EgyValves at Cardioegypt

Patient Selection and Preparation for TAVI

By

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Agenda

- Some definitions.
- Indications for intervention in severe AS.
- TAVI vs. SAVR.
- The heart team and clinical evaluation of patients with severe AS.
- Assessment of fitness & procedural planning.

Types of AS

- ***High-gradient aortic stenosis***
  (valve area <1 cm2, mean gradient >40mmHg).
- ***Low-flow, low-gradient AS with reduced EF*** [valve area <1cm2, mean gradient <40mmHg, EF < 50%, stroke volume index < 35mL/m2]
- ***Low-flow, low-gradient AS with preserved EF*** (valve area <1cm2, mean

The HEART TEAM

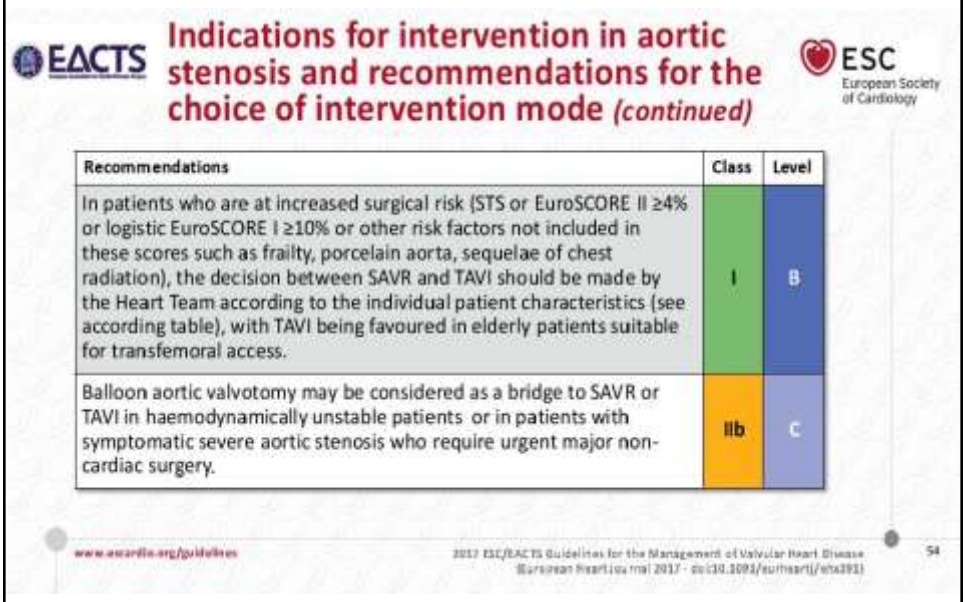
- A multidisciplinary team responsible for taking decisions of treatment in cardiac patients.
- ***Main players***: cardiologist, cardiac surgeon, anesthesiologist, intensivist.
- ***Other players*** join the team when needed: pulmonologist, hepatologist, neurologist, geritrician, ……

Indications for intervention in aortic stenosis and recommendations for the choice of intervention mode

Recommendations	Class	Level
a) Symptomatic aortic stenosis		
Intervention is indicated in symptomatic patients with severe, high-gradient aortic stenosis (mean gradient ≥40 mmHg or peak velocity ≥4.0 m/s).	I	B
Intervention is indicated in symptomatic patients with severe low-flow, low-gradient (<40 mmHg) aortic stenosis with reduced ejection fraction, and evidence of flow (contractile) reserve excluding pseudo-severe aortic stenosis.	I	C
Intervention should be considered in symptomatic patients with low flow, low-gradient (<40 mmHg) aortic stenosis with normal ejection fraction after careful confirmation of severe aortic stenosis.	IIa	C

Indications for intervention in aortic stenosis and recommendations for the choice of intervention mode *(continued)*

Recommendations	Class	Level
The choice for intervention must be based on careful individual evaluation of technical suitability and weighing of risks and benefits of each modality (aspects to be considered are listed in the according table). In addition, the local expertise and outcomes data for the given intervention must be taken into account.	I	C
SAVR is recommended in patients at low surgical risk (STS or EuroSCORE II <4% or logistic EuroSCORE I <10% and no other risk factors not included in these scores, such as frailty, porcelain aorta, sequelae of chest radiation).	I	B
TAVI is recommended in patients who are not suitable for SAVR as assessed by the Heart Team.	I	B



Aspects taken into consideration by the heart team

Aspects to be considered by the Heart Team for the decision between SAVR and TAVI in patients at increased surgical risk

	Favours TAVI	Favours SAVR
Clinical characteristics		
STS/EuroSCORE II <4% (logistic EuroSCORE I<10%)		+
STS/EuroSCORE II ≥4% (logistic EuroSCORE I ≥10%)	+	
Presence of severe comorbidity (not adequately reflected by scores)	+	
Age <75 years		+
Age ≥75 years	+	
Previous cardiac surgery	+	

2017 ESC/EACTS Guidelines for the Management of Valvular Heart Disease (European Heart Journal 2017 - doi:10.1093/eurheartj/ehx391)

