A Novel Technique for Commissural Alignment of Balloon-Expandable Transcatheter Aortic Valve Replacement: The SBCA Experience

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Nature of Financial Relationship	Ineligible Company
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Background

- Commissural alignment (CA) of balloon-expandable transcatheter aortic valve replacement (BE-TAVR) remains elusive
- Despite previous attempts of CA of BE-TAVR, none have been successful at consistently achieving CA
- Proposed benefits of CA include simpler coronary re-access, improved hemodynamics, decreased incidence of hypoattenuated leaflet thickening, and decelerated TAVR deterioration

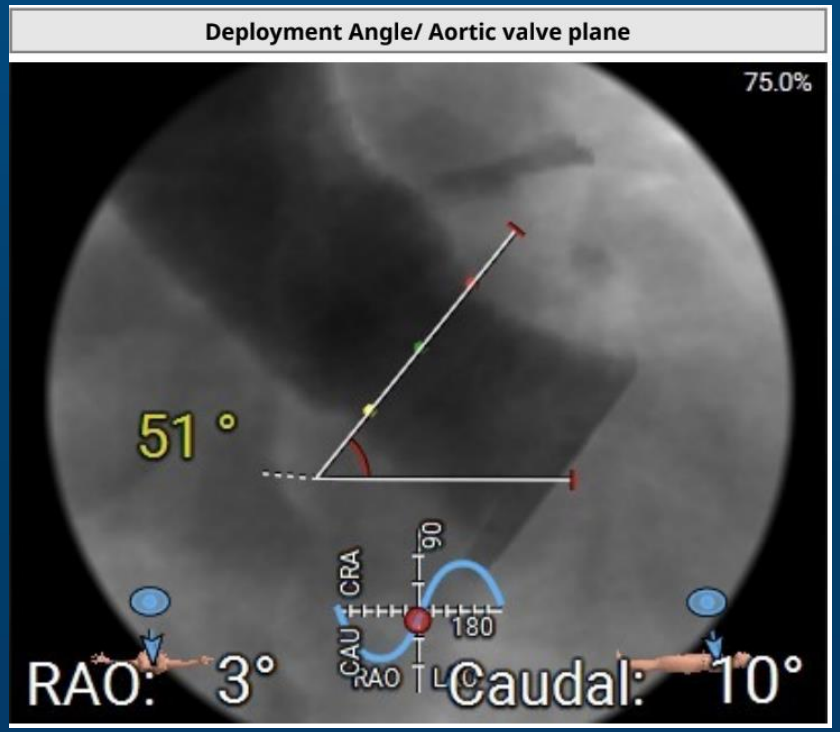
Methods

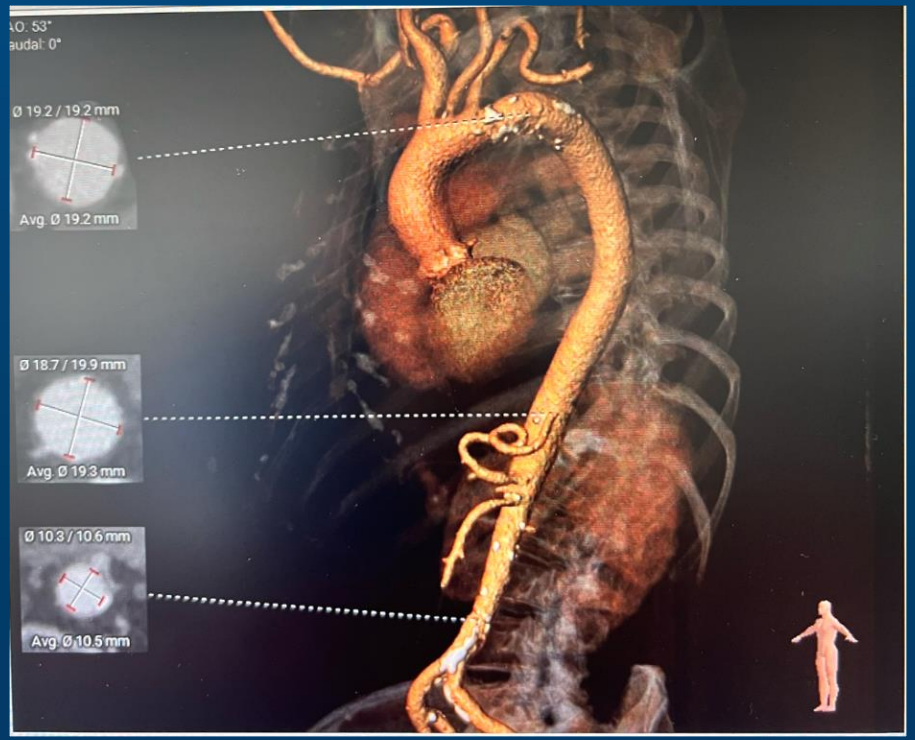
- *Prospectively* evaluated the effects of BE-TAVR crimping orientation based on CT-derived aortic valve plane for *76 patients*, utilizing the Shenoda-Blocker Commissural Alignment (SBCA) technique
- Rates of successful CA were then *retrospectively* compared the previous *76 patients* who had undergone BE-TAVR using standard crimping and valve implantation techniques.

