



Washington
Hospital Center



Physiology: Non-Invasive Imaging

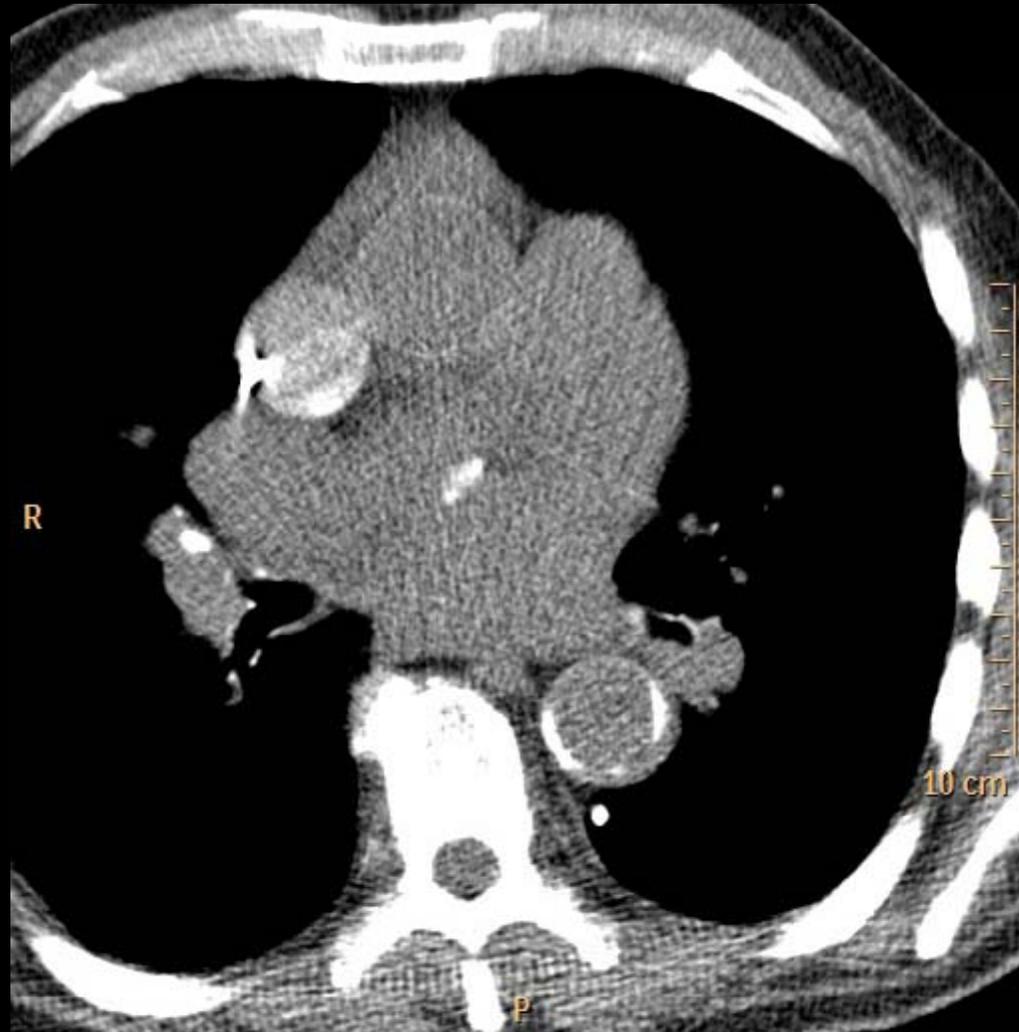
What Else Can CT Tell Us?

