

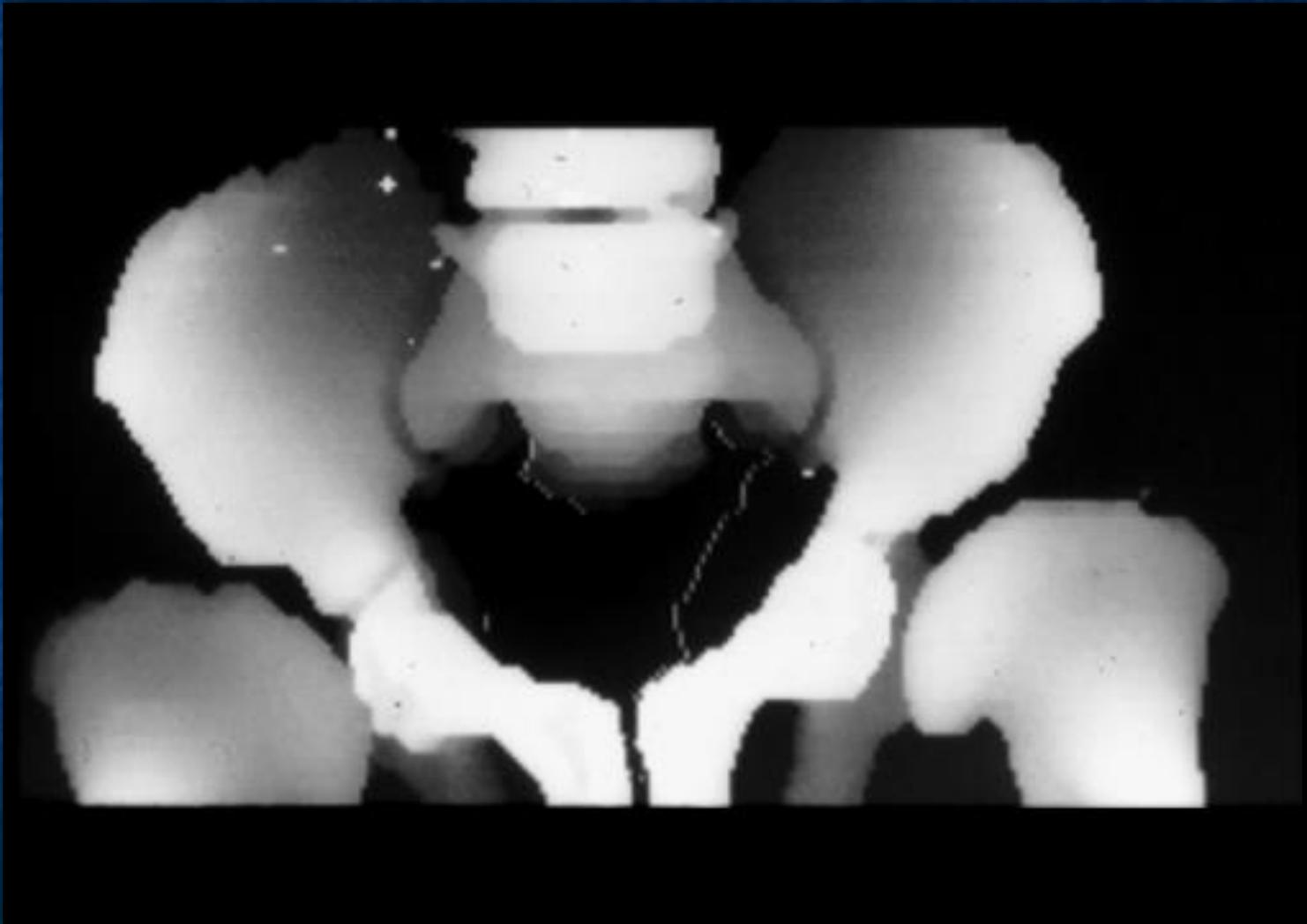
Debate: 3D Post Processing Should Be Done by a Radiologist

Elliot K. Fishman MD FACR
Johns Hopkins Hospital

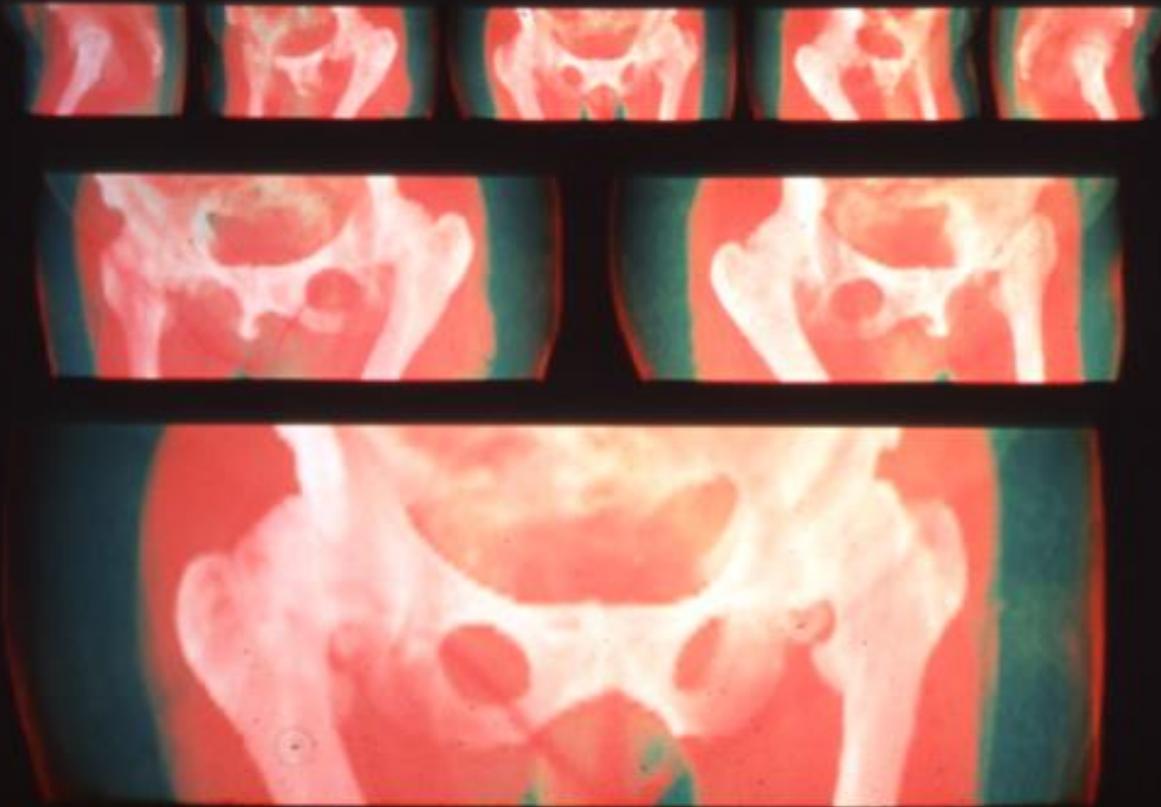
Most Radiologists read imaging studies like it was 1986 with a computer screen replacing film.

