Sonography of the renal allograft: Correlation between doppler sonographic resistance index (RI) and histopathology.

Allograft rejection (AR), chronic allograft injury (CAI) and acute tubular necrosis (ATN) can lead to renal allograft dysfunction after kidney transplantation. Interstitial fibrosis/tubular atrophy (Banff classification 2005) describes chronic allograft injury with no specific etiology, thus explaining the common final endpoint of various (immunologic and non immunologic) etiologies. The aim of this study was to evaluate correlations between the Doppler sonographic RI-values and histopathological changes of renal allografts biopsies during rejection, acute tubular necrosis and chronic allograft injury as well as the influence of donor and recipient features on the intrarenal RI-values. 102 allograft biopsies and ultrasound reports of 69 patients with kidney transplantation performed at the hospital Klinikum rechts der Isar (Technische Universität München, Germany) between 2009 and 2013 were analyzed retrospectively (41 biopsies of living donors, 61 biopsies of deceased donors). Chronic allograft injury was described using the IFTA (interstitial fibrosis and tubular atrophy) or the ECAI score (extended chronic allograft injury score). The ECAI score was built out of the chronic histological lesions glomerulopathy, interstitial
fibrosis, tubular atrophy and fibrous intimal thickening (cg + ci + ct + cv) of the BANFF scoring. Intrarenal RI-values were significantly higher in patients with allograft rejection than without rejection (median 0.79 vs. 0.73; inter quartile range: 0.20 vs. 0.13; p = 0.018). The same was found for T-and non-T cell mediated rejection (median 0.78 vs. 0.73; inter quartile range 0.20 vs. 0.13; p = 0.039). There were no significant differences in the RI-values between the subtypes of T-cell mediated rejection (type IA-IIB). Furthermore, there were no significant differences of RI-values regarding antibody-mediated rejection (present vs. not present) or type of rejection (T-cell- vs. antibody mediated rejection). Patients with rejection and simultaneously chronic allograft injury showed significantly higher RI-values than patients with only chronic allograft injury. Analyses using the IFTA or the ECAI score showed comparable results (IFTA p = 0.043; Score p = 0.021). The intrarenal RI-value was neither able to detect chronic allograft injury nor to distinguish between acute tubular necrosis and rejection. The intrarenal RI-value showed a significant correlation with recipient age (p< 0.001) but not with donor features. In summary, the intrarenal RI-value can indicate a rejection but gives no clear hint to acute tubular necrosis and cannot differentiate from it. Since patients with rejection can have normal RI-values, a biopsy should always be performed in case of suspected rejection. The intrarenal RI-value has no unambiguous validity to determine intrinsic values of the renal allograft, but should rather be understood and interpreted as a systemic parameter influenced by multiple factors.