Methods

- Used the ALIGN-TAVR Consortium definitions of CA.
- However, valve alignment was assessed by *intraprocedural transesophageal echocardiogram* during the index TAVR, rather than retrospective CT analysis.
- Categories included:
  - CA (0-15.0°)
  - Mild commissural malalignment (CMA) (15.1°- 30.0°)
  - Moderate CMA (30.1°- 45.0°)
  - Severe CMA (45.1°- 60.0°)

CT-Derived Aortic Root Angle





SBCA Commissural Alignment Technique

CT-DERIVED AORTIC ROOT ANGLE	CRIMPING ORIENTATION
< 35°	3:00
35° - 55°	3:30
55° - 65°	4:00
> 65°	4:30

SBCA Commissural Alignment Technique

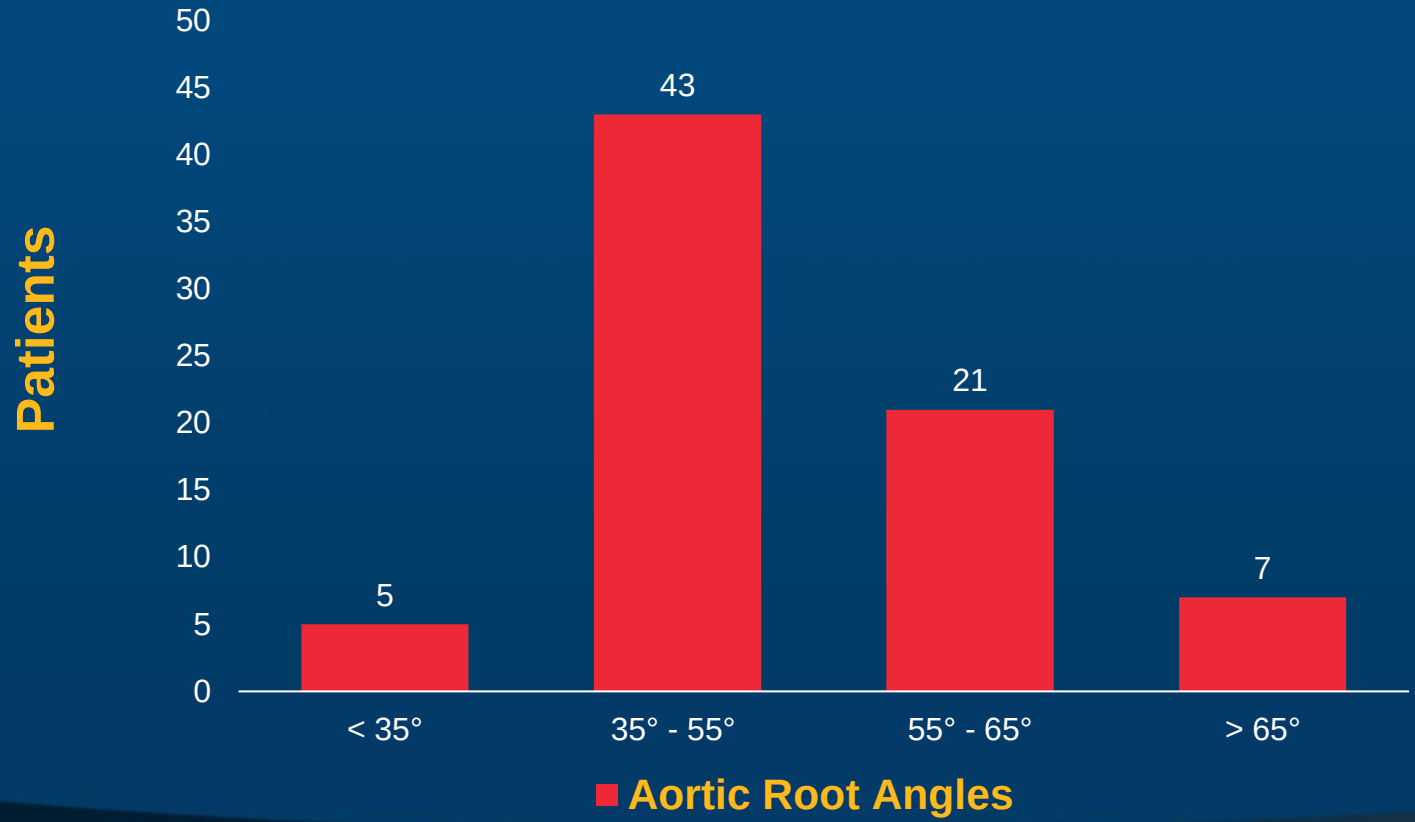
Results

- Baseline patient characteristics for both groups were similar
- Rate of CA for BE-TAVR utilizing the SBCA technique was 66% (*50/76 patients*) compared to 31% in the standard group (*23/75 patients*)
- *Two-Sample Proportions Chi-Squared Test* was performed to examine the relationship between these two independent proportions, [χ^2 (1, N= 151)= 17.27, 95% CI (0.18, 0.51), $p < 0.01$] signifying statistically sufficient evidence to conclude that the proportion of patients with CA utilizing the SBCA technique is higher than the proportion of patients with CA pre-technique

Results

- The rate of CA + mild CMA (coronary alignment) for the SBCA technique was 80% (61/76 patients) compared to 53% (40/75 patients) in the standard group, which was also statistically significant for the SBCA technique (95% CI (0.11, 0.43), $p < 0.01$).
- Severe CMA was rare with the SBCA technique at 1.3% (1/76 patients) compared to the standard technique at 31% (23/75 patients) favoring the SBCA technique (95% CI (0.17, 0.41), $p < 0.01$).

