

Chlamydia trachomatis in acute salpingitis

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SUMMARY In a study to evaluate the possible role of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in acute salpingitis, 26% of 106 patients with severe symptoms had positive culture results for *C. trachomatis*; 43% of the 72 patients from whom paired sera were obtained had either positive culture results for or seroconversion in the single antigen immunofluorescence test to *C. trachomatis*. Twenty-six per cent of patients harboured *N. gonorrhoeae* and 14% had gonococcal complement-fixing antibody titres ≥ 8 . Intrauterine devices were used by 48% of patients, no difference being found in the frequency of use between patients harbouring *C. trachomatis* or *N. gonorrhoeae*. The possible role of *C. trachomatis* should be considered in the treatment of acute salpingitis.

Introduction

Acute salpingitis is a common disease and seems to be increasing. In 99% of such cases the infection ascends from the lower genital tract, usually the cervix (Falk, 1946, 1965; Sweet, 1977). The remaining cases are caused by tuberculous salpingitis or by infections which spread from nearby pelvic structures, such as the appendix. Despite the high incidence (Widholm and Kallio, 1965; Weström and Mårdh, 1977) and morbidity (Weström, 1975) of acute salpingitis, the cause of the tubal infection remains uncertain in a large proportion of cases. Acute salpingitis has been associated with *Neisseria gonorrhoeae* (Falk, 1965; Sweet, 1977; World Health Organisation, 1978), with *Mycoplasma hominis* and T-mycoplasma (Mårdh and Weström 1970), and with mixed aerobic and anaerobic bacterial pathogens (Chow *et al.*, 1975; Eschenbach *et al.*, 1975). A significant decrease in the percentage of cases of salpingitis attributed to *N. gonorrhoeae* has been noted, however, during the past decade in Scandinavia (Kallings and Moberg, 1977; Weström and Mårdh, 1977). Recently, *Chlamydia trachomatis* has attracted attention as an important infective agent (Schachter, 1978). A relationship between *C.*

trachomatis infection and acute salpingitis was suggested by Dunlop and his co-workers in 1966 (Dunlop *et al.*, 1966). More recently, Mårdh *et al.* (1977a) recovered *C. trachomatis*, during laparoscopy, from six out of 20 specimens from the Fallopian tubes of patients with acute salpingitis compared with zero out of 12 specimens from patients with no signs of genital infection.

The present work is a prospective study of the frequency of urogenital *C. trachomatis* and *N. gonorrhoeae* infections in patients admitted to hospital with acute salpingitis and evaluates the possible role of chlamydiae in this disease using antibody studies.

Material and methods

PATIENTS

The study population consisted of 106 women with acute pelvic symptoms who attended the outpatient clinics of the first and second departments of gynaecology and obstetrics at the Helsinki University Central Hospital from October 1977 to June 1978.

The clinical diagnosis of acute salpingitis was based on common criteria: pelvic pain of short duration, tender adnexal masses, increased erythrocyte sedimentation rate, and, usually, fever. All the patients were admitted to hospital because of the severe symptoms. Ten patients had received antimicrobial treatment during the two weeks before admission.

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The mean age of the patients was 27.3 years and the range, 15-49 years. Fifty-one (48%) patients were fitted with an intrauterine device (IUD), 10 (9%) were taking oral contraceptives, and the remainder used other methods or none at all.

CULTURE TECHNIQUES AND SEROLOGICAL METHODS

Cervical and urethral specimens were cultured for *C. trachomatis* in irradiated McCoy cells (Paavonen *et al.*, 1978b). Serum antibodies were determined by the single antigen immunofluorescence test (IFAT) using *C. trachomatis* L2 (434 Bu) inclusions in dog kidney cells as antigen (Saikku and Paavonen, 1978). Acute and convalescent phase sera (obtained one to four weeks later) were obtained from 72 patients. Cervical and urethral specimens were cultured for *N. gonorrhoeae* by the conventional method (Lennette *et al.*, 1974). The gonococcal microcomplement fixation (CF) test was performed using a mixture of 20 recently isolated strains as the test antigen (Aho and Sievers, 1972). Statistical significance was evaluated by the χ^2 test with Yates's correction.

