Cervical sampling for diagnosis of genital chlamydiad infection with a new brush device

L-O Svensson, M Domeika, P-A Mårdh

Abstract

Objectives—to compare a new sampling device, a brush, Accellone-Multi-Instrument (AMI), with a dacron-tipped swab for detection of Chlamydia trachomatis in endocervical specimens, and to evaluate if consecutive multiple cervical sampling as compared with such a single specimen would increase the sensitivity. Methods—501 females attending an STD clinic and 172 females attending a family planning clinic were examined prospectively. Two cervical specimens were collected from each woman. C trachomatis were detected by culture or enzyme immunoassay (IDelia-III). Positive EIA samples were confirmed by a direct immunofluorescent test. Results—When cervical specimens were collected with the brush as the first device, 92% of the culture-positive cases were detected, and when the samples were collected with the dacron-tipped swab first, 84% of the culture-positive cases were detected (p < 0.05). The first collected specimen detected 89% of the culture-positive cases and 81% of those that were positive by IDEIA. Conclusions—The study indicates that the AMI brush is superior to non-toxic, dacron-tipped swabs for detection of C trachomatis in cervical specimens by cell culture but not by ELISA, and that the sensitivity could be improved by analysing multiple cervical samples.

Material and methods

Study populations
Specimens were collected from 501 females attending a sexually transmitted disease clinic (Group A), who were aged 18–35 years (mean 25.0), many of whom had symptoms. Also included in the study were 172 asymptomatic females (Group B) attending a family planning clinic for contraceptive advice, between the ages of 16–35 years (mean age 23.4 years).

Specimen collection
Two cervical specimens were collected from each woman, one specimen with a new type of brush, the Accellone-Multi-Instrument® (AMI) (Medscand, Malmö, Sweden) and the other specimen with a dacron-tipped swab. The former is a brush with a thin plastic shaft with its tip covered with soft bristles. Before taking the samples the exocervix was cleansed with a dry cotton pad. On even calender dates the dacron-tipped swab was used first and vice versa on odd calender dates.

The specimens were placed in the transport medium supplied by the kit procedure (Novo Bio Labs) of the enzyme immunoassay used or in a sucrose-phosphate (2-SP) buffer for tissue culture studies.

Detection of chlamydia trachomatis
Within 72 hours of sampling, samples from Group A were inoculated into cycloheximide-treated McCoy cell cultures. Samples from Group B were analysed in an enzyme immunoassay, (IDEIA-III (Novo Bio Labs)). Positive samples were confirmed by a direct immunofluorescence test (DIF), (MicroTrak (Syva). Only samples positive either by culture or in both the IDEIA and the DIF tests were regarded as true positives.

Results
Of the 673 women included in the study, 85 (12.6%) were found to be infected by C trachomatis. Of the 501 females in Group A, 64 (12.8%) were positive as evidenced by culture. Of the 501 samples collected by use of a dacron-tipped swab, 51 (10.2%) were culture-positive. They constituted 79.7%
of the cases detected to be infected with *C trachomatis*.

With the AMI brush, 59 (11.8%) were culture-positive, i.e. 92.2% of all chlamydia cases detected in Group A (table 1).

In Group B, 21 (12.2%) of the 172 women were chlamydia-positive in IDEIA-111 in all cases confirmed by DIF. Both the dacron-tipped swab and the AMI brush revealed 17 (9.9%) of the chlamydia-infected cases which were 81% of those found to be infected in Group B (table 2).

When samples were taken by the dacron-tipped swab before the brush in Group A, 21 of 25 (84%) chlamydia-positive cases were detected by the first specimens, while when the AMI brush was the first device used, 36 of 39 (92%) specimens were culture-positive (p < 0.05) (table 3).

In Group B, 11 specimens were ELISA-positive when the dacron-tipped swab was the first device used, while this was true for 10 specimens when the AMI brush was used first (table 4).

The first collected specimens detected 86% (57/66) of the culture-positive cases and 81% (17/21) of those who were positive by IDEIA-111.

No samples collected with the AMI brush or the dacron-tipped swab were found to be cytotoxic.

