Pre-Procedural Radiologic Evaluation of Transcatheter Aortic Valve Replacement

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Agenda: Radiologic Pre-TAVR Assessment

- Prognosis of Aortic Stenosis (AS);
- Indications for Surgical vs Transcatheter Aortic Valve Replacement (SAVR vs TAVR);
- Menu of Radiologic Tests Available for Imaging the Aortic Valve;
- Echocardiography in Diagnosis and Evaluation of AS Severity;
- Detailed Anatomy of the Aortic Valvular Complex;
- CT in Assessing Peripheral Vascular Access;
- CT in Measuring Anatomical Landmarks for Valve Sizing;
- Overview of Currently Available Prosthetic Valves;
- Importance of Radiologic Assessment to Avoid Complications.

Welcome to this tutorial on the radiologic pre-TAVR assessment. Here is our agenda for today.

The text provided in this blue box will provide additional commentary to the slides.
**Our Patient: Presentation and History**

**Chief Complaint:** Light-headedness

**History of Present Illness:** Our patient is a 91 year old woman with known history of severe AS, as well as hypertension, hyperlipidemia and a cerebrovascular accident two years ago. She presents complaining of persistent lightheadedness for the past 4 weeks, particularly when bending or getting up from sitting. She denies any chest pain, shortness of breath, palpitations, or peripheral edema.

**Past Medical History:**
- Severe AS
- Hypertension
- Hyperlipidemia
- Cerebrovascular accident
- Renal Cysts

**Past Surgical History:**
- Right total hip replacement
- Right rotator cuff repair

**Active Medications:**
- Clopidogrel 75 mg QD
- Lisinopril 20 mg QD
- Atorvastatin 40 mg QD

**Allergies:**
- Clindamycin (rash)

**SH:**
- Never smoked
- No Alcohol use
- Three children
- Widowed, retired publicist

**FH:**
- Noncontributory

Familiarize yourself with our patient, who has a known history of aortic stenosis.
Our Patient: Focused Physical Exam

Cardiovascular:
Nondistended Jugular Venous Pulse, Regular Rate and Rhythm.

- Murmurs: Crescendo-decrescendo Mid-systolic murmur, best heard over the right upper sternal border
- Gallops: S4

- Carotid pulse: “Parvus et Tardus”, murmur is heard radiating from the chest

Pulmonary:
Symmetric chest expansion. No wheezing, Crackles or Rales

Extremities:
No peripheral edema.

Here is the presentation of our patient with aortic stenosis on physical exam.
Aortic Stenosis: Natural History

- AS initially follows an asymptomatic course, which however masks a progressive increase in valvular obstruction and left ventricular hypertrophy.

- Eventually a decompensated state is reached, with the onset of one or more of three classic manifestations: angina pectoris, syncope, or heart failure.
Importantly, the onset of each of these manifestations marks the end-stage of the disease, and even mild symptoms require prompt intervention.

Average survival without valve replacement is only 5 years in the setting of angina, 3 years in the setting of syncope, and 2 years in the setting of heart failure.
There are no current medical therapies that have been shown to delay progression of aortic stenosis;

To date, valve replacement is the only effective treatment to prolong survival in the setting of symptomatic AS.
The aortic valve can be replaced surgically via a sternotomy (SAVR)…

… Or a new valve can be delivered via an arterial catheter (TAVR).
While in SAVR the native stenotic valve is physically excised and replaced with a prosthetic valve that is sutured in place of the old one…
In TAVR the native stenotic valve is NOT excised. Rather, the prosthetic valve is expanded with the aid of an inflatable balloon, crushing the native valve against the wall of the left ventricular outflow tract.
Recent trials have shown that, in patients who are at **high-risk** for surgical complications, TAVR is a valid alternative to SAVR because the two procedures resulted in similar mortality and reduction of cardiac symptoms at 1 year, and TAVR additionally allows to avoid the known risks of open-heart surgery.
Even more recently, additional trials have shown similar mortality and reduction in cardiac symptoms also for patients at intermediate-risk for surgical complications, where again TAVR would be a valid alternative to SAVR because it avoids the known risks of open-heart surgery.

