Perineal Anatomy and Urine-Voiding Characteristics of Young Women with and without Recurrent Urinary Tract Infections

We evaluated the association of specific perineal anatomic factors and urine-voiding characteristics with recurrent urinary tract infection (UTI) in young college women. Subjects were eligible for inclusion if they were healthy nonpregnant women aged 18–30 years with no known abnormalities of the urinary tract. Case subjects had had ≥3 UTIs in the past 12 months or ≥2 UTIs in the past 6 months, whereas control subjects had had no UTI in the past year and no more than 1 UTI in any previous year. Case subjects were identified through a monthly computer search of patient-encounter forms, and medical records were reviewed for information on UTI diagnoses. Control subjects were randomly selected each month from the pool of age-eligible women who had attended the student health clinic in the past 12 months.

Each subject was asked to come to the clinic with a comfortably full bladder and to urinate into a UroScan Uroflowmeter (Dacomed, Minneapolis, MN). Then, with the subject in the lithotomy position, a small plastic ruler was used to measure the anatomic distances given in table 1. Finally, within 5 minutes after urination, a 16-French Foley catheter was inserted into the urethra, the balloon was inflated, and the post–void residual urine volume was measured. The catheter was marked with a marking pen at the urethral orifice, and the distance from the base of the balloon to the mark on the catheter was taken as the urethral length.

A total of 213 women were enrolled. There were no statistically significant differences in demographics, except that control subjects were more likely to be white (87% vs. 74%; P = .02). The mean distances from urethra to anus and from posterior fourchette to anus were significantly shorter in case subjects (table 1). These differences were similar in each of the racial groups. The distance from urethra to anus was significantly associated with weight (P < .001), height (P = .002), and body mass index (P < .001), but case subjects and control subjects did not differ significantly in terms of these variables.

Case subjects were more likely than control subjects to have a distance from urethra to anus of <4.5 cm (the 25th percentile figure for control subjects) (OR, 2.4; 95% CI, 1.2–4.8; P = .013). Moreover, of the 109 women who reported no spermicide use in the past year, 15 (38%) of 40 case subjects versus 7 (10%) of 69 control subjects had a distance from urethra to anus of <4.5 cm (OR, 5.7; 95% CI, 2.0–16.6, after adjustment for the frequency of coitus in the past month; P = .0013). This association was not seen in the 96 spermicide users (OR, 0.9; 95% CI, 0.3–2.6; P = .90).

Urethral length, post–void residual urine volume, and urine-flow characteristics (peak and average flow rate, time to peak flow, voiding time, and total volume urinated), on the other hand, were not associated with risk of recurrent UTI. The results of our study suggest that the distance uropath-

Table 1. Characteristics of young women with recurrent urinary tract infections and of control subjects.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Patients (n = 98)</th>
<th>Controls (n = 107)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance from urethra to anus, cm</td>
<td>4.8 ± 0.6 (3.5–7.0)</td>
<td>5.0 ± 0.7 (3.6–7.5)</td>
<td>.03</td>
</tr>
<tr>
<td>Distance from posterior fourchette to anus, cm</td>
<td>2.6 ± 0.5 (1.7–4.0)</td>
<td>2.8 ± 0.5 (1.5–4.8)</td>
<td>.04</td>
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<tr>
<td>Length of urethra, cm&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.6 ± 0.4 (2.8–4.6)</td>
<td>3.5 ± 0.4 (2.8–4.4)</td>
<td>.27</td>
</tr>
<tr>
<td>Volume of post–void residual urine, mL&lt;sup&gt;b&lt;/sup&gt;</td>
<td>43 ± 41 (0–140)</td>
<td>49 ± 48 (0–190)</td>
<td>.41</td>
</tr>
</tbody>
</table>

NOTE: Data are mean ± SD (range)

<sup>a</sup> Patients, n = 80; controls, n = 83.

<sup>b</sup> Patients, n = 82; controls, n = 84.
ogens must travel from the fecal reservoir to the urethra may be related to the risk of recurrent UTI in some women. Although such anatomic differences are of relatively little consequence in women who have other risk factors for UTI, such as frequent coitus or use of spermicides, which facilitate both colonization of the vagina with uropathogens [1] and subsequent UTI [2], it is possible that anatomic differences play a greater role in the pathogenesis of UTI in women who do not have these or other exogenous risk factors.

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References
