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Role of twinkling artifact in characterization of urinary calculi

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Introduction: Stone characterization is becoming important before decision of treatment such as percutaneous nephrolithotomy (PCNL) and extracorporeal shock wave lithotripsy (ESWL). Some studies have reported that the twinkling artifact (color-flow ultrasonography artifact) may be useful to detect urinary stones. This study aims to determine whether the presence or absence of the twinkling artifact is correlated with the chemical composition of the stones.

Material and Method: Patients with renal stones > 0.5 cm were included in a prospective study. Sixty patients were examined with x-ray film, intravenous pyelography, non-contrast computerized tomography, and color and spectral doppler ultrasonography. The artifact was considered grade 1 when occupied only one portion of the acoustic shadowing and when the artifact occupied the entire acoustic shadowing was considered grade 2. Patients with stones smaller than 2 cm were treated with SWL and patients with stones larger than 2 cm were treated with PCNL.

Results: No artifact (grade 0) was detected in 11 subjects, grade 1 in 25 and grade 2 in 24. Significant relationship was found between the increase in twinkling artifact and stone size ($p < 0.001$). When the relation between the composition of the stones and the twinkling artifact was analyzed, artifact was detected nearly in all of the calcium oxalate dihydrate and calcium phosphate stones; whereas the artifact was detected in more than half of the calcium oxalate monohydrate and uric acid stones. In ESWL group it was observed that as the grade of the twinkling artifact increases, the number of required ESWL sessions decreases ($p < 0.001$). In PCNL group twinkling artifact was found in all of the patients (100%) with roughly surfaced stones.

Conclusion: The roughness of stone surface is the most important factor in terms of formation of the twinkling artifact in kidney stones. This artifact can be of use in anticipating the breakability of the stones of those patients to be treated with applied ESWL. One might anticipate that cases where the size of the stone is larger than 2 cm but no twinkling artifact is detected are calcium oxalate monohydrate, which is one of the stones with highest level of breakability.