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Kidney transplant crystal deposits understanding in the light of Infrared microspectroscopy analysis

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Background: Composition, etiology and consequences of microcalcifications in kidney allograft are unclear. Here we test the contribution of infrared microspectroscopy (IR-MS) to the kidney transplant crystal deposits understanding.

Materials and methods: We compare 55 patients with calcifications (C+) to 100 without calcification (C-). Biopsies were evaluated by microscopy examination. In case of visualization of crystalloid deposits, an IR-MS analysis was performed with an IN10MX microscope to identify chemical composition and to assess the spatial distribution and quantification of the calcifications (score 1 to 4). Clinical and biochemical data and graft outcome were compared between both populations.

Results: Biopsies were performed at 5.2 ± 6 months and 6.9 ± 7 months after transplantation respectively in C- and C+ groups. Microcalcifications were calcium phosphates in 91%. Crystal deposits abundance was considered moderate (score 1-2) for 45 (82%) patients and high (score 3-4) for 10 (18%) patients. Microcalcifications were associated with a higher 3 months post-graft parathyroid hormone concentration (C- 123 ±59 pg/ml; C+ 211±177; $p=0.003$). A high score of crystal deposits was associated with a poor graft function as judged by the rate of eGRF<30ml/mn at 2 years: 33% in high C+, 15% in moderate C+ , 5% in C-, ($p<0.001$). The 7-years graft survival rates were lower in patients C+ than in patients C- (C+75%; C-85%; $p=0.006$).

Conclusion: IR-MS demonstrated that most kidney transplant microcalcifications (91%) contained calcium phosphate deposits. These deposits were associated with a higher post-graft parathyroid hormone serum concentration. Long term graft survival rates were significantly lower in the case of crystal deposits with a worse graft function in the case of high score of microcalcifications. IR-MS is a high-performance tool for detection, identification and quantification of crystal deposits within allograft kidney biopsies.