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article

Microscopic features of vaginal candidiasis and their relation to symptomatology

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Objectives: To document the microscopic features of vaginal candidiasis and to examine the relation between yeast morphology and patient symptomatology.

Method: The study population comprised women undergoing screening for genital infection at a department of genitourinary medicine.

Results/Conclusion: Data were collected on 267 women of whom 234 were found to have vaginal candidiasis by vaginal culture. The remaining 33 patients had microscopic features of candidiasis (spores and/or hyphae) but were culture negative. Of the culture positive women, microscopy was positive in 182 (78%). "Spores only" were identified in 65 (28%), "hyphae only" in 16 (7%), and both "spores and hyphae" in 101 (43%). 68% of culture positive women were symptomatic, the commonest symptoms being irritation alone (27%) or irritation plus vaginal discharge (25%). No association was found between yeast morphology (spores, budding/non-budding; hyphae, branching/non-branching) as identified on microscopy of vaginal secretions and symptomatology.

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Keywords: spores; hyphae; genital symptoms; *Candida*

Introduction

Yeast associated vaginal discharge was first reported by Wilkinson in 1849¹ and we now recognise vaginal candidiasis as a common condition which affects approximately 75% of all women at some point in their lifetime.² Mean vaginal isolation rates for *Candida albicans* from asymptomatic women and women with vaginitis have been reported as 8% and 26% respectively.³ The natural history of asymptomatic vaginal yeast carriage is unknown although a number of studies suggest that colonisation may persist for months or even years.⁴ Those familiar with vaginal microscopy will appreciate that *Candida albicans* is a dimorphic yeast. Blastospores are unicellular forms of the fungus and may be seen budding. Hyphae are long "tubes" comprising multiple fungal cell units divided by septae. Hyphae arise as branches of existing hyphae or by germination of spores (germ tube formation). Pseudohyphae resemble true hyphae but have a different mode of formation.⁵ Both true and pseudohyphal growth forms may be described as "filamentous." A number of investigators have suggested that symptomatic vaginal candidiasis is related to changes in the vaginal environment which favour yeast germination and subsequent hyphae formation.⁶ Sobel considered germination to be a critical virulence factor in the pathogenesis of vaginal candidiasis and has reported a close association between symptomatic infection and the presence of germinated or filamentous *Candida*.⁶ Although there is undoubtedly an association between hyphae formation and enhanced virulence, Odds considers this to be relative and not absolute.⁵ The purpose of this study was to re-examine this issue by comparing yeast morphology, as identified by microscopy of vaginal

secretions, with genital symptoms in women with vaginal candidiasis.

Methods

The study population comprised women attending a department of genitourinary medicine with microscopic features suggestive of vaginal candidiasis and/or who were culture positive for *Candida* species, as described below. All women underwent routine genital examination and screening for genital tract infection. Vaginal samples were obtained for Gram staining and subsequent microscopy and culture for *Candida* species and *Trichomonas vaginalis*. Microscopy was performed by experienced nursing staff and vaginal smears examined for at least 1 minute with the assessment of multiple high power fields ($\times 1000$ magnification). Feinberg-Whittington culture medium was used for both *Candida* and *Trichomonas vaginalis* culture. Women with trichomoniasis were excluded from the study. Details of clinical symptoms were recorded on women with microscopic evidence of candidiasis, with and without confirmation by culture, and women with positive vaginal culture but negative microscopy. For those with positive microscopy, a record was made of whether spores were budding and/or non-budding and whether hyphae were branching and/or non-branching.

Table 1 Symptoms of *Candida* culture positive women

Symptoms	Number
Irritation	63 (27%)
Soreness	10 (4%)
Discharge	23 (10%)
Irritation plus discharge	58 (25%)
Soreness plus discharge	5 (2%)
No symptoms	75 (32%)

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Table 2 Association between symptomatology and findings on microscopy in *Candida* culture positive women

	Spores only			Hyphae only			Hyphae and spores				
	Budding only	Non-budding only	Total	Branching only	Non-branching only	Total	Spores		Hyphae		Total
							Budding only	Non-budding only	Budding only	Non-budding only	
Symptomatic	16	15	31*	7	4	11*	20	15	23	24	82*
Asymptomatic	9	6	15*	1	2	3*	6	3	6	7	22*

*NS.

