Purpose:To compare the ability of coherent scatter computed tomography (CSCT) to determine the composition of kidney stones, including the core components which are thought to be most important for recurrence prevention, with conventional infra-red spectroscopy (IRS) in the management of urinary stone disease.

Methods:CSCT is a tomographic imaging method being developed in our laboratory that is based on x-ray diffraction measurements of intact specimens. In this study, intact kidney stones and large fragments obtained from minimal invasive surgery in 118 patients were collected and scanned using CSCT to determine the distribution of minerals, and in particular minerals at the stone core, before undergoing the conventional (destructive) IRS analysis.

Results:Overall, the CSCT-IRS agreement rate for the primary (most abundant) component was 85%. CSCT produces “maps” of each component including the core. In 42%, CSCT found a core mineral not reported by IRS. Overall, CSCT has detected minerals missed by IRS in 46% of all cases. In particular, struvite, which indicates a urinary bacterial involvement, was found in the stone core significantly more often (22%) than previously believed based on IRS.:

Conclusions:The high agreement rate with IRS gives overall confidence in both CSCT and IRS. The ability of CSCT to identify the composition of the core where stone formation first starts, suggests an improved method for kidney stone composition analysis. The elevated presence of struvite in the stone core may indicate a more prominent role of specific bacteria in urolithiasis than generally accepted at present.