Assessment of Two Experimental Models of Renal Failure in the Rat: Applicability to the Study of Acute and Chronic Disease

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Introduction and Objective: Rodent models of renal failure frequently fail to recapitulate human disease states at the histologic and systemic levels. We examined the histological and clinical features of two previously-described models of renal injury: the two-step 5/6 surgical nephrectomy (model 1) and the bilateral ischemia/reperfusion (model 2).

Methods: Removing both poles of the right kidney followed by left nephrectomy 1 week later created Model 1. Renal failure was induced in Model 2 rats by ligating both renal pedicles for 75 minutes followed by reperfusion. Age matched healthy rats served as controls. Blood was collected weekly for hematology and serum chemistry.

Results: Model 1 had a mean survival of 139 ± 29 days after the first surgery. Kidney function levels rose to >200% of the controls within 5 weeks of nephrectomy. Hematocrit (HCT) and red blood cell number (RBC) decreased to <90% of the controls. Histologically, the kidney and bone marrow tissues showed progressive tubular and glomerular degeneration. Renal function levels rose significantly and subsequently declined, reaching normal levels within 4 weeks after injury. Histologically, the kidney tissues showed progressive glomerular and tubular degeneration.

Conclusion: Both injury models result in significant elevations of renal functions, indicating renal impairment. Model 1 may provide an appropriate vehicle for evaluation of therapeutic interventions aimed at slowing or reversing progression of kidney disease. On the other hand, model 2 may be optimal for the evaluation of therapeutic modalities targeted to improve survival and lessen damage associated with the acute renal failure.

References:


Acknowledgment:

This work was supported by Tengion Inc. through a sponsored research agreement.

Drs. Atala and Yoo serve as consultants to Tengion Inc.