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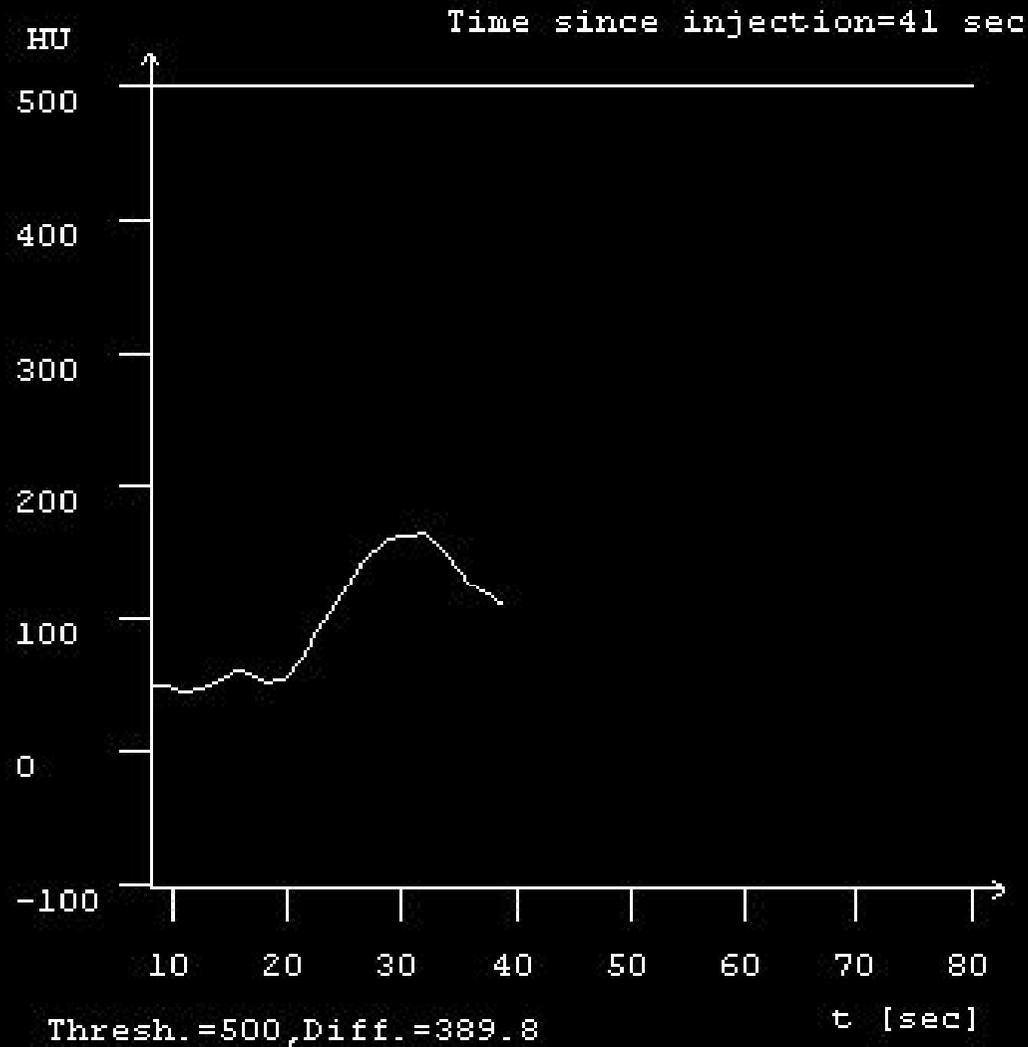
Case Presentation

- 86 yo man with severe aortic stenosis
- CT angio as part of evaluation for TAVI
- Plan: CT angio chest (separate CT angio iliac/femoral)
- Initial HR 65, sinus rhythm w/ occas ectopy, BP 124/74
- Start with timing bolus: 20mL contrast

