Ultra Low Contrast Computed Tomography (CT) for Transcatheter Aortic Valve Replacement (TAVR) Planning

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Disclosure of Relevant Financial Relationships

I, Lesley Field DO NOT have any financial relationships to disclose over the past 24 months.

Severe aortic stenosis and CKD

High risk subset of patients at increased risk of morbidity and mortality post TAVR

Major risk factor:
Exposure to a significant dose of iodinated contrast (iohexol) during TAVR CT evaluation

Can result in acute kidney injury from contrast induced nephropathy which for some patients means ESRD requiring dialysis

Current Strategies to Reduce Contrast Nephropathy During TAVR Workup for Patients with CKD

Pre and Post procedure hydration with normal saline

- Difficult in patients with tenuous volume status
- Additional resources required
- Insufficient protection in many cases

Use of 3D Transesophageal echocardiography for Sizing

- Likely requires general anesthesia
- Not as reliable/reproducible as CT
- Does not evaluate vascular access

Current Strategies to Reduce Contrast Nephropathy During TAVR Workup for Patients with CKD

Stage CT Scan, Catheterization and TAVR procedures

- Can lengthen time from work-up to procedure
- May not be possible in hospitalized patients with acute aortic valve syndrome (acute CHF, syncope, arrest)

Non-Contrast CT Scan

- Annulus sizing less accurate/reproducible

Low Dose Contrast Pilot Study

- Collaboration with our chief of radiology to help with the technical aspects of CT, as well as helping to determine contrast administration and timing details
- 9 patients were selected for either low dose gadobutrol or low dose iohexol between the dates of 11/08/2024 and 06/06/2025
- Images were sent to the structural heart interventional cardiologist and the aortic valve company for 3 mensio analysis to determine diagnostic image quality and valve selection

Low dose gadolinium (gadobutrol) vs ultra low dose iodine (iohexol) TAVR CT

Low dose gadobutrol

- Initial 10cc dose iohexol for timing
- Timing of gadobutrol injection achieved using a cursor on ascending aorta with 3 second delay for scan onset + timing of early rise of contrast density in ascending aorta
- 20cc gadobutrol administered via right arm IV, CT set 100kV

Ultra low dose iodine

- Initial 10cc dose iohexol for timing
- Timing of second iohexol injection achieved using a cursor on ascending aorta with 3 second delay for scan onset + timing of early rise of contrast density in ascending aorta
- 20cc iohexol administered via right arm IV, CT set 100kV

Image quality and Impact on Renal Function

- Image quality determined by measuring Houndsfield units at the aortic annulus for both protocols
  - Both protocols provided diagnostic pre TAVR CT images
  - Low dose iohexol generated better enhancement of the aortic annulus
- Renal function: pre and post CT GFRs were obtained for all patients
  - None of the patients experienced a significant change in GFR post CT with either protocol

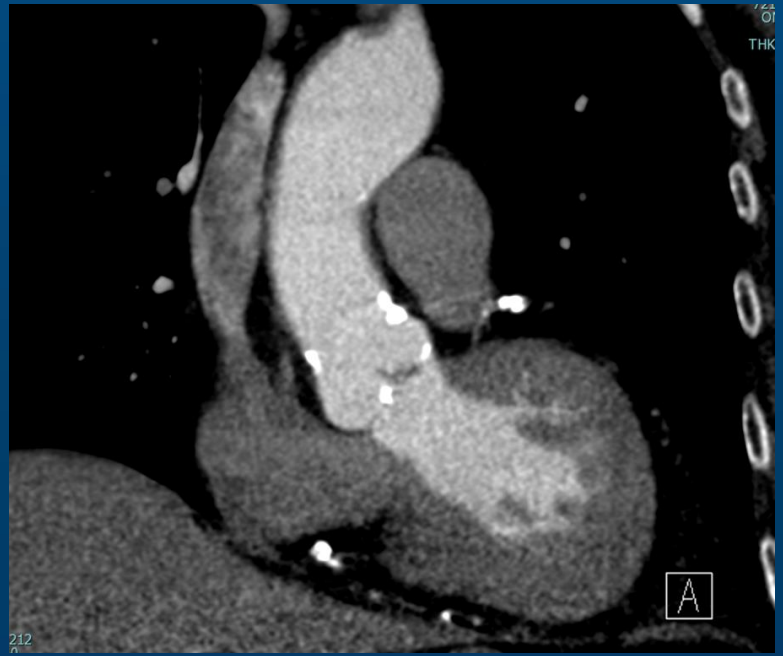
Low Dose Iohexol vs Gadobutrol Protocol Results

