The Role of End-State Imaging in Enhancing Transcatheter Aortic Valve Implantation Outcomes and Procedural Success

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STEPS

1. Prep & Drape
2. TAVI Access
3. Pacing Access
4. Digital Access
5. Preclose Femoral Artery for TAVI Access
6. Stiff Wire Access
7. TAVI Sheath
8. CEP
9. Aortic Root Angiogram
10. Cross AV
11. LV Wire Stiff Exchange
12. BAV
13. TAVI Check
14. TAVI: Delivery Sheath to Descending AO
15. TAVI: Across AV
16. TAVI: Deploy
17. TAVI: Release
18. TAVI: Deploy Assess – AO/LV Pressure
19. TAVI: Deploy Assess – Root Angiogram
20. CEP: Remove
21. TAVI: Sheath Remove

Introduction/Background

Despite over 20 years of Transcatheter Aortic Valve Implantation (TAVI), patient outcome success relies on a number of factors that are yet to be optimised and there is a lack of uniformity in procedural safety and quality. TAVI is a minimally invasive procedure used to replace a stenotic aortic valve1,2. The literature thus far has illustrated pre and postoperative recommendations for TAVIs, including the criteria involved in selecting patients for TAVIs to the exploration of post operational outcomes for TAVI patients3,4,5. However, there is limited to no information on a standardised practice for TAVIs including the breakdown of the steps involved.

The involvement of machine learning and artificial Intelligence(AI) in imaging modalities for cardiac procedures has also been recognised and researched, which shows potential for the implementation of AI in TAVI procedures6,7. This quantitative prospective cohort study is novel in its approach to evaluating how the TAVI procedural variations influence complication rates, recovery trajectories and key clinical outcomes in 115 cases curating a standardised protocol for TAVI procedures.

Methodology

This prospective quantitative cohort study was conducted on the SXR® platform.

Patient selection was conducted through the cardiology clinic referrals and interdisciplinary Sydney Heart Team demographic data Table 1, severity of disease in Graph 1. Exclusion Criteria was based on contraindication for TAVI listed in the European Society of Cardiology Guidelines.

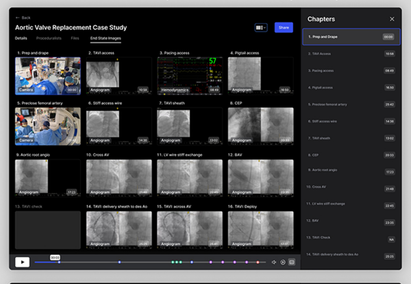
A Stratified Random Sampling strategy was used to collate the data from the 15month period February 2024-May 2025. TAVI recordings on the SXR ® platform were mapped with time stamps, stages and chapters in chronological order including 18 steps: Prep and Drape, Pacing access, Tavi access, Pigtail access, Preclose Femoral Artery for TAVI Access, Stiff access wire, TAVI sheath, CEP insertion, Aortic root Angiogram capture, Cross AV, LV wire stiff exchange, Balloon Aortic Valve, TAVI Check, TAVI delivery sheath to descending aorta, TAVI across Aortic valve, TAVI deploy, TAVI release, TAVI deploy assessment(AO/LV Pressure), TAVI deploy assessment (Root Angiogram), CEP removal, TAVI sheath removal, Access close and Angiogram. Start time, End time and End stage Images were recorded for each stage. The type of device, valve and deployment were also documented to then compare their effectiveness.

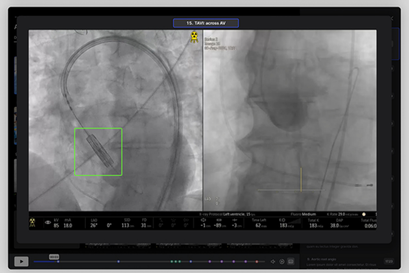
Objective

This study investigates the quality and completeness of end-state imaging datasets in TAVI and utilises the novel SXR® platform to capture end-state imaging. The aim of this study is to explore predictive modelling linking procedural metrics such as fluoroscopy, pacing during, valve position with the SXR® platform of procedural step tagging, chaptering and analysis.

SXR® platform real time step data capture

End-State data capture and analysis system



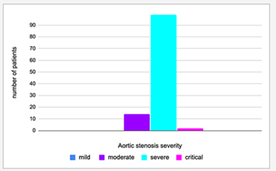


Results

Table 1: Patient Demographic Data

	TAVI Data
Male	72 (63%)
Female	43 (37%)
Age (years)	Mean 80 Min 63 Max 93
BMI (kg/m2)	Mean 30
Valve in Valve	8 including 1 TAVI In TAVI
Valve Type	Sapien Ultra Evolute Pro Evolut R Evolut FX MYVAL Octacor Navitor
Valve Size	26

Graph 1: PreTAVI: Valve disease severity

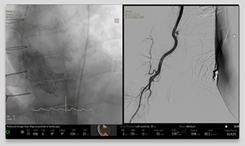


Once the data was collected, the SXR team analysed the collated data for interpretation. This was performed through SXR's proprietary platform and AI models as well as utilising SageMaker for real time processing. This benchmarked to gold standard expert interpretation. The interpreted data was then used to identify the necessary and optional steps involved in a TAVI and a standardised protocol for TAVI procedures was completed.

TAVI is an effective treatment alternative in surgical high risk or patients not eligible for surgery. Pre-procedural, intra and post procedural imaging plays an integral part in the planning, deployment and performance of TAVI, critical for success.

Case Subsets - Valve in Valve data capture

SXR® platform capture of valve-valve TAVI



Conclusion

This innovative platform seeks to establish benchmarks for optimal performance of procedural steps. Findings provide actionable insights for refining TAVI protocols, optimizing procedural outcomes for the purpose of enhancing long-term patient recovery.

For more information scan the QR code

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