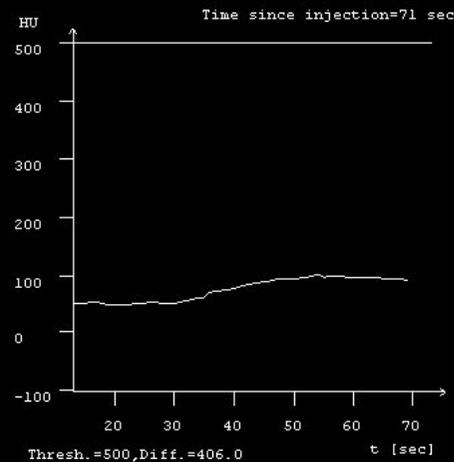
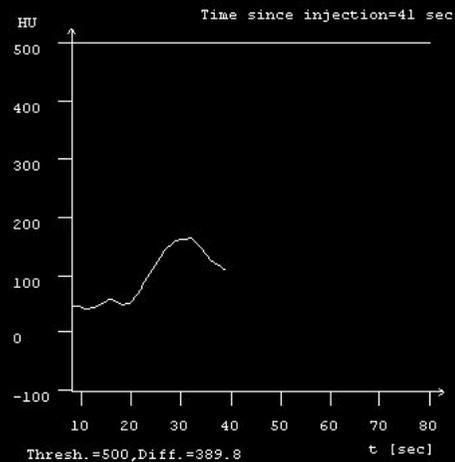
Timing Bolus



Time-Attenuation Curve



Physiologic Significance of Timing Bolus Data

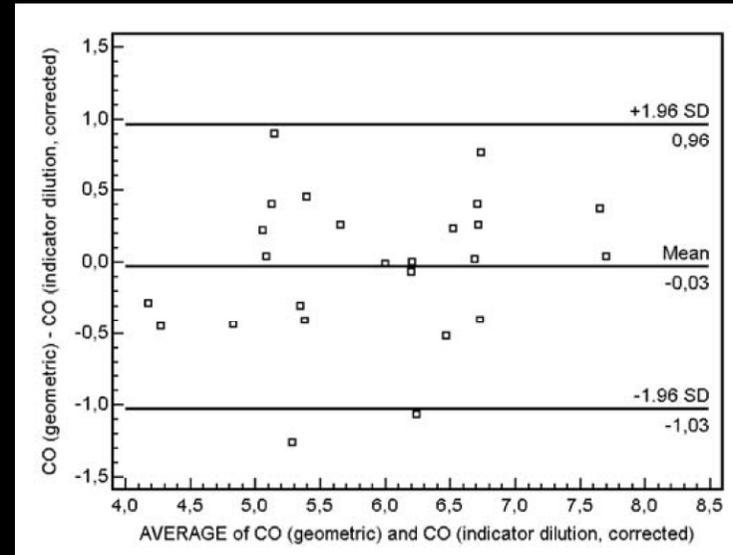
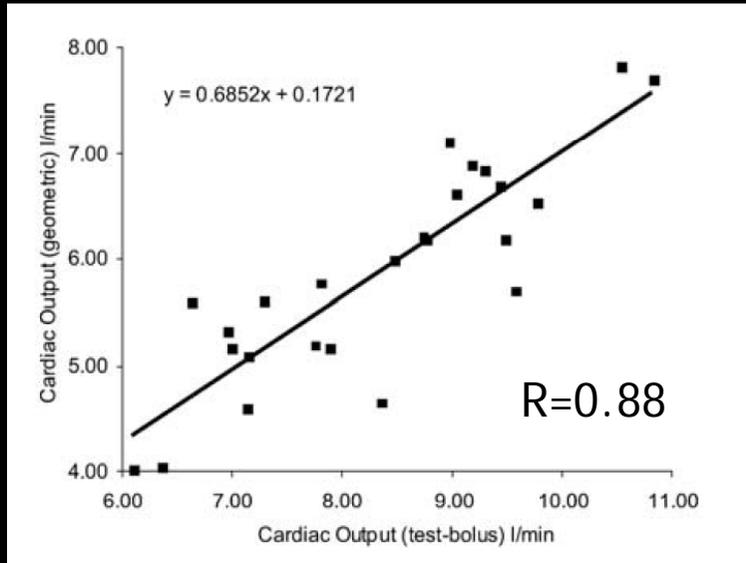


- Cardiac output approximated from timing bolus behavior
- Indicates presence/severity of poor cardiac output
- Use to avoid “early” scans, and optimize dx
- Contrast as the indicator and CT as the densitometer
- Modified Stewart-Hamilton equation as in thermodilution catheters