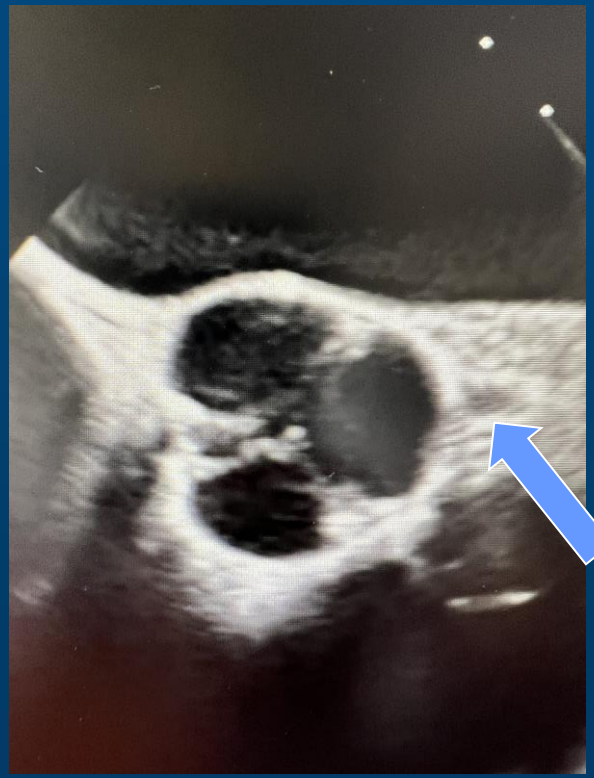
Aortic Valve Plane Trends

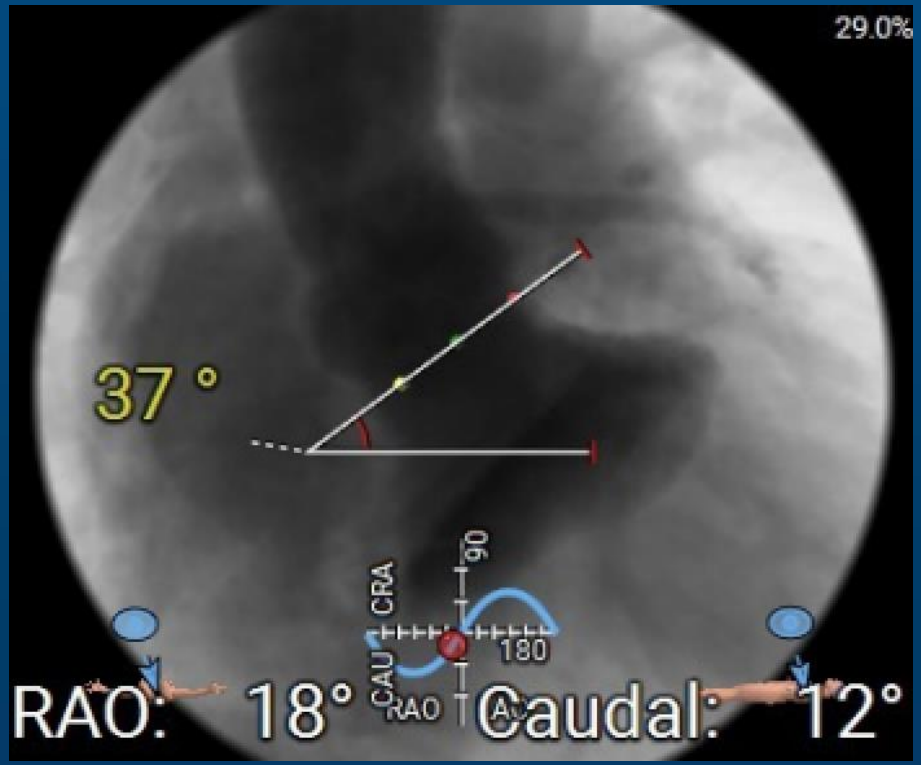


Bicuspid Valves

- Bicuspid type 0: 2 (1 Mod CMA, 1 Severe CMA)
- Bicuspid type 1: 4 (2 CA, 1 Mild CMA, 1 Mod CMA)

