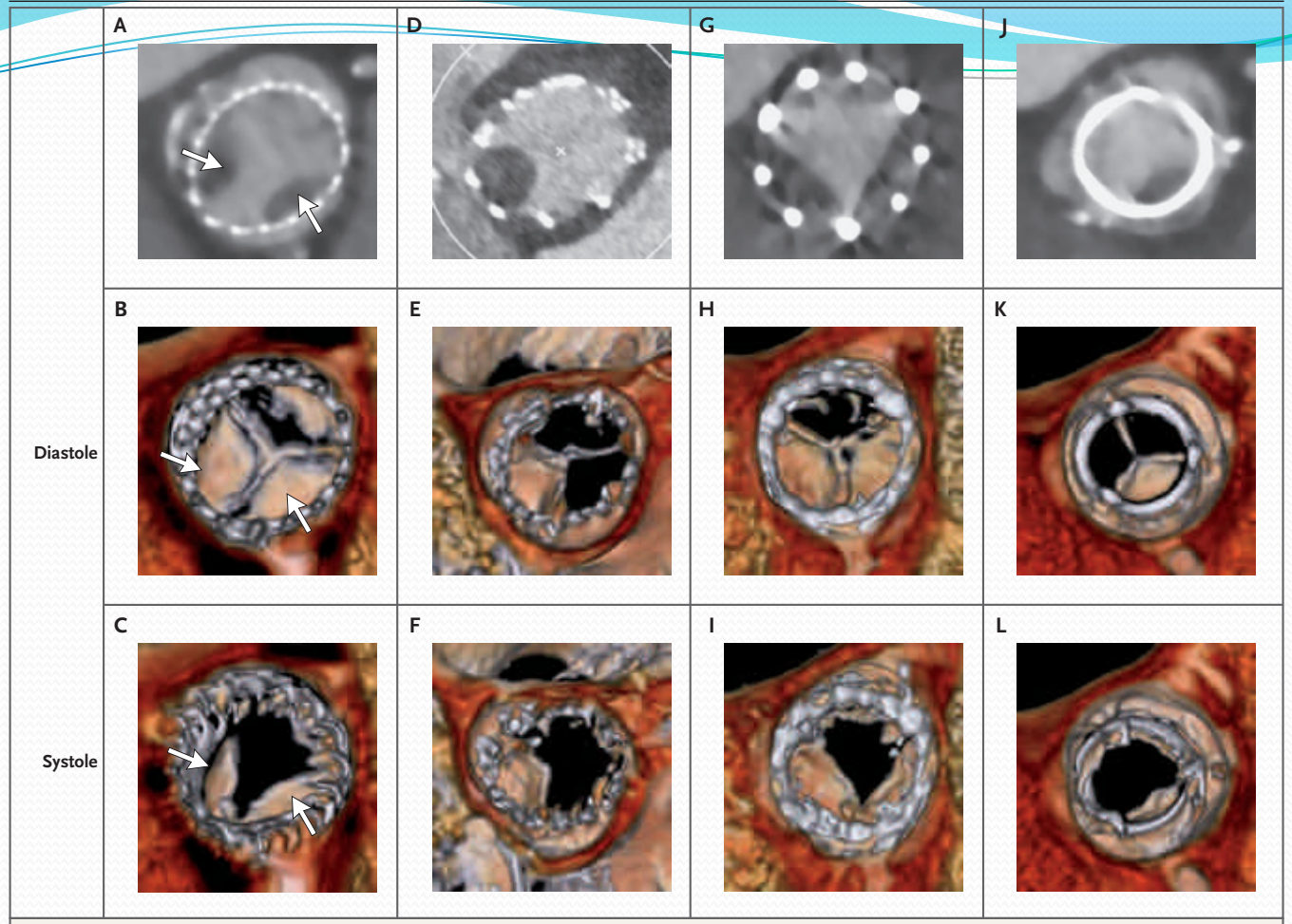


Figure 2. Evidence of Reduced Leaflet Motion in Multiple Prosthesis Types.