Aspects to be considered by the Heart Team for the decision between SAVR and TAVI in patients at increased surgical risk *(continued)*

	Favours TAVI	Favours SAVR
Clinical characteristics *(continued)*		
Frailty	+	
Restricted mobility and conditions that may affect the rehabilitation process after the procedure	+	
Suspicion of endocarditis		+
Anatomical and technical aspects		
Favourable access for transfemoral TAVI	+	
Unfavourable access (any) for TAVI		+

2017 ESC/EACTS Guidelines for the Management of Valvular Heart Disease (European Heart Journal 2017 - doi:10.1093/eurheartj/ehx391)

Aspects to be considered by the Heart Team for the decision between SAVR and TAVI in patients at increased surgical risk *(continued)*

	Favours TAVI	Favours SAVR
Anatomical and technical aspects *(continued)*		
Sequelae of chest radiation	+	
Porcelain aorta	+	
Presence of intact coronary bypass grafts at risk when sternotomy is performed	+	
Expected patient–prosthesis mismatch	+	
Severe chest deformation or scoliosis	+	
Short distance between coronary ostia and aortic valve annulus		+

2017 ESC/EACTS Guidelines for the Management of Valvular Heart Disease (European Heart Journal 2017 - doi:10.1093/eurheartj/ehx391)

Aspects to be considered by the Heart Team for the decision between SAVR & TAVI in patients at increased surgical risk *(continued)*

	Favours TAVI	Favours SAVR
Anatomical and technical aspects *(continued)*		
Size of aortic valve annulus out of range for TAVI		+
Aortic root morphology unfavourable for TAVI		+
Valve morphology (bicuspid, degree of calcification, calcification pattern) unfavourable for TAVI		+
Presence of thrombi in aorta or LV		+
Cardiac conditions in addition to aortic stenosis that require consideration for concomitant intervention		
Severe CAD requiring revascularization by CABG		+

2017 ESC/EACTS Guidelines for the Management of Valvular Heart Disease (European Heart Journal 2017 - doi:10.1093/eurheartj/ehx391)

Aspects to be considered by the Heart Team for the decision between SAVR and TAVI in patients at increased surgical risk *(continued)*

	Favours TAVI	Favours SAVR
Cardiac conditions in addition to aortic stenosis that require consideration for concomitant intervention *(continued)*		
Severe primary mitral valve disease, which could be treated surgically		+
Severe tricuspid valve disease		+
Aneurysm of the ascending aorta		+
Septal hypertrophy requiring myectomy		+

Evidence

- *Available data from randomized controlled trials and large registries in elderly patients at increased surgical risk show that TAVI is*:
  - Superior in terms of mortality to medical therapy in ***extreme-risk (inoperable)*** patients.
  - Non-inferior or superior to surgery in ***high-risk*** patients
  - Noninferior to surgery and even superior when transfemoral access is possible in ***intermediate-risk patients***

So, the heart team decided to perform TAVI…… What's next??

Assessment of fitness & procedural planning

MSCT

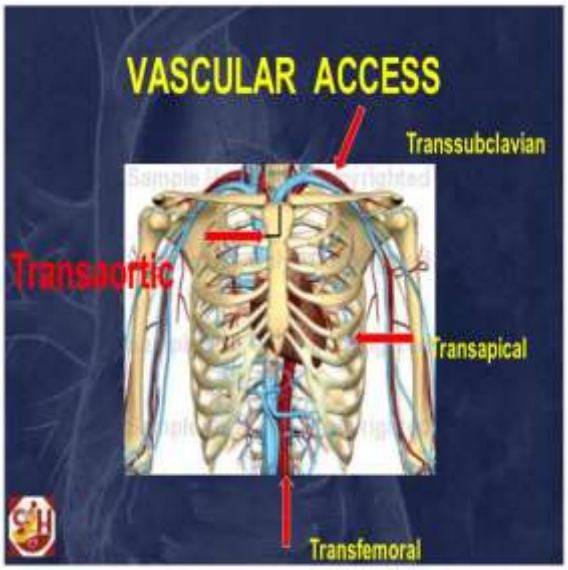
Why MSCT?

- High spatial resolution.
- Scanning Large volume in a short time.
- Method of choice to assess calcification.
- Widely available.
- Easy to perform & read.

Main role of MSCT

- Assessment of vascular access.
- Assessment of Aorta.
- Assessment chest anatomy
- Assessment of the aortic root & annulus.

