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article

A new visual indicator of chlamydial cervicitis?

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Objectives: To determine the usefulness of endocervical discharge opacity as a risk indicator for chlamydial infection in relation to two acknowledged visual indicators—yellow endocervical discharge and easily induced mucosal bleeding of the cervix.

Methods: Women from two family planning clinics, a therapeutic abortion clinic, and a university student health clinic (n=1418 total) consented to a pelvic examination and chlamydia testing, and completed a questionnaire on sociodemographics, sexual behaviour, medical history, and symptoms. A case of chlamydia was defined as positive by culture or blocked enzyme immunoassay in an endocervical swab.

Results: The prevalence of chlamydial infection in the clinics was 6.3%. All three of the visual indicators—yellow endocervical discharge, easily induced bleeding, and opaque cervical discharge—were statistically significantly and independently associated with chlamydial infection (odds ratios 2.8, 2.3, and 2.9 respectively), independent of clinic type. Adjustment for the other visual indicators made little difference to the odds ratios.

Conclusion: Opacity of endocervical discharge was at least as important as the other two commonly acknowledged indicators of chlamydial cervicitis—yellow endocervical discharge and easily induced mucosal bleeding of the cervix.

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Keywords: risk factors; *Chlamydia trachomatis*; women

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Introduction

Effective strategies for the detection of cervical chlamydial infections, particularly among young women, have been the focus of considerable research, owing to their serious reproductive consequences if untreated.¹

Clinically observed characteristics of the cervix have been used to predict the presence of chlamydial infection in women. Among these, mucopurulent (yellow) endocervical discharge and easily induced bleeding of the cervix (friability) have been shown to be predictive of chlamydial infection of the cervix in several studies.^{2–4} These visual indicators of chlamydial cervicitis have been of interest for use in the immediate treatment of women with clinical signs of infection (presumptive diagnosis),^{5,6} and the cost effective identification of higher risk women for chlamydia screening (selective screening).⁷

Another potentially valuable visual indicator of chlamydial infection, as distinct from yellow colour and easily induced bleeding, may be the opacity of the endocervical discharge. An association between opacity of endocervical discharge and chlamydial cervicitis has been found in two previous studies that specifically assessed the translucence of endocervical discharge.^{4,7} The current study assessed the statistical independence and strength of association of the opacity of discharge relative to that of mucopurulent endocervical discharge and cervical friability in three samples of women in one city.

Methods

SAMPLE SPECIFICATION

Women who were sexually active and 16 years of age or older, were enrolled between 1989 and 1992 from one urban and one suburban

family planning clinic (total n=1002), from the McMaster University student health service clinic (n=191), and from a therapeutic abortion clinic (n=225), all in Hamilton, Ontario. Women from the family planning clinics and the student health clinic were mostly asymptomatic and attending for routine care, and were excluded if they were known to be pregnant or had used antibiotics in the previous 14 days. All women gave written informed consent which was approved by the McMaster University ethics review committee. A self administered questionnaire was completed dealing with demographic information, sexual, gynaecological and obstetric history, and symptoms.

CLINICAL AND LABORATORY EXAMINATION

A gynaecological examination was performed on all women. After the cervix was cleaned of excess mucus with a large cotton swab, three endocervical specimens were obtained for *Chlamydia trachomatis* culture, chlamydial enzyme immunoassay (EIA) with blocking confirmation (Chlamydiazyme, Abbott Laboratories, North Chicago, IL, USA), and *Neisseria gonorrhoeae* culture for all women as previously described.⁷ All specimens were collected according to a standardised protocol.

Endocervical discharge was assessed for translucence (opaque or clear) in situ, and for colour (yellow or white) on the initial white-tipped swab. Easily induced mucosal bleeding was noted if bleeding occurred with any cervical swabbing. The characteristics of the cervix and endocervical discharge were recorded on standardised forms.

STATISTICAL METHODS

A case of chlamydial infection was defined as either culture positive or blocked EIA positive

at the cervix. Data were analysed by exact statistical methods, using the EGRET (Epidemiological Graphics, Estimation, and Testing, Egret Statistical Software and Epidemiology Research Corporation, Seattle, WA, USA, 1990) package, to test the association of chlamydial infection with the visual (clinical) indicators. The associations were also tested for heterogeneity by clinic and the other visual indicators. The association of chlamydial infection with various combinations of indicators was also investigated.

The probability (two tailed) of a type I error was set at 0.05.

Results

SAMPLE CHARACTERISTICS

The mean ages of the women in the family planning, student health, and therapeutic abortion clinics were 21.4 (SD 3.1), 21.7 (1.9), and 25.0 (6.6) years respectively. A partner change in the previous year was reported by 44.8%, 51.3%, and 26.7%, and previous sexually transmitted disease was reported by 23.9%, 19.5%, and 19.9% respectively. The prevalence of *C trachomatis* was 7.0% in the family planning clinics, 4.2% in the student health clinic, and 4.9% in the therapeutic abortion clinic. *N gonorrhoeae* was isolated from four women in the family planning clinics.

