Essential Imaging for Post-TAVR and Aortic Stenosis Evaluation

Evidence, Technique, and two case studies on leaving your Comfort Zone

Michael Trump, RCS, FASE
Lead Heart and Vascular Center Sonographer II
University of Alabama at Birmingham (UAB)

SDMS Annual Convention 2025

1

SPEAKER PRESENTATION DISCLAIMER

The content and views presented are made available for educational purposes only. The information presented are the opinions of the presenter and do not necessarily represent the views of the Society of Diagnostic Medical Sonography (SDMS) or its affiliated organizations, officers, Boards of Directors, or staff members.

The presenter is responsible for ensuring balance, independence, objectivity, scientific rigor, and avoiding commercial bias in their presentation. Before making the presentation, the presenter is required to disclose to the audience any relevant financial interests or relationships with manufacturers or providers of medical products, services, technologies, and programs.

The SDMS and its affiliated organizations, officers, Board of Directors, and staff members disclaim any and all liability for all claims that may arise out of the use of this educational activity.

2

RESEARCH DISCLAIMER

The information presented in this presentation is based on research conducted to the best of the presenters' abilities and knowledge. Research involves uncertainty and is subject to limitations. The findings and conclusions presented herein may be influenced by various factors including but not limited to data quality, methodology, assumptions, and interpretation.

Research outcomes may not always accurately predict real-world scenarios or future events. While the presenter may make efforts to ensure the accuracy and reliability of the information presented, completeness or absolute correctness is not guaranteed. This presentation is intended for informational purposes only and should not be construed as professional advice. Participants are encouraged to independently verify any information provided and consult relevant experts or professionals where appropriate.

The SDMS and its affiliated organizations, officers, Board of Directors, and staff members disclaim any and all liability for all claims that may arise out of the use of this educational activity.

3

GENERATIVE AI DISCLAIMER

The presenter utilized the use of large language models (LLMs) and generative artificial intelligence (AI) as a productivity tool to assist in drafting and refining content in this presentation.

While these tools can aid in structuring ideas, summarizing, paraphrasing, and language polishing, they have inherent limitations and cannot replace human creativity, critical thinking, or expert judgment. AI-generated content may contain errors, biases, or gaps in knowledge.

This presentation is intended for informational purposes only and should not be construed as definitive or authoritative guidance. Participants are encouraged to critically evaluate the information presented and consult relevant experts as needed. The SDMS and its affiliated organizations, officers, Board of Directors, and staff members disclaim any and all liability for claims that may arise from the use or interpretation of this educational material.

4

Disclosures

- **Professional, non-product speaker:**
  - **Edwards Lifesciences** - Aortic Stenosis education
  - **Abbott Medical** - Mitral Regurgitation education
  - **Bristol Myers Squibb** - Hypertrophic Cardiomyopathy education

No additional financial relationships or conflicts of interest to disclose

5

Learning Objectives

1. **Describe** the LVOT-to-aorta anatomy and Doppler-angle principles the make RSB critical for accurate gradients
2. **Summarize** key guidelines and peer-reviewed data showing how often apical windows fail
3. **Apply** the continuity equation to LVOT diameter, PW, CW Doppler from the same window and know when that window is RSB
4. **Integrate** quick, patient-friendly RSB imaging when rolling the patient, using Pedoff, and documenting the optimal window into routine workflow.

6

Aortic Stenosis

- Aortic Stenosis
- Continuity equation
- Left ventricular outflow tract
- Apical windows
  - Pulsewave LVOT
  - Continouswave aortic valve

Image 1: LVOT diameter PLAX, from author's clinical collection, de-identified (M.Trump, 2025)

7

Aortic Stenosis

- Aortic Stenosis
- Continuity equation
- Left ventricular outflow tract
- Apical windows
  - Pulsewave LVOT
  - Continouswave aortic valve

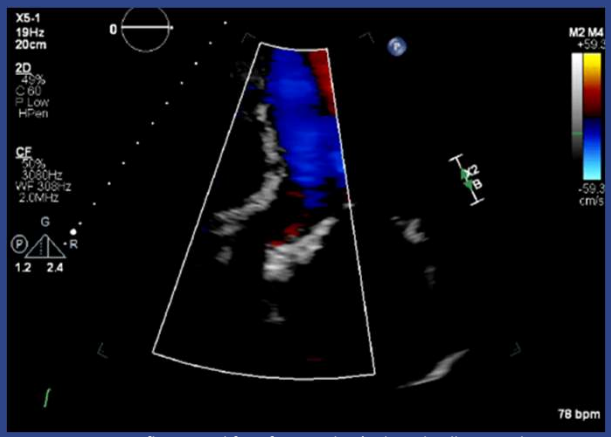


Image 2: LVOT outflow apical five, from author's clinical collection, de-identified (M.Trump, 2025)