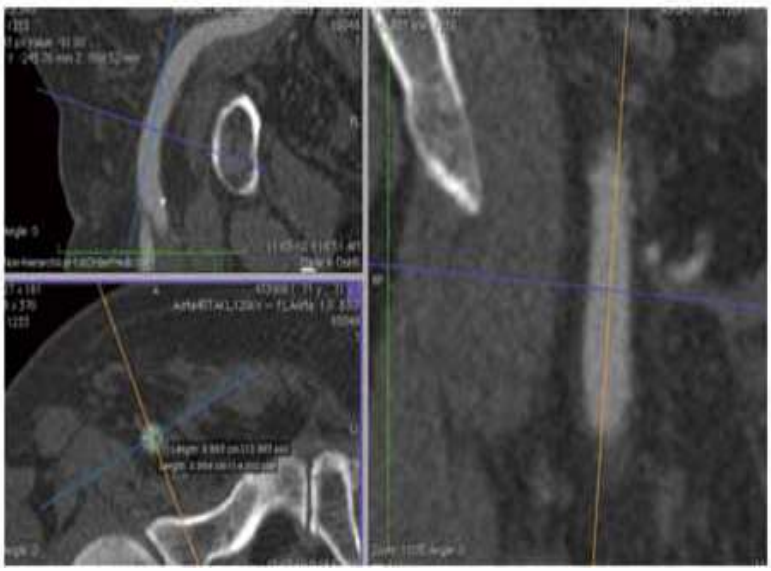
I-Vascular access



Good assessment of vascular access by CT helps to decrease vascular complications by evaluation of

1- Minimal luminal diameter

- Across the whole access (iliofemoral or subclavian).
- Accurate MPRs are used to get orthogonal images for accurate assessment.



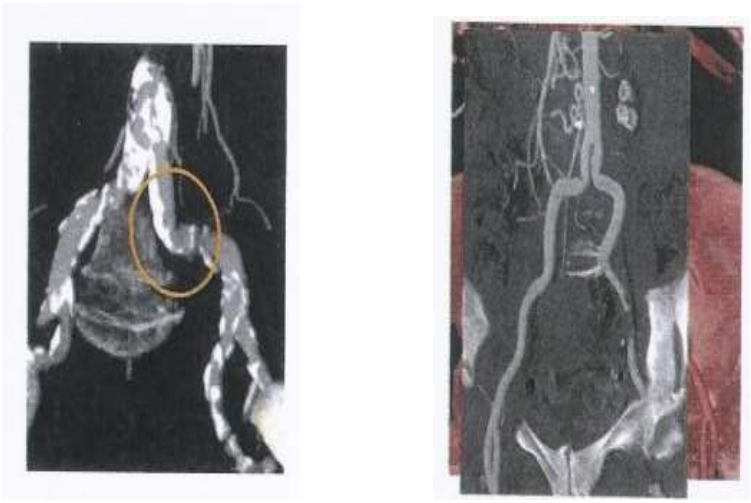
- Sapien XT:
  - 23 mm →6mm
  - 26 mm → 6.5 mm
  - 29 mm → 7 mm
- Sapien 3:
  - 23, 26 mm → 5.5 mm
  - 29 mm → 6 mm
- Corevalve:
  - 26, 29, 31 mm → 6 mm
- Evolut R:
  - 23, 26, 29 mm → 5 mm

2- Calcifications

3- Tortousity

- Not a problem by itself (solved by passage of stiff wire).
- Becomes a problem if calcified.

Calcified vs. non calcified tortuous vessels



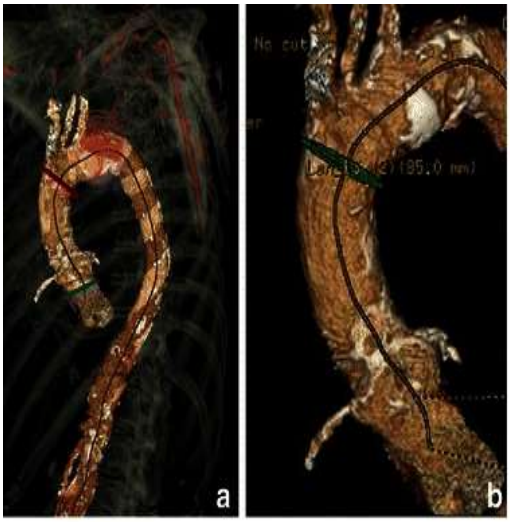
4- Additional data

- Site of common femoral bifurcation in relation to femoral head.
- Distance between anterior wall of access vessel and skin.

II-Aorta

- Entire aorta should be screened if transfemoral access is planned.
- Femoral access is contraindicated with aortic:
  - Massive elongation with kinking.
  - Dissection.
  - Thrombi or large plaques protruding to lumen.

- If transaortic approach is planned → must know position of ascending aorta relative to chest wall



- In cases of previous CABG surgery, the position of grafts & its potential adhesions to chest wall is important in case emergency open heart surgery is needed.

II-Left ventricle & chest wall

- Exclude LV thrombi
- For transapical access:
  - position of apex in relation to chest wall
  - Alignment of LV axis with LVOT orientation.

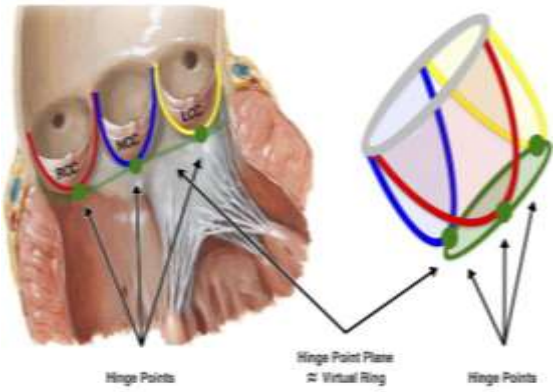
IV- Aortic annulus

Why do we need to accurately assess the annulus?