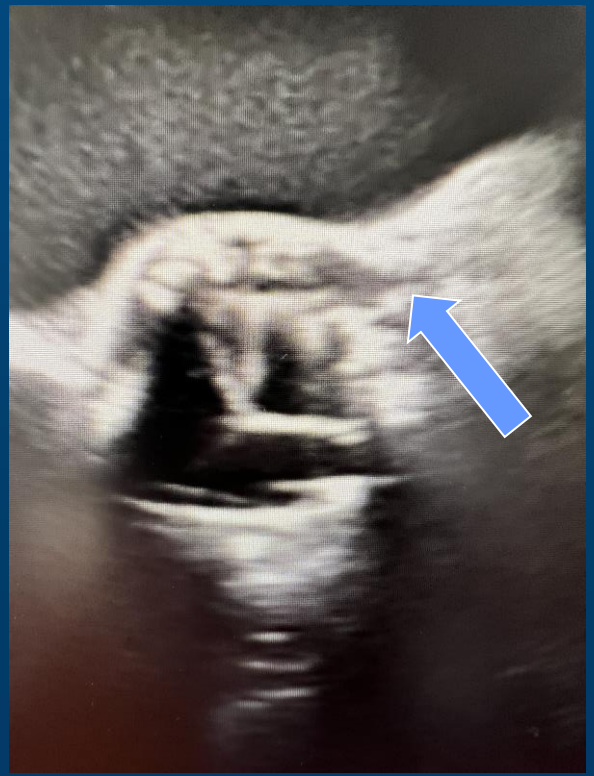
Example – Trileaflet Valve





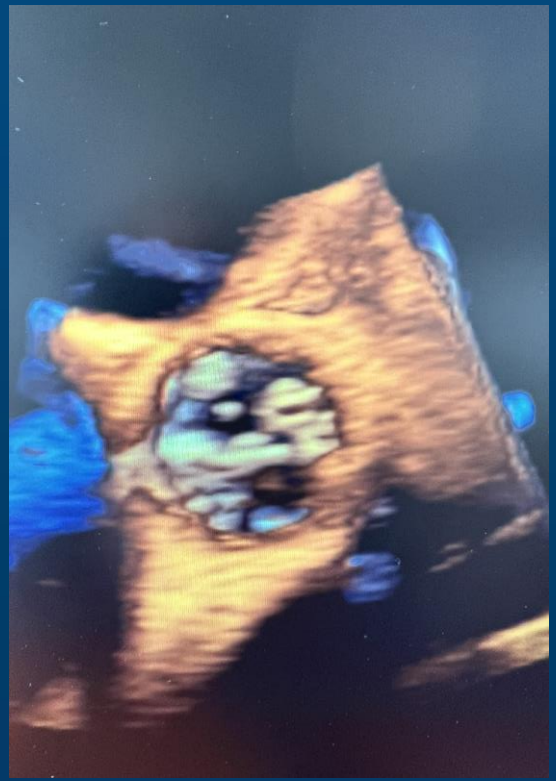
37° Aortic Valve Plane

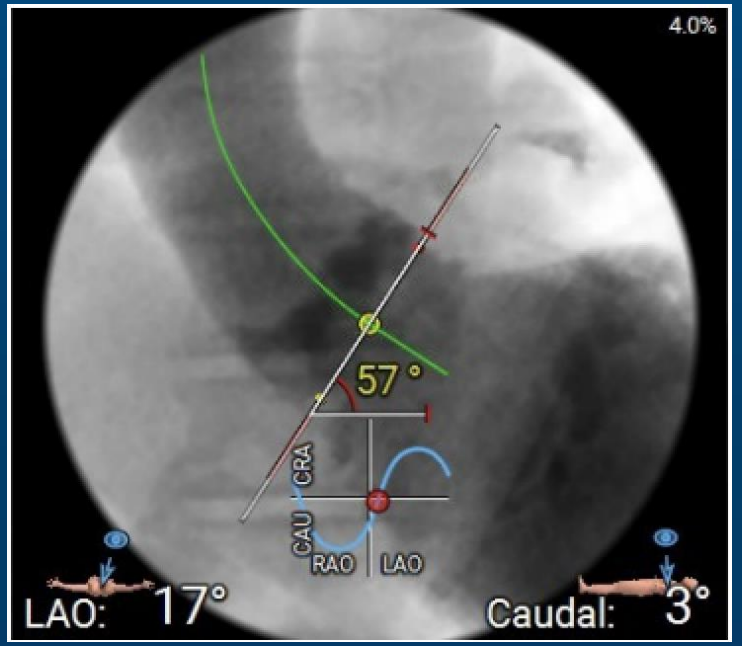
Example – Trileaflet Valve



37°Aortic valve plane – 3:30 crimping orientation

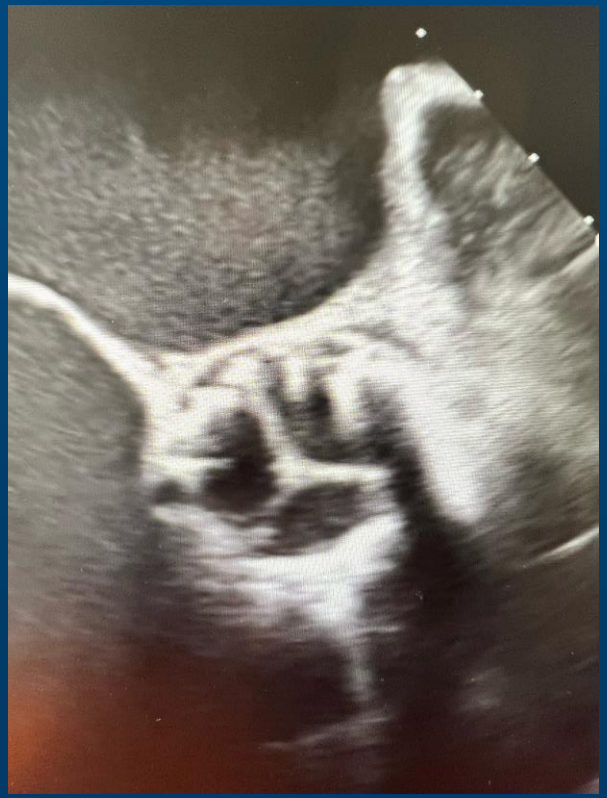
Example – Bicuspid Valve Type I





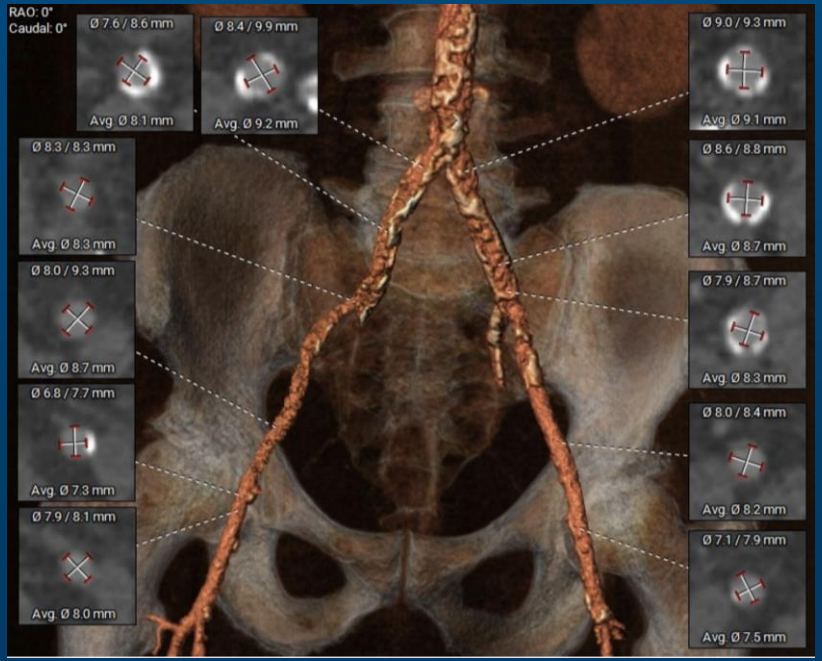
57° Aortic Valve Plane

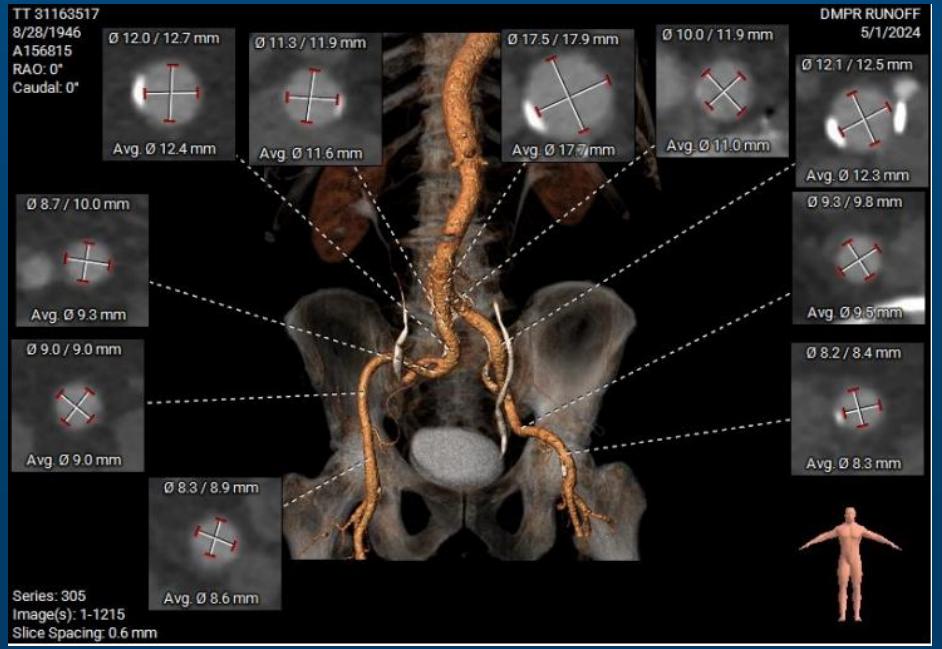
Example – Bicuspid Valve Type I



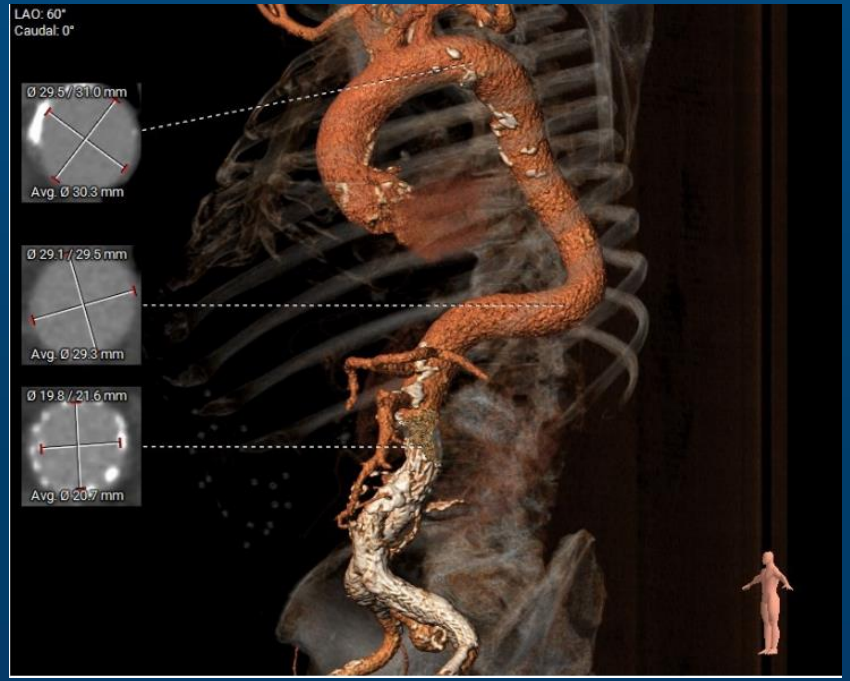