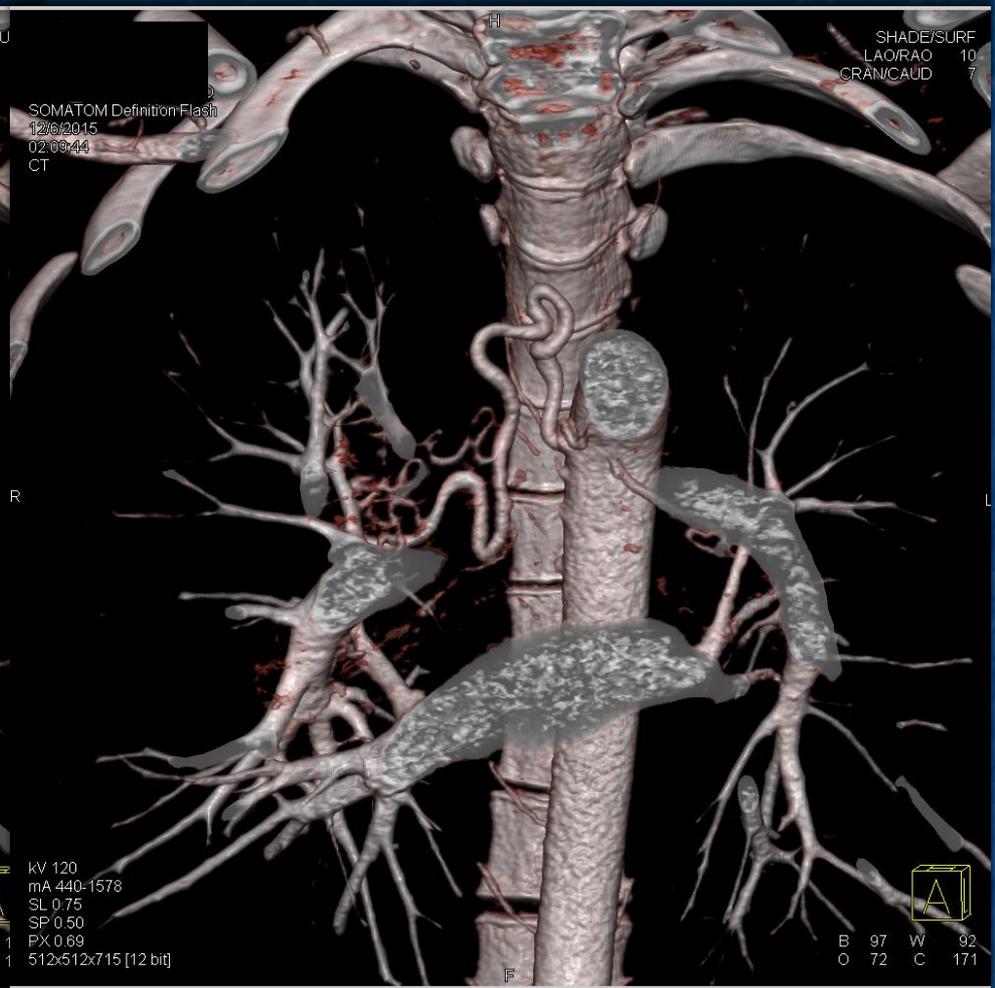
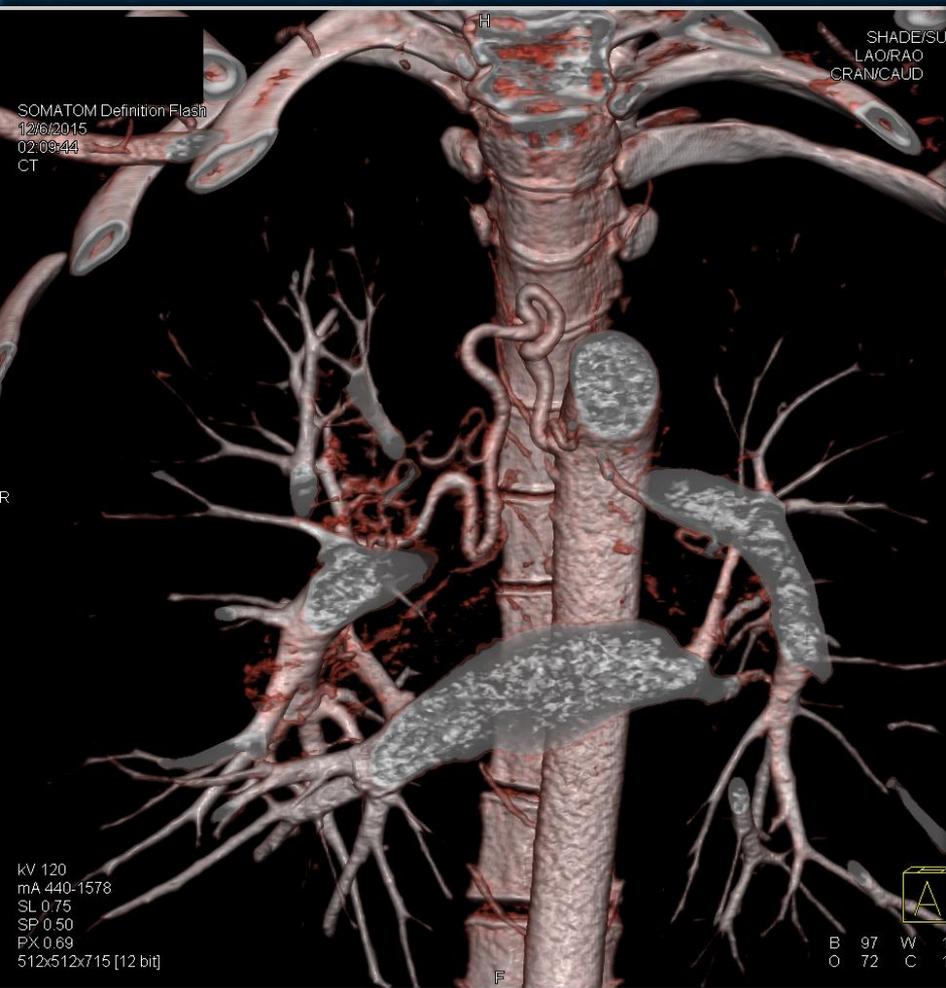
The big advantage at times seems to be multiple copies of the dataset and less issues with scan retrieval.