Leon et al. NEJM. 2016
The surgical risk is calculated using a risk model developed by the Society of Thoracic Surgeons (STS), which estimates the risk of death at 30 days after surgery. These details are beyond the scope of this presentation.
Using the STS calculator, our patient was found to have a sufficiently elevated surgical risk for SAVR, so she began assessment for TAVR. Let’s now review the imaging modalities available to evaluate the severity of AS.
1) Echocardiography
(Transthoracic / Transesophageal)
Imaging of choice for:
- Diagnosis of AS
- Evaluation of AS severity
Pre-TAVR Evaluation: Radiologic Imaging

MENU OF TESTS

1) Echocardiography
   (Transthoracic / Transesophageal)
   Imaging of choice for:
   - Diagnosis of AS
   - Evaluation of AS severity

2) CT scan
   Multiple Detector CT (MDCT)
   Imaging of choice for:
   - Peripheral vascular access evaluation
   - Aortic valve annular sizing
   - Aortic root anatomy assessment

Coronal Oblique MDCT
Pre-TAVR Evaluation: Radiologic Imaging

MENU OF TESTS

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   - Aortic valve annular sizing
   - Aortic root anatomy assessment

3) MRI
   Rarely used for TAVR; available in case of contrast allergy or renal insufficiency.
Pre-TAVR Evaluation: Radiologic Imaging

**MENU OF TESTS**

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- Aortic root anatomy assessment

Echocardiography and MDCT are NOT mutually exclusive. Rather, they offer complementary information to assess the severity of AS, and inform valve prosthesis sizing and artificial valve selection.

Courtesy of Dr. Catherine Wei, BIMDC PACS
Now that we have described the two main imaging modalities routinely used for pre-TAVR evaluation, let’s review each one individually, starting with echocardiography.
Echocardiographic Assessment of the Aortic Valve: *Apical 5 chamber view*

Full echocardiographic assessment of the aortic valve is performed with multiple views of the heart. Here we explain the apical 5 chamber view, which allows great visualization of the aortic valve.
Echocardiographic Assessment of the Aortic Valve:
*Apical 5 chamber view*

- The ultrasound transducer is placed in the fifth intercostal space and pointed at the heart apex, thus cutting a section across the long axis of the heart.
- The transducer is tilted upwards and downwards to produce the desired view.
Echocardiography: What are the 5 chambers?

In clockwise order, the 5 chambers are:
1: Left Ventricle (LV)
2: Left Atrium (LA)
3: Aorta (Ao)
4: Right Atrium (RA)
5: Right Ventricle (RV)
Echocardiography: What are the 5 chambers?

If you confuse right with left, think back to organic chemistry and “mirror images”:

1. Right atrium
2. Left atrium
3. Right ventricle
4. Left ventricle
5. Interventricular septum

Transthoracic Echocardiogram
If you confuse right with left, think back to organic chemistry and “mirror images”:

If we draw an imaginary horizontal mirror line in **purple**, we see how the transducer is producing a mirror image of the heart (**orange**), flipped on the horizontal axis.

The flipped image is the one commonly shown in textbooks.
Now that we are oriented to echocardiography, Let’s look at the systematic echocardiographic evaluation of AS.
Echocardiographic Assessment of the Aortic Valve: Simplified Systematic Approach

Qualitative Assessment

1. Severity of Valve Calcification
2. LV Wall Thickness
3. Valvular Mobility*

We will first review the qualitative findings listed above, which help us understand the severity of the AS disease for our patient.

* (Valvular mobility cannot be demonstrated with still shot images in a PDF format. In the next slides, we provide reference to the original movies from which the still shots were taken.)
Let us compare the still shots from two separate echocardiogram:
- Left: TTE from a companion patient with a healthy aortic valve;
- Right: TTE from our patient with AS.
Notice the different echogenicity both in the aortic valve and LV between the two patients.
There are **no/minimal hyperechoic calcifications** in the healthy valve.

In AS, the valve has **hyperechoic thickening**, which suggest significant calcifications.
A well-functioning valve prevents abnormal increase in LV afterload. Thus, the LV has normal thickness with no echogenic signal.

Increased afterload in AS will cause concentric LV hypertrophy, therefore resulting in an abnormally thick and echogenic LV wall.
Healthy Valve vs AS: Summary of echocardiogram findings:

- No Valve Calcifications
- No LV Wall Hypertrophy
- Hyperechoic Valvular Calcifications
- Associated LV Wall Hypertrophy
Echocardiographic Assessment of the Aortic Valve: Simplified Systematic Approach

<table>
<thead>
<tr>
<th>Qualitative Assessment</th>
<th>Diagnostic Measurements</th>
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<tbody>
<tr>
<td>1. Severity of Valve Calcification</td>
<td>1. Aortic Valve Area</td>
</tr>
<tr>
<td>2. LV Wall Thickness</td>
<td>2. Pressure Gradient Across Valve</td>
</tr>
<tr>
<td>3. Valvular Mobility</td>
<td>3. Maximum Transvalvular Velocity</td>
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<td>4. LVEF</td>
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</table>