Shown are hypoattenuating opacities on two-dimensional computed tomography (CT) (maximum intensity projection of gray-scale image) and volume-rendered CT (color images) for multiple prosthesis types, including the CoreValve (Panels A through C, arrows), Portico (Panels D through F), Sapien XT (Panels G through I), and Carpentier–Edwards Perimount surgical valve (Panels J through L) during diastole and systole. The hypoattenuating lesions always involve the base of the leaflet and extend to the center of the frame. Normal leaflets are visible only on volume-rendered CT in diastole, at their line of coaptation in axial images. Leaflets with reduced motion are visible as wedge-shaped or semilunar opacities in both systole and diastole.

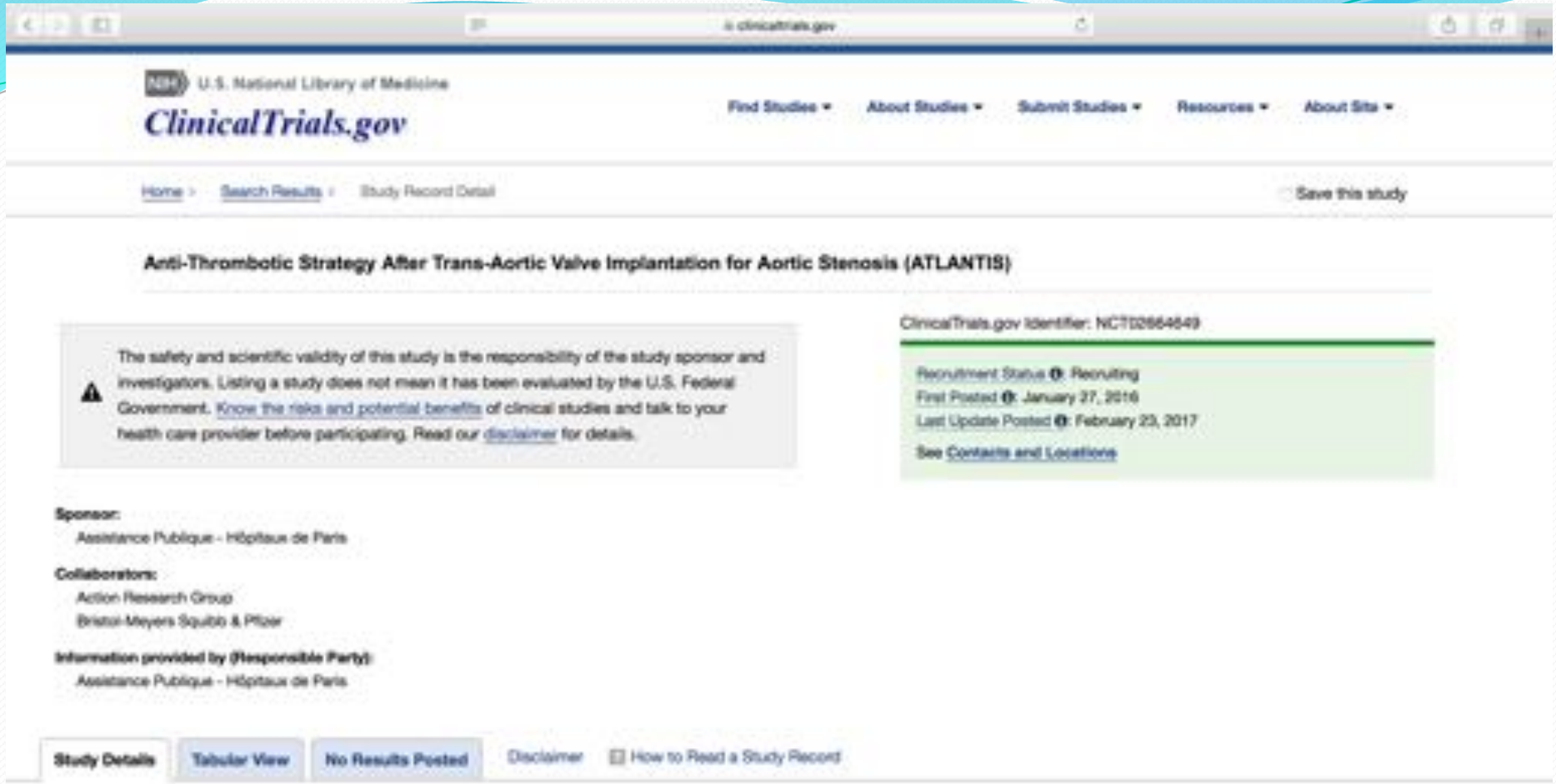
Makkar et al. NEJM 2015

Subclinical leaflet thrombosis in surgical and transcatheter bioprosthetic aortic valves: an observational study