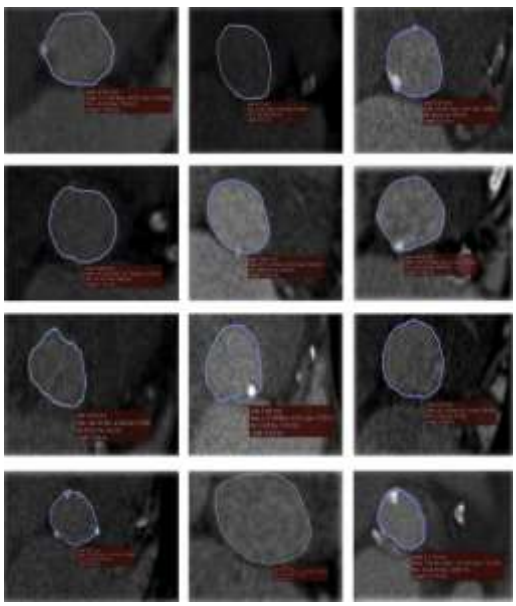
- Too small prosthesis
  - → embolization.
  - → Paravalvular regurge
- Too large
  - → rupture

What is the annulus?

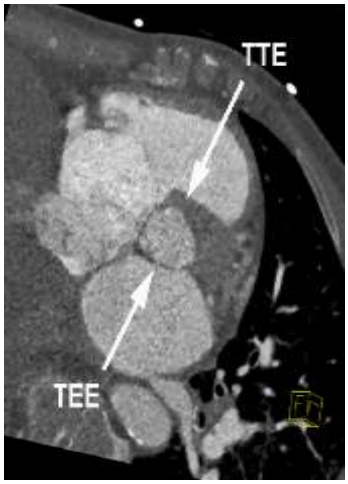
- Not a separate anatomical structure.
- Formed by a plane joining the hinge points of the 3 cusps

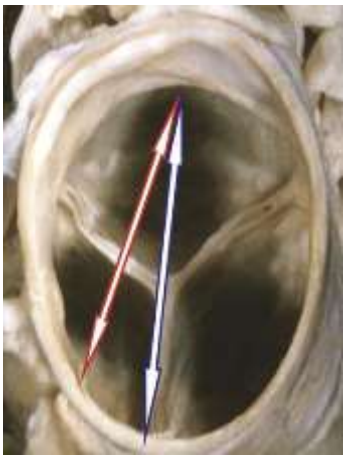


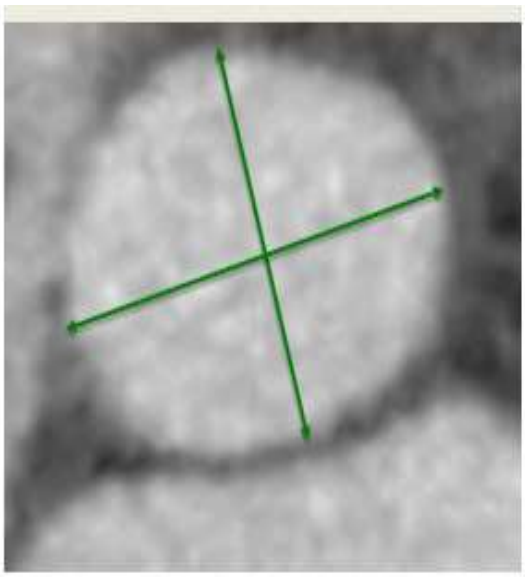
It is always oval



2D echo vs. 3D MSCT

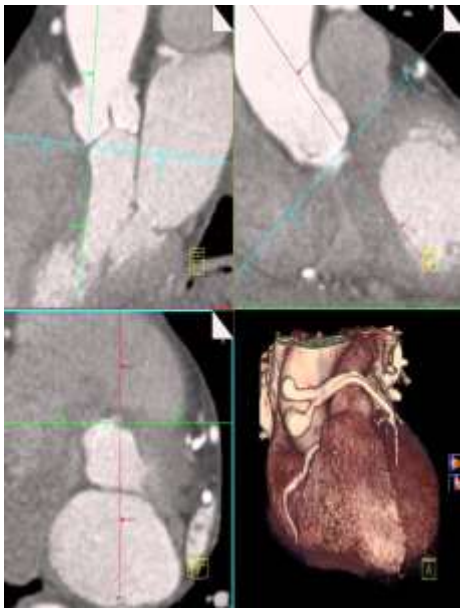






How do we get the accurate plane containing the annulus?