Having completed our echocardiographic qualitative assessment, we now review a series of quantitative diagnostic measures that are performed via echocardiography, as listed above.
Here, for example, we are performing an echocardiographic measurement of the peak velocity of the blood travelling across the aortic valve. In our patient, the maximum velocity (4.10 m/s) is marked by the orange asterisk in the center of the velocity curve.
Understanding how to measure these numbers is beyond the scope of this presentation. Rather, we want to conceptually understand WHY these numbers are calculated. Specifically, these parameters are collected to stage the severity of AS.
Staging of AS via Echocardiographic Measurements

1. Aortic Valve Area (AVA)
2. Pressure Gradient Across Valve (∆P)
3. Maximum Transvalvular Velocity ($V_{\text{max}}$)
4. LV Ejection Fraction (LVEF)

You can see how as the AVA decreases, the ∆P and/or the $V_{\text{max}}$ increase, the severity of AS increases from “asymptomatic”…

Otto et al. UpToDate, adapted from Nishimura et al. J Am Coll Cardiol. 2014
# Staging of AS via Echocardiographic Measurements

1. **Aortic Valve Area (AVA)**
2. **Pressure Gradient Across Valve (ΔP)**
3. **Maximum Transvalvular Velocity (V\text{max])**
4. **LV Ejection Fraction (LVEF)**

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<table>
<thead>
<tr>
<th>Stage</th>
<th>Definition</th>
<th>Valve anatomy</th>
<th>Valve hemodynamics</th>
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<tbody>
<tr>
<td><strong>D: Symptomatic severe AS</strong></td>
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<tr>
<td><strong>D1</strong></td>
<td>Symptomatic severe high-gradient AS</td>
<td>- Severe leaflet calcification or congenital stenosis with severely reduced leaflet opening</td>
<td>- Aortic V\text{max} ≥ 4 m/s or mean ΔP ≥ 40 mmHg</td>
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<td></td>
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<td>- AVA typically ≤ 1.0 cm² (or AVAi ≤ 0.6 cm²/m²) but may be larger with mixed AS/AR</td>
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<tr>
<td><strong>D2</strong></td>
<td>Symptomatic severe low-flow/low-gradient AS with reduced LVEF</td>
<td>- Severe leaflet calcification with severely reduced leaflet motion</td>
<td>- AVA ≤ 1.0 cm² with resting aortic V\text{max} &lt; 4 m/s or mean ΔP &lt; 40 mmHg</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- Dobutamine stress echocardiography shows AVA ≤ 1.0 cm² with V\text{max} ≥ 4 m/s at any flow rate</td>
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<tr>
<td><strong>D3</strong></td>
<td>Symptomatic severe low-gradient AS with normal LVEF or paradoxical low-flow severe AS</td>
<td>- Severe leaflet calcification with severely reduced leaflet motion</td>
<td>- AVA ≤ 1.0 cm² with aortic V\text{max} &lt; 4 m/s or mean ΔP &lt; 40 mmHg</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- Indexed AVA ≤ 0.6 cm²/m² and</td>
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<td>- Stroke volume index &lt; 35 mL/m²</td>
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<td>- Measured when patient is normotensive (systolic BP &lt; 140 mmHg)</td>
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…to “severely symptomatic”.

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**Otto et al. UpToDate**, adapted from **Nishimura et al. J Am Coll Cardiol. 2014**
1) Echocardiography
(Transthoracic / Transesophageal)
Imaging of choice for:
- Diagnosis of AS
- Evaluation of AS severity

Transthoracic Echocardiogram

We have reviewed the role of echocardiography in the diagnosis and staging of AS.
1) Echocardiography (Transthoracic / Transesophageal) Imaging of choice for:
   - Diagnosis of AS
   - Evaluation of AS severity

2) CT scan
Multiple Detector CT (MDCT) Imaging of choice for:
   - Peripheral vascular access evaluation
   - Aortic valve annular sizing
   - Aortic root anatomy assessment

Now, let’s talk about the role of MDCT in Pre-TAVR evaluation.
Transcatheter Aortic Valve Replacement (TAVR)

Remember that in TAVR we deliver a prosthetic aortic valve using a catheter that travels in the patient’s arteries.
We therefore must first assess the peripheral arterial “highways” of our patient, to ensure that we can slide a catheter and deliver the prosthetic valve.