Traces of blood were observed in 297 (44%) of the samples collected by the AMI device and in 152 (23%) of those collected by the dacron-tipped swab.

**Discussion**

The detection of the intracellular organism *C trachomatis* in tissue cell culture is related to the quantity of epithelial cells in the specimen collected.

The detection rate is dependent on the amount of chlamydia organisms (or antigen) present in the specimen and the toxicity of the sampling device is a factor which influences the outcome of culture studies. The recovery rate has been reported to be improved by using a brush device, the Cytobrush* compared with dacron- or cottontipped swabs.5-7 The brushes yield an increased number of epithelial cells as compared with ordinary swabs in samples collected from the cervical channel.5 The same is true for the number of elementary bodies (EB) of *C trachomatis* detected in such samples analysed by DIF. However, the advantage with the brush device has not been confirmed in other studies.5-13

The brush can induce bleeding from the friable cervical channel and a cytotoxic effect on McCoy cells, when samples have been contaminated with blood, has been reported. Bleeding occurred in 44% of the samples collected using the AMI-brush and in 23% of the cases using the dacron-tipped swab. The bleeding did not seem to affect the detection of *C trachomatis*. However, samples taken with the AMI-brush has a higher sensitivity for detection of *C trachomatis* by tissue cell cultures than when dacron-tipped swabs were used, which may be explained by the former sampling result in a higher number of epithelial cells in the specimen.

Dunlop et al14 found that multiple endocervical swabs increased the sensitivity of detecting genital infection by *C trachomatis*. They found that the first collected swab iden-

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Comparison of a brush sampling device (Accelone-Multi-Instrument) and a dacron-tipped swab for detection of <em>Chlamydia trachomatis</em> by culture in group A (N = 501).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampling device</td>
<td>Culture test</td>
</tr>
<tr>
<td>Brush</td>
<td>+</td>
</tr>
<tr>
<td>Swab</td>
<td>+</td>
</tr>
<tr>
<td>Total</td>
<td>46</td>
</tr>
</tbody>
</table>

In total, 59 and 51 of the chlamydia positive specimens had been sampled by the brush and the dacron-tipped swab, respectively.

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Comparison of detection rate of <em>Chlamydia trachomatis</em> by culture between first and second consecutive sampling occasion in women sampled by a brush device (Accelone-Multi-Instrument) and a dacron-tipped swab. (N = 501)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampling device</td>
<td>Sampling order</td>
</tr>
<tr>
<td>Brush</td>
<td>1</td>
</tr>
<tr>
<td>Swab</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>27</td>
</tr>
</tbody>
</table>

In total, 36 women were chlamydia-positive in the first sampling from the cervix when the sampling was made with the brush, while 21 women were positive when the dacron-tipped swab was first to be used (p < 0.05).

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Comparison of a brush sampling device (Accelone-Multi-Instrument) and a dacron-tipped swab used for detection of <em>Chlamydia trachomatis</em> by immunofluorescent-confirmed enzyme immunoassay (IDEIA-111) (N = 172).</th>
</tr>
</thead>
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<tr>
<td>Sampling device</td>
<td>Immunoassay</td>
</tr>
<tr>
<td>Brush</td>
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<td>Swab</td>
<td>+</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
</tr>
</tbody>
</table>

In total, 17 chlamydia-positive specimens were detected in samples collected both by the brush and the dacron-tipped swab.

<table>
<thead>
<tr>
<th>Table 4</th>
<th>Comparison of the detection rate of <em>Chlamydia trachomatis</em> between first and second consecutive sampling occasion from the cervix in specimens collected by a brush device (Accelone-Multi-Instrument) and a dacron-tipped swab when analysed by IDEIA-111 and confirmed by direct immunofluorescence (Mikro Trak) (N = 172).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampling device</td>
<td>Sampling order</td>
</tr>
<tr>
<td>Brush</td>
<td>1</td>
</tr>
<tr>
<td>Swab</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
</tr>
</tbody>
</table>

In total, 8 women were chlamydia-positive when the first sampling from the cervix was made with the brush, while 9 women were positive when the dacron-tipped swab was first to be used. (Not significant).
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