8

Aortic Stenosis

- Aortic Stenosis
- Continuity equation
- Left ventricular outflow tract
- Apical windows
  - Pulsewave LVOT
  - Continouswave aortic valve

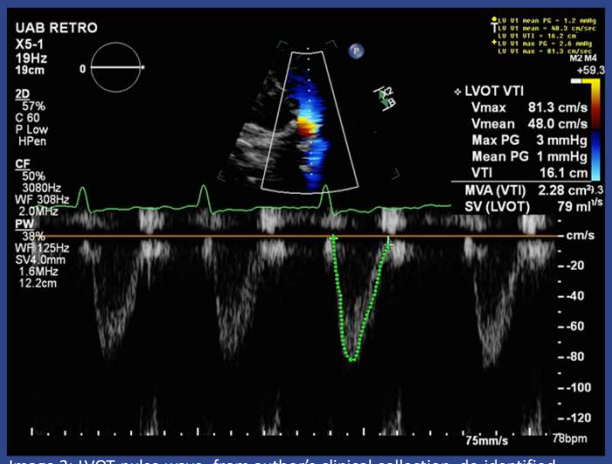


Image 3: LVOT pulse wave, from author's clinical collection, de-identified (M.Trump, 2025)

9

Aortic Stenosis

- Aortic Stenosis
- Continuity equation
- Left ventricular outflow tract
- Apical windows
  - Pulsewave LVOT
  - Continouswave aortic valve

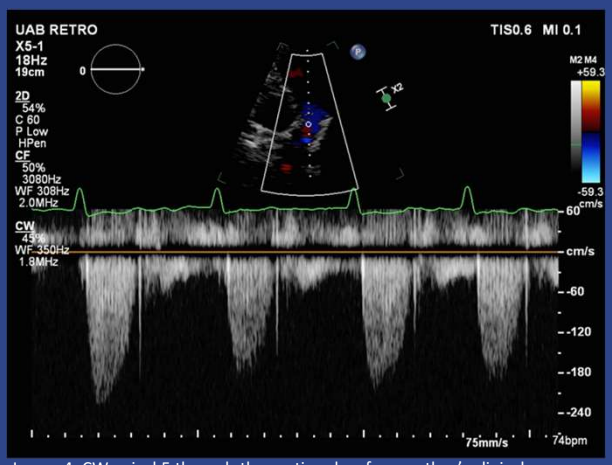


Image 4: CW apical 5 through the aortic valve, from author's clinical collection, de-identified (M.Trump, 2025)

10

Aortic Stenosis

- Aortic Stenosis
- Continuity equation
- Left ventricular outflow tract
- Apical windows
  - Pulsewave LVOT
  - Continouswave aortic valve
- Right sternal border

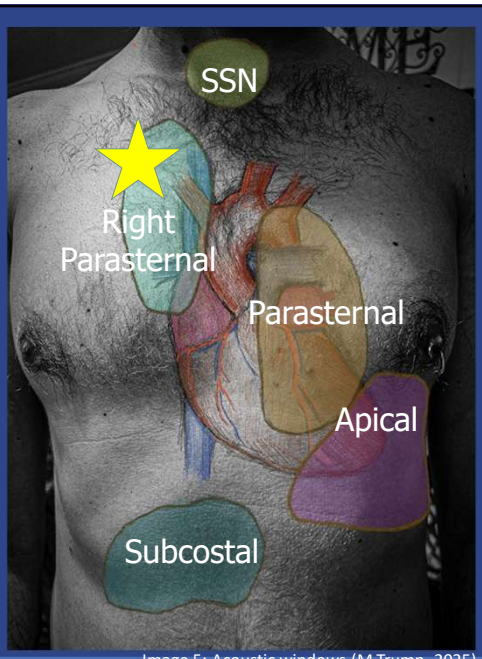


Image 5: Acoustic windows (M.Trump, 2025)

11

Aortic Stenosis

- Aortic Stenosis
- Continuity equation
- Left ventricular outflow tract
- Apical windows
  - Pulsewave LVOT
  - Continouswave aortic valve
- Right sternal border