Pour retenir, thrombose TAVI

- Le plus souvent la première année
- Incidence: 13% des TAVR
- 2/3 dyspnée, 1/3 asymptomatique
- AIT/AVC
- ETT : gradient moyen > 20 mmHg dans plus de 90% des cas
- Plus fréquentes avec les « balloon-expandables » qu'avec les « Self-expandable »
- Peuvent survenir sous DAPT ++, plus rarement sous traitement anticoagulant
- 100% résolutives sous anticoagulants (AVK ou AOD)

Chakravarty, Lancet 2017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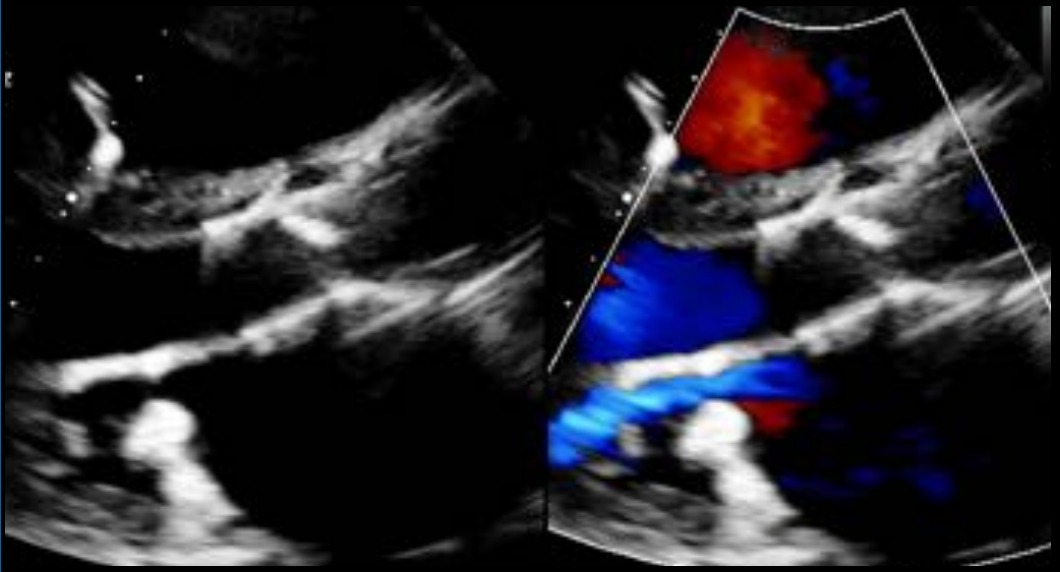
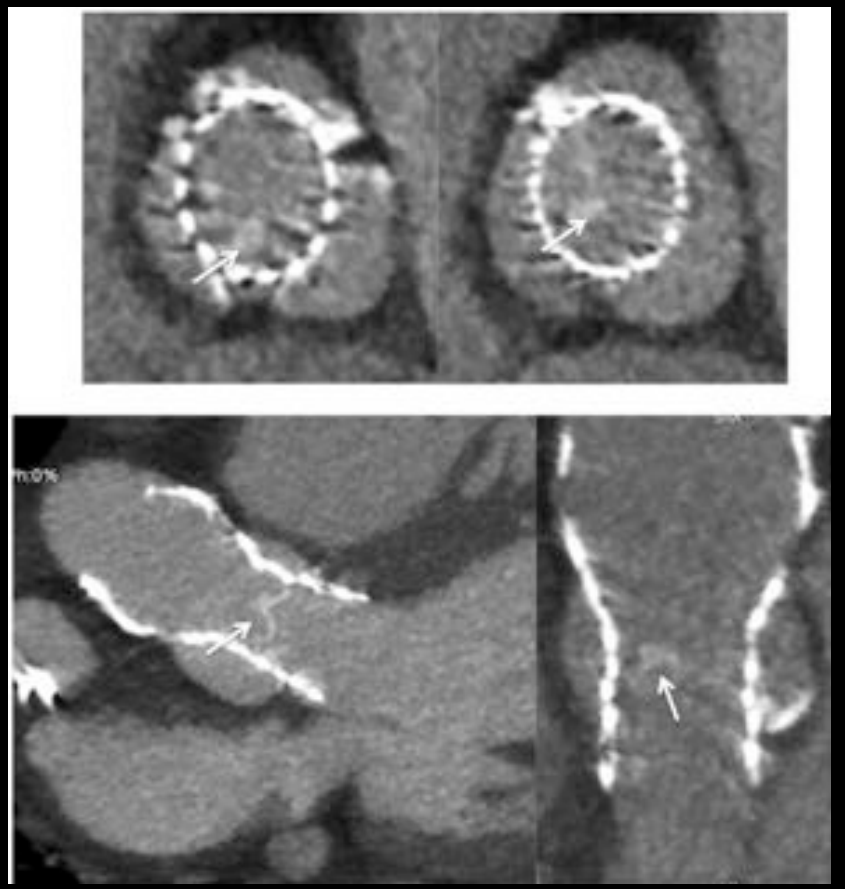
Anti-Thrombotic Strategy After Trans-Aortic Valve Implantation for Aortic Stenosis (ATLANTIS)
The safety and scientific validity of this study is the responsibility of the study sponsor and investigators. Listing a study does not mean it has been evaluated by the U.S. Federal Government. Know the risks and potential benefits of clinical studies and talk to your health care provider before participating. Read our disclaimer for details.
ClinicalTrials.gov Identifier: NCT02664649
Recruitment Status: Recruiting
First Posted: January 27, 2016
Last Update Posted: February 23, 2017
See Contacts and Locations
Sponsor:
Assistance Publique - Hôpitaux de Paris
Collaborators:
Action Research Group
Bristol-Meyers Squibb & Pfizer
Information provided by (Responsible Party):
Assistance Publique - Hôpitaux de Paris
Study Details
Tabular View
No Results Posted
Disclaimer
How to Read a Study Record
Study Description
Go to
Brief Summary:
ATLANTIS is a multicenter, phase IIIb, prospective, open-label, randomized trial.
The objective of this study is to demonstrate superiority of a strategy of anticoagulation with apixaban (Anti-Xa Group) as compared to the current standard of care in patients who have undergone a successful TAVI procedure.