Data were analysed by GRAPHPAD INSTAT using χ^2 with Yates's correction or Fisher's exact test.

Results

Data were collected on 267 women, 234 of whom were confirmed *Candida* positive by vaginal culture. Considering only culture positive women, 159 (68%) were symptomatic, most commonly with irritation or discharge and irritation (table 1). Microscopy was positive (that is, spores and/or hyphae identified) in 182 (78%). Spores only were seen on microscopy in 65 (28%) women, hyphae only in 16 (7%), and both hyphae and spores in 101 (43%). Neither spores or hyphae were found in 52 (22%) culture positive women. Considering the findings on microscopy in the 33 culture negative women, spores only were found in 12 (36%), hyphae only in 10 (30%), and both hyphae and spores in 11 (34%). Hyphae were identified as both branching and non-branching in 43 (36%) culture positive women, "branching only" in 37 (32%), and "non-branching only" in 37 (32%). Spores were identified as budding and non-budding in 33 (20%) culture positive women, "budding only" in 84 (51%), and "non-budding only" in 49 (29%). The association between microscopy findings and symptomatology is shown in table 2. No statistically significant association could be found between presence or absence of symptoms and the findings on microscopy.

Discussion

This study has, not surprisingly, confirmed that vulval irritation and vaginal discharge are the commonest presenting features of symptomatic vulvovaginal candidiasis. Just over 50% of culture positive patients presented with irritation with or without discharge which compares favourably with the results of the study by Oriol *et al* which documented symptoms in 50% of cases.⁷ Asymptomatic infection/carriage was slightly more common in the current study (32%) compared with the study by Oriol *et al* (20%).⁷

A microscopic diagnosis of candidiasis was made in 78% of culture positive samples, which is somewhat higher than previous studies which found positive microscopy in 47%⁷ and 65%⁸ of culture positive cases. Our higher detection rate with microscopy may have been related to a more detailed examination of specimens as all microscopists were aware that accurate specimen assessment was essential for the purpose of the study. The experience of the microscopist may also be of relevance. In this study microscopy was performed by nursing

staff as part of the routine investigation of patients and not by a microbiologist. Although this may appear less satisfactory, all nurses had been trained to perform microscopy of vaginal samples, which included an initial period of close supervision, and were experienced to the extent that they had assessed many hundreds of samples before the onset of the study. We are aware of no published data comparing "nurse led" microscopy with that performed by microbiology trained staff and previous studies fail to mention whether microscopy was performed by nursing staff or by a microbiologist, although one study did blind samples for microbiological analysis.⁸

Previous studies have documented an association between symptomatic vaginal candidiasis and yeast germination. Germination of *Candida* enhances colonisation and facilitates tissue invasion^{9,10} and it has been suggested that factors that enhance germination tend to promote symptomatic vaginitis, whereas measures that inhibit germination may prevent vaginitis in women who are asymptomatic carriers of *Candida*.¹¹ An association between germinated yeasts and symptomatic vaginitis was not confirmed by the present study which found no association between yeast morphology and symptomatology. This is in agreement with previous studies which have suggested that although the capacity of *Candida albicans* to produce hyphae appears to be an important virulence factor this may not be essential in the pathogenesis of candidal vaginitis.^{12,13} One important criticism of this study concerns the accuracy of microscopy. Although microscopic features were categorised according to presence or absence of hyphae and spores and as to whether these were branching or budding forms, it is unlikely that each vaginal smear was fully examined and therefore features may have been missed. An attempt was made to minimise this possibility by scanning each specimen as comprehensively as possible in the time allowed in the clinic setting and by continuing to examine other fields even when spores or hyphae had been identified. In addition, we have not distinguished between *Candida* species and therefore have no data on microscopic features and symptomatology with respect to *albicans* and non-*albicans* infection.

In conclusion, this study has failed to find an association between yeast morphology, as identified on direct microscopy of vaginal secretions, and symptomatology in women with vaginal candidiasis.

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