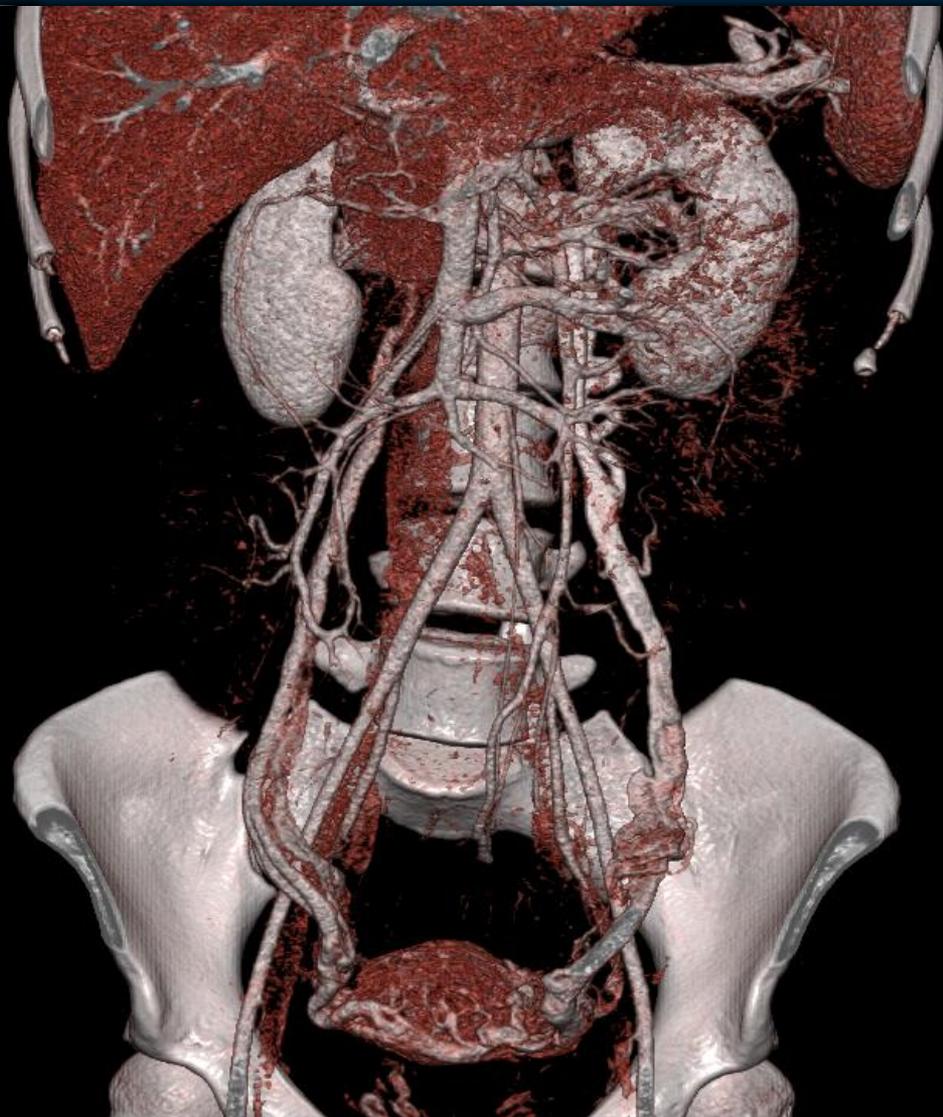
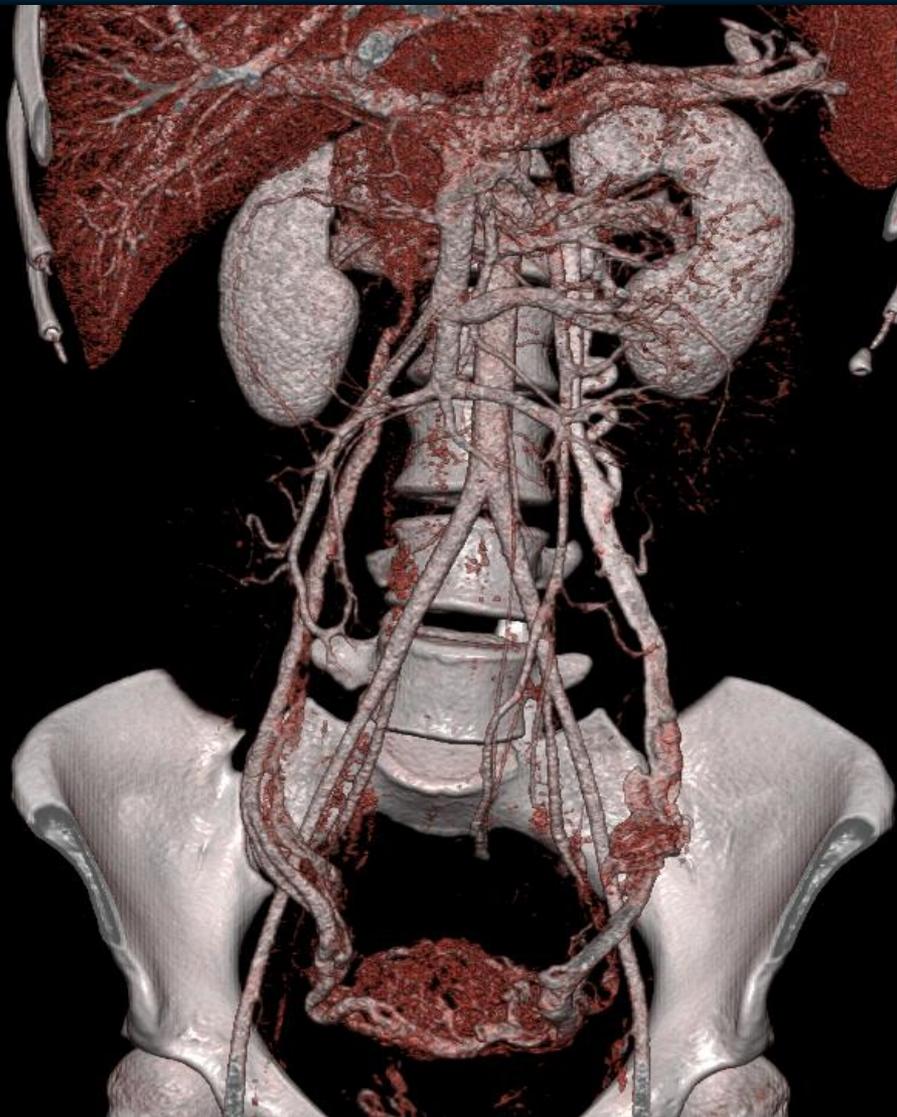
Dysplastic Hips: Circa 1982