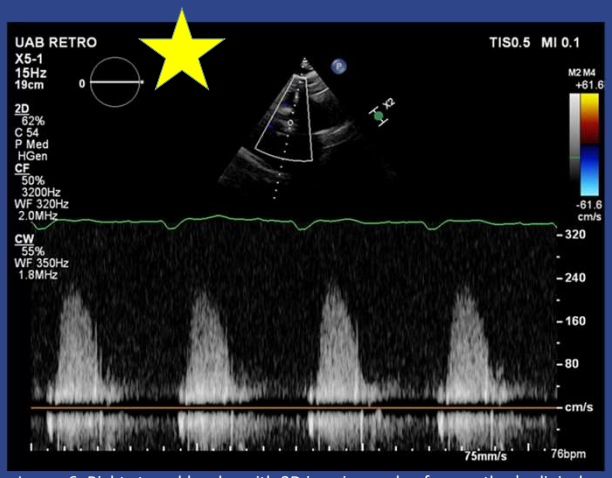
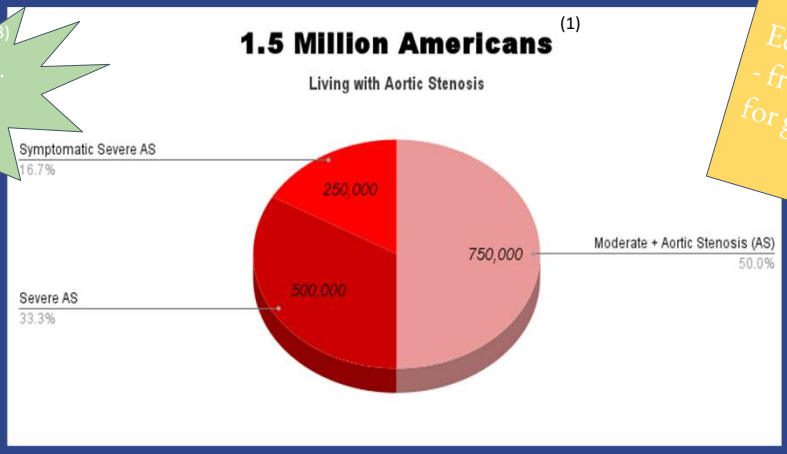


Image 6: Right sternal border with 2D imaging probe, from author's clinical collection, di-identified (M.Trump, 2025)

12

Aortic Stenosis: Why Missing the Peak Jet Matters

Untreated Severe Symptomatic AS: 50% 2-year mortality (3)



Echo Doppler (2) - front line test for grading AS

Missing the highest jet = missing the diagnosis

13

Aortic Stenosis - Standard Apical Assessment

- **Continuity equation:**
  - AVA= ($LVOT_{area}$ *x* LVOT PW_{VTI})/ AV CW_{VTI} (1)
- **Apical 5 & 3 Ch** views (standard of care)
  - PW sample 0.5-1 cm below the valve (4)
  - CW beam through an optimized view of the aortic jet
- **Pitfall:** Even a ***15-20°*** mal-alignment underestimates velocity & gradient (4)

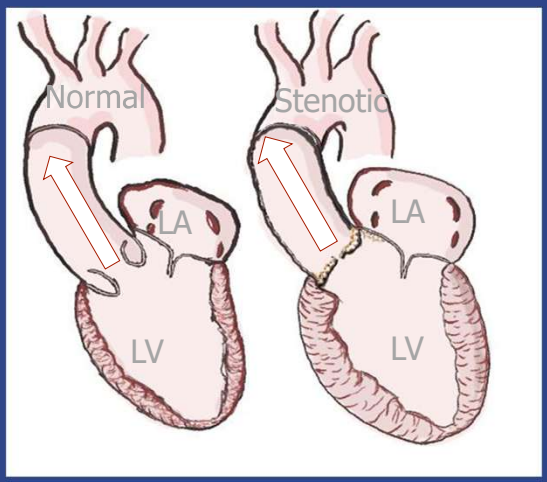


Image 8: Hand drawing of normal and stenotic aortic valve and left ventricle (M.Trump, 2025)

14

Case Study 1

- Male
- 360 LBS
- SAVR
- Concern for stenotic prosthetic valve

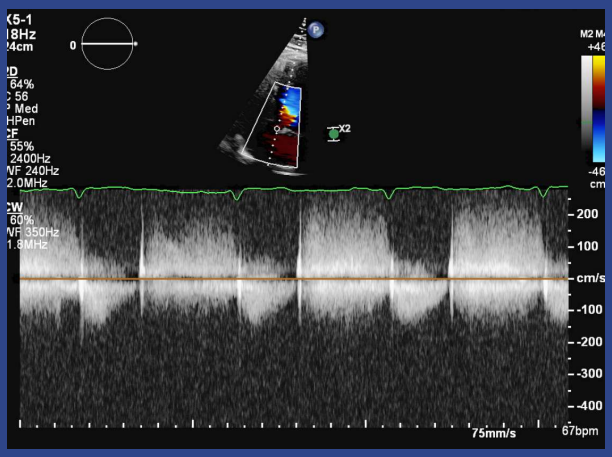


Image 9: Apical CW Doppler across surgical AV, from author's clinical collection, di-identified (M.Trump, 2025)

