



Transcatheter Aortic Valve Replacement (TAVR)

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Introduction

Transcatheter aortic valve replacement (TAVR) is a minimally invasive procedure option for patients suffering from severe aortic stenosis. The procedure is quickly evolving and is crucial to individuals who cannot receive open heart procedures. Aortic stenosis occurs when the aortic valve (valve connecting the aorta to the left ventricle) of the heart is unable to fully open. This is detrimental to a person because the stenosis prohibits blood from properly flowing to the body. This condition weakens the heart over time, thus the body doesn't get the oxygen it needs resulting in the accumulation of fluid in the lungs. Aortic valve stenosis develops and progresses over time. Therefore, a healthcare team monitors the aortic valve and evaluates its function through clinical assessment, echocardiograms, cardiac catheterizations, etc. In this project, a case study is reported of a fifty-four year old male with Hodgkin's disease which lead to his aortic stenosis. Previous diagnostic evaluations and treatments that the patient experienced are discussed. The project explores the reason that TAVR was the best procedure for this patient pertaining to his health and overall well-being.

Transcatheter Aortic Valve Replacement (TAVR):

- A method of aortic valve replacement that includes a transfemoral (TF) approach as preferred access (Mohammadi, S., et al., 2019).
- Historical treatment approach was surgical aortic valve replacement (SAVR), or medical management. Treatment of aortic stenosis (AS) surgically was 30% of the patient population because many patients suffering AS were not surgical candidates (Kumar, V., et al., 2020).

Aortic Stenosis (AS) is:

- Thickening, fibrosis, calcification, and retraction of the aortic valve (Guedeney, P., Collet, J., 2020).
- A detrimental disease due to the aortic valve becoming severely calcified with stenosis and mild regurgitation (Xing Sheng Yang., et al., 2018).

Patient History

- 52-yr-old, Male patient
- Experienced chest pain and difficulty completing physical activities
- History included Hodgkin's disease
- Underwent full-chest radiation therapy and chemotherapy (1993)
- Diagnosed with severe aortic valve stenosis (2020)

Patient Diagnosis and Treatment

- 10-24-19: Echocardiogram
 - valve area of 0.8 cm squared, mean gradient was 33 mm of mercury, velocity of 0.7 m/s, ejection fraction (EF) of 60-65%, left ventricular hypertrophy (LVH) present
- 11-27-19: Cardiac Cath
 - right coronary artery (RCA) had 80% stenosis, left main had 60-70% stenosis
- 2-17-20: Cardiac Cath
 - stented RCA and left main
- 4-2-20: TEE Prior to Cardiac Cath
 - TAVR, Edwards SAPIEN was used 29 mm valve

