

(6.7% ) to infection. In 2 patients (13.3%) the cause of death was unknown. Of the 10 patients who died in connection with biopsy-proven AR, 6 also had relevant CAV that developed after the second post-HTx year. In 10 patients with moderate/severe late ARs, but without CAV during their first episode of late AR diagnosed at 4.6± 1.3 years after HTx, the angiogram showed relevant CAV lesions 2.4± 1.3 years after the first late AR. The mean number of late ARs/patient/year was higher in those with angiographic CAV that developed after the second post-HTx year than in those without CAV after >2 years since HTx (p<0.01).

**Conclusions:** Late ARs are the major cause of late allograft dysfunction in children and may also be involved in the development of CAV. Together with CAV, late ARs are the dominant cause of death after the second post-HTx year and thus, continuous and close rejection surveillance late after HTx is justified to improve the long-term outcome.

**1089-113 Accuracy of Hemodynamic Measures by Impedance Cardiography in Heart Transplant Patients**

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**Background:** The ability to accurately measure cardiac index (CI) non-invasively could reduce the frequency of surveillance right-heart catheterization (RHC) in post-transplant patients. Impedance cardiography (IC) has been proposed as an inexpensive, accurate, and non-invasive method of measuring hemodynamic variables. In this study we evaluated the accuracy of IC in post-heart transplant patients compared to hemodynamic measurements by Fick method at RHC.

**Methods:** Post-heart transplant patients undergoing routine RHC for endocardial biopsy and measurement of hemodynamic variables were enrolled during randomly selected clinic days. Each patient underwent IC within two hours of RHC. Fick cardiac index (CI) was calculated using estimated resting VO<sub>2</sub>. The accuracy of the IC compared to Fick measurement of CI was evaluated by correlation analysis using the SAS statistical software.

**Results:** 55 patients were enrolled in the study. The average age was 54.6 years old and the average months post-transplant was 28.4. 78.9% were white, 15.8% African American, 85.7% male. The large majority of patients did not have a significant degree of rejection on biopsy: 80.4% grade 0 or 1A, 14.3% grade 2, 5.4% grade 3A or 3B. The mean CI as measured by IC was 2.725 (SD 0.693). The mean CI as measured by Fick method was 2.885 (SD 0.608). Measurements by the two methods demonstrated a positive correlation with a correlation coefficient(r) of 0.35 and a P value of 0.0087.

**Conclusions:** Our study population was predominantly white, male, middle aged, and had a low prevalence of significant rejection. In this population, IC measures of CI do correlate significantly with CI determinations by Fick method in heart transplant patients (p = 0.0087). This suggests that serial measurement of CI by impedance cardiography may be useful. Relative drops in CI measured by IC may indicate true drops in CI as measured by Fick method and prompt invasive diagnostic testing. Further studies on the sensitivity of impedance cardiography to help detect cardiac transplant rejection should be undertaken.

**1089-114 C-Reactive Protein but Not Markers of Myocardial Necrosis May Preclude Endomyocardial Biopsy for the Detection of Cardiac Allograft Rejection**

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**Background:** Histological examination of endomyocardial biopsy (EMB) samples remains the standard for assessing rejection after heart transplantation. However, EMB is expensive, complex, time-consuming, uncomfortable and risky. The purpose of this prospective study was to evaluate the diagnostic efficacy of C-reactive protein (CRP) and myocardial necrosis markers (cardiac-specific troponin I: cTnI; creatine-kinase MB mass: CK-MB; myoglobin: Myo) for the noninvasive detection of cardiac allograft rejection.

**Methods:** 166 EMB were performed in 41 heart transplant recipients (>10 days postoperatively). Blood samples obtained immediately before EMB were assayed for cTnI, CK-MB, Myo and CRP. Biopsies were graded (0 to 4) according to ISHLT criteria. Biochemical marker levels were compared to biopsy results. ROC curves were constructed to determine the CRP level with highest efficiency for the detection of cardiac allograft rejection grade ≥ 3 (discriminative value).

**Results:** Three EMB samples were inappropriate for histological examination. In the remaining 163 EMB (rejection grade 0 in 110 EMB, 1 in 46, 2 in 1, 3 in 5, and 4 in 1), there was no significant relation between cardiac allograft rejection grade and cTnI (p=0.36), CK-MB (p=0.88), and Myo (p=0.42). In contrast, CRP levels increased significantly with increasing rejection grade (p=0.02). CRP >= 0.4 mg/dl (discriminative value) demonstrated a 67% sensitivity, 63% specificity, 7% positive predictive value, and 98% negative PV for the detection of cardiac allograft rejection grade ≥ 3.