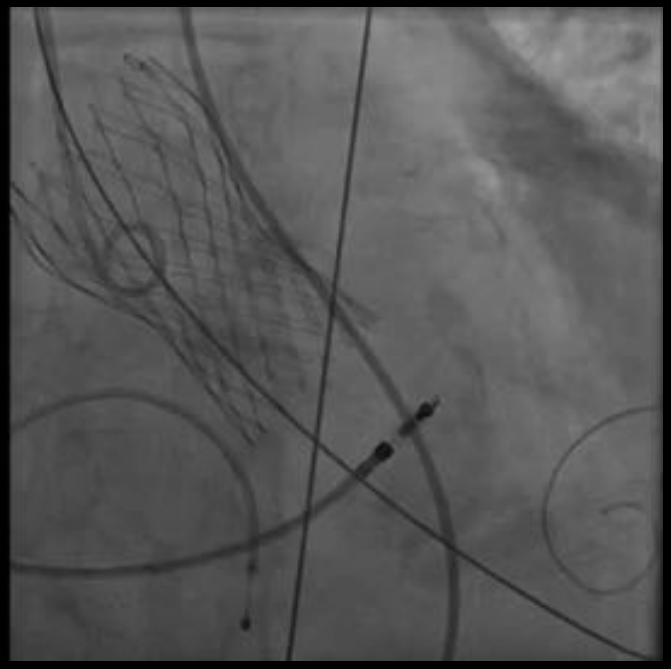
- Patient 76 Mr S. JJ, dialysé chronique
- PM biV
- TAVI Il y a 18 mois
- Hospitalisé pour ACR sur OAP asphyxique
- ETT et ETO : FEVG 25% ; gradient moyen à 31 mmHg (versus FEVG à 40% et gradient moyen à 7 mmHg 6 mois plus tôt)
- Calcifications des cusps sans thrombose au scanner

