

QUANTITATIVE MULTI-CONTRAST AGENT SEPARATION USING A SPECTRAL PHOTON- COUNTING COMPUTED TOMOGRAPHY PROTOTYPE

INITIAL EXPERIENCE

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BACKGROUND

Dual contrast agent imaging with computed tomography.

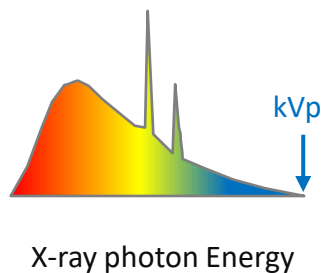
OBJECTIVE

To evaluate the feasibility of preclinical spectral photon-counting computed tomography prototype (SPCCT) to detect and quantify different mixed contrast agents with a single scan.

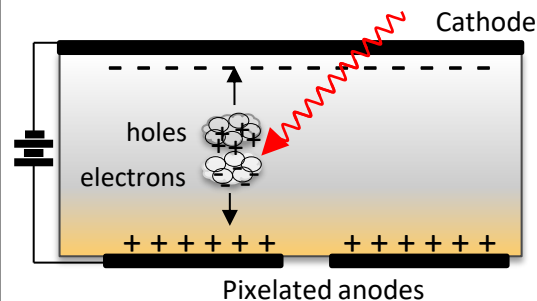
MATERIALS AND METHODS **SPCCT**



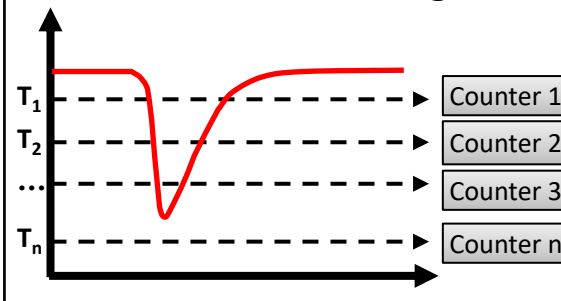
1. X-ray spectrum



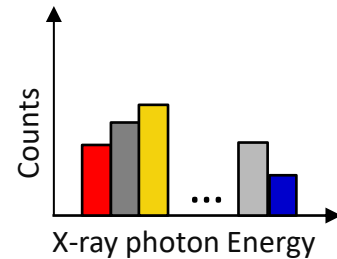