15

Why the Angle Matters

- Acute aortoseptal angle (<119°) AO jet aims anterior and to the right.(5)
- In a contemporary severe-AS cohort, Peak V_{max} is not at the Apical window 61% of the time.(6)
- Even with a "wide" angle, more than 50% of patients still need non-apical windows.(6)

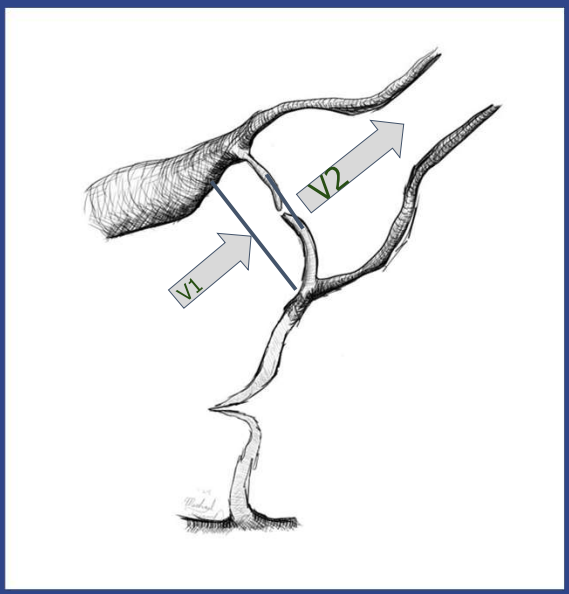


Image 10: Hand drawing PLAX of the LVOT, AV and Ascending AO (M.Trump, 2024)

16

Case Study 1

- Male
- 360 LBS
- SAVR
- Concern for stenotic prosthetic valve

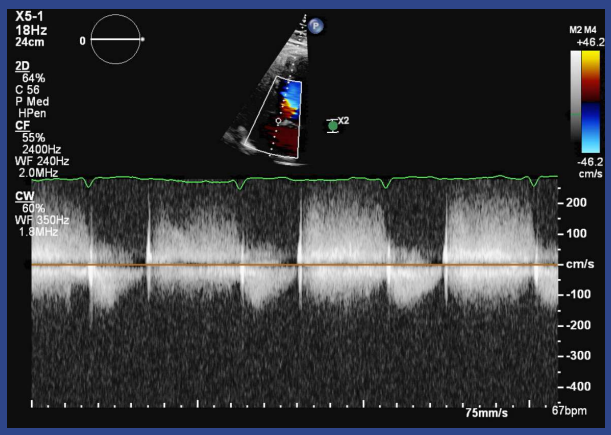


Image 9: Apical CW Doppler across surgical AV, from author's clinical collection, di-identified (M.Trump, 2025)

17

Case Study 1

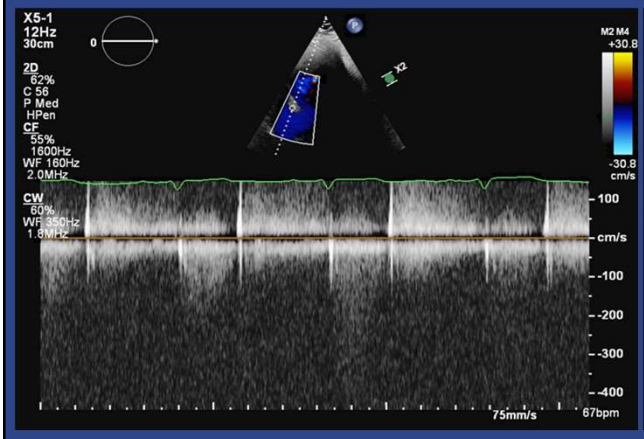


Image 11: Apical CW Doppler across surgical AV, from author's clinical collection, di-identified (M.Trump, 2025)

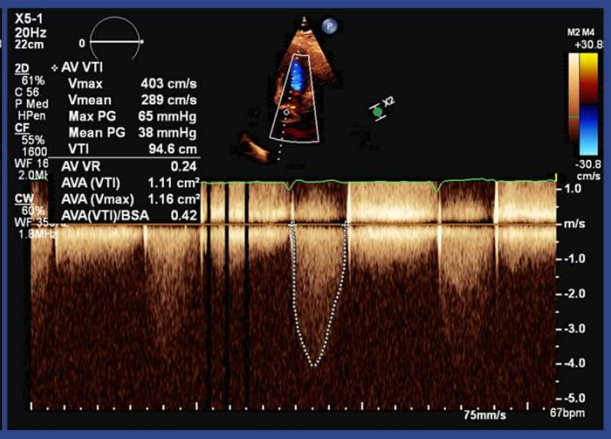


Image 12: Apical CW Doppler across surgical AV "buddy sonographer" assisting, from author's clinical collection, di-identified (M.Trump, 2025)

18

"I need you to roll to your right side."