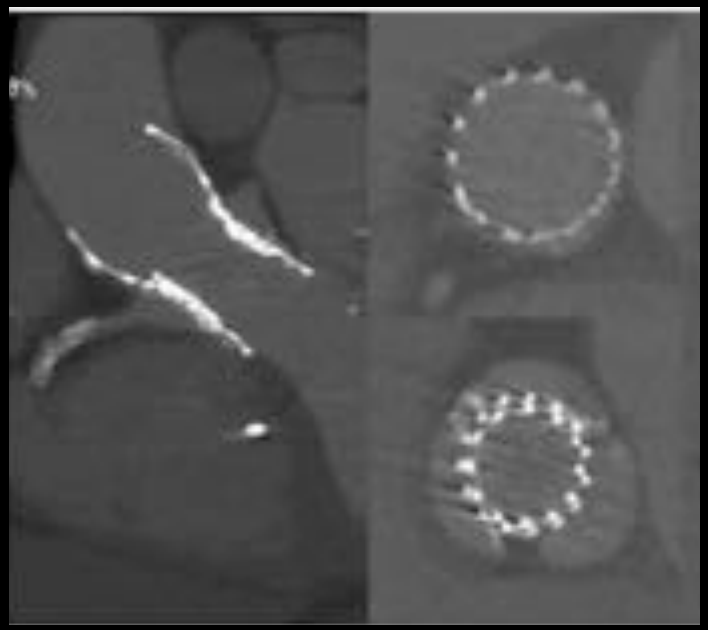


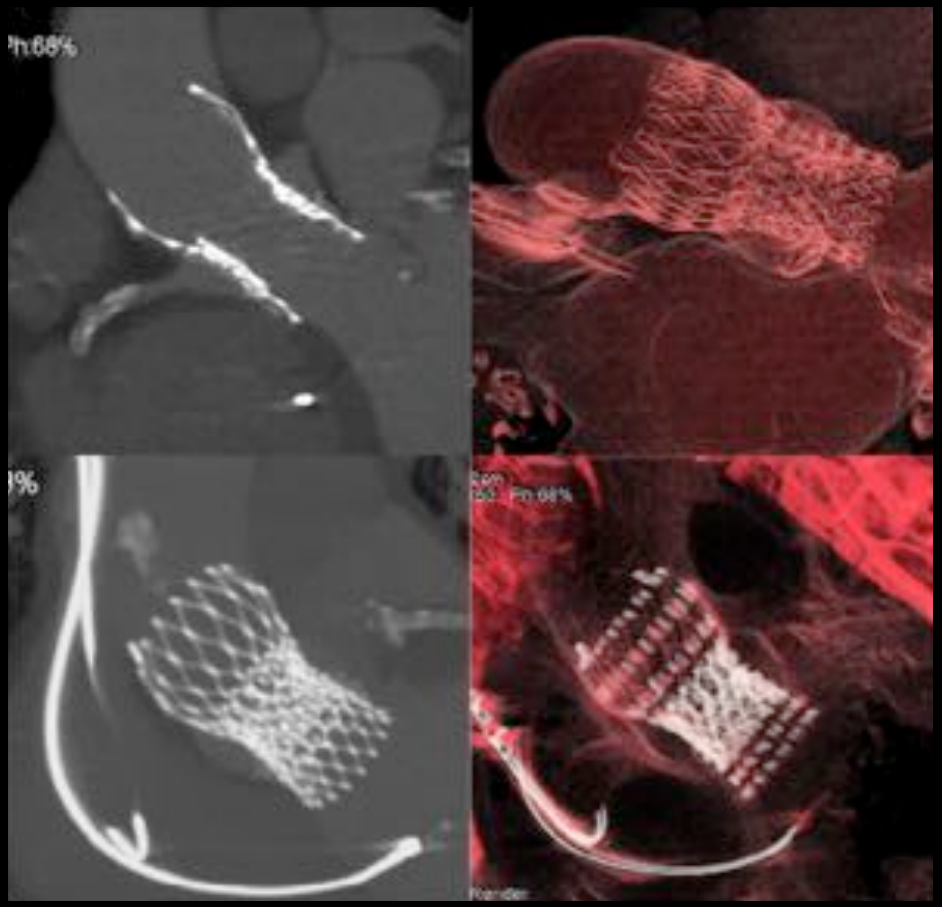


->Dégénérescence précoce de TAVI

Procédure TAVI-in-TAVI

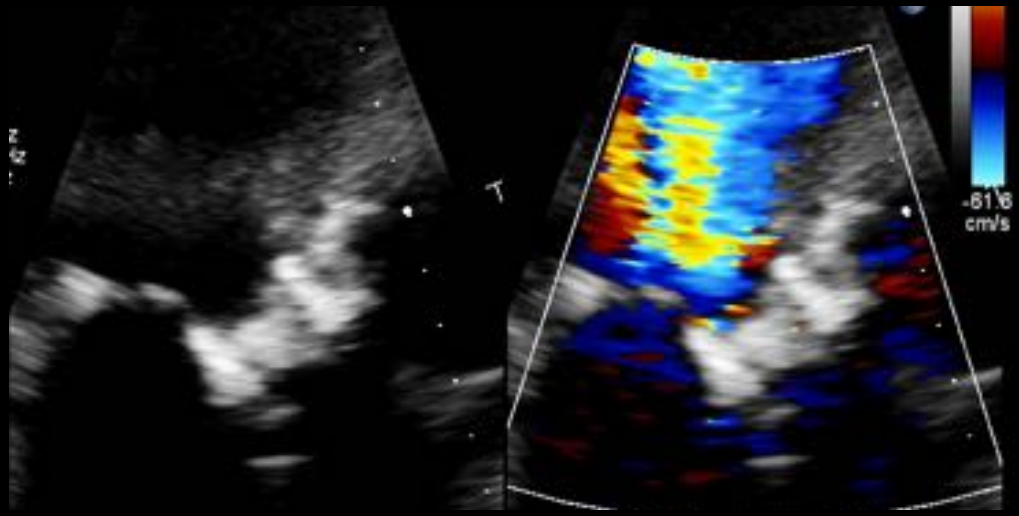


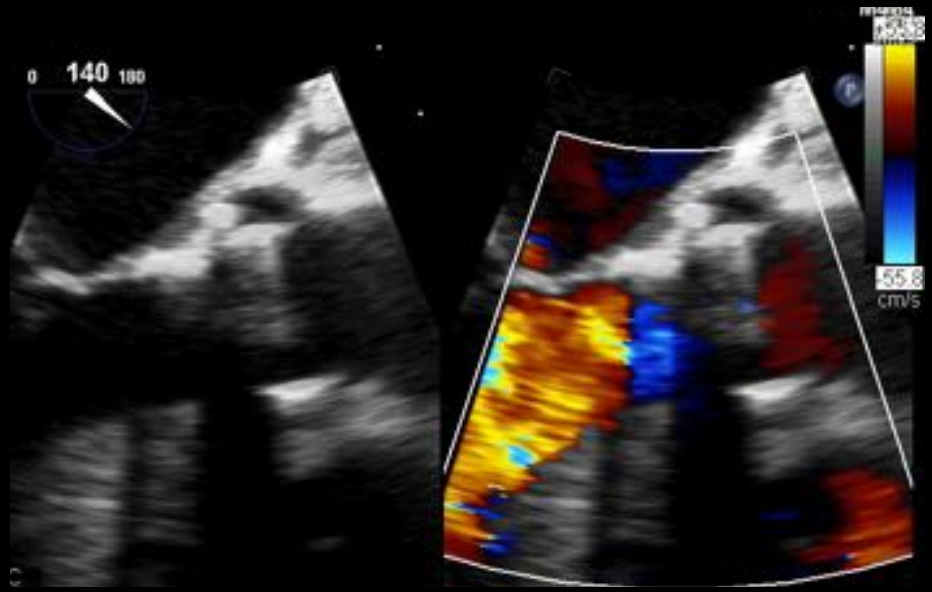


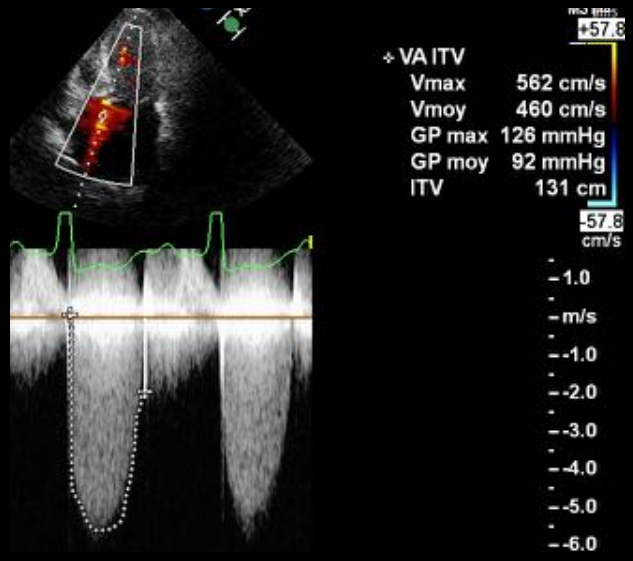


Sochala et al. Under submission…

- Patiente 85 ans
