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Contrast Enhanced Sonography shows Superior Microvascular Renal Allograft Perfusion in Patients Receiving mTOR-inhibitor Therapy

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The purpose of this study was to compare two immunosuppression medication regimes (mTOR inhibitors and calcineurin inhibitors) using real-time contrast enhanced sonography (CES) to evaluate microvascular tissue perfusion of renal transplant recipients. The renal perfusion was evaluated with contrast enhanced sonography, prior to the medication switch (all patients received calcineurin inhibitors) and 12 months following a switch to mTOR inhibitors.

Contrast enhanced sonography is a noninvasive, reproducible, bed-side technique, which uses low power imaging with an IV injected gas filled microbubbles which function as a sonographic contrast agent. The "enhancement" of the sonograph is achieved with a sonocontrast agent, biodegradable microbubbles, which are injected intravenously. The perfusion of the microbubbles increases the echogenicity and enhances visualization of the renal vessels.[10, 72]

The mammalian target of rapamycin is a kinase involved in cell growth and development. Calcineurine is a protein which stimulates the differentiation and activation of T-cells. Both inhibitors are immune suppressants.

Preceding this study, there was no published data investigating the use of contrast enhanced sonography, to compare the effects of calcineurin inhibitors and m-TOR inhibitors on microvascular tissue perfusion in human renal allograft recipients.

This study is part of a prospective, randomized, controlled trial, conducted within the ZEUS study; a multi-center, open-label, prospective, parallel group study investigating medication therapy with Certican® (mTOR inhibitor) in comparison to standard immune suppression therapy with Sandimmun Optoral® (calcineurin inhibitor) in de novo renal transplant recipients (begun in 2005, sponsored by Novartis Pharma GmbH Nuernberg).

Our study demonstrates that allograph microperfusion, as well as kidney function, improved after switching from a calcineurin to an mTOR inhibitor. After an average of 12 months of immunosuppressive therapy with mTOR inhibitors, our patients showed a significant improvement in glomerular filtration rate and renal microperfusion. Contrast enhanced sonography provided quantitative information on microvascular perfusion and allograft integrity for each immunosuppression medication regime, and detected significant renal blood flow improvements after one year of mTOR inhibitor therapy.