Results

Of the 106 patients with acute salpingitis, 27 (26%) harboured *C. trachomatis* in their urogenital tract, 12 in the cervix and urethra, 13 in the cervix alone, and two in the urethra alone. In paired sera 10 (46%) out of 22 chlamydia-positive patients and nine (18%) out of 50 chlamydia-negative patients showed significant (\geq fourfold) change in IFAT titres (Figure). Thus, seroconversion occurred in 19 (26%) out of 72 patients with salpingitis from whom paired sera were obtained. The geometric mean titre (GMT) of titres ≥ 8 was 219 in chlamydia-positive patients and 73 in chlamydia-negative patients. The 10 patients in whom antimicrobial treatment was begun before culture was attempted were all chlamydia-negative. Five of them, however, showed significant change in IFAT titres in paired sera (Figure).

Of the 27 chlamydia-positive patients, eight (30%) also had gonorrhoea compared with 19 (24%) out of 79 chlamydia-negative patients (statistically not significant, $P > 0.1$). A total of 15 (14%) of the 106 patients had gonococcal CF titres of ≥ 8 . Of the 27 patients with positive culture results for *N. gonorrhoeae*, nine (33%) had titres of ≥ 8 compared with six (8%) of the 79 culture-negative patients (statistically significant, $P < 0.01$). The highest CF titre was 16, and even this occurred in only five patients, all of whom were culture-positive.

Of the 51 patients using an IUD, nine were chlamydia-positive, eight were *N. gonorrhoeae*-positive, and two harboured both organisms.

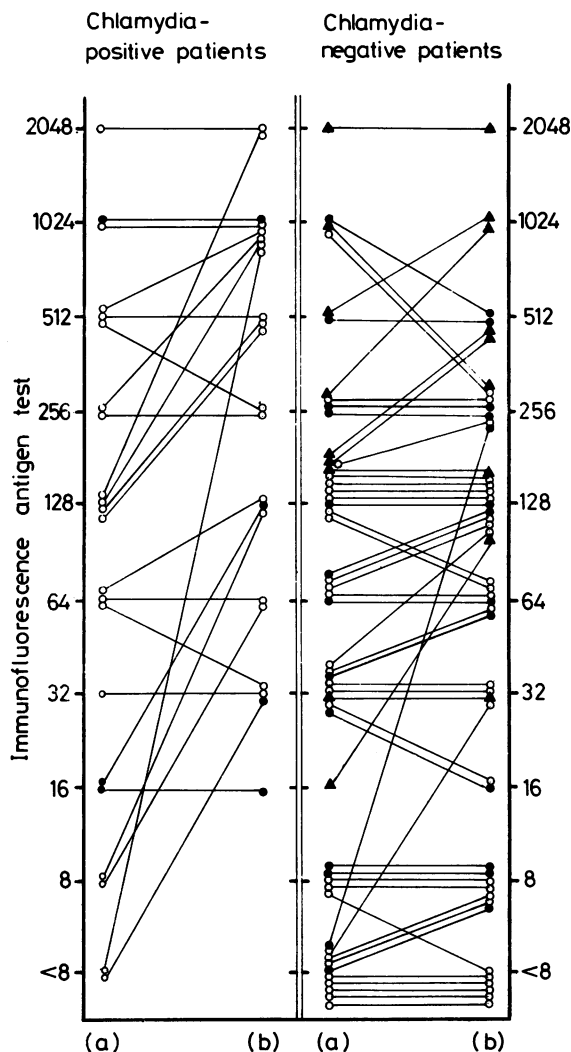


Figure Antibody titres in IFAT against *C. trachomatis* in paired sera from patients with acute salpingitis. (Acute phase (a) and convalescent phase (b) sera are connected with a line)