- TAVI Edwards S3 n°23 en 11/2014 ; gradient moyen à 19 mmHg à la sortie du TAVI et à 25 mmHg il y a 6 mois
- Hospitalisée en octobre 2018 pour IC globale, souffle RAc 3/6 B2 aboli

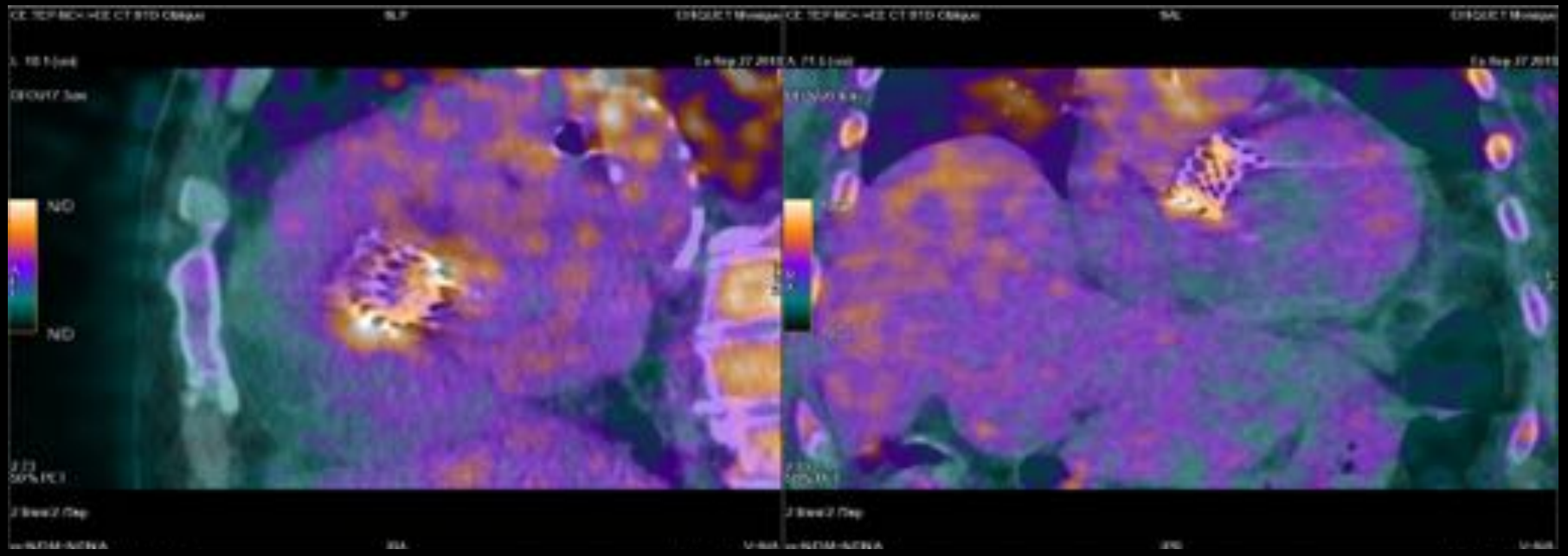






Endocardite sur TAVI
→ Chirurgie RVAo

- Fièvre à 39°C + frissons
- Hémocultures + à Streptococcus vestibularis (ORL)
- CRP à 70 mg/dL



Patient vu à 6 mois post-TAVI: augmentation du gradient moyen significative par rapport à l'ETT de référence post-TAVI. Quelles hypothèses évoquer ?

A. Anémie
B. Hypovolémie
C. Hyperthyroïdie

} « Etiologies fonctionnelles »

D. Thrombose TAVI
E. Dégénérescence précoce TAVI
F. Endocardite infectieuse

} « Etiologies organiques »

Look at the cusps !

Merci !