CO from Timing Bolus

- 25 pt for coronary CTA
- Std test bolus: 20 mL contrast + 30 mL saline at 4 mL/s
- Std helical cardiac CT
- Gated cine CT to calculate “geometric” CO from LVEDV, LVESV, and HR
- Time-enhancement curve to derive CO

Results

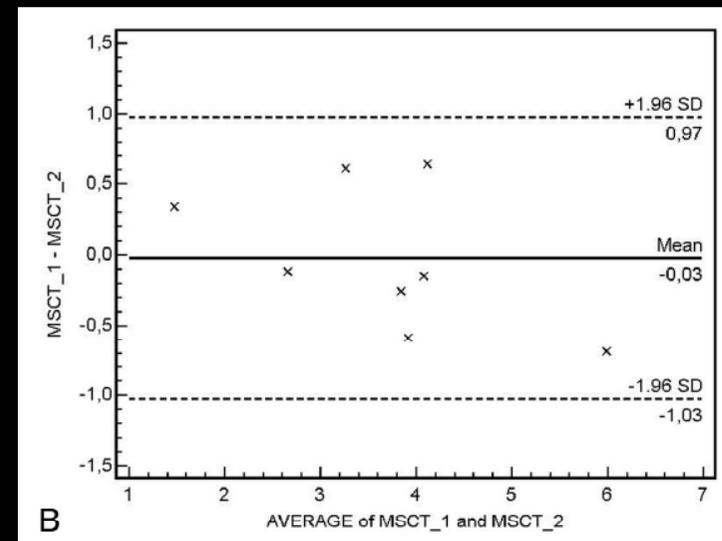
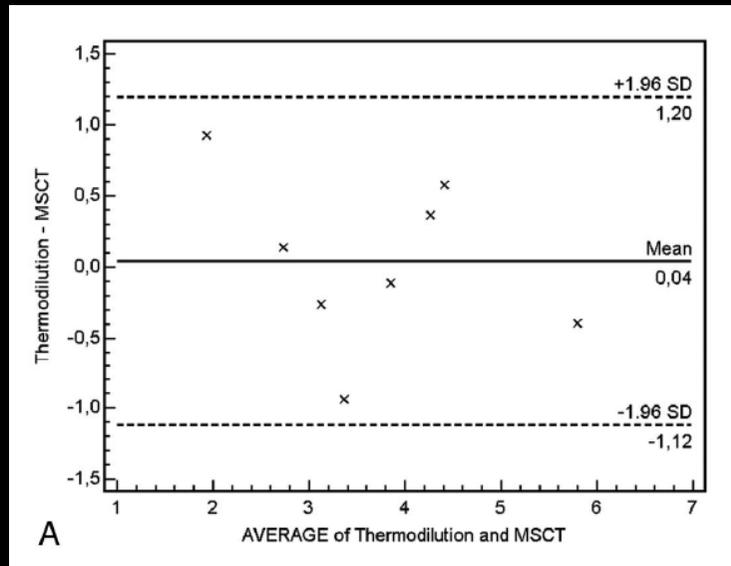


	Geometric analysis	Indicator dilution (Uncorrected)	Indicator dilution (Corrected)	Correlation Coefficient
CO (l/min)	5.88 ± 1.02 (4.04–7.72)	8.33 ± 1.33 (6.08–10.82)	5.91 ± 0.92 (4.32–7.68)	0.87 –
SV (ml)	88.86 ± 20.39 (51.9–148.4)	126.62 ± 33.00 (79.89–207.95)	89.90 ± 23.43 (56.72–147.64)	0.88 –