Which arteries do we assess?
There are three ways to deliver a prosthetic valve via a transcatheter approach:

- Transfemoral, by accessing the femoral artery;
- Transapical, by performing an incision through the heart apex;
- Transaortic, by accessing the aortic arch.
This presentation will focus on the MDCT evaluation for the Pre-TAVR transfemoral approach, which is the most popular approach.
Given that the diameter of the catheter delivering the prosthetic valve is around 5-6 mm, we need to ensure that the arterial “highway” is has a wide enough diameter to allow the smooth advancement of the catheter.
According to the ACR Appropriateness Criteria, MDCT is the most appropriate imaging tool to assess the peripheral arterial system.
1. Peripheral Vascular Access

A. Rule Out Contraindications to Transfemoral Approach:
   C- phase:
   • Arterial Calcified Plaques
   C+ phase:
   • Aneurysmal Disease
   • Arterial Dissections
   • Arterial Tortuosity

B. Assess minimum diameter of:
   • b/l common femoral artery
   • b/l external iliac artery
   • b/l common iliac artery
   • b/l subclavian artery

Here is the list of the anatomical measurements that we must perform in assessing the peripheral arterial system for our patient: let’s review these items one by one.
Peripheral Vascular Access

1. R/o Transfemoral Contraindications:

C-phase:
- Calcified Plaque

In the MDCT C-phase, we start by assessing for calcifications in the wall of the arterial “highway”, from the femoral access site until the ascending aorta.
Peripheral Vascular Access

1. R/o Transfemoral Contraindications:

C- phase:
- Calcified Plaque

C+ phase:
- Aneurysms
- Dissections
- Arterial Tortuosity

Excessive calcifications, aneurysm, chronic aortic dissections or excessive arterial tortuosity, are contraindications to performing the transcatheter procedure.
Peripheral Vascular Access

1. R/o Transfemoral Contraindications:
   
   C- phase:
   • Calcified Plaque

   C+ phase:
   • Aneurysms
   • Dissections
   • Arterial Tortuosity

2. Assess minimum diameter of:

Next, we can elaborate the information from the MDCT to create 3D volume rendering of the peripheral arterial system, in order to calculate arterial diameters.
Peripheral Vascular Access

1. R/o Transfemoral Contraindications:

C- phase:
• Calcified Plaque

C+ phase:
• Aneurysms
• Dissections
• Arterial Tortuosity

2. Assess minimum diameter of:
• Femoral artery
• External iliac artery
• Common iliac artery
• Subclavian artery

Our patient’s femoral artery diameter is wide enough to allow for the advancement of the catheter (6.69 mm > 5.3 mm)

Three-dimensional Volume Rendering of MDCT Data
Peripheral Vascular Access

1. R/o Transfemoral Contraindications:
   
   C- phase:
   - Calcified Plaque
   
   C+ phase:
   - Aneurysms
   - Dissections
   - Arterial Tortuosity

2. Assess minimum diameter of:
   - Femoral artery
   - External iliac artery
   - Common iliac artery
   - Subclavian artery

Similarly, our patient’s external iliac artery diameter is wide enough to allow for the advancement of the catheter (6.58 mm > 5.3 mm)

Courtesy of Dr. Catherine Wei, BIMDC PACS
Peripheral Vascular Access

1. R/o Transfemoral Contraindications:
   
   C- phase:
   • Calcified Plaque

   C+ phase:
   • Aneurysms
   • Dissections
   • Arterial Tortuosity

2. Assess minimum diameter of:
   • Femoral artery
   • External iliac artery
   • Common iliac artery
   • Subclavian artery

Similarly, our patient’s common iliac artery diameter is wide enough to allow for the advancement of the catheter (9.42 mm > 5.3 mm)
Peripheral Vascular Access

1. R/o Transfemoral Contraindications:
   - **C- phase:**
     - Calcified Plaque
   - **C+ phase:**
     - Aneurysms
     - Dissections
     - Arterial Tortuosity

2. Assess minimum diameter of:
   - Femoral artery
   - External iliac artery
   - Common iliac artery
   - Subclavian artery

Lastly, our patient’s subclavian artery diameter is wide enough to allow for the advancement of the catheter (7.51 mm > 5.3 mm)

Courtesy of Dr. Catherine Wei, BIMDC PACS
After confirming that our patient has no contra-indication to the transfemoral approach, we now need to assess the native aortic valve, to select the most appropriate prosthetic valve.
Once again, the ACR Appropriateness Criteria shown how MDCT is the most appropriate imaging tool to assess the aortic valve.
But before we proceed with MDCT evaluation, we must fully understand the complex anatomy of the aortic valve!