19

Case Study 1

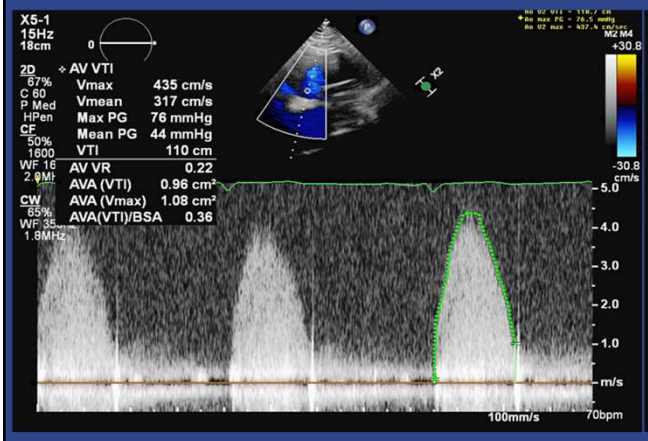


Image 13: Right sternal boarder CW Doppler across surgical AV, over gained, from author's clinical collection, di-identified (M.Trump, 2025)

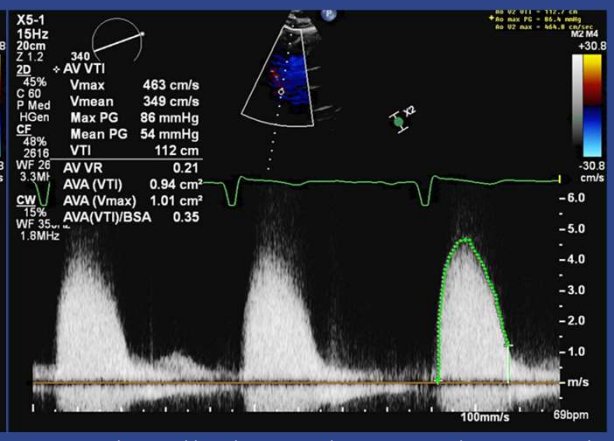


Image 14: Right sternal boarder CW Doppler across surgical AV, UEA assisted, from author's clinical collection, di-identified (M.Trump, 2025)

20

Case Study 1

Intra-op Apical 3 CW after TAVR procedure.

MAC

PT Supine

About 1 m/s or 100 cm/s

Image 15: Apical CW Doppler across intra-op TAVR, from author's clinical collection, di-identified (M.Trump, 2025)

21

Case Study 1

Intra-op CW right sternal border

Pt supine

The right sternal window is still significantly higher than the apical window.

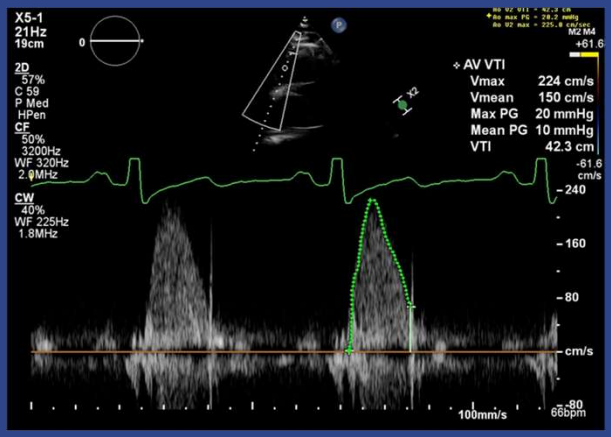


Image 16: Right sternal boarder CW Doppler across surgical AV, intra-op post procedure, from author's clinical collection, di-identified (M.Trump, 2025)

22

Case Study 1

SAVR; concern for stenotic prosthetic valve

V max at 1m/s

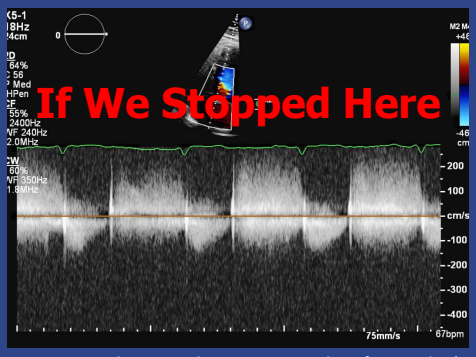


Image 9: Apical CW Doppler across surgical AV, from author's clinical collection, di-identified (M.Trump, 2025)

4 X HIGHER

V max at 4.6m/s and a mean of 54mmHg

Image 14: Right sternal boarder CW Doppler across surgical AV, UEA assisted, from author's clinical collection, di-identified (M.Trump, 2025)

23

Case Study 1

PT Supine. Intra-op Apical 3 CW after TAVR procedure.