**Conclusions:** In contrast to myonecrosis biomarkers, CRP levels relate to EMB results. CRP showed a very low positive and a very high negative predictive value for the detection of moderate to severe rejection. The mode of myocyte injury during rejection may not represent irreversible cell death.

**1089-116 Regional Versus Global Left Ventricular Function in Patients After Heart Transplantation: A Doppler Myocardial Imaging Study**

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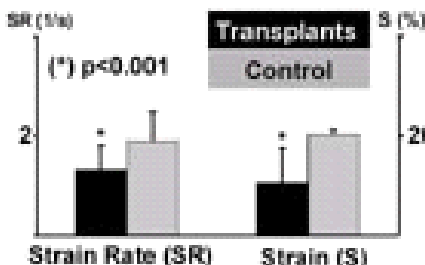
Decreased exercise capacity as well as myocardial structural abnormalities may occur in patients post heart transplantation (HTx) even in the presence of normal LV systolic function. This study investigates regional longitudinal motion and deformation properties after

HTx.

**Methods:** 30 HTx (53,9±9,5 yrs) without evidence of acute rejection or transplant vasculopathy (angiography) and mild to moderate biopsy evidence of interstitial fibrosis were compared to 20 age-matched controls. Colour Doppler Myocardial Imaging (CDMI) data were obtained from the mid segment of the interventricular septum and the lateral, inferior and anterior wall. From each segment peak systolic velocity (parameter for motion) and peak systolic strain rate and systolic strain (parameter for deformation) were extracted by postprocessing the CDMI data. LV ejection fraction (EF) as a parameter of global systolic function was assessed by MUGA scans.

**Results:** LVEF was normal in HTx (57±6%). Also, peak systolic velocities did not differ (HTx: 3,0±2,9cm/s, controls 2,9±2,8cm/s;NS). However, peak systolic strain rate and systolic strain were significantly reduced in HTx (figure). No relationship was found between time post HTx and systolic myocardial function parameters.

**Conclusion:** This study implies that regional deformation parameters (strain rate and strain) might be more sensitive for the detection of structural myocardial abnormalities in HTx than global EF or motion parameters (velocities).



**1089-117 Brain Natriuretic Peptide Levels Correspond With Diastolic Function Following Orthotopic Heart Transplantation**

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**Background:** Orthotopic heart transplantation (OHT) in the early post-operative phase is associated with restrictive physiology based on hemodynamic and echocardiographic data. Brain natriuretic peptide (BNP) levels are elevated in patients with non-transplanted hearts and diastolic impairment. We sought correlation between BNP levels and diastolic function, as determined by 2 dimensional surface echocardiography, in patients 1 week after OHT.

**Methods:** With informed consent, 3 ml of venous blood was drawn and BNP levels were analyzed using a point of care assay (Biosite Diagnostics®, San Diego, California) in patients 1 week following OHT. Two dimensional surface echocardiography was performed within 48 hours of the BNP sampling to assess left ventricular diastolic function. Peak early (E) and late (A) velocities and early deceleration time (DT) were measured from pulsed Doppler tracings of transmitral flow.-.

**Results:** Of 26 OHT patients (25 male, mean age 58 ± 10 years) included in the study, the mean BNP level was 804 ± 459 pg/mL and the mean left ventricular ejection fraction was 56 ± 5%. Rejection ≥ grade 2 was present on 18 (69%) of first biopsies. There was no correlation between E or A wave velocities and BNP levels, but there was a significant correlation between log-transformed BNP levels and deceleration time and E/A ratio.

**Conclusion:** Patients have diastolic abnormalities early following OHT and the degree of abnormality correlates with BNP levels.

	Mean value ± SD	Correlation with LnBNP	P value
E wave velocity cm/sec	91 ± 22	0.01	NS
A wave velocity cm/sec	43 ± 22	-0.02	NS
E/A ratio	2.2 ± 0.8	0.41	<0.01
Deceleration time ms	167 ± 22	-0.40	<0.05

**1089-118 Evaluation of the "Normal" Spectrum of Changes in Regional Deformation Induced by Heart Transplantation: An Ultrasonic Strain and Strain Rate Study**

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**Background:** Ultrasonic Strain (S) and Strain rate imaging (SRI) indices are a more sensitive measure of regional myocardial function than standard echo measurements. Thus they might provide a new tool to define normal graft function in transplant (Tx) pts and to detect early changes due either to rejection, vasculopathy or drug therapy. Prior to investigating the role of SRI in detecting such abnormalities, normal Tx S/SR values must be established as graft regional function could be altered by ischemic time, cardioplegic arrest or age mismatch.

**Methods:** 57 pts (age 36±12 y; post Tx 5.5±3 y) were studied. All had normal coronary angiography, LV ejection fraction, right heart pressure and negative endomyocardial biopsy. SRI data was acquired from the base, mid and apex of anterior, inferior, septal,