2. Direct conversion detector



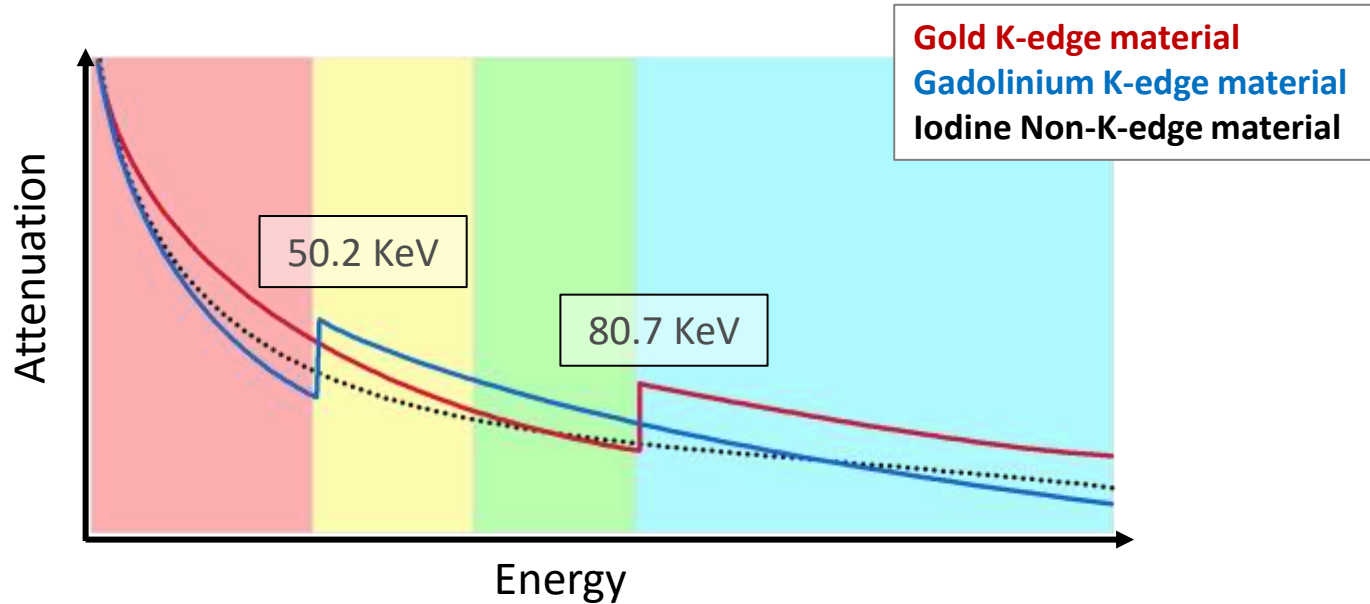
3. Photon Counting



4. Energy spectrum



MATERIALS AND METHODS K-EDGE



MATERIALS AND METHODS **PROTOCOL**

≡ non-mixed Contrast agents:

- Iodine (33.2 KeV)
400 mg/mL Iomeron, Bracco
- Gadolinium (50.2 KeV)
78 mg/mL Multihance, Bracco
- Gold Nanoparticles (80.7 KeV)
65 mg/mL , *

≡ Mixed contrast agents :

- Gold + Gadolinium
- Iodine + Gold
- Iodine + Gadolinium

≡ Imaging protocols:

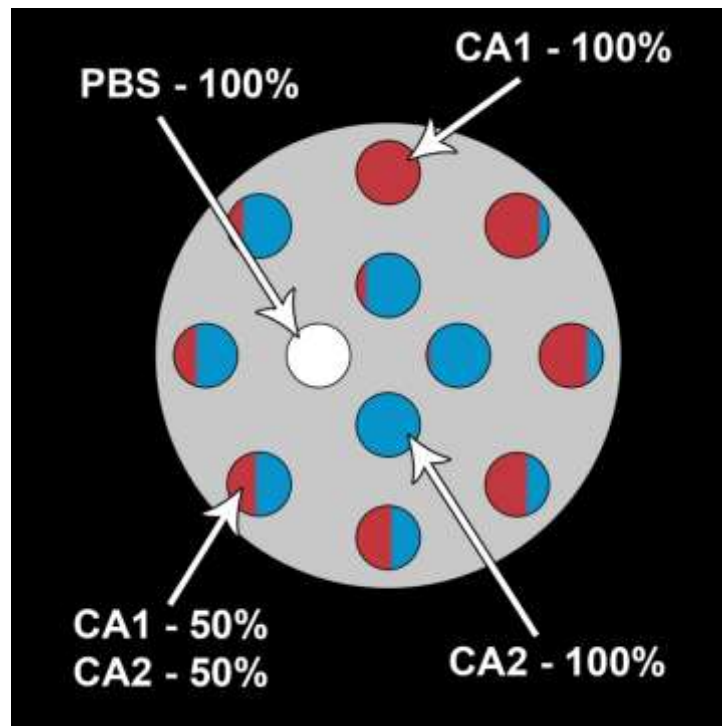
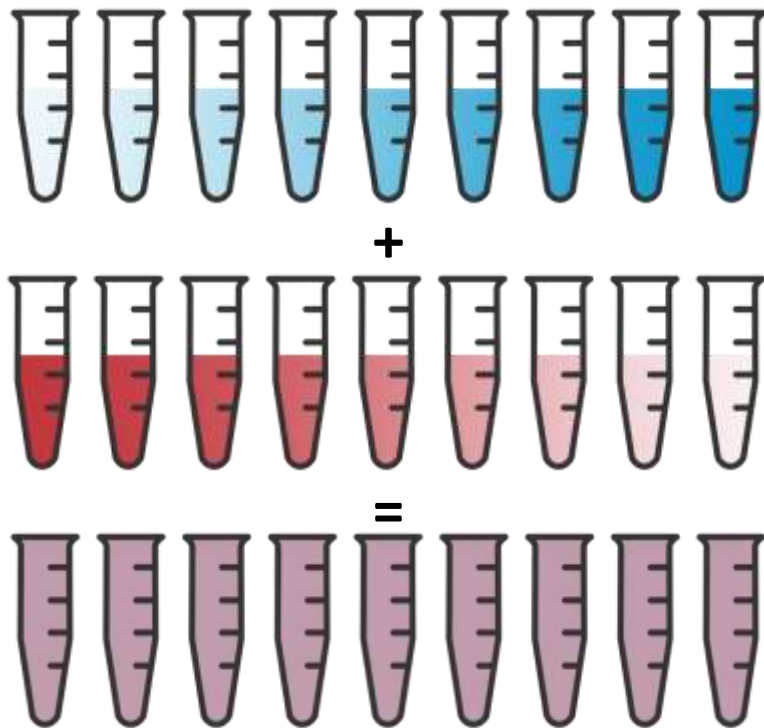
- tube voltage of 120 kVp
- tube current of 100 mAs
- Rotation speed of 1 sec
- Image filter: Standard
- Voxel size 0.3x0.3x2 mm³