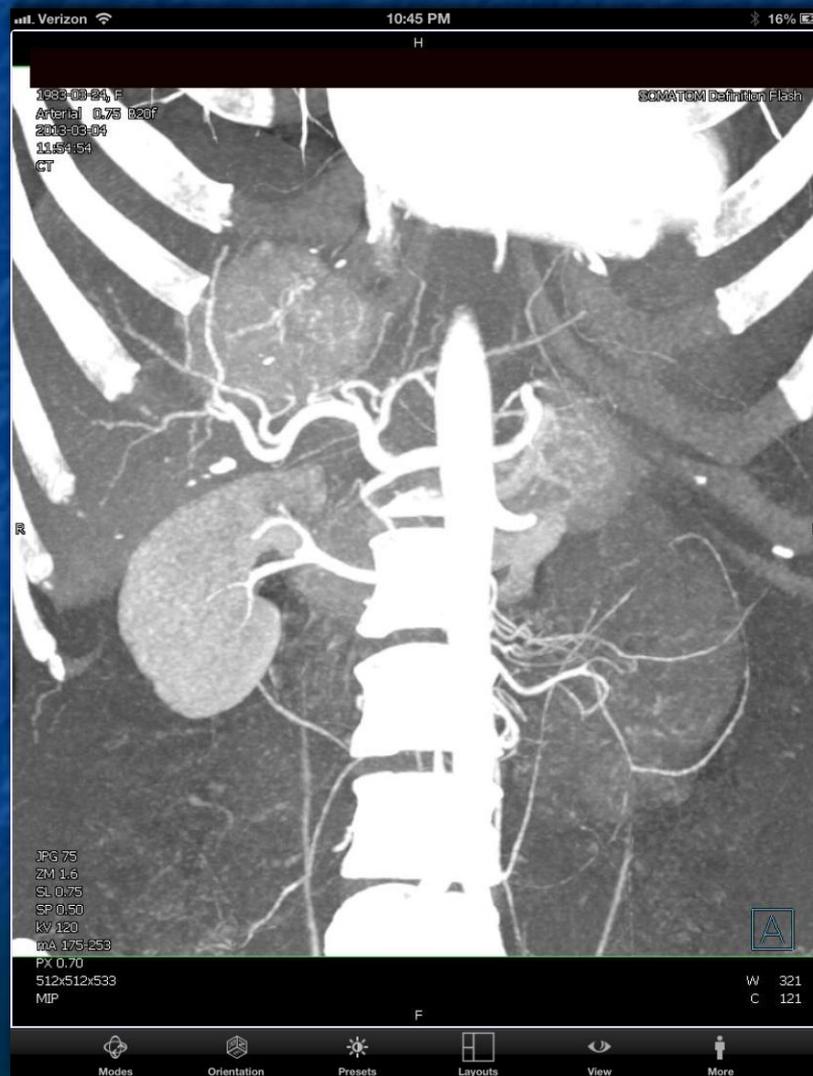
LucasFilms 1985 (PIC)

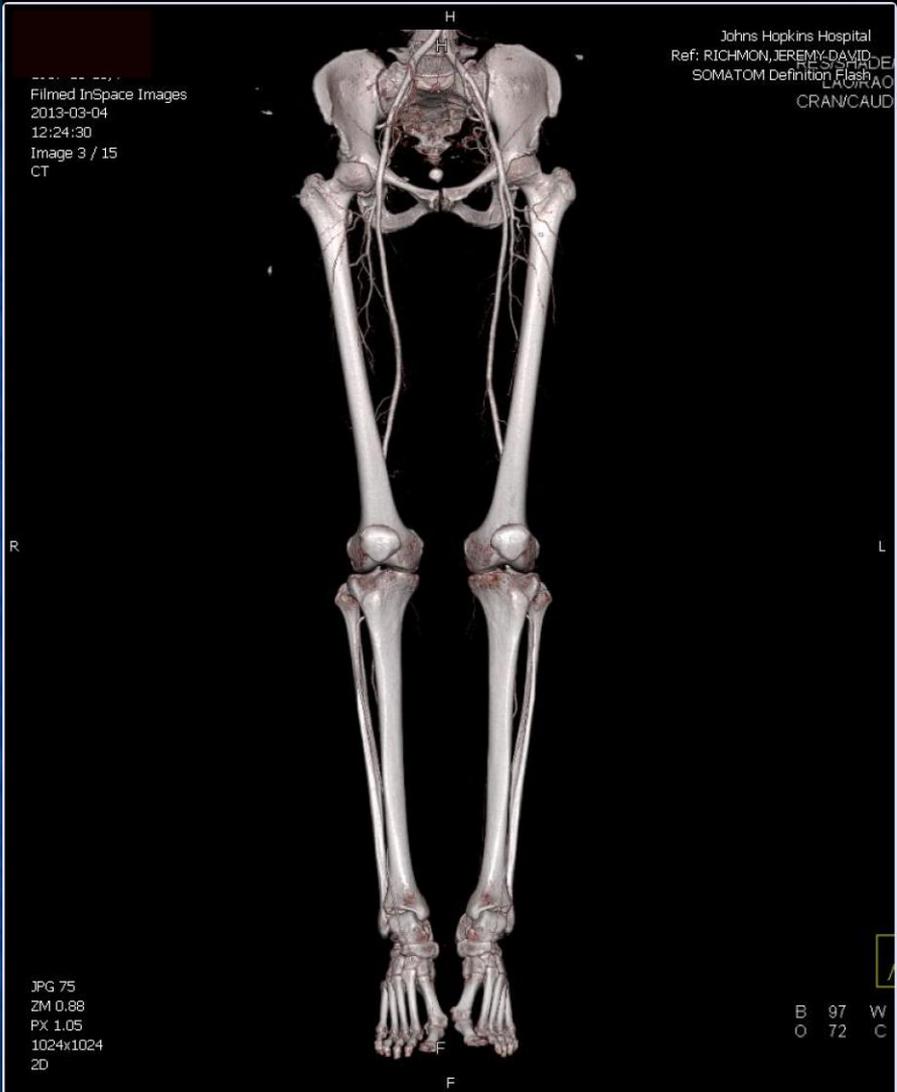






CTA: FNH





“ Volumetric rendering is a new approach to three-dimensional (3D) imaging that overcomes many of the drawbacks of currently available surface rendering systems.”

Volumetric Rendering Technique: Applications for Three-dimensional Imaging of the Hip
Fishman EK, Drebin RA, Ney DR et al.
Radiology 1987 Jun;163(3):737-738

“ 3D imaging is becoming a valuable tool for both diagnostic and therapeutic display of digital information.”

Three-Dimensional Imaging: State of the Art

Fishman EK et al.

Radiology 1991;181:321-337

“ Radiologists much embrace this paradigm shift from traditional axial slices to primary 3D volume visualization in order to efficiently and comprehensively review large datasets and ultimately improve patient care. We predict that within a few years, 3D CT imaging will no longer be a specialized study done on select patients, but will also be a part of review of routine cases as well.”

Fishman EK et al.

RadioGraphics 2006

May-June;26(3);905-922

“Postprocessing of computed tomography data is thus no longer an option, but a true requirement in this era of 64-row multidetector computed tomography and beyond.”

Computed Tomography Dataset Postprocessing:

From Data to Knowledge

Johnson PT, Fishman EK

Mt Sinai J Med 2012 May;79(3);412-21

What percent of Radiologists in practice use 3D in CT?