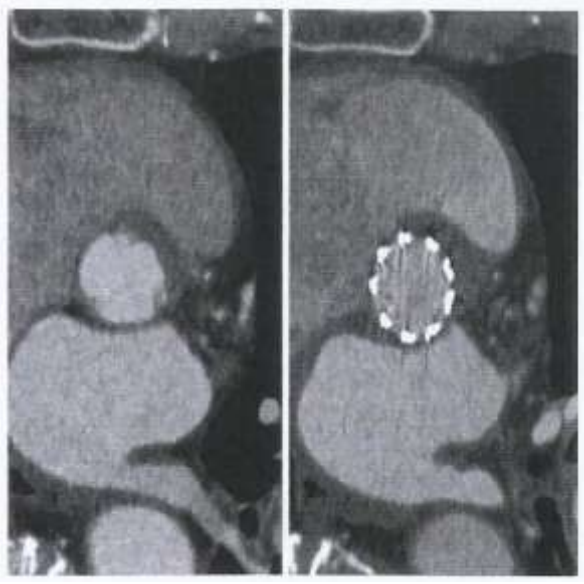
By modifications of the axial plane in sagittal & coronal planes.



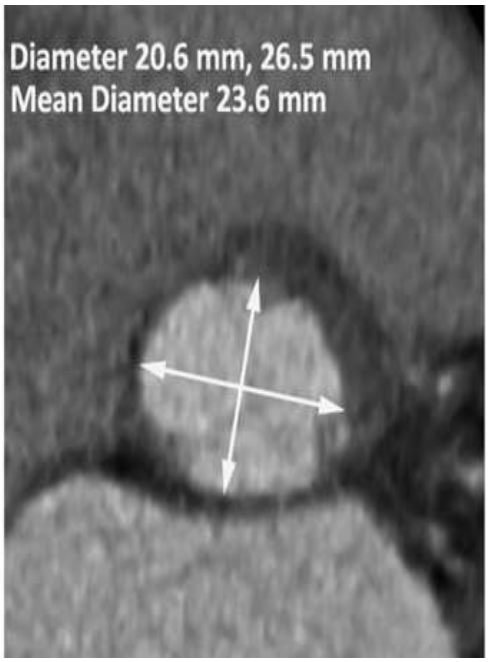
- Once the accurate annular plane is obtained, a lot of data can be extracted

Prosthesis sizing

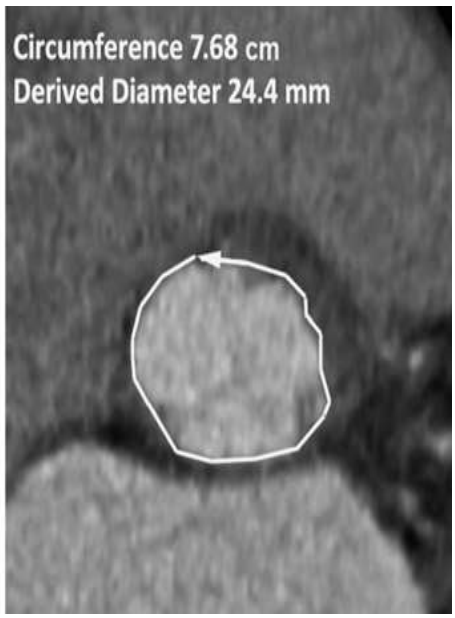
The oval shape always (esp. in balloon expandable prosthesis) changes to near circular after valve implantation