≡ SPCCT reconstructions:

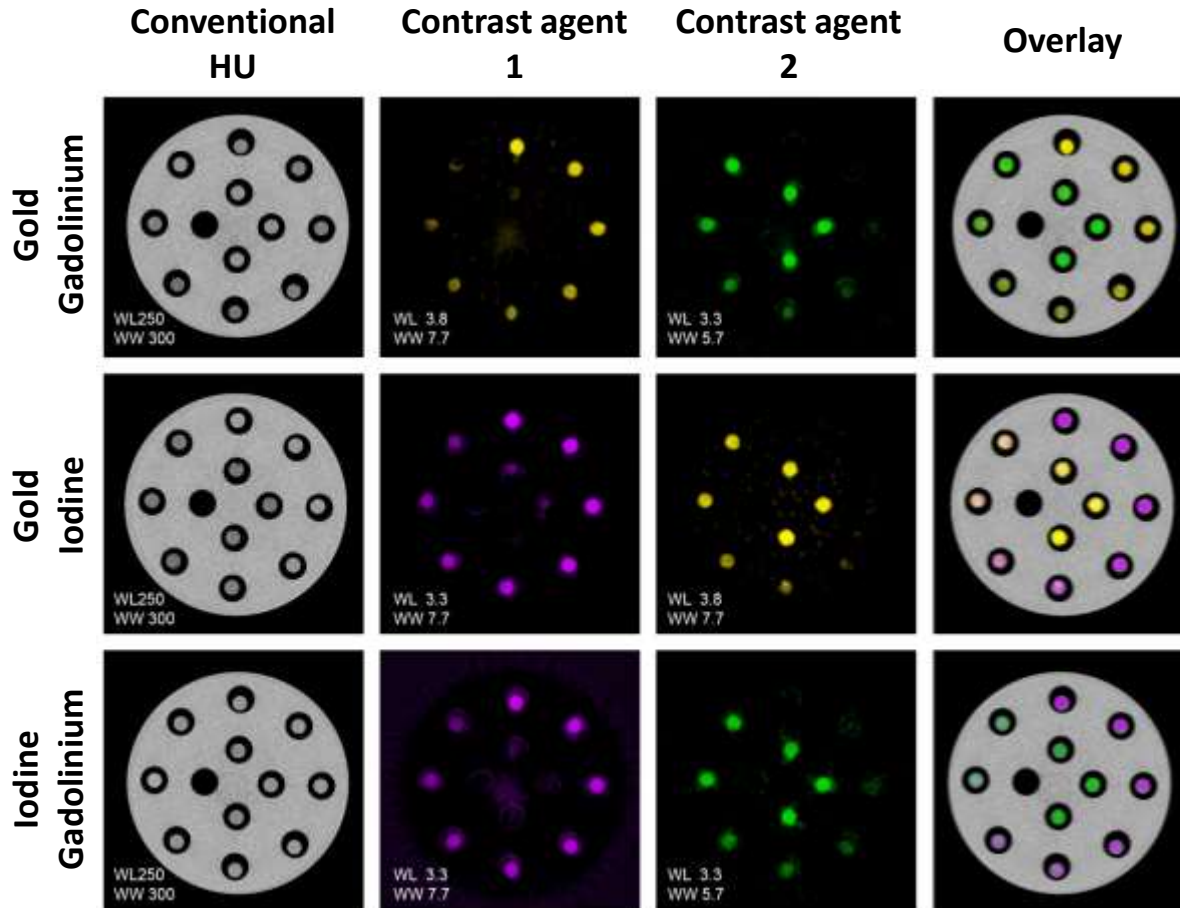
- Conventional CT HU
- **Iodine** material decomposition
- **Gadolinium** and **Gold** specific K-edge