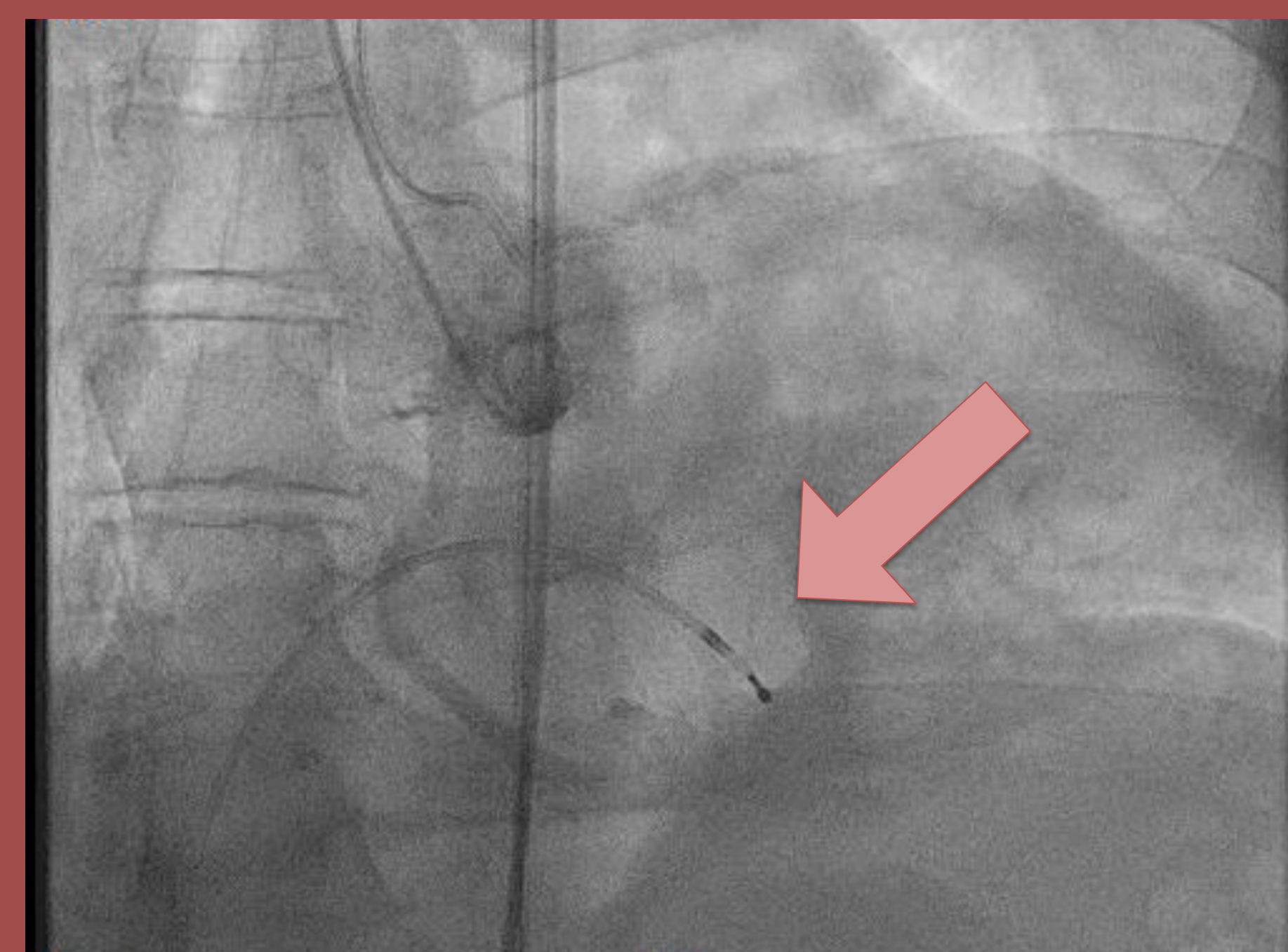


(Equipment, 2022)

TAVR Procedure

- TEE (transesophageal echocardiogram) is performed prior to procedure, to view valve measurements.
- Scrub nurse preps the chest.
- Technologist preps patient for procedure.
- Interventional Cardiologist gains venous and arterial lines.
 - Venous access for temporary pacer
 - Arterial access for pigtail catheter to introduce contrast while images are displayed
- Ten French sheath is introduced to the femoral artery.
- Artificial valve is prepped and is introduced into sheath.
- Valve is deployed.
- TEE is reviewed, images of the iliacs arteries and veins are obtained, and the artery is closed.

