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### Dual energy can accurately differentiate urea acid containing stones from calcium stones

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**Objectives:** To evaluate the accuracy of the dual-energy CT to detect the chemical composition of urinary calculi and establish a correlation with infrared spectroscopic stone analysis.

**Methods:** n=64 patients with clinical symptomatic urolithiasis were included. All patients underwent diagnostic imaging with dual energy CT (DECT). After surgical removal of the stone by ureterorenoscopy, the chemical stone composition was detected with infrared spectroscopy. We evaluated the correlation of DECT findings using the dual-energy-indices (DEI) and chemical stone composition. DEI was generated by a formula using HU of higher and lower tube voltages and is e.g. 0 for water.

**Results:** 213 calculi were evaluated. 38 patients had multiple stones. DECT was used to differentiate stones and stones harboring calcium were marked blue. Respectively stones consisting of urea acid were colored red. Median DEI in urea-acid containing stones was 0.001. Non-urea containing stones had a DEI between 0.073 for pure calcium oxalate stones and 0.077 for stones containing calcium and other substances (p=0.001 and p=0.03 respectively). Sensitivity of DECT was 98.4 % for differentiation of urea-acid from non-urea acid containing calculi. Mean effective radiation dose of DECT was 4,18mSv (0.44mSv – 14.27mSv) and thus comparable to conventional CT scans of the abdomen.

**Conclusion:** DECT with post-processing imaging discriminates calculi in urea-acid containing versus non-urea acid containing stones without additional radiation exposure. Discrimination within the non-urea acid stones could not be achieved. Further studies are needed to differentiate non urea-acid containing stones.