

Microbial aetiology and diagnostic criteria of postpartum endometritis in Nairobi, Kenya

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SUMMARY Using a protected triple lumen device, *Neisseria gonorrhoeae* or *Chlamydia trachomatis*, or both, were isolated from the endometria of five out of 35 women with clinical postpartum endometritis compared with none of a control group of 30 puerperal women without endometritis ($p < 0.05$) in Nairobi, Kenya. These sexually transmitted agents were also found in 12 cervical specimens from women with and three without postpartum endometritis ($p = 0.04$). *Mycoplasma hominis* and *Ureaplasma urealyticum* were equally isolated from the endometrium in both groups. Histology showed plasma cell infiltration in 6/25 patients compared with 1/22 controls ($p = 0.06$). A history of foul lochia ($p < 0.01$) and abdominal pain ($p = 0.02$) were associated with postpartum endometritis. Sexually transmitted agents appear to be major causes of puerperal upper genital tract infections in Nairobi.

Female infertility remains a major health problem world wide, especially in Africa where tubal obstruction among previously pregnant women is often noted.¹ For instance, Walton and Mati reported that female infertility occurs in Kenya more often in women who have had at least one pregnancy, and is usually due to tubal scarring.² In a previous study we found that 20.3% of 1013 consecutively delivering women of lower socioeconomic strata in Nairobi developed postpartum endometritis, as defined by clinical criteria.³ The incidences of gonococcal and chlamydial infections in that population were 7% and 21%, respectively. Postpartum pelvic infections may play a major part in the aetiology of secondary infertility because of scarred fallopian tubes. Ascending infections of the female genital tract with both sexually transmitted agents and the bacterial flora of the lower genital tract may readily occur during the postpartum period.

The aims of this pilot study were to assess the correlation between clinical criteria and microbial and

histological findings in the diagnosis of postpartum endometritis, and to assess the role of different microorganisms in the aetiology of this infection.

Patients, materials, and methods

PATIENT ASSESSMENT

The 35 patients recruited to the study were a subsample of a prospective cohort study on the epidemiology of ophthalmia neonatorum.⁴ At enrolment, demographic and obstetric data were recorded on a standard form. During labour, cervical swabs were obtained for cultures for *Neisseria gonorrhoeae* and *Chlamydia trachomatis*. Mothers and neonates were discharged 24 hours after delivery. Only women who delivered vaginally were enrolled in the study. At the first postpartum follow up on day 7 to 9, a standardised history of fever, abdominal pain, and the appearance of the lochia was obtained from each woman, and her temperature was taken sublingually. The lochia was defined as purulent if it was yellow or green in colour. The presence of uterine subinvolution and uterine or adnexal tenderness was assessed by bimanual examination. Clinical severity was scored by grading signs and symptoms on a scale from absent or normal to severe.

Postpartum endometritis was diagnosed if at least

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two of the following criteria were present: fever, foul lochia, uterine tenderness, or uterine subinvolution. Controls were 32 puerperal women with at most only one of the above criteria. They were drawn from women who presented themselves at the postpartum clinic on the same day as a patient. As all patients were examined between day 7 and day 9 after delivery, these data concern late postpartum endometritis.⁵

COLLECTION OF SPECIMENS

An unlubricated speculum was used to expose the cervix. Specimens for the isolation of *N gonorrhoeae*, *C trachomatis*, *Mycoplasma hominis*, *Ureaplasma urealyticum*, and group B streptococci were taken from the cervix. A vaginal swab was obtained for Gram smear microscopy and gas liquid chromatography. After cleaning the cervix with povidone iodine, endometrial culture specimens for the same microorganisms were obtained using a protected triple lumen device (uterine sampling device (USD) 10/23; Medi-tech, Watertown, USA), which contains a protected triple lumen brush with a protective polyethylene glycol plug. A single strip endometrial biopsy specimen was obtained transcervically using a Novak curette.

