

Group A streptococcal endometritis: Report of an outbreak and review of the literature

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ZA MEMISH, D GRAVEL-TROPPER, C OXLEY, B TOYE, GE GARBER. Group A streptococcal endometritis: Report of an outbreak and review of the literature. Can J Infect Dis 1994;5(6):276-281. Two cases of group A streptococcus (GAS) postpartum endometritis were diagnosed within 24 h following uncomplicated vaginal delivery. Investigation by the infection control service identified all 10 obstetric personnel who performed any invasive procedure on both cases. These personnel were questioned about a recent history of sore throat, skin lesions, vaginal or rectal symptoms. Throat and rectal cultures were obtained for GAS from all 10 personnel. A carrier was identified among the personnel screened. This nurse was removed from direct patient care and treated with a two-week course of oral clindamycin and rifampin with documentation of carrier eradication of GAS at the end of therapy, 30 days, 60 days and six months post-treatment. All three isolated strains were identical by restriction endonuclease analysis and by M and T typing. Rapid implementation of infection control measures were successful in arresting this outbreak, with no further cases of GAS occurring in the subsequent year.

Key Words: *Endometritis, Infection control, Streptococcus pyogenes*

Endométrite à streptocoque du groupe A : rapport de deux cas et revue de la littérature

RÉSUMÉ : Deux cas d'endométrite post-partum à streptocoque du groupe A ont été diagnostiqués à l'intérieur d'une période de 24 heures après des accouchements par voies naturelles. Les recherches effectuées par le service de prévention des infections ont identifié 10 membres du personnel ayant procédé à des examens effractifs chez les deux parturientes. Ces personnes ont été interrogées sur de possibles antécédents récents de maux de gorge, de lésions cutanées ou de symptômes vaginaux ou rectaux. Des cultures de gorge et de selles ont été obtenues pour le dépistage du streptocoque du groupe A auprès des dix personnes examinées. Une porteuse a été identifiée parmi elles. Cette infirmière a été écartée des soins directs aux parturientes et traitée durant deux semaines par clindamycine et rifampin; l'éradication du pathogène a été obtenue chez cette porteuse à la fin du traitement et 30 jours, 60 jours puis six mois après le traitement. Les trois souches isolées étaient identiques selon l'analyse de l'endonucléase de restriction et les typages M et T. L'application rapide de mesures de lutte contre l'infection a réussi à enrayer cette épidémie, aucun autre cas d'infection à streptocoque du groupe A ne s'étant déclaré au cours de l'année suivante.

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EPIDEMICS OF PUERPERAL SEPSIS DURING THE 16TH TO 19th centuries were not uncommon and the mortality rate was extremely high (up to 40%) (1-3). Puerperal sepsis follows abortion or vaginal delivery when streptococci either colonizing the patient or inadvertently transmitted from medical personnel invade the endometrium, surrounding tissues and blood stream. This may result in complications including pelvic cellulitis, septic pelvic thrombophlebitis, peritonitis or pelvic abscess. In the 20th century, with the advent of antibiotics and improved socioeconomic conditions, the rate and severity of group A streptococcus (GAS) infection have declined, with only sporadic cases and clusters of puerperal infections (4-13). In two studies involving women of childbearing age, the prevalence of vaginal colonization with GAS was less than 1% (14,15) suggesting that endogenous sources are uncommon and that clustering of cases can usually be traced to a single carrier (5-8,10-13). These carriers are usually health care workers colonized with the organism in the throat, anus, vagina or a skin lesion. The cause of colonization with GAS and, in some cases, subsequent transmission is unknown. A few reports of attempt at GAS carrier eradication have been published. In most of these reports the treatment modality, extent and duration of follow-up varied, giving little information to guide physicians in the management of these carriers.

In our tertiary care centre there are 36 obstetrical beds with over 3675 admissions in 1992. In July 1992, two cases of GAS endometritis were diagnosed within 24 h of each other, prompting investigation by the infection control service of the hospital. We summarize these two cases and review the literature with respect to possible therapeutic options and infection control response to such an outbreak.

CASE PRESENTATIONS

Case 1: A 32-year-old woman presented one week postnormal vaginal delivery with fever, chills, nausea and abdominal pain. Her physical examination on admission revealed a temperature of 39°C and a tender uterus. The laboratory investigation revealed an elevated white blood cell count of 1.69×10^4 cells/mm³ and a urine and vaginal culture positive for GAS. She was admitted to hospital with the diagnosis of postpartum endometritis and treated with intravenous ceftizoxime for 48 h, then switched to oral cephalexin. Her symptoms markedly improved and she was discharged from hospital after two days.

Case 2: A 30-year-old woman had fever and abdominal pain four days postnormal vaginal delivery. Physical findings on admission included a fever of 40°C, a very tender uterus and foul smelling lochia. The laboratory investigation revealed a white blood cell count of 2.49×10^4 cells/mm³ with urine and vaginal cultures positive for GAS. She was admitted to hospital with the diagnosis of postpartum endometritis and was treated

with intravenous ceftizoxime for 48 h followed by oral cephalexin. After marked improvement she was discharged.