Some variability possibly explained by occult valvular disease

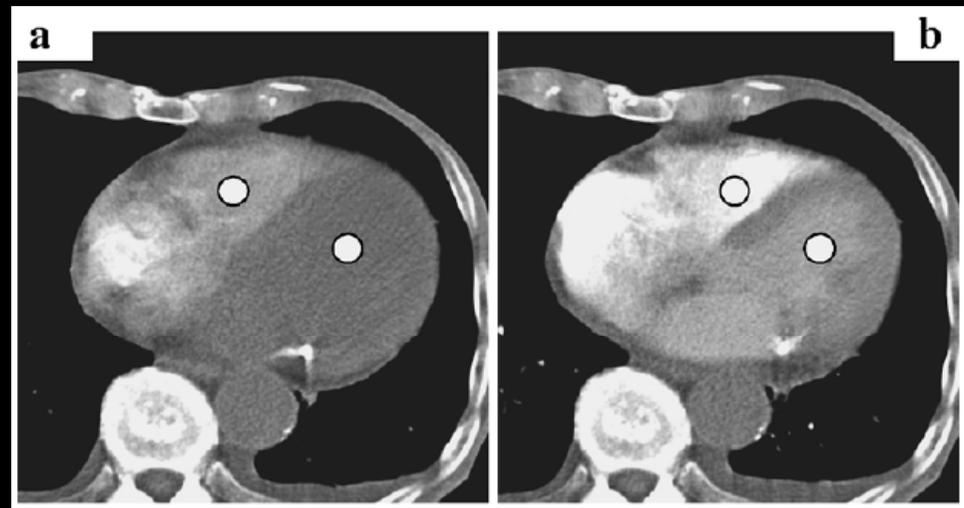
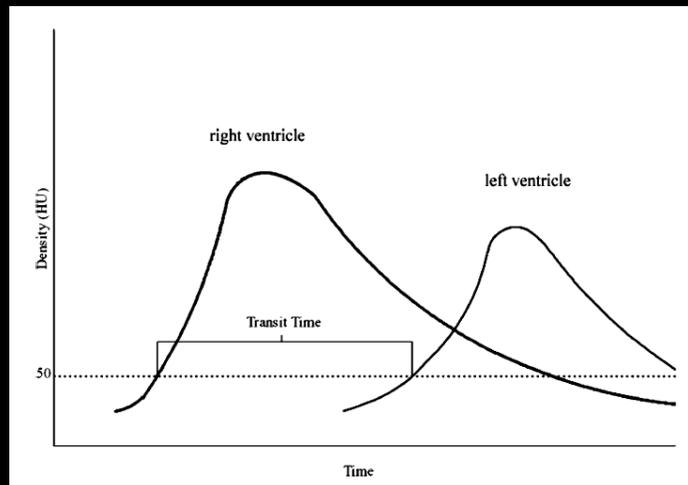
Validation Study