[Image of heart with aortic valve highlighted]

Realize how the aortic valve is surrounded by many vital structures, which must not be compromised as the prosthetic valve is inflated against the walls of the aortic base.
Anatomy of the Aortic Valvular Complex

- Aortic Valve is composed of three cusps: right coronary cusp (RCC), Left Coronary Cusp (LCC) and Non Coronary Cusp (NCC);
- The sinuses of Valsalva (SOV) are three anatomic dilations of the ascending aorta, opposite to the three cusps of the aortic valve. One has been filled in yellow.
Anatomy of the Aortic Valvular Complex

Hinge Points: Lowest Point of each cusp, embedded in LV muscle.

Virtual Ring = Aortic Annulus: Imaginary line connecting the three hinge points.
Anatomy of the Aortic Valvular Complex

Anatomic VA Junction: Transition point from the distal end of the LV to the proximal start of the aorta;

Sinotubular Junction (STJ) = first level at which the tubular configuration of the aorta is attained.

After reviewing the complex anatomy of the aortic valve complex, we can now perform the anatomical measurements to choose our prosthetic valve. Let’s individually review these items.
Aortic Valve Assessment

1. C-phase:
   • Valve calcifications;
Aortic Valve Assessment

1. C- phase:
   - Valve calcifications;

2. C+ phase (in systole):
   - Max Valve diameter;
   - Min Valve diameter; (i.e. perpendicular to max)

We then assess for the diameter of the aortic valve lumen. Notice how the valve has elliptical (and not circular!) shape, therefore both a maximum and “minimum” diameters are measured: the latter is actually measured as the line perpendicular to the maximum diameter.
Aortic Valve Assessment

1. C- phase:
   - Valve calcifications;

2. C+ phase (in systole):
   - Max Valve diameter;
   - Min Valve diameter;
     (perpendicular to max)
   - Valve Area;
   - Valve Perimeter;

We then measure the **area** and the **perimeter** of the valve lumen, which will be used to size the appropriate prosthetic valve.
Aortic Valve Assessment

1. C- phase:
   • Valve calcifications;

2. C+ phase (in systole):
   • Max Valve diameter;
   • Min Valve diameter;
     (perpendicular to max)
   • Valve Area;
   • Valve Perimeter;
   • Height to Coronary Ostia;

Applying the information we learned about the anatomy of the aortic valvular complex, we now measure the **height from the aortic annulus to the coronaries**. Usually, the ostia of the left coronary is found to be lower than the ostia of the right coronary.
Aortic Valve Assessment

1. C- phase:
   • Valve calcifications;

2. C+ phase (in systole):
   • Max Valve diameter;
   • Min Valve diameter; (perpendicular to max)
   • Valve Area;
   • Valve Perimeter;
   • Height to Coronary Ostia;
   • Aortic Annulus;

Applying the information we learned about the anatomy of the aortic valvular complex, we then measure the diameter of the aortic annulus.
Aortic Valve Assessment

1. C- phase:
   • Valve calcifications;

2. C+ phase (in systole):
   • Max Valve diameter;
   • Min Valve diameter; (perpendicular to max)
   • Valve Area;
   • Valve Perimeter;
   • Height to Coronary Ostia;
   • Aortic Annulus;
   • Sinotubular Junction;

Followed by the measurement of the diameter of the sinotubular junction.

Courtesy of Dr. Catherine Wei, BIMDC PACS
Aortic Valve Assessment

1. C- phase:
   - Valve calcifications;

2. C+ phase (in systole):
   - Max Valve diameter;
   - Min Valve diameter;
   - Height to Coronary Ostia;
   - Aortic Annulus;
   - Sinotubular Junction;
   - Ventriculo-Arterial Junction

Lastly, we measure of the **diameter of the ventriculo-arterial junction.**
Aortic Valve Assessment

1. C- phase:
   • Valve calcifications;

2. C+ phase (in systole):
   • Max Valve diameter;
   • Min Valve diameter; (perpendicular to max)
   • Valve Area;
   • Valve Perimeter;

   • Height to Coronary Ostia;
   • Aortic Annulus;
   • Sinotubular Junction;
   • Ventriculo-Arterial Junction

In so doing, we have recreated the aortic valvular complex on MDCT!