57° Aortic valve plane - 4:00 crimping orientation

Caution/Downfalls – Iliofemoral Tortuosity

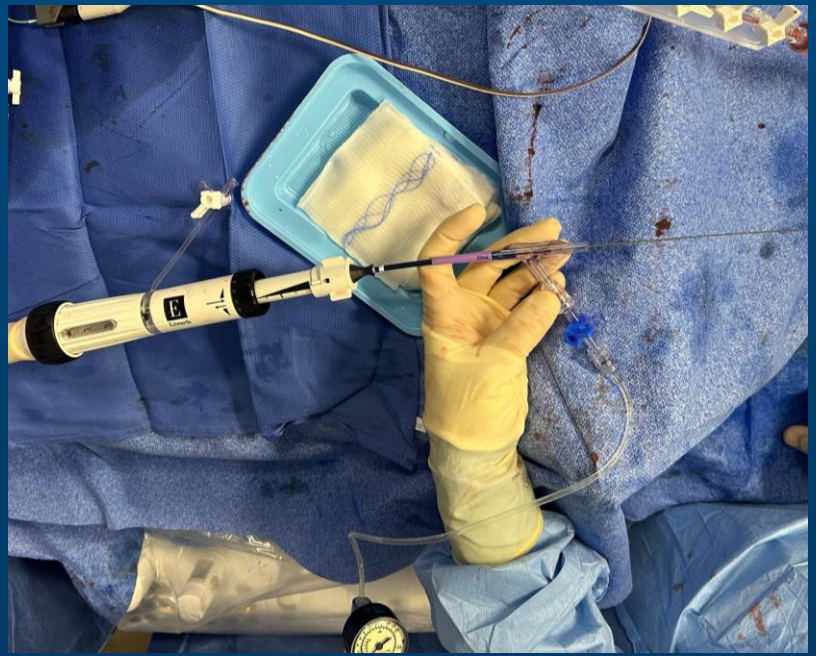




Caution/Downfalls – Aortic Tortuosity



Caution/Downfalls – Catheter Rotation



- Balloon port orientation should always remain in the *9:00* position
- May need to adjust after crossing the valve
- Adjusting during rapid ventricular pacing results in better translation of torque

Conclusion

- SBCA technique of Sapien 3 THV orientation during valve crimping based on CT-derived aortic valve plane resulted in a significant improvement in commissural alignment (66%) when compared to standard implantation technique (31%)
- Increased to 80% with CA + mild CMA (coronary alignment) compared to 53% with the standard implantation technique
- Severe CMA was rare with the SBCA technique
- CA outliers were associated with *extremes of aortic root angulation* (<35° or >65°), *significantly tortuous iliofemoral vessels*, *aortic tortuosity*, and with significant catheter manipulation during TAVR.

Citations

- Tang, GHL et al. Alignment of transcatheter aortic-valve neo-commissures (ALIGN TAVR): Impact on final orientation and coronary artery overlap. *JACC Cardiovasc Inter.* 2020, 13(9):1030-42
- Tang, GHL et al. Rationale, definitions, techniques, and outcomes of commissural alignment in TAVR; From the ALIGN-TAVR consortium. JACC Cardiovasc Inter. 2022, 15(15):1497-1518
- Akodad M et al. Transcatheter heart valve commissural alignment: An updated review. *Front. Cardiovasc. Med.* 2023, 10:1154556. doi: 10.3389/fcvm.2023.1154556