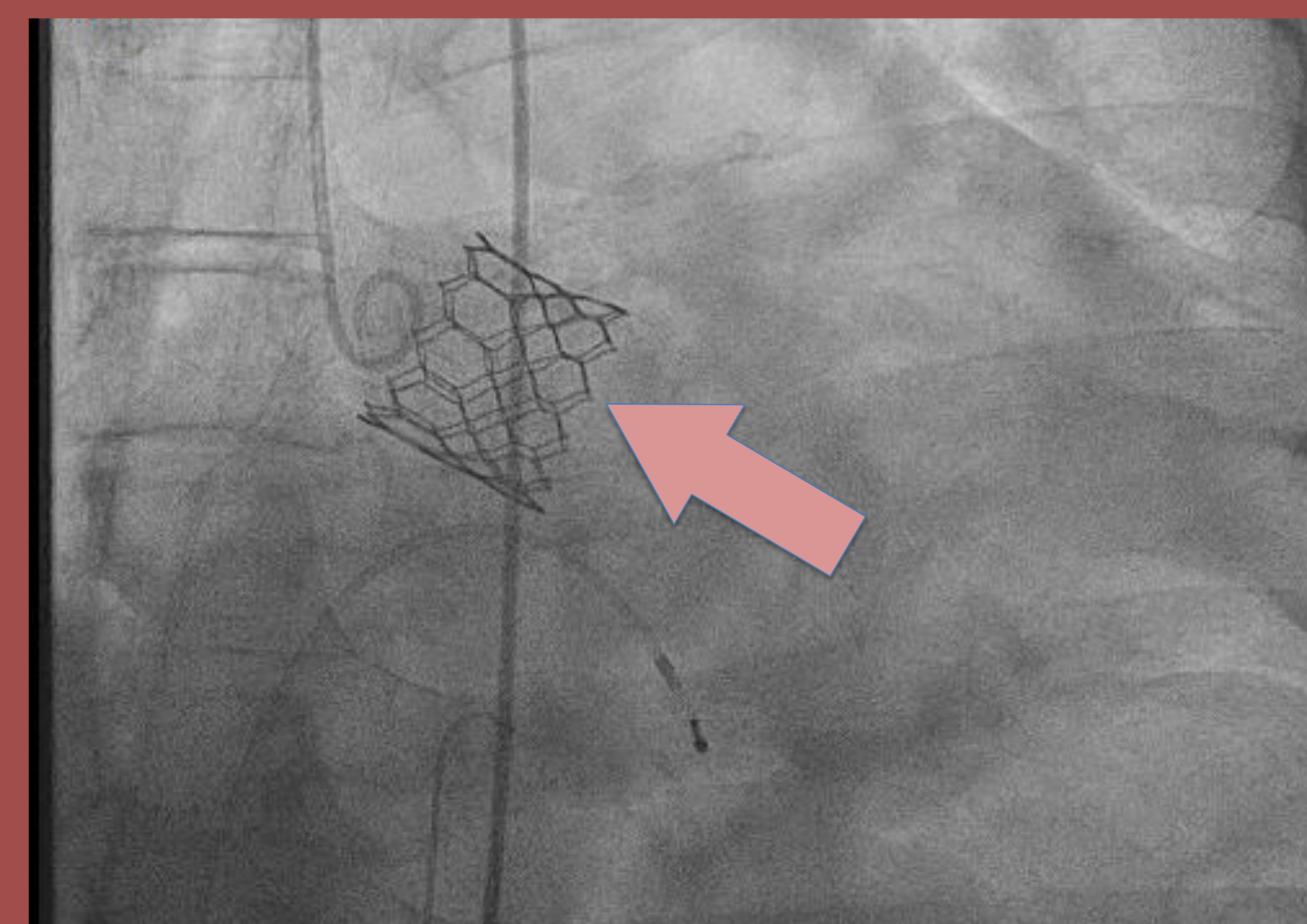
Pre-TAVR Image



(Regional Hospital of Scranton, 2022.)

Temporary pacemaker put in place to pace the heart during valve deployment. Access gained to the aortic valve, images are taken using contrast to view stenosis

Post-TAVR Image



(Regional Hospital of Scranton, 2022.)

Pacing of the heart begins to create a stillness so the valve can be placed
Valve is fed through aorta, released, and deployed

Figure 1 Low-Risk Patients Receiving TAVR in the "Real-World vs. Pivotal Trials"

	TVT Registry	Low Risk Trial #1	Low Risk Trial #2
Number of Patients Receiving TAVR	8,385 in 2019 (7,101 in 2nd half of 2019)	496 (as treated cohort)	725 (as treated cohort)
Age of Patients	Median 75 years (IQR 70,81)	Mean 73 years	Mean 74 years
Sex	65% Male	67.5% Male	66% Male
Race	93% White	NA	92% White
STS PROM Score	Median 2.3% (IQR 1.6, 3.45)	Mean 1.9%	Mean 1.9%
Baseline NYHA Class 3 and 4	48.9%	31.2%	25.1%
Femoral Access	97.8%	100%	100%
Length of Hospital Stay	Median 1 (IQR 1,2)	Mean 3 days	NA
In-Hospital Mortality	0.5%	0.4%	NA

(American College of Cardiology, 2021).

TAVR vs. SAVR

- SAVR results in greater complication than TAVR. (Guedeney, P., Collet, J., 2020).
- TAVR has become the dominant approach to patients undergoing aortic replacement (Mohammadi, S., et al., 2019).
- Unless patients have health risks preventing them from a transcatheter procedure, TAVR has become the procedure of choice for nearly all patients.
- TAVR has a procedural mortality rate of only 2.0% whereas SAVR has a mortality rate of 3.9% (Mohammadi, S., et al., 2019).
- Edwards SAPIEN valves were approved for TAVR patients who had severe AS but were inoperable (ineligible for SAVR).
 - This has created eligibility for individuals who were previously high-risk (Kumar, V., et al., 2020).
- A risk of the TAVR population includes higher rates of major vascular complication (Kumar, V., et al., 2020).
- Stroke rates of TAVR patients versus SAVR are also increased (Kumar, V., et al., 2020).

Conclusion

Transcatheter aortic valve replacement (TAVR) is becoming the gold standard for repairing aortic stenosis. The procedure is minimally invasive, thus resulting in eligibility for patients who do not qualify for SAVR. The procedure itself has developed overtime. Historically the procedure was only completed surgically through open-heart. Now a transcatheter procedure that is minimally invasive has replaced the need for open-heart. Patients recovery time has minimized with transcatheter procedures versus open heart. The patient presented in this case study sample was unable to receive surgical aortic valve replacement (SAVR) due to prior chest radiation treatments. TAVR was the best treatment option for this patient, and he has resumed normal activity.