Law of Urination: All humans do not empty their bladders over the same duration

Ioannis E. Karyotis
Private Surgery Clinic, Larissa, Greece

Abstract

While parameters such as maximum flow rate, average flow rate, opening detrusor pressure, show an acceptable accuracy in indicating bladder outlet obstruction and/or detrusor dysfunction, other such as flow time are not diagnostic. In this article we discuss the issue and we theoretically demonstrate why all humans do not empty their bladders over the same duration.

Introduction

The Hypotheses/Ideas

Urodynamic investigation is actually a functional assessment of the urinary tract that provides objective pathophysiological explanations for symptoms and dysfunctions. However, urodynamic evaluation of lower urinary tract function is not a single and physiological test. In fact it comprises a series of tests and a notable variability in reference ranges of normal urodynamic parameters exists. This fact is of great interest since appropriate treatments are decided upon urodynamic findings. While parameters such as maximum flow rate, average flow rate, opening detrusor pressure, show an acceptable accuracy in indicating bladder outlet obstruction and/or detrusor dysfunction, other such as flow time are not diagnostic.

This happens because some less studied factors such as the redox status, gravity, urethral viscosity pressure, integrity of autonomous nervous system, the opening diameter of urethra, compression forces of prostate or urethral strictures, the barycenter of human body (including BMI), inertia, etc.

In this article we discuss the issue and we theoretically demonstrate why all humans do not empty their bladders over the same duration.

Physics of flow

Flow is defined as the quantity of fluid (gas, liquid or vapour) that passes a point per unit time. A simple equation to represent this is \( F = \frac{Q}{t} \) where \( F \) is the flow rate, \( Q \) is the quantity of fluid and \( t \) is the time. Thermodynamically, flow is sometimes defined with the equation as \( \Delta Q = H - T\Delta S \) where \( H \) is enthalpy, \( T \) is temperature and \( S \) is entropy.
entropy and $T =$ absolute temperature, or with different words, the rate of change of mass or volume or chemical reaction. Due to the number of different fluids that are given to our patients, flow is obviously an important area of physics to understand. Flow can be divided into 2 different types, laminar and turbulent. A number of different physical characteristics determine whether a fluid obeys the principles of one or the other.

In laminar flow the molecules of the fluid can be imagined to be moving in numerous “layers” or laminar. Although all the molecules are moving in straight lines they are not all uniform in their velocity. If the mean velocity of the flow is $v$, then the molecules at the center of the tube are moving at approximately $2v$ (twice the mean), whilst the molecules at the side of the tube are almost stationary. Flow is usually considered to be laminar when a fluid flows through a tube and the rate of flow is low. This is therefore the type of flow we would expect to see when a fluid flows through a cannula or a tracheal tube. For flow to occur, there must be a pressure difference ($\Delta P$) between the ends of a tube, and it can be demonstrated that $\Delta Q$ is directly proportional to $\Delta P$, in other words the greater the pressure difference, the greater the flow. As fluid flows through tubes there is resistance, between the fluid and urethral wall that opposes the flow. For any given system, this resistance is constant and can be expressed as: Resistance $= \frac{\Delta P}{\Delta G} = R$ (constant). (This can be compared with $V=IR$ in electrical physics). Urine Flow can also be Turbulent. Turbulent flow occurs when fluids flow at high velocity, in large diameter tubes and when the fluids are relatively dense. Also, decreasing the viscosity of a fluid leads to turbulent flow. The factors that determine when turbulent flow commences can be combined to form an equation which calculates the Reynolds number.

**Significant statements in male human urination**

- Driving forces such as gravity, bladder pressure
- Compression forces of prostatic urethra
- Thermodynamic status of male
Results
The max urine flow is closed related to process of cell death. The process of cell death is destructive, self-amplification when two basic reasons are present: a) acid PH, b) decrease of the levels of diatomic oxygen and c) decrease of the levels of water (decreased hydrolysis) inside the human body. The reasons for the above mentioned are unknown by scientists. I present in the following figures the chemical denaturation of a DNA’s helix (Figure 2) in the human cell (based in crystalloid transmission of quantum packages of light) (Figure 1). The final effect is the well-known material gap (or mass gap) and the correspondent particles are named anti-hyaloidonia (or anti-quartzonia). These are the well known black holes, which can be viewed and in the human body (e.g. after transurethral prostatectomy) with white light. This effect is due to material gap (or effect of photonic embracing due to electromagnetic dipole), which is explained with dianymatic logism, Euclid geometry, centroid and barycenter photonic embracing inside the body. Finally I present an equation regarding the law of male urination (mean max flow) with the following parameters.

\[
\text{Mean max flow} = 8 \Delta G \left( \pm 0.2 \text{SD} \right) \sqrt{32 \text{ g bladder g}^{-1} \text{L}}
\]

Where, \( \Delta G = \text{urine Flow (Thermodynamically)} \)
\( P = \text{bladder pressure} \)
\( g = \text{gravity} \)
\( L = \text{total length of urethra} \)

This equation is predicts 95% the velocity of urine under normal conditions of normal bladder oxygenation (as well prostate and urethra) and PH status. (unpublished data).

Conflicts of interest:
The author declared no conflicts of interest.