Patient Number	Protocol	Annulus Houndsfield Units	Pre-CT GFR	Post CT GFR
1	Gadobutrol+Iohexol	106	23	27
2	Gadobutrol+Iohexol	62	18	18
3	Gadobutrol+Iohexol	116	28	29
4	Gadobutrol+Iohexol	87	12	21
5	Iohexol Only	267	60	60
6	Iohexol Only	119	34	36
7	Iohexol Only	130	38	40
8	Iohexol Only	225	35	33
9	Iohexol Only	254	22	20

Standard Full Dose Iohexol TAVR CT

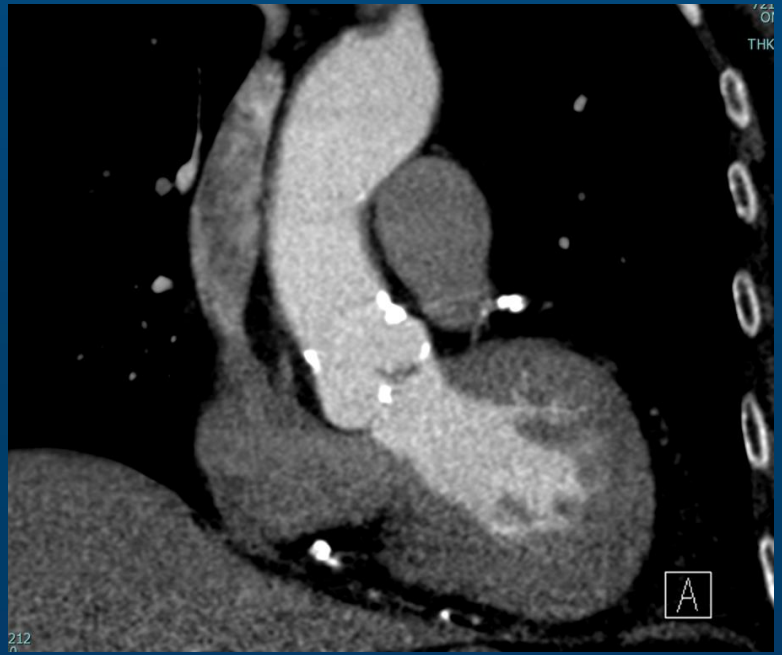
Full Dose Iohexol vs Low Dose Iohexol TAVR CT

Full dose iohexol 130cc

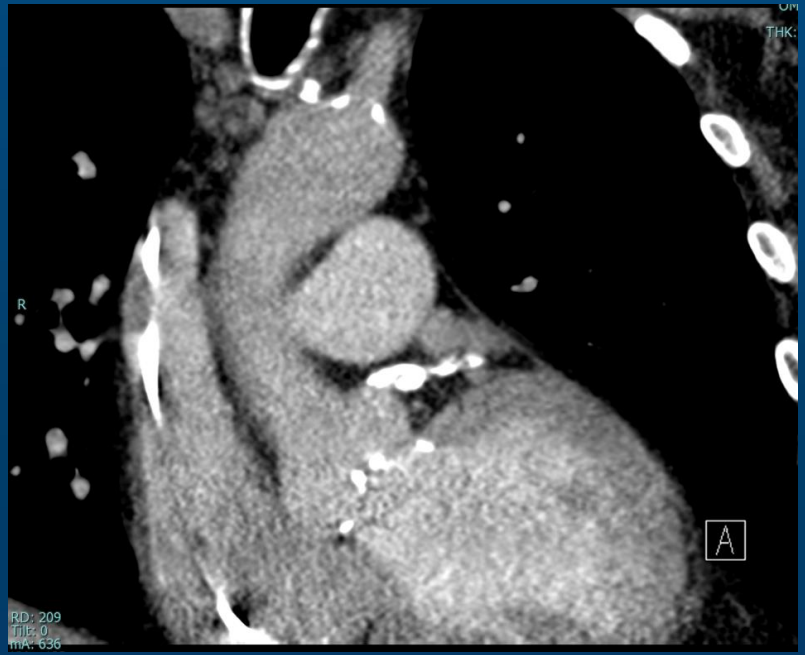


Low dose iohexol 30cc

Low Dose Iohexol vs Low Dose Gadobutrol TAVR CT



Low dose iohexol



Low dose gadobutrol

Take-home Message

- Patients with CKD can undergo successful TAVR CT utilizing a total dose of 30 cc of Iohexol
- This pilot study of 9 patients showed no evidence of a change in GFR after ultra-low dose iodine contrast CT

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