ASSOCIATIONS BETWEEN VISUAL INDICATORS AND CHLAMYDIAL INFECTION

The unadjusted odds ratios for the three visual indicators, endocervical discharge opacity (OP), yellow colour (YE), and easily induced mucosal bleeding (BL), were 2.9, 2.8, and 2.3 respectively. All were statistically significant ($p < 0.01$). The odds ratios for the three visual indicators, adjusted for the three clinic types

(family planning, student health, and therapeutic abortion) are shown in table 1. Each visual indicator remained statistically significantly associated with chlamydial infection after controlling for clinic type (table 1) and each of the other indicators (data not shown). There was no detectable heterogeneity in the odds ratios between the strata defined by the adjustment factors and the overall adjusted estimates of the odds ratios differed only slightly from the unadjusted estimates.

TESTING COMBINATIONS OF THE THREE VISUAL INDICATORS

The sensitivity, specificity, positive and negative predictive values of the three visual indicators in different combinations, and the odds ratios (stratified by clinic) of the combinations are shown in table 2. The presence of both opaque endocervical discharge and yellow endocervical discharge was the combination that had the strongest association (odds ratio = 4.9) with chlamydial infection ($p < 0.0001$). The occurrence of easily induced mucosal bleeding of the cervix alone was the single indicator with the highest sensitivity (0.43). Compared with the individual factors, the combinations of factors had much lower sensitivities and higher specificities. This is to be expected given that requiring a combination of factors constitutes a more stringent definition of infection.

Discussion

Endocervical discharge opacity, in addition to yellow endocervical discharge colour and easily induced cervical bleeding, appears to be a useful predictor of chlamydial cervicitis in young women. The results are generalisable since multiple physicians were involved in the assessments. Physicians were trained in the clinical methods in only the family planning clinic; however, the observed associations did not vary by clinic. While nucleic acid amplification was not used to detect chlamydia, each woman was tested by culture and EIA and we feel that sensitivity was adequate.

The associations between each of these three visual indicators and chlamydial infection after adjusting for clinic type and the possible confounding effects of the other indicators were statistically significant and substantial. While other studies examining clinical indicators for chlamydial cervicitis have found associations between yellow endocervical discharge, easily induced mucosal bleeding, and cervical chlamydial infections,^{2 3 7-9} this study was the first to demonstrate that opaque endocervical discharge is associated with infection, regardless of the presence of the other two indicators.

In future studies of selective versus universal screening of young women for chlamydial cervicitis, discharge opacity should be further assessed for its ability to predict infection, since it may improve the effectiveness of selective screening rules in comparison with previous studies.^{3 4 7 9-12} Another role that visual indicators may play is in the presumptive diagnosis of

Table 1 Associations of each of the three visual indicators with chlamydial cervicitis, stratifying by the other factors and testing for heterogeneity

Visual indicator tested	Stratification	Odds ratio (95% confidence interval)	p Value for test for heterogeneity
OP*	Crude odds ratio	2.9 (1.7-4.8)	NA
	Clinic	3.0 (1.8-5.0)	0.24
YE†	Crude odds ratio	2.8 (1.5-4.9)	NA
	Clinic	2.8 (1.1-4.1)	0.60
BL‡	Crude odds ratio	2.3 (1.4-3.7)	NA
	Clinic	2.4 (1.4-3.9)	0.85

*Opaque endocervical discharge.

†Yellow endocervical discharge.

‡Easily induced mucosal bleeding.

NA=not applicable.

Table 2 Sensitivity, specificity, positive and negative predictive values, and associations of the three visual indicators alone and in combinations, with chlamydial cervicitis, stratifying for the three clinic types

	Sensitivity	Specificity	Positive predictive value	Negative predictive value	OR* (stratified by clinic)	p Value
OP†	0.40	0.81	0.11	0.96	3.0	<0.0001
YE‡	0.25	0.89	0.12	0.95	2.8	<0.0001
BL§	0.43	0.75	0.09	0.96	2.4	0.001
OP+YE	0.16	0.96	0.19	0.95	4.9	<0.0001
OP+BL	0.17	0.94	0.14	0.95	3.2	<0.0001
YE+BL	0.11	0.96	0.14	0.95	3.1	0.01
OP+YE+BL	0.05	0.98	0.14	0.95	3.0	0.07

*Odds ratio.

†Opaque endocervical discharge.

‡Yellow endocervical discharge.

§Easily induced mucosal bleeding.

chlamydial cervicitis before test results are available but where it is unlikely that the patient will return for treatment.

In developing countries, syndromic management⁵ may decrease the burden of sexually transmitted diseases. Given that internal examinations using a speculum currently are not part of the syndromic management approach, these three visual indicators of chlamydial cervicitis are still of limited application. We suggest that all three indicators should be considered for inclusion in future studies of innovative approaches to diagnosis.

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