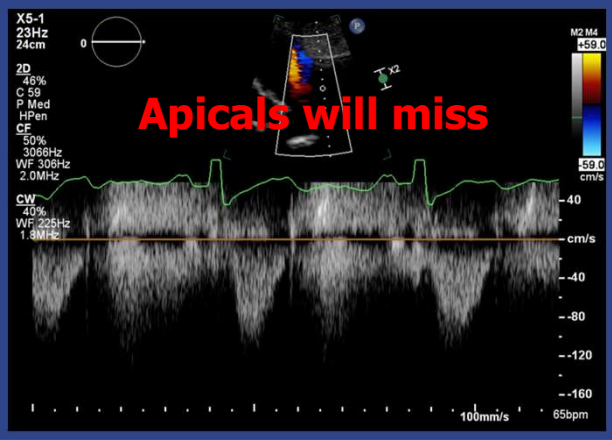


Image 15: Apical CW Doppler across intra-op TAVR, from author's clinical collection, di-identified (M.Trump, 2025)

Intra-op CW of RSB. The right sternal window is significantly higher than the apical window.

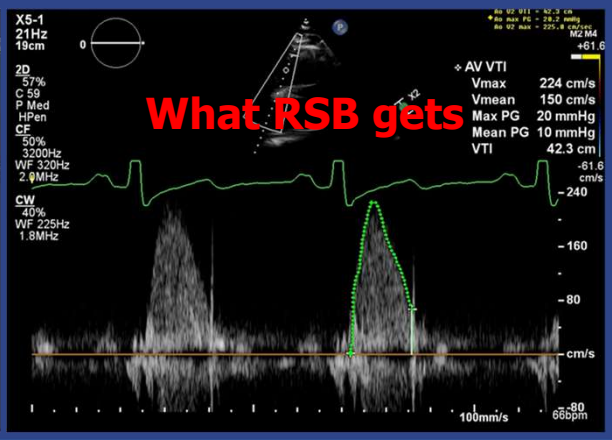


Image 16: Right sternal boarder CW Doppler across surgical AV, intra-op post procedure, from author's clinical collection, di-identified (M.Trump, 2025)

24

Case Study 2

- Male
- 140 LBS
- ESRD
- Post-op 1 year scheduled visit

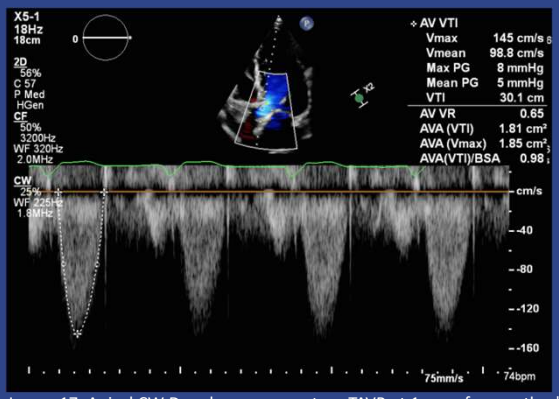


Image 17: Apical CW Doppler across post-op TAVR at 1 year, from author's clinical collection, di-identified (M.Trump, 2025)

25

Case Study 2

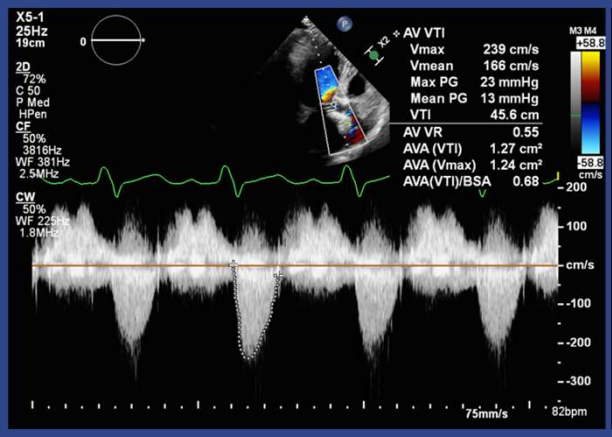


Image 18: Apical CW Doppler across post-op day 1TAVR, from author's clinical collection, di-identified (M.Trump, 2025)

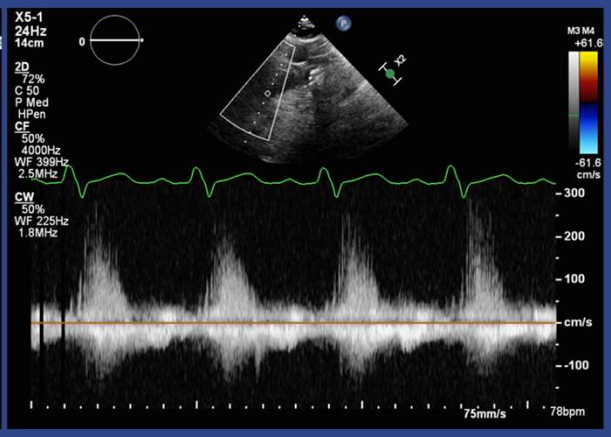


Image 19: RSB CW Doppler across post-op day 1 TAVR, from author's clinical collection, di-identified (M.Trump, 2025)