- A. over 90%
- B. over 70%
- C. 50%
- D. 20-30%
- E. 10%

What percent of Radiologists in practice use 3D in CT?

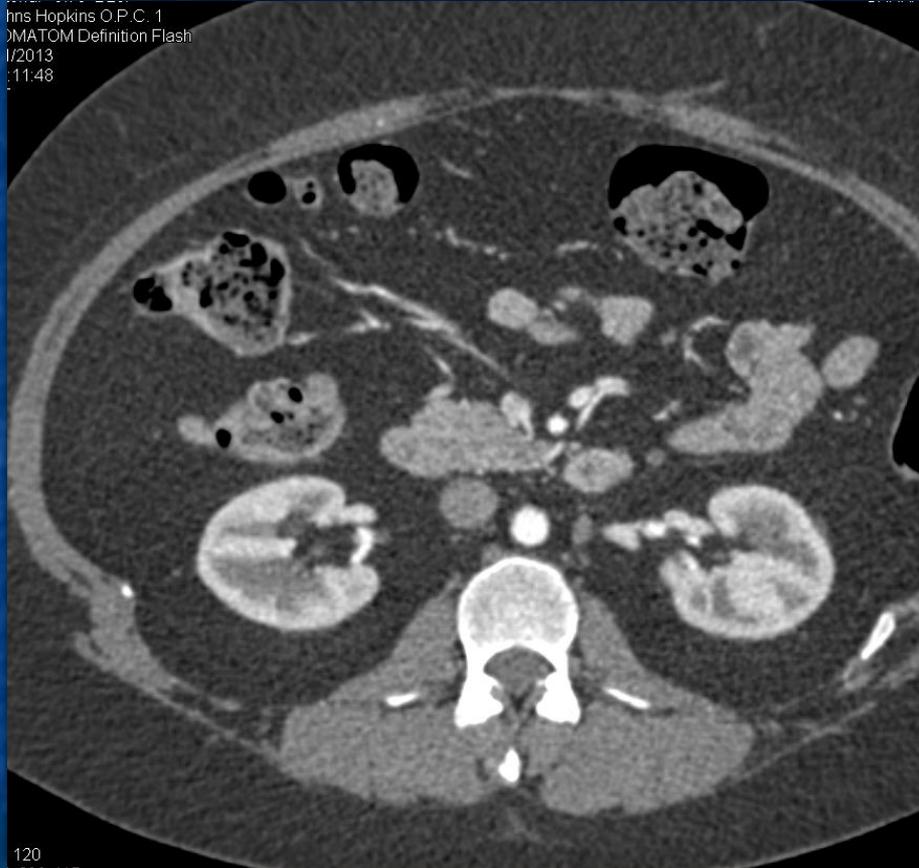
- A. over 90%
- B. over 70%
- C. 50%
- D. 20-30%
- E. 10%

“Visualization is the process of transforming information into a visual form, enabling users to observe the information. The resulting visual display enables the scientist or engineer to perceive visually features which are hidden in the data but nevertheless are needed for data exploration and analysis.”

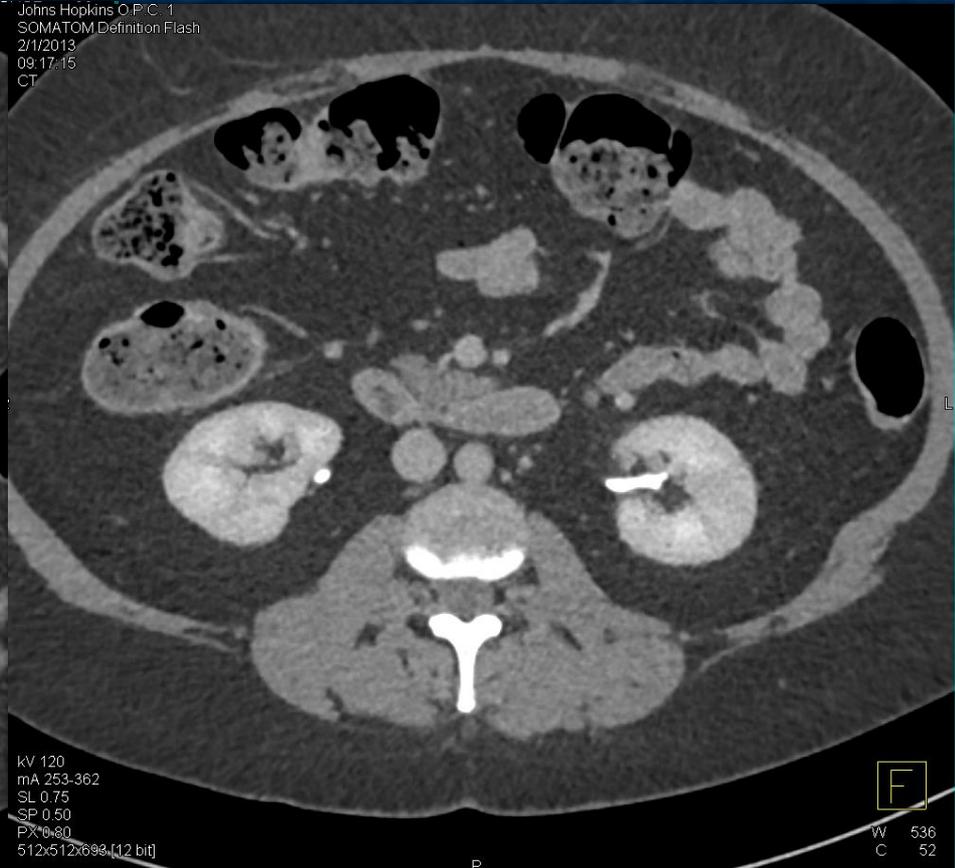
N. Gershon, *From Perception to Visualization* (1994)