MICROBIOLOGICAL, HISTOLOGICAL, AND BIOCHEMICAL STUDIES

Specimens for *N gonorrhoeae* were inoculated direct on to modified Thayer-Martin medium and stored at room temperature until transported to the laboratory. Cultures were then incubated in humidified candle extinction jars and read at 24, 48, and 72 hours. *N gonorrhoeae* was presumptively identified by colony morphology seen on Gram staining and by oxidase reactivity, and was later confirmed by the production of acid from glucose but not from maltose or lactose. Specimens for *C trachomatis* isolation were cultured on cycloheximide treated McCoy cells and read 72 hours after iodine staining. *U urealyticum* and *M hominis* were cultured from vaginal swabs on New York City medium. Specimens were plated direct on sheep blood agar for the recovery of *Streptococcus agalactiae*. Vaginal samples were analysed for organic acids by gas liquid chromatography as described previously.⁶

Endometrial biopsy specimens were fixed in formalin, and sections were stained with haematoxylin and eosin and methyl green pyronine to show plasma cells. Histological examination of the biopsy specimens was performed blind regarding the clinical and microbiological findings. Endometritis was classified as mild, moderate, or severe for plasma cell infiltration. Only moderate and severe endometritis was taken into account for the data analysis. Insufficient endometrial material was collected from

Table 1 Characteristics of 35 women with postpartum endometritis and 30 control puerperal women

	Patients (n = 35)	Controls (n = 30)
Mean age (years)	22	23
No primiparous	20	20
No married	28	22
Mean gestational age (weeks)	39	40
Duration of labour (hours)	10	12
Duration of ROM* (hours)	3	3
Birth weight (g)	3167	3208
No with perinatal complications	3	3

*Rupture of membranes.

nine women, and nine specimens were lost from follow up.

STATISTICAL METHODS

The χ^2 test with Yates's correction and Fisher's exact test were used to compare sample proportions, and Student's *t* test was used to compare sample means.

Results

During six weeks we recruited 35 women with postpartum endometritis and 30 control women. Table 1 shows the characteristics of patients and controls; there was no difference between the two populations regarding age, parity, marital status, gestational age, duration of labour, duration of rupture of membranes, birth weight, and perinatal complications.

Table 2 compares the histories of the patients with those of the controls. The differences were significant for foul lochia ($p = 0.005$) and abdominal pain ($p = 0.02$).

Table 3 shows the microbiological findings. The sexually transmitted agents, *N gonorrhoeae* and *C trachomatis*, were isolated from the cervixes of 12 patients compared with three controls ($p < 0.05$) and from the endometriums of five patients compared with none of the controls ($p < 0.05$). The isolation of *M hominis* and *U urealyticum* was similar from the cervixes and the endometriums of patients and controls. Overall 11 women had an increased peak ratio of vaginal succinate to lactate of 0.4 or more and five had vaginal smears compatible with bacterial vaginosis

Table 2 History of puerperal women with or without postpartum endometritis during seven to nine days after delivery

	Patients (n = 35)	Controls (n = 30)	Difference
Fever	7	1	NS
Foul lochia	20	6	$p = 0.005$
Abdominal pain	27	14	$p = 0.02$

Table 3 Microbiological findings in puerperal women with or without postpartum endometritis

	Patients (n = 35)	Controls (n = 30)	Difference
<i>Neisseria gonorrhoeae</i> from:			
Cervix	8/34	2/30	p = 0.052
Endometrium	3/35	0/30	p = 0.15
<i>Chlamydia trachomatis</i> from:			
Cervix	6/30	2/29	p = 0.24
Endometrium	3/35	0/30	p = 0.15
<i>N gonorrhoeae</i> and <i>C trachomatis</i> from:			
Cervix	12/35	3/30	p = 0.04
Endometrium	5/35	0/30	p = 0.04
<i>Mycoplasma hominis</i>	18/34	20/29	p = 0.09
<i>Ureaplasma urealyticum</i>	24/31	18/25	p = 0.22
Gas liquid chromatography findings:			
Vaginal succinate:lactate ratio > 0.4	4/25	7/29	p = 0.23
Clue cells	1/32	4/28	p = 0.12

(containing clue cells). Group B streptococci were not isolated.