* Naha PC, Chhour P, Cormode DP. 2015. Toxicol In Vitro. 1445

MATERIALS AND METHODS PHANTOM PREPARATION

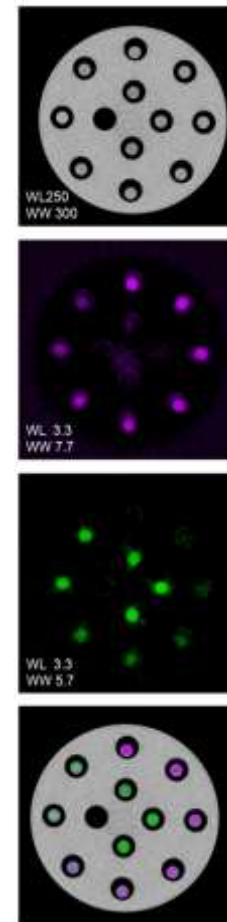
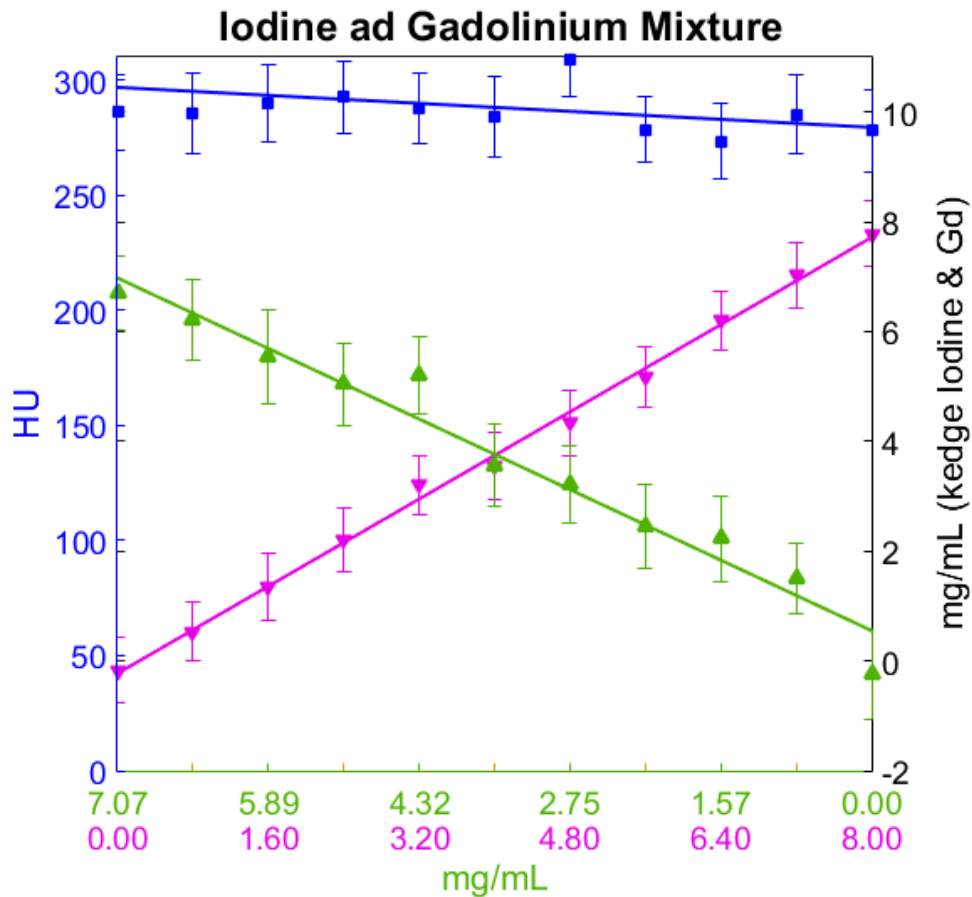
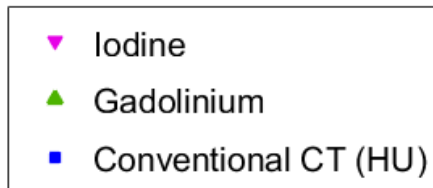