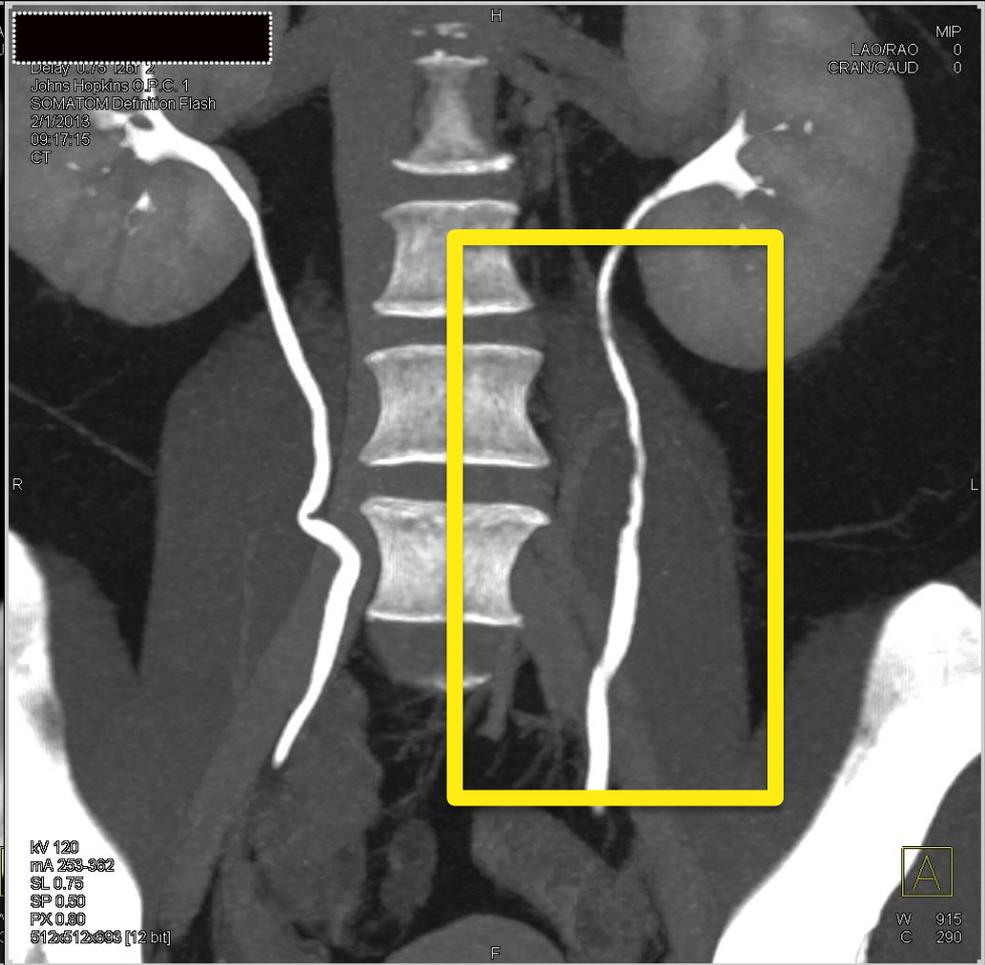
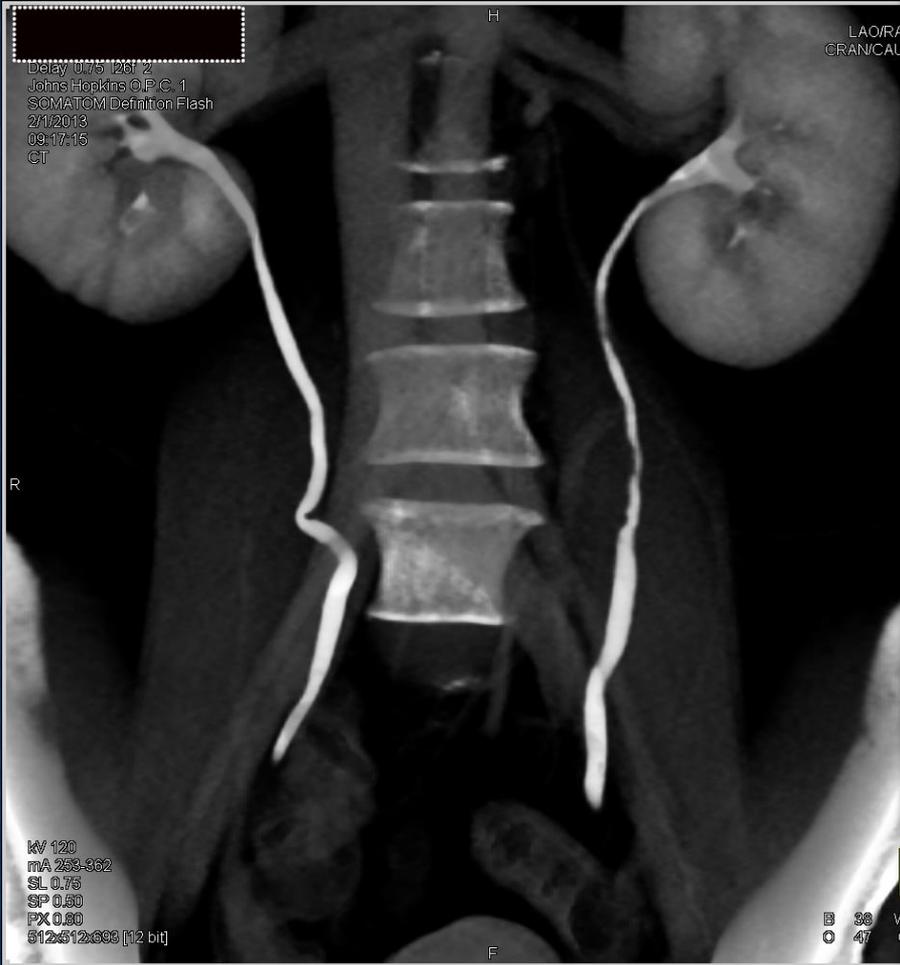
TCC Proximal Ureter

