Applications of Basic Physics for a Surgeon

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Dear Editor,

We read the Editorial article titled “Basic Physics Revisited for a Surgeon” [1] with great interest. Application of physics in day to day surgical practice is very interesting specially for a surgeon, who has been good in physics also. The article highlights basic laws of physics, e.g., Poiseuille’s law, Pascal’s law, Laplace’s law, Bernoulli theorem, Ohm’s law, and Piezoelectric effect. Authors have done a commendable job in this aspect. Sir, though most of the surgical situations have been covered, I would like to add few more examples of basic physics.

Floating Ball Valve Mechanism A mass tethered to the wall or lumen of a hollow viscera by a stalk causes partial or complete obstruction to the free flow of a gas or fluid [2].

This is classically seen in many conditions.

1. In partial intestinal obstruction, specially at a stricture/narrowing when a food bolus gets stuck there, it causes complete obstruction. If we treat such patient non-operatively by giving rest to the gut, the pressure gradient proximal to the obstruction decreases and the food bolus gets dislodged. Thus, most of the times obstruction gets relieved.
2. In the heart, the flow of blood is blocked by atrial myxoma.
3. In the chest, a partial endobronchial obstruction allows entry of air but not egress of air, resulting in buildup of pressure in the terminal airways and potential rupture of alveoli; air percolates into soft tissue, causing interstitial emphysema. Extreme leaks may cause tension pneumothorax with increased

positive pressure in the hemithorax, shifting of mediastinum and compromised circulation.

4. The partial obstruction of urinary tract by a mass, i.e., a leiomyoma present at the trigone blocks the outflow of urine.

Kite Line Effect Knotting of sutures/ligatures/threads: Tightening of threads and tying along the axis of suture bite does not cut through the tissue. But if we pull the thread and tighten at right angle to the bite, it cuts through the tissue. It can thus lead to leakage through that point [2].

Air-Water Seal System For chest tube drainage, air-water seal system acts as one-way valve to air. It allows air to escape from chest cavity to the draining bag or bottle. But there is no movement of air in reverse direction.

I understand that it is still not possible to cover all the aspects regarding application of physics in surgical practice.

Compliance with Ethical Standards

Conflict of Interest The author declares that he has no competing interests.

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