Post-op Day 1

26

Case Study 2

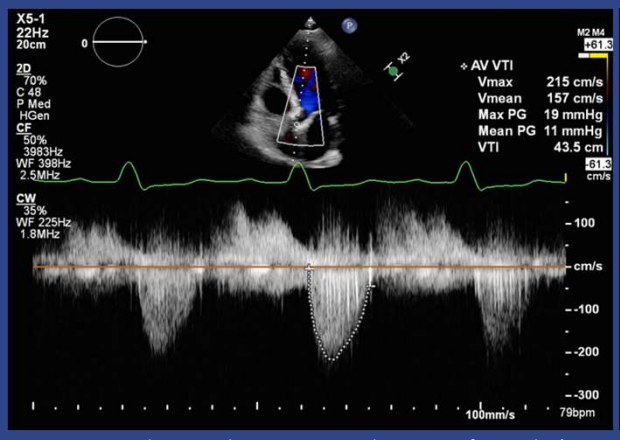


Image 20: Apical CW Doppler across post-op day 30 TAVR, from author's clinical collection, di-identified (M.Trump, 2025)

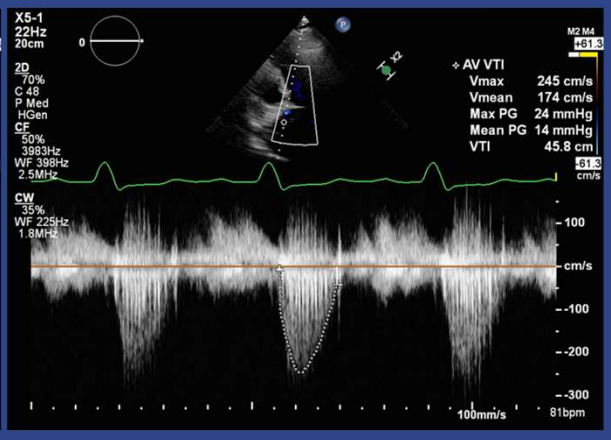


Image 21: Apical CW Doppler across post-op day 30 TAVR, from author's clinical collection, di-identified (M.Trump, 2025)

Post-op day 30

27

Case Study 2

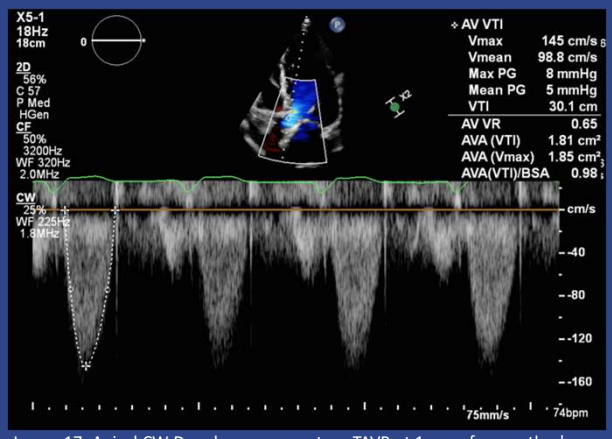


Image 17: Apical CW Doppler across post-op TAVR at 1 year, from author's clinical collection, di-identified (M.Trump, 2025)

Beautiful waveform
Great gradients
Patient feels fine
I'm done right?

28

"I need you to roll to your right side."

29

Case Study 2

Image 17: Apical CW Doppler across post-op TAVR at 1 year, from author's clinical collection, di-identified (M.Trump, 2025)