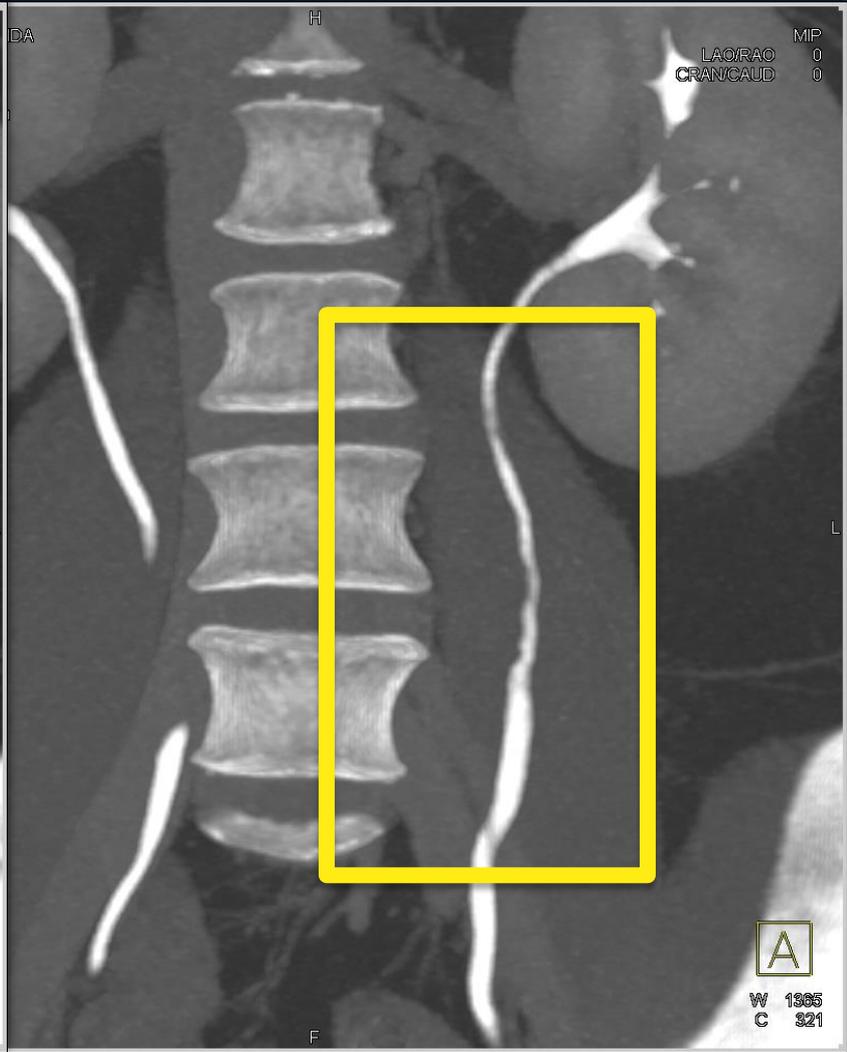
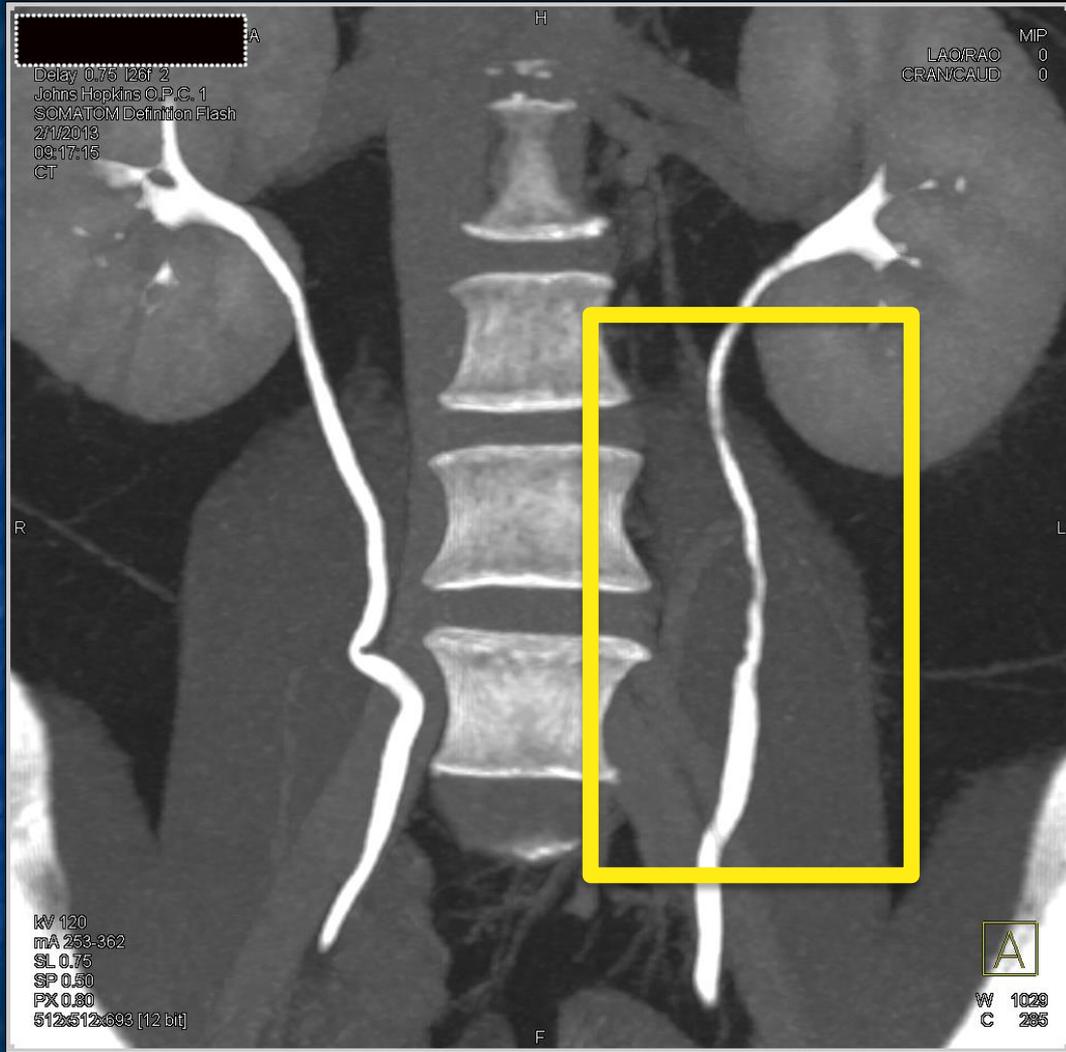
Johns Hopkins O.P.C.: 1
SOMATOM Definition Flash
2/1/2013
09:17:15
CT



Johns Hopkins O.P.C.: 1
SOMATOM Definition Flash
2/1/2013
09:17:15
CT







“ In the daily radiology practice, the rate of interpretation error is between 3% and 4%; however, of the radiology studies that contain abnormalities, the error rate is even higher, averaging in the 30% range.”

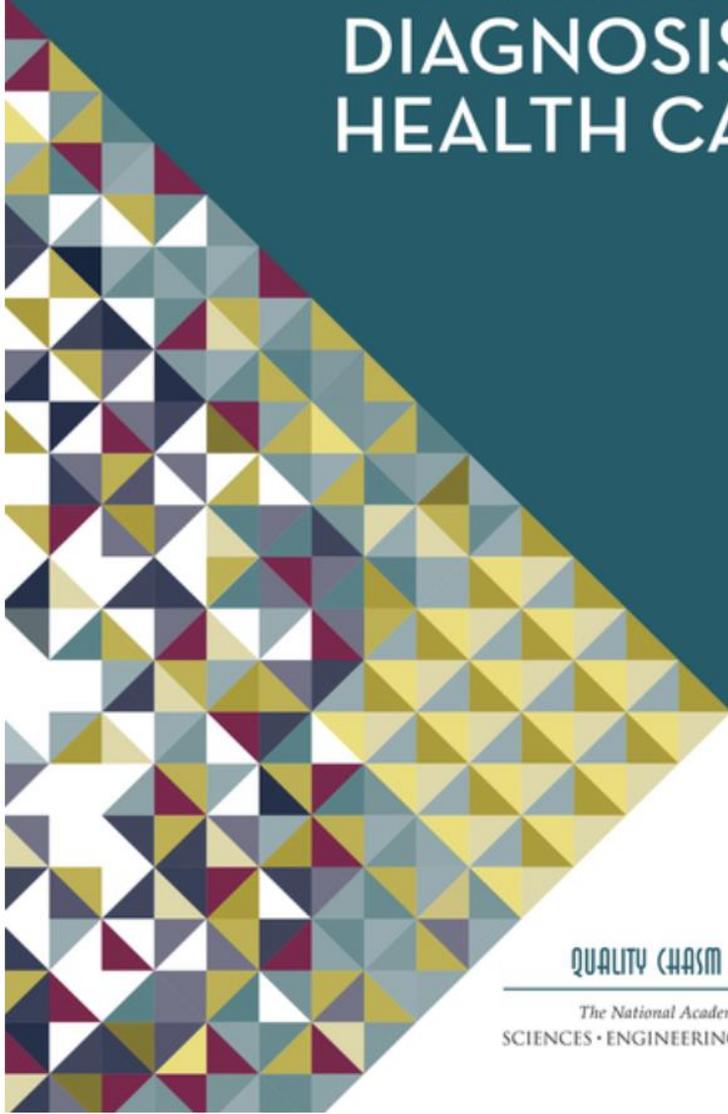
Fool Me Twice: Delayed Diagnoses in Radiology With
Emphasis on Perpetuated Errors

Kim YW, Mansfield LT
AJR 2014;202:465-470

“ In our study, the majority of errors made were errors of underreading (42%), where the finding was simply missed.”