RESULTS



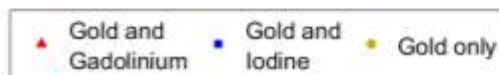
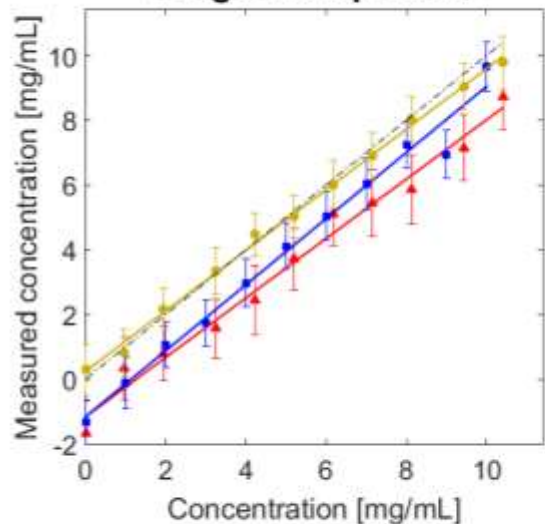
(2 pix gaussian filter)

RESULTS

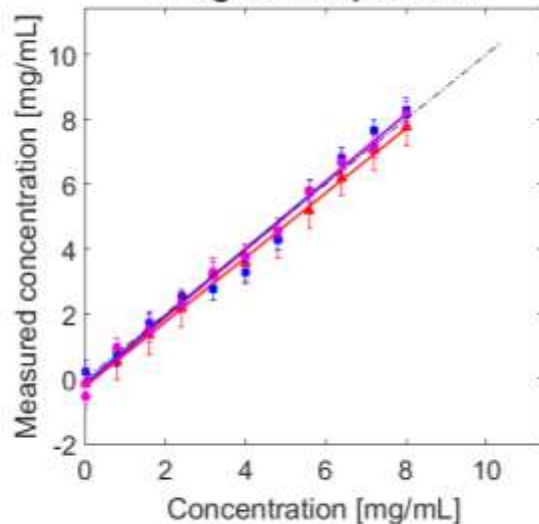


RESULTS

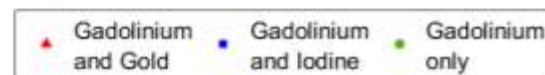
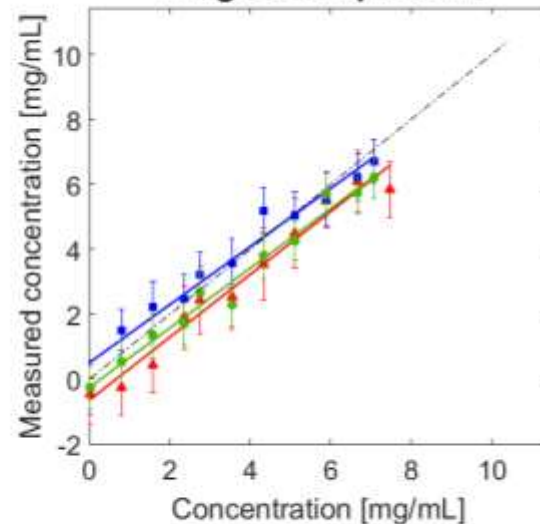
Gold K-edge images comparison



Iodine non-K-edge images comparison



Gadolinium K-edge images comparison



CONCLUSION

- Multi-contrast agent quantitative separation via K-edge imaging is achievable using SPCCT as demonstrated by the accurate differentiation between multiple contrast materials within the same voxel using their spectral characteristics.

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THANK YOU