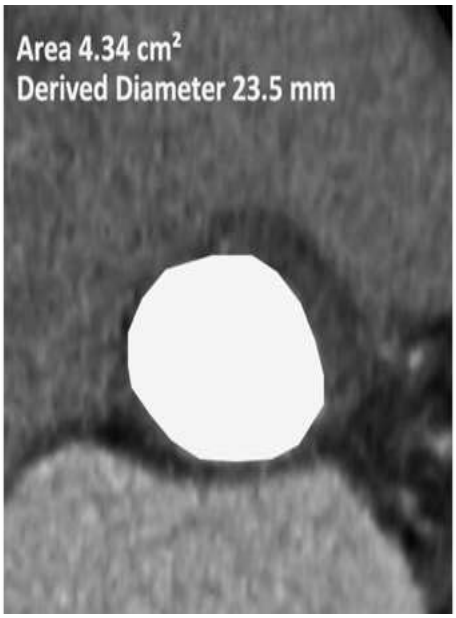
D =
D1+D2/2



D =
circumference /
π

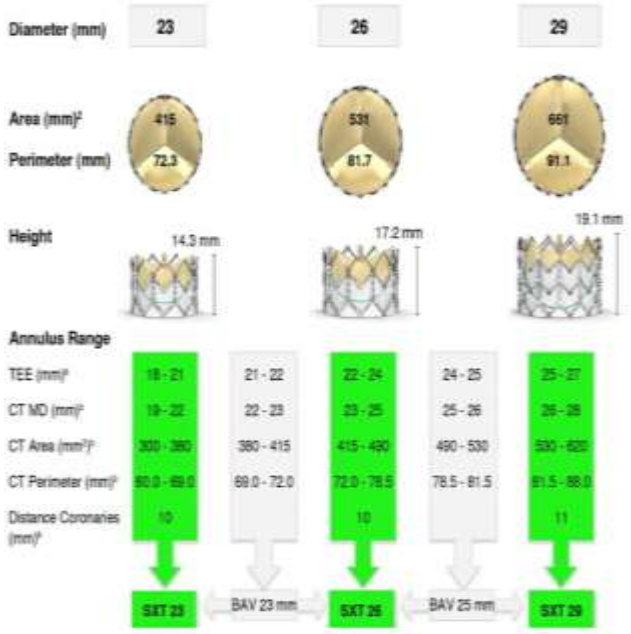


$D = 2 * \sqrt{(area / \pi)}$

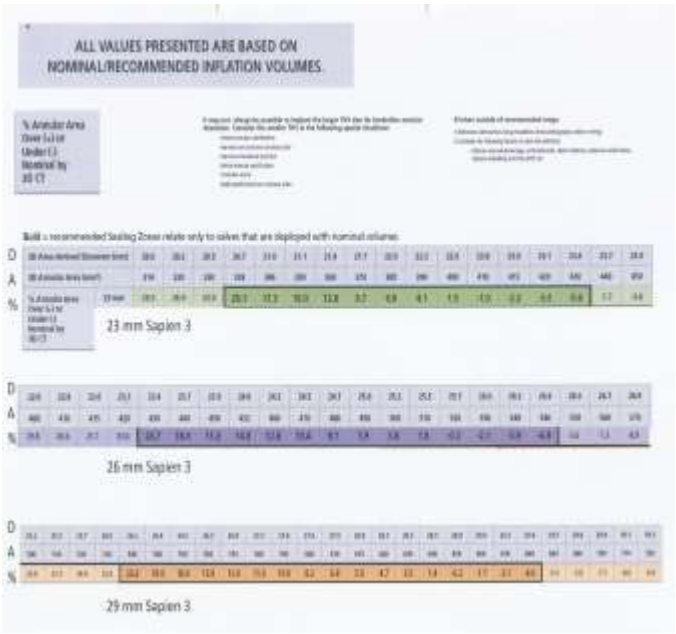


- Each manufacturer provides detailed charts for choosing the prosthesis size according to mean diameter, circumference & area of the annulus.

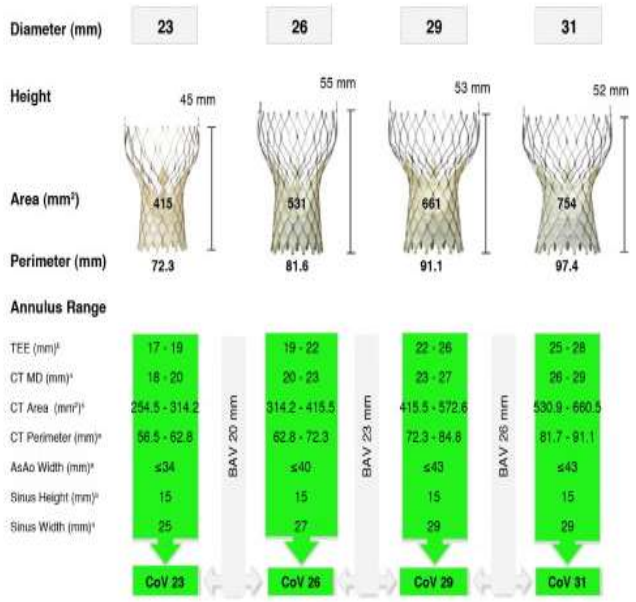
Sapien XT®



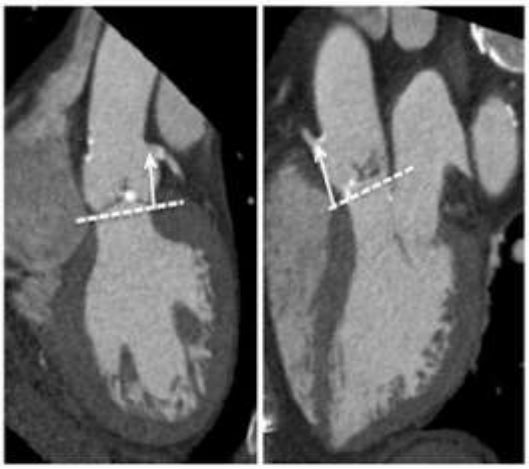
Sapien 3®



Corevalve ®



Height of coronary ostia (more important in Sapien)

