

# Correlating MRI BOLD Measurements with Serum Markers of Oxidative Stress in Patients with Chronic Allograft Nephropathy

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## Introduction:

The purpose of our study is to assess the effects of Losartan, an Angiotensin receptor blocker (ARB), on renal medullary oxygenation in normal native kidneys and in transplanted kidneys with chronic allograft nephropathy. Increased levels of Angiotensin II are known to be detrimental to renal medullary oxygenation, and it is hypothesized that Angiotensin receptor blockers might improve intrarenal oxygenation and oxidative stress balance in patients with chronic allograft nephropathy.

## Material and Methods:

Six healthy volunteers and six patients with chronic allograft nephropathy were enrolled in this study, which has been approved by our human subjects review committee. A single oral dose of Losartan (50mg) was used. Blood pressure, hematocrit and creatinine were obtained before Losartan administration. Serum levels of nitrite/nitrate were measured by ELISA before and two hours after Losartan. Blood oxygen level dependent magnetic resonance imaging (BOLD MRI) was performed to estimate R2\* in the medulla, before and one in half hours after Losartan.

BOLD MRI was performed on a 1.5T system (GE Signa, Waukesha, WI), using a torso coil. A multi-echo gradient recalled echo sequence with 16 echoes at 1mm interval and 5mm slice thickness was used to image the kidney pre and post Losartan administration. Each set of 16 T2\*-weighted images required 11 sec to obtain. The gray scale and color R2\* map were generated and ROI's were recorded in both the cortex and medulla. R2\* values are expressed as mean +/-se. The color maps were used to avoid placement of the ROI's in an area of artifact and to visually look at the differences between subjects.

## Preliminary Results:

The medullary R2\* values increased in the control group post-Losartan administration (Table 1: R2\* pre = 22.6±0.5 vs. R2\* post = 23.7± 0.8) which would correlate to an increase in deoxyhemoglobin, or a decrease in oxyhemoglobin. Serum markers of oxidative stress were increased in the control group post-Losartan administration (Table 2), correlating with the decrease in oxygen concentration measured by BOLD MRI.

The medullary R2\* values decreased in patients with CAN post-Losartan administration (Table 1: R2\* pre = 21.8/s±0.9 vs R2\* post = 20.8/s±0.9) which would correlate to a decrease in deoxyhemoglobin, or an increase in oxyhemoglobin. Serum markers of oxidative stress were decreased in patients with CAN post Losartan administration (Table 2), correlating with the increase in oxygen concentration measured by BOLD MRI.

Table 1:

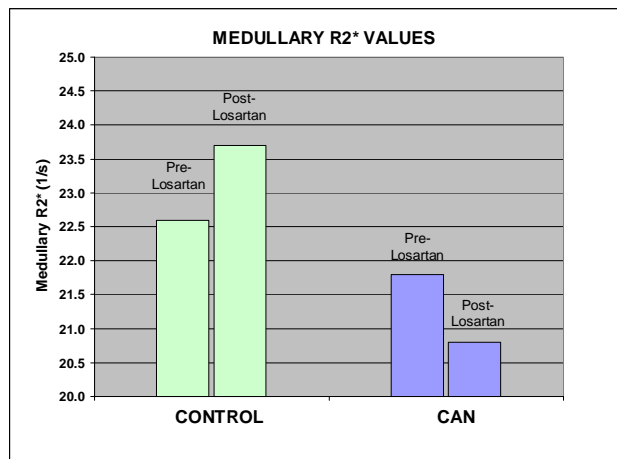
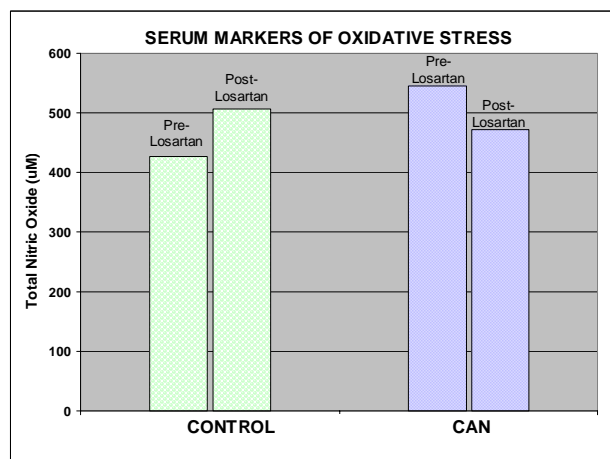


Table 2:



## Conclusion:

Trends in the R2\* measurements in the medulla of patients with CAN show Losartan may increase medullary oxygenation, which would correlate to the decrease in serum oxidative stress markers observed in these patients.

## References:

1. Prasad PV, et al. Breath-hold R2\* mapping with a multiple gradient-recalled echo sequence: Application to the evaluation of intrarenal oxygenation. JMRI 1997; 7:1163-1165.
2. Badzyska B, et al. Differential effect of angiotensin II on blood circulation in the renal medulla and cortex of anaesthetised rats. J Physiol 2002;538:159-166.