We performed adequate histological studies of endometrial biopsy specimens from 25 patients and 22 controls. Moderate or severe plasma cell infiltration was found in six of the patients and in one of the controls ($p = 0.06$). Plasma cell infiltration did not correlate with the isolation of micro-organisms from either the cervix or the endometrium. Only one woman who yielded *C trachomatis* from the endometrium showed plasma cells on biopsy.

Discussion

The diagnosis of postpartum uterine infection is often uncertain due to the lack of sensitive and specific clinical criteria. Other methods have therefore been developed, such as endometrial sampling that avoids contamination with cervical flora. In this study the sexually transmitted agents, *N gonorrhoeae* and *C trachomatis*, were isolated from a third of the women with postpartum endometritis. They were only found in the endometria of patients with clinical manifestations of endometritis, which suggests that they were the cause of the upper genital tract infection, assuming that contamination with cervical flora was avoided by using a protected triple lumen device. It has been shown previously that uterine cultures obtained through the cervical canal do not enable the investigator to distinguish between infected and non-infected patients because of contamination.^{7,8} Organisms were thus isolated from the endometrium in equal proportions from febrile and afebrile puerperal

women, using an unprotected swab⁹ or a Milex canula.⁸

Cervical contamination was reduced by Pezzlo *et al* using a double lumen protected swab,¹⁰ and by Eschenbach, who isolated organisms from six (43%) out of 14 afebrile women without clinical endometritis compared with 51 out of 55 (93%) febrile postpartum women, using an open ended triple lumen device.¹¹ Knuppel *et al* described a double lumen protected brush with a protective polyethylene glycol plug, with which they recovered organisms from the endometria of 12 (57%) out of 21 afebrile women.¹² Organisms have also been isolated from the postpartum endometrium by transfundal sampling methods,^{11,13,14} which may underestimate the problem because of the difficulty of ensuring that the aspiration needle enters the cavity. Culdocentesis has been used by Platt *et al*, who found anaerobes in the cul-de-sac in 87% of women with postpartum endometritis.¹⁵ Vaginal contamination, however, is difficult to exclude using this technique. Using a triple lumen polyethylene glycol plug protected brush we did not isolate gonococci or chlamydiae from the endometria of women in the control group, including the three who yielded positive cervical cultures, which suggests a low contamination rate. Both organisms have been associated with postpartum endometritis.^{3,5,16}

In contrast, *M hominis* and *U urealyticum* were isolated equally from the cervixes and endometria of both groups, which suggests that these low virulence organisms may asymptotically colonise the postpartum endometrium. These data accord with the findings of others.^{11,13} Firm conclusions cannot be drawn from our data on genital mycoplasmas, however, as we did not undertake quantitative cultures. Both species of mycoplasma have been isolated from the blood of women with mild postpartum fever,^{17,18} which suggests that these micro-organisms play a part in the aetiology of this condition.

The histological criteria used to define postpartum endometritis are based on plasma cell infiltration. Data on the histology of the postpartum uterus are scarce. Paavonen *et al* reported that *C trachomatis* and *N gonorrhoeae* in the endometria of patients with acute pelvic inflammatory disease were associated with lymphoid follicles and the density of plasma cells on biopsy.¹⁹ In the present study severe plasma cell infiltration was found in 24% of patients compared with 5% of the controls ($p = 0.06$), but there was no correlation between microbiology and histology. This may be due to the small number of patients and to insufficient material, as a single strip biopsy specimen contains only a small portion of endometrial tissue.

We wish to emphasise the fact that in this study a third of the cases of postpartum endometritis were due to sexually transmitted diseases (STDs), whereas the

aetiology of the remaining cases was not known. The control of maternal STDs may have a major impact on postpartum pelvic infections and secondary infertility.

Further prospective studies of a larger population are under way to elucidate the clinical and histological manifestations of postpartum endometritis in conjunction with a comprehensive study of the endometrial flora.

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