- 8 pigs: PA catheter thermodilution CO and MDCT

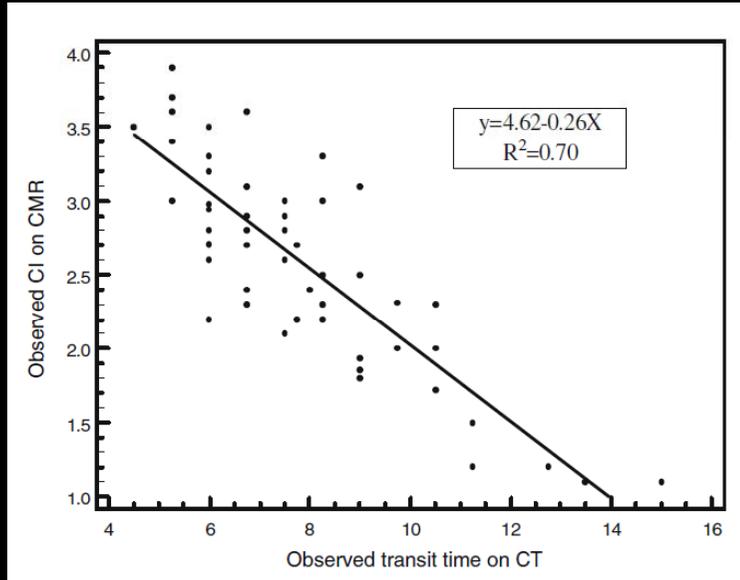


Non-Cardiac Study

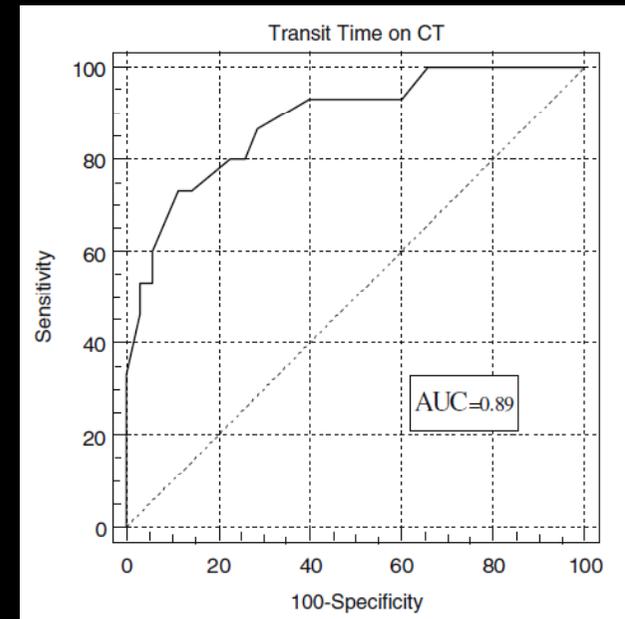
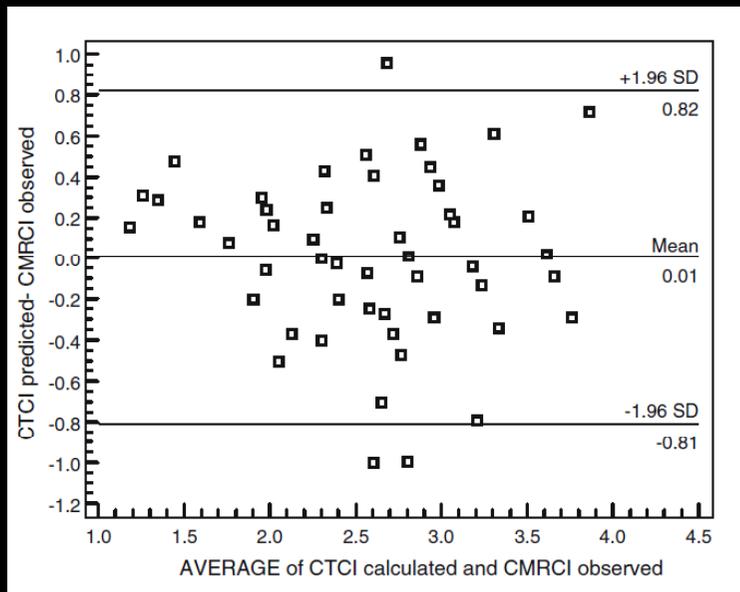
- 100 pt referred for body CT
- Std test bolus and 50 HU threshold for "arrival time" to derive "transit time"
- CI and EF by CMR (CI=1.0 to 4.0)



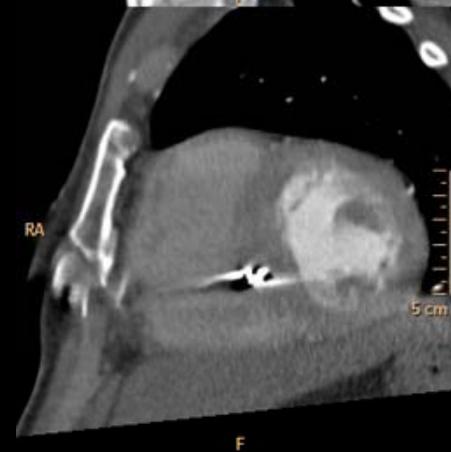
Transit Time to Predict CI



- AUC analysis: for CI of 2.2
 - 8.25 s sensitivity 73%
 - specificity 88%
 - 10.5 s 100% specific



Scan Final Result



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Conclusions

- Our standard practice:
 - Any pts with known coronary heart disease, cardiomyopathy, or valvular disease undergo a timing run before CTA
 - Especially in AS patients being considered for TAVI, this can be useful to ensure best diagnostic quality and derive a little additional functional information