○ Negative gonococcal isolation; ● positive gonococcal isolation; ▲ antibiotic treatment begun before culture

Discussion

The results of the present study provide additional support for the concept that acute salpingitis may in many cases be due to infection with *C. trachomatis*; 26% of the patients harboured the organism, and 26% showed seroconversion in the single antigen immunofluorescence test. Seroconversion occurred more often ($\chi^2_1 = 4.60$; $P < 0.025$) among

chlamydia-positive patients than among chlamydia-negative patients. The average GMT in patients with acute salpingitis was high compared with that (GMT 27) in our earlier findings in women of fertile age (mean 29.5 years) representing hospital outpatients (Paavonen *et al.*, 1978b) or in asymptomatic but chlamydia-positive sexual partners of men with nongonococcal urethritis (GMT 80) (Saikku and Paavonen, 1978), thus suggesting systemic chlamydial infection.

Similarly, Eschenbach *et al.* (1975) noted rising micro-IF antibody titres to *C. trachomatis* in 24% of women with nongonococcal pelvic inflammatory disease. In addition, Lycke *et al.* (1976) demonstrated chlamydial antibodies in the haemolysis-in-gel test in sera from all seven chlamydia-positive patients with salpingitis and in four of 17 chlamydia-negative patients with salpingitis. Hamark *et al.* (1976) observed a significant rise in CF antibody titre in four patients with salpingitis from whom *C. trachomatis* was isolated from the cervix. In one of these women the organism was isolated from the Fallopian tubes as well.

The frequency of gonococcal infection was as low in our study as in the recent findings in Sweden (Danielsson *et al.*, 1975; Weström and Mårdh, 1977). The role of mycoplasmas as genital tract pathogens is under debate (Lancet, 1970; Mårdh and Weström, 1970; Eschenbach *et al.*, 1975; Vaughan-Jackson *et al.*, 1977; Paavonen *et al.*, 1978a). Furthermore, the isolation of anaerobes from the Fallopian tubes has not been successful (Weström and Mårdh, 1975, Mårdh *et al.*, 1977b).

It is still possible that the frequent finding of *C. trachomatis* in the urogenital tract reflects only the sexual mode of transmission of pathogens responsible for salpingitis or that chlamydial cervical infection allows other pathogens to ascend. Seroconversions and high antibody titres, however, provide evidence to the contrary; *C. trachomatis* seems to participate actively in this systemic infection. The fact that even chlamydia-negative patients had high IFAT titres (GMT 73) needs explaining. High titres may be due to a past chlamydial infection. Technical failure as well as recent treatment with antimicrobial agents might be responsible for the negative culture results in some cases.

In the present series the overall frequency with which IUDs were used was high (48%). This may be compared with the frequency of 29% among 202 sexually active partners of men with nongonococcal urethritis examined in the same clinic during the same period (Paavonen *et al.*, unpublished data). No difference was found between chlamydia-positive and *N. gonorrhoeae*-positive patients in the use of

IUDs. Other investigators have found a frequency rate of 24-81% in patients with salpingitis (Sweet, 1977). Weström *et al.* (1976) reported a significantly increased risk of acquiring acute salpingitis in patients using an IUD compared with non-users.

The late sequelae of salpingitis are well known: infertility, increased frequency of ectopic pregnancies, and chronic abdominal pain. The risk of spread of cervical infection to the Fallopian tubes must be considered in the treatment of cervical chlamydiae. The role of *C. trachomatis* in the aetiology of acute salpingitis necessitates a re-examination of present treatment guidelines. In addition, the isolation of *C. trachomatis* in many cases (30% in the present study) concomitantly with *N. gonorrhoeae* should influence the choice of treatment for gonococcal disease. A treatment regimen which is not totally effective against *C. trachomatis* may give rise to persistent, latent chlamydial infection which later requires further treatment for chronic salpingitis and its long-term sequelae. At the moment, the role of *N. gonorrhoeae* in the aetiology of salpingitis may well be overestimated.

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