Courtesy of Dr. Catherine Wei, BIMDC PACS
MCDT Pre-TAVR Assessment: Systematic Approach

1. Peripheral Vascular Access
   A. Rule Out Contraindications to Transfemoral Approach:
      contraindications:
      C- phase:
      • Arterial calcifications/Atheromas
      C+ phase:
      • Aneurysmal disease
      • Previous dissections
      • Arterial Tortuosity
   B. Assess minimum diameter of:
      • b/l common femoral artery
      • b/l external iliac artery
      • b/l common iliac artery
      • b/l subclavian artery

2. Aortic Valve Assessment
   A. C- phase:
      • Aortic valve calcifications
   B. C+ phase (in systole):
      • Maximum Valve diameter;
      • Minimum Valve diameter;
      (diameter perpendicular to max. diameter)
      • Valve Area;
      • Valve Perimeter;
      • Height to Coronary Ostia;
      • Aortic Annulus;
      • Sinotubular Junction;
      • Ventriculo-Arterial Junction.

This concludes our systematic pre-TAVR MDCT approach.
Why did we have to measure so many anatomic landmarks with such precision?!
Because we need to use the information acquired via MDCT to choose one of the commercially available prosthetic valves for our patient!

For example, in the case of the Sapien valve shown above, the diameter of the valve has to match the diameter of the aortic annulus that we measured on MDCT.
Alternatively, the CoreValve shown above has to anchor both at the aortic annulus and the Sinotubular Junction, which we measured on MDCT.
Now, let’s apply everything we have learned with some critical thinking...
TAVR: Critical Thinking Questions

Why is it so important to precisely measure the diameter(s) of the aortic ring?

What would happen if the valve is oversized?

What would happen if the valve is undersized?
What would happen if the valve is **oversized**?

Remember the “precious real estate” around the aortic valve! If we expand the prosthetic valve excessively, we risk transection of the aortic annulus, as well as damage to the mitral valve and the other nearby structures*.

*Litmanovitch et al., 2014
Adams and Cribier, Courtesy of Dr. Jeffrey Popma – BIDMC
What would happen if the valve is **undersized**?

- If the valve does not adhere tightly to the walls of the aortic root, blood can leak through the space between the valve and the wall of the aortic root, effectively resulting in aortic regurgitation.
- Even worse, a loosely attached valve could embolize (!)
Critical Thinking Questions

Why is it so important to precisely measure the various heights of the aortic valvular apparatus?

What would happen if the valve is placed “too high”?

What would happen if the valve is placed “too low”?
What would happen if the valve is placed “too high”? Once expanded, the prosthetic valve could cause iatrogenic occlusion of the coronary artery sinuses (!)
What would happen if the valve is placed “too low”?
Compression of the AV node and electric conduction system could cause iatrogenic rhythm disturbances, and result in the need for a pacemaker.
Our Patient: TAVR Outcomes

Operative Note

Initial aortic pressures measured:
LV 156/15 mm Hg
Ao 118/79 mmHg
Mean gradient (ΔP): 31.2 mmHg

Final aortic pressures measured:
LV 123/14 mmHg
Ao 121/78 mmHg
Mean gradient (ΔP): 4.02 mmHg

After final deployment and post BAV, there was mild aortic regurgitation by TEE. Selective aortography showed mild AR and coronary patency.

s/p TAVR: Post-procedurally, patient had bleeding from right groin access site, so remained in PACU for 2 hours to achieve hemostasis before transfer to floor. Additionally, patient was found to have Left bundle branch block (LBBB) on EKG. Nevertheless, patient has good potential for discharge to home following 1-2 additional inpatient PT visits, and is an excellent candidate for outpatient cardiac rehabilitation once referred by cardiologist, with a requirement of subacute rehabilitation.

Please read these excerpts from our patient operative note and inpatient follow-up note to learn about her outcomes and transitional issues for outpatient care.
Summary: Radiologic Pre-TAVR Assessment

• Prognosis of Aortic Stenosis (AS);
• Indications for Surgical vs Transcatheter Aortic Valve Replacement (SAVR vs TAVR);
• Menu of Radiologic Tests Available for Imaging the Aortic Valve;
• Echocardiography in Diagnosis and Evaluation of AS Severity;
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• Overview of Currently Available Prosthetic Valves;
• Importance of Radiologic Assessment to Avoid Complications.
References:

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8. https://acsearch.acr.org/docs/3082594/Narrative/