Letter to the Editor

Hemodilution of Prostate-Specific Antigen Levels Among Obese Men

To the Editor: A recent article by Grubb and colleagues (1) shows that the inverse relationship between prostate-specific antigen (PSA) test results and body mass index (BMI) among men from the Prostate, Lung, Colorectal, and Ovarian Cancer Screening Trial can be explained by the higher blood volume in the obese, an effect called hemodilution (2). Their finding is consistent with our analyses in the EHE International, Inc. clinical population (3). We suggested new PSA cut points for clinical follow-up for obese and morbidly obese men, but agree with Grubb et al. (1) that using body surface area in conjunction with PSA test results to set clinical cut points has merit (3). We suggest an equation based on hemodilution models to standardize PSA test results for differences in body surface. The equation is an algebraic rearrangement of the formulas used by Grubb et al. (1), and ourselves, standardizing the PSA test results to a man who has the mean height for the U.S. (175.77 cm) and whose weight is equivalent to a BMI of 25 for that height (3). The adjusted PSA value can then be compared with standard thresholds for clinical decision making regarding follow-up.

$$\text{Adjusted PSA} = \frac{((0.007184*(\text{height in cm}^{0.725})*(\text{weight in kg}^{0.425}))*1578*\text{PSA test score})}{(0.007184*(175.77\ \text{cm}^{0.725})*(77.25\ \text{kg}^{0.425})*1578)}$$

Using this approach, a man who is 183 cm tall (6 foot), 100 kg (220 pounds), with a PSA of 3 ng/mL, would have an adjusted PSA of 3.45; if he were 143 kg (313 pounds), the adjusted PSA would be 4.0.

Grubb et al. (1) also discuss the possibility that the inverse association between PSA and BMI could be due to hormonal disturbances caused by obesity, rather than a hemodilution effect. However, our recently published analyses show that both lean and fat mass are inversely associated with PSA test scores (4). The finding of an association between PSA test results and lean mass is inconsistent with a hormone disturbance theory, which focuses on the effects of fat mass on PSA. However, because both lean and fat mass require a blood supply the finding is consistent with the hemodilution theory.

We are gratified to see that others have observed results regarding hemodilution and PSA similar to those observed by Banez and colleagues and ourselves (2, 3). We suggest the formula for calculating a hemodilution adjusted PSA score will be useful for physicians working with obese men.

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Disclosure of Potential Conflicts of Interest

There are no potential conflicts of interest.

References

1. Grubb RL III, Black A, Izmirlian G, et al. Serum prostate-specific antigen hemodilution among obese men undergoing screening in the Prostate, Lung, Colorectal, and Ovarian Cancer Screening Trial. Cancer Epidemiol Biomarkers Prev 2009;18:748–51.
2. Banez LL, Hamilton RJ, Partin AW, et al. Obesity-related plasma hemodilution and PSA concentration among men with prostate cancer. JAMA 2007;298:2275–80.
3. Rundle A, Neugut AI. Obesity and screening PSA levels among men undergoing an annual physical exam. Prostate 2008;68:373–80.
4. Rundle A, Richards C, Neugut AI. Body composition, abdominal fat distribution, and prostate-specific antigen test results. Cancer Epidemiol Biomarkers Prev 2009;18:331–6.

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