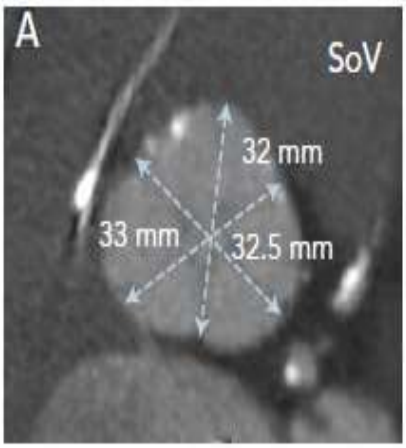


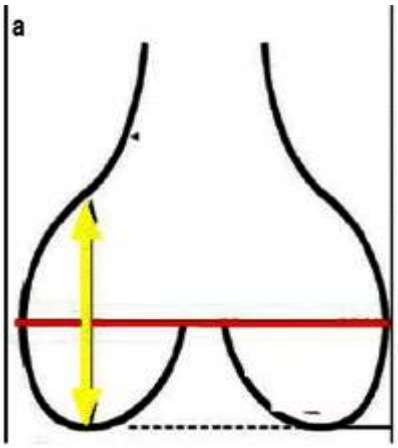
Distance to left main coronary artery 18.3 mm

Distance to the right coronary artery 19.2 mm

Length & calcification of cusps

Sinus of valsalva width & height (for Corevalve)





Recommended SOV measurments for each Corevalve® size

Valve Size	Aortic Annulus Measurements			Sinus of Valsalva Diameter	Native Leaflet to Sinotubular Junction Length	Ascending Aorta Diameter*
	Diameter	Perimeter	Area Range			
23	18-20 mm	56.5-62.8 mm	254.5-314.2 mm	≥ 25 mm	≥ 15 mm	≤ 34 mm
26	20-23 mm	62.8-72.3 mm	314.2-415.5 mm	≥ 27 mm	≥ 15 mm	≤ 40 mm
29	23-27 mm	72.3-84.8 mm	415.5-572.6 mm	≥ 29 mm	≥ 15 mm	≤ 43 mm
31	26-29 mm	81.7-91.1 mm	530.9-660.5 mm	≥ 29 mm	≥ 15 mm	≤ 43 mm

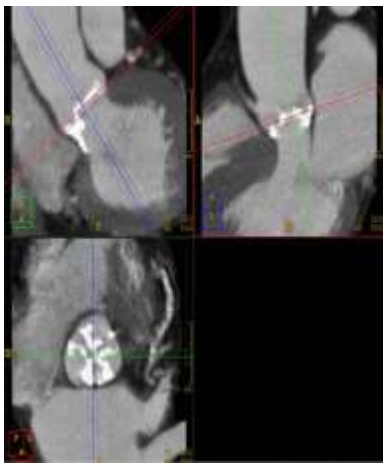
- There is more risk of coronary occlusion in case of:
  - heavily diffusely calcified cusps.
  - Long cusps.
  - shallow sinuses

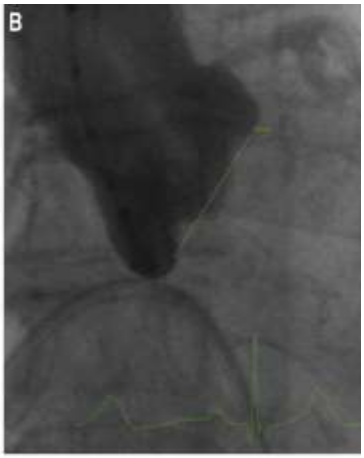
Dangerous anatomy (dense calcification at aortomitral continuity)

→ Regurge

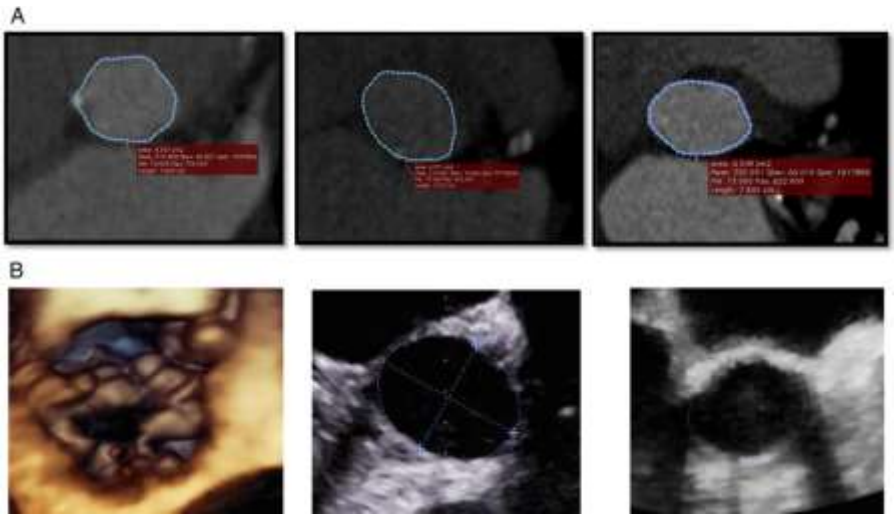
→ Rupture

Implantation angle orthogonal to annulus





3D Echo



- *Avoids disadvantages of MSCT*:
  - radiation
  - contrast
  - higher cost
  - motion artefacts
  - accessibility

- However, echocardiography has inferior spatial resolution especially with severe calcifications (which is always there in TAVI candidates).
- No data about other necessary informations (vascular access, sinuses of valsalva, coronary ostia, distribution of calcifications, ….)

