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**Introduction & Objectives:** To assess the efficacy of dual-energy computed tomography (DECT) in predicting the composition of urinary stones with a single index (dual-energy ratio (DER)) and five indices.

**Materials & Methods:** Patients undergoing DECT prior to active urolithiasis treatment were prospectively enrolled in the study. Predictions of stone composition were made based on discriminant analysis with a single index (dual-energy ratio, DER) and five indices (stone density at 80 kV and 135 kV, Zeff (the effective atomic number of the absorbent material) of the stone, DER, dual-energy index (DEI) and dual-energy difference (DED)). After extraction, the stone composition was evaluated by means of physicochemical analyses (X-ray phase analysis, electron microscopy, wet chemistry techniques, and infrared spectroscopy).

**Results:** A total of 91 patients were included. For calcium oxalate monohydrate (COM) stones, the sensitivity, specificity and overall accuracy of DECT with one index (DER) were 83.3%, 89.8% and 86.8%, respectively; for calcium oxalate dihydrate (COD) and calcium phosphate stones - 88.2%, 92.9% and 91.2%, respectively; for uric acid stones - 0%, 98.8% and 97.8%, respectively; for struvite stones - 60%, 95.3% and 93.4%, respectively. Discriminant analysis with five indices yielded the following sensitivity, specificity, and overall accuracy: 95.2%, 89.8%, and 92.3% for COM stones, 85.3%, 96.4%, and 92.3% for COD stones, and 100% in all three categories for both uric acid and struvite stones.

**Conclusions:** DECT is a promising tool for stone composition assessment. It allowed for evaluation of the chemical composition of all stone types with specificity and accuracy ranging from 85% to 100%. Five DECT indices have shown much better diagnostic accuracy compared to a single DECT index.