

Calyceal-renalpelvic mechanisms for urine transport: Physiological role of kidney pacemaker system in hydronephrosis and obstruction

Christos E Constantinou

Stanford University School of Medicine, CA, USA

The human kidney is made up of a multi-calyceal system draining into the renal pelvis and from where it is transported to the ureter and bladder. The physiological mechanism through which drainage is made from the renal papillae incorporates a system of pacemakers located in the uppermost regions of each calyx. Each calyceal pacemaker unit possesses its unique frequency of contraction determined by a unique system of cells. Renal pelvic pressures within each calyx are low 6-8 cm of H₂O and contract at a frequency of approximately 12/min. The calyces are connected to the renal pelvis via the infundibulae, pooling their individual contribution of urine. The renal pelvis has a resting pressure of about 10-12 cm of H₂O and drains to the ureter at a rate depending on the amount of urine produced which is related to hydration. The contractile frequency of the renal pelvis is considerably lower than that of the calyces and is about 2-5/min. Because of their intrinsic pacemaker systems both the calyx and renal pelvis can contract at their intrinsic frequency even when removed from the organism. Furthermore, sections of the smooth muscle constituting these structures can contract spontaneously *in vitro* and do not require stimulation from the nervous system. In this presentation the response of this system will be demonstrated under conditions of experimental hydronephrosis due to ureteral obstruction in the porcine kidney. The interplay between bladder pressures and renal pelvic pressures will be presented and the mechanisms conducive to vesicourethral reflux will be demonstrated. Presentation will discuss recent findings of molecular pathways that mediate these interactions in terms of gene expression and activity to provide information into central regulatory processes governing calyceal and renal pelvic organization and consider possible ramification in the organogenesis of the upper urinary tract.

Biography

Christos E Constantinou has completed his Ph.D. from Stanford University. He has been on the faculty of the department of Urology at the Stanford University School of Medicine since 1977. His work focused in basic physiological and pharmacological investigations in the upper and lower urinary tract. He has published more than 100 papers in peer-reviewed journals and has written many chapters in clinical books relating to urodynamics and pelvic floor function. He is on the editorial board of a number of clinical and basic science journals as well as the Chief Editor to the open journal of Obstetrics and Gynecology.

chris.constantinou@alumni.stanford.edu