- Also, results are not always reproducible even in highly experienced hands.

- Data regarding its accuracy in comparison to MSCT (the gold standard) is still conflicting.

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doi:10.1093/ehjci/jev238

Three-dimensional echocardiography vs. computed tomography for transcatheter aortic valve replacement sizing

Beatriz Vaquerizo[1,2]*, Marco Spaziano[1], Juwairia Alali[1], Darren Mylote[1,3], Pascal Theriault-Lauzier[1], Rashed Alfagih[1], Giuseppe Martucci[1], Jean Buithieu[1], and Nicolo Piazza[1]

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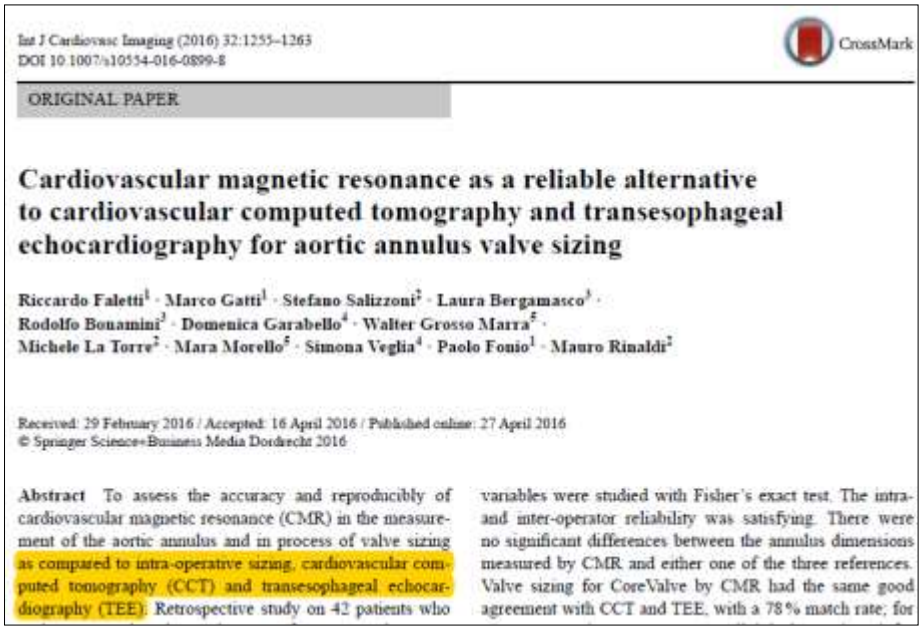
Conclusion Aortic annulus measurements for pre-procedural TAVR assessment by 3D-TEE are significantly smaller than MSCT. In this study, such discrepancy would have resulted in up to 50% of all patients receiving the wrong THV size. 3D-TEE should be used for TAVR sizing, only when MSCT is not available or contraindicated. The clinical impact of this information requires further study.

- So, for the time being 3D TEE can be used for annular sizing only if MSCT is not available or contraindicated (which is also a rare situation).

Cardiac MRI



Int J Cardiovasc Imaging (2016) 32:1255–1263
DOI 10.1007/s10554-016-0899-8

CrossMark

ORIGINAL PAPER

Cardiovascular magnetic resonance as a reliable alternative to cardiovascular computed tomography and transesophageal echocardiography for aortic annulus valve sizing

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Abstract To assess the accuracy and reproducibly of cardiovascular magnetic resonance (CMR) in the measurement of the aortic annulus and in process of valve sizing as compared to intra-operative sizing, cardiovascular computed tomography (CCT) and transesophageal echocardiography (TEE). Retrospective study on 42 patients who variables were studied with Fisher's exact test. The intra- and inter-operator reliability was satisfying. There were no significant differences between the annulus dimensions measured by CMR and either one of the three references. Valve sizing for CoreValve by CMR had the same good agreement with CCT and TEE, with a 78 % match rate; for

Results

- ***CMR was found to be a reliable imaging technique for annulus sizing. Its performance stands up to the level of confidence of CCT***

Why CMR?

- 3D
- Suitable in patients with CKD.
- Indications of TAVI are extending to include younger patients with lower risk in whom minimizing exposure to ionizing radiation is of great importance.

- If both MSCT & TEE are difficult to do (e.g. elderly with CKD & oesophageal problems or poor airway control.

- Possible use of gadolinium-based contrast material, which is significantly less nephrotoxic and produces less adverse reactions than CT contrast media, permits assessment of scarring & fibrosis that are associated with worse prognosis in AS.

But

- Expensive & has limited availability.
- Contraindicated in case of previous implantation of metallic devices or prosthesis (which is not uncommon in elderly population).
- Its efficiency in assessment of other data needed for the procedure (coronary heights, sinuses, access, …) is not yet well tested.

Coronary anatomy

- Assessment with revascularization if needed better before the procedure

Finally

- Talk to your patient and the family:
  - Why TAVI was decided
  - Procedural steps.
  - Expected postprocedural course.
  - Possible complications.

Looking Forwards to see you

THANK YOU