Fool Me Twice: Delayed Diagnoses in Radiology With
Emphasis on Perpetuated Errors

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IMPROVING DIAGNOSIS IN HEALTH CARE

QUALITY CHASM SERIES

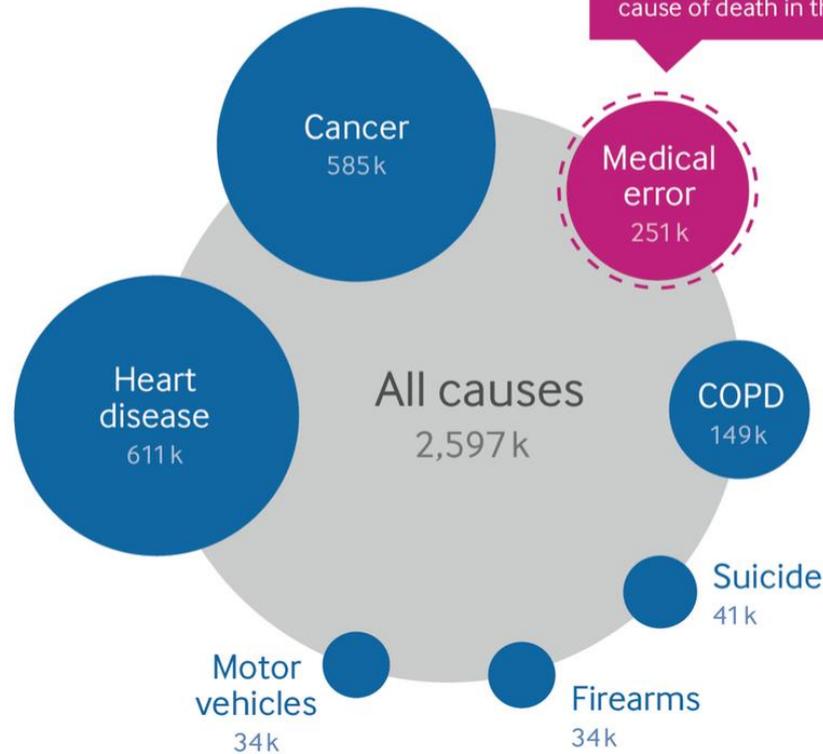
The National Academies of
SCIENCES • ENGINEERING • MEDICINE

“ Human error is inevitable. ”

Medical error-the third leading cause of death in
the US.

Makary MA, Daniel M
BMJ. 2016 May 3;353:i2139.

Causes of death, US, 2013



Based on our estimate, medical error is the 3rd most common cause of death in the US

However, we're not even counting this - medical error is not recorded on US death certificates

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Data source:
http://www.cdc.gov/nchs/data/nvsr/nvsr64/nvsr64_02.pdf

Fig 1 Most common causes of death in the United States, 2013²

3D Limitations in Clinical Practice

- Scan data sets
 - Slice thickness
 - Interscan spacing
 - Temporal resolution
 - Spatial resolution

3D Limitations in Clinical Practice

- **Computer Processing Power**
 - Limited volumes that could be rendered
 - Speed of rendering
 - Quality of rendering
 - Cost of a 3D system

3D Limitations in Clinical Practice

- **Workstation Design and Interface**
 - Under powered computer processing
 - Poor workstation design (corner menus, 20 year old interface)
 - Lack of customization
 - Limited usefulness in a busy clinical practice
 - Lack of a Apple, Facebook or Amazon in medical imaging

3D Limitations in Clinical Practice

■ The Radiologist

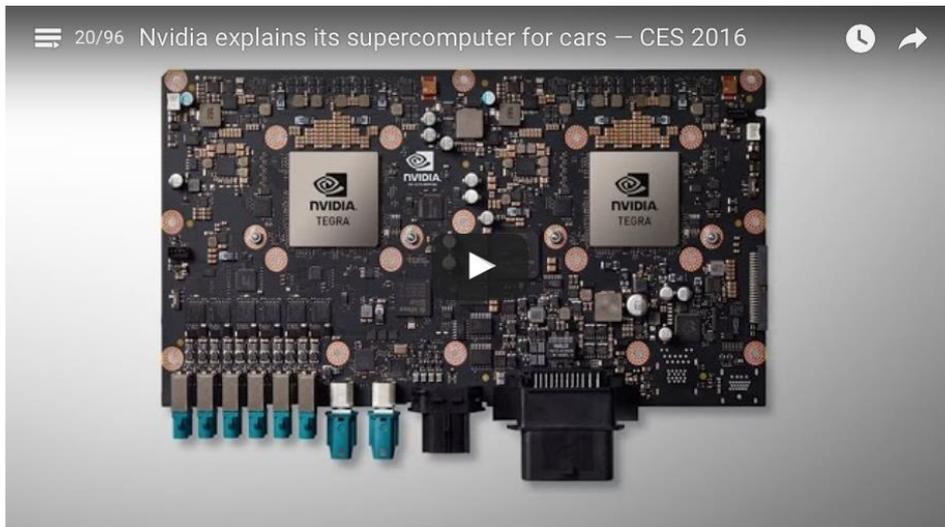
- RVUs are king
- Less is more
- Poor understanding of the role of 3D in patient management
- Poor understanding of the role of Radiology in clinical practice

What is the role of 3D in Clinical Practice?

- “ a technique that decreases the number of missed diagnosis and errors in CT ”
- “ a technique that can handle the multiple datasets created by the newest CT scanners”
- A new paradigm in imaging (only 30 years late)

Watch Nvidia explain its supercomputer for self-driving cars

By **Ross Miller** on January 5, 2016 09:56 am [Email](#) [@ohnorosco](#)



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Nvidia, a company known predominantly for its graphics card business, has over the last few years been making a big push toward automotive. More specifically, Nvidia wants to power the future slate of self-driving cars — and it has **a number of automakers** lined up to help.

Nexus 6P
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PART OF THIS STORYSTREAM
106 UPDATES TO CES 2016 Day 2: All the news

If you can have self driving cars,
you can have a workstation that
improves the radiologist
decision making