Basic Research

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Re: Duration of Urination does not Change with Body Size

Yang PJ[1], Pham J[1], Choo J[1], Hu DL[2]

[1]Georgia Institute of Technology, Division of Mechanical Engineering, Atlanta, USA
[2]Georgia Institute of Technology, Division of Mechanical Engineering and Biology, Atlanta, USA

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EDITORIAL COMMENT

In mammals, the bladder acts as a water-proof reservoir to be emptied at a time of convenience. Urinary flow is driven by a combination of both gravity and bladder pressure. Urination physiology has not been clearly described yet. Urination may be simply described mathematically. In this study, the authors want to elucidate the hydrodynamics of urination in 5 different animals by using high-speed videography and flow-rate measurement. They found that all mammals above 3 kg in weight empty their bladders over nearly constant duration of 21±13s. This finding can be explained with larger animals have longer urethras and thus, higher gravitational force and higher flow speed. Smaller mammals are challenged during urination by high viscous and capillary forces that limit their urine to single drops. Their findings reveal that the urethra is a flow-enhancing device and this study may help to diagnose urinary problems in human as well as hydrodynamic system. Pressures are effective on bladder emptying. This equality can be described as $P_{bladder} + P_{gravity} = P_{inertia} + P_{viscosity} + P_{capillary}$ formulation. According to this research, the urethra is critical to the bladder's ability to empty quickly, moreover the modeling of the bladder and urethra can be useful especially for neobladder operations. Additional mathematical techniques as well as accurate urethral measurements are needed to increase correspondence with experiments in the future.

Fehmi Narter, MD