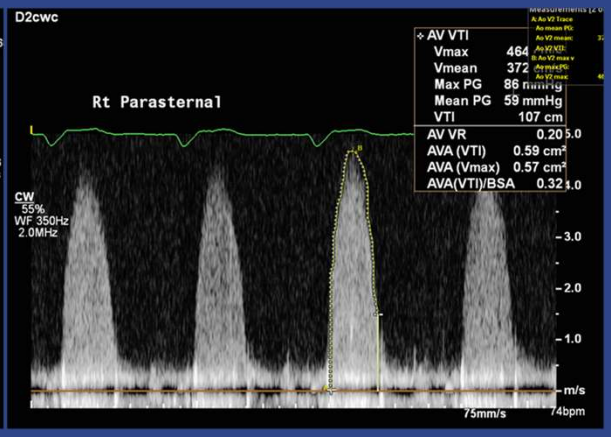
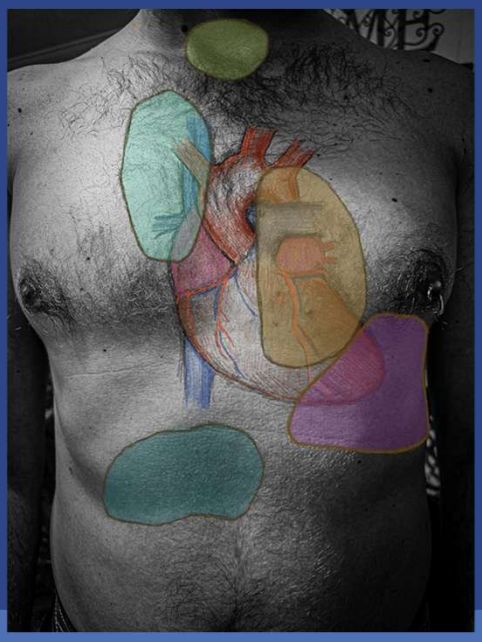


Image 22: Right sternal border CW Doppler across post-op TAVR at 1 year, from author's clinical collection, di-identified (M.Trump, 2025)

30

Right Sternal Window

- Don’t ask; tell them.
- “We are at the portion of the test where I need you to roll to the right side and bring that right arm up under your head like a pillow.”
- Use the imaging probe to find your placement.



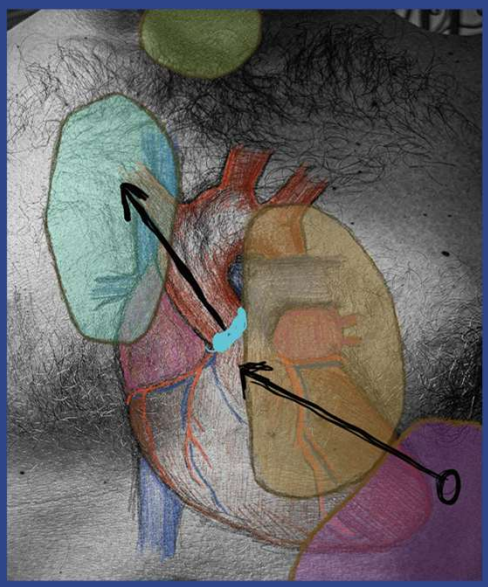
31

RIght Sternal Window

Why does is work?

Calcium ?

Acute aortoseptal angle (<119°) AO jet aims anterior and to the right.[5]



32

Thank you!

"I need you to roll to your right side."

Michael Trump, RCS
michaeltrump@live.com
https://www.linkedin.com/in/thetrump/

33

Citations

1. Badr A, Suppah M, Awad K, et al. Reevaluating normal-flow low-gradient severe aortic stenosis: Clinical phenotypes and outcomes in severe aortic stenosis among transcatheter aortic valve replacement patients. Journal of the American Society of Echocardiography. 2025;38(4):310-319. doi:10.1016/j.echo.2024.12.010
2. Desai, K., Slostad, B., Twing, A., Krishna, H., Frazin, L., & Kansal, M. (2023). Application of a novel two-dimensional echocardiographic calcium quantification method to assess all severities of aortic stenosis. Journal of the American Society of Echocardiography, 36(1), 69–76. https://doi.org/10.1016/j.echo.2022.10.023
3. Anjan VY, Herrmann HC, Pibarot P, et al. Evaluation of flow after transcatheter aortic valve replacement in patients with low-flow aortic stenosis. *JAMA Cardiology*. 2016;1(5):584. doi:10.1001/jamacardio.2016.0759
4. Baumgartner H, Hung J, Bermejo J, et al. Recommendations on the echocardiographic assessment of Aortic Valve Stenosis: A focused update from the European Association of Cardiovascular Imaging and the American Society of Echocardiography. *Journal of the American Society of Echocardiography*. 2017;30(4):372-392. doi:10.1016/j.echo.2017.02.009
5. Cho, E. J., Kim, S., Park, S., Lee, S., & Park, S. W. (2016). Identification of factors that predict whether the right parasternal view is required for accurate evaluation of aortic stenosis severity. Echocardiography, 33(6), 830–837. https://doi.org/10.1111/echo.13181
6. Thaden, J. J., Nkomo, V. T., Lee, K. J., & Oh, J. K. (2015). Doppler imaging in aortic stenosis: The importance of the nonapical imaging windows to determine severity in a contemporary cohort. Journal of the American Society of Echocardiography, 28(7), 780–785. https://doi.org/10.1016/j.echo.2015.02.016

34

Image citations:

- All images are de-identified captures in the authors clinical collection unless otherwise cited.