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Taurine Protects Kidney from Ischemia / reperfusion Injury after Transplantation

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Ischemia / reperfusion injury (IRI) is a major problem in clinical transplantation (Tx). Because of the unique functions of the ancient amino acid; taurine being as a modulator of transmembraneous Ca^{2+} transport, an osmoregulator, anti-oxidant agent and free radical scavenger, it seems to be a suitable protective agent against the renal cellular injury owing to IR. Thus, this study was designed to evaluate its effect on kidney grafts.

Various concentrations of taurine were infused before donor nephrectomy (1.5 ml; 30, 100, 300 mM). Controls were given the same volume of Ringers' solution. Subsequently, grafts were cold stored for 19 hours in HTK solution and transplanted into bilaterally nephrectomized rats. Both, graft function and injury was assessed 6 hours after Tx with BUN/creatinine and AST/LDH, respectively. Graft biopsies were taken to evaluate tubular damage. Further, immunohistochemistry for caspase-3 and heat shock protein (HSP) 72 was performed to index apoptosis and regeneration, respectively. Survival was compared on day 7 after Tx. The second set of experiments was designed to compare the effects of taurine given to donors vs. given to recipients. TAU (1.5 ml; 300 mM) was given to recipients 10 min before transplantation (without donor preconditioning). Blood and tissue samples were collected 6 hours after reperfusion. The biochemical and pathological studies were the same as described above.

Taurine significantly decreased BUN/creatinine and AST/LDH in a dose-dependent manner to up to 71%/69% and 51%/53% of controls, respectively ($p<0.05$). Further, tubular damage decreased to 44% of control values ($p<0.01$). Staining for caspase-3 decreased to 18% of controls ($p<0.01$) and HSP72 expression increased by 77% of controls ($p<0.01$). Taurine improved survival from about 67% in controls to 89%. Compared with TAU-recipient group, TAU-donor group showed better result in BUN, creatinine ($p<0.01$), LDH ($p<0.05$) and tubular damage index ($p<0.01$).

Donor preconditioning with taurine protects kidney from injury (apoptosis, necrosis), improves graft function, and an increased potential to regenerate most likely via mechanisms including anti-oxidation, anti-apoptosis and regeneration.