MATERIALS AND METHODS

Infection control surveillance: Immediately after these two cases were identified, the hospital's infection control service implemented the following measures:

- The two patients were promptly isolated in private rooms with proper skin barrier techniques.
- The charts of the two cases were reviewed to identify all obstetrical care personnel who had performed invasive procedures on both cases. These procedures included: vaginal examination, artificial rupture of membranes or insertion of Foley catheter.
- Obstetrical care personnel who were involved were questioned about a recent history of sore throat, skin lesions, and vaginal or rectal symptoms.
- Throat and rectal swabs for GAS culture were taken from personnel identified in the chart review.

Microbiological methods: Swabs obtained for GAS culture were inoculated onto 5% sheep blood agar and incubated anaerobically. Colonies that were beta-hemolytic and suspected to be streptococci were identified as GAS using a latex agglutination test (PathoDx Strep Grouping, Diagnostic Products Corporation, California).

Two methods of typing the GAS isolates were used. In the first method, serological typing for M protein, T protein and opacity factor were carried out at the National Streptococcus Laboratory, Edmonton, Alberta using standard techniques. In the second method, restriction enzyme analysis (REA) was done as follows: isolates of GAS were grown overnight at 37°C in 5 mL of Todd-Hewitt broth. Cells were washed twice with 0.2 M sodium acetate, pH 6.0, and resuspended in 500 µL of TE-glucose (100 mM Tris, 10 mM EDTA, 25% glucose, pH 8) containing 50 µg of mutanolysin (Sigma). Following a 1 h incubation at 37°C, the cells were lysed with 0.5% sodium dodecyl sulphate and 500 µg of proteinase K for 60 mins. After extraction with phenol-chloroform and ethanol precipitation, total genomic DNA was digested with *Hind* III or *Clal* and separated by agarose gel electrophoresis. Two other clinical strains of GAS not epidemiologically linked to the outbreak strains were used as controls.

RESULTS

Infection control results: Chart review identified 10 obstetrical care personnel who had performed invasive procedures on both cases. All had surveillance culture for GAS from the throat and rectum; none had any skin lesions. All throat cultures were negative. A nurse who

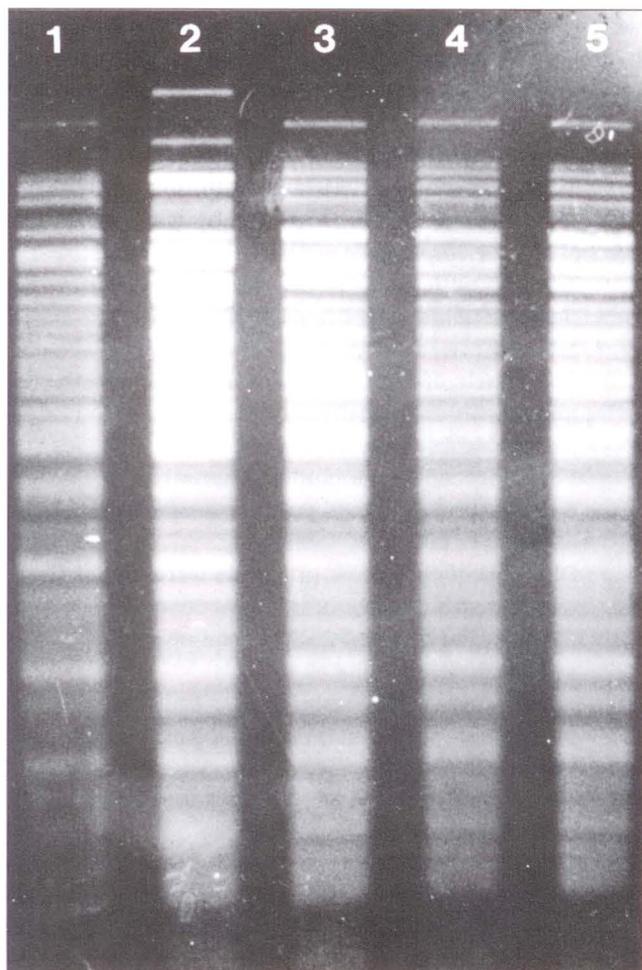


Figure 1) Restriction enzyme analysis patterns following digestion of extracted DNA with *Hind* III. Lanes 1 and 2 are control group *A streptococcus* (GAS) strains that are not epidemiologically linked. Lanes 3 to 5 are the GAS isolates from the two cases and the rectal carrier

performed vaginal examinations on both patients was the only person with a positive anal culture for GAS, and she also gave a history of recent sinus infection. She had received two courses of oral antibiotics in the preceding month (penicillin/cephalosporin, specific drug not recalled). A retrospective chart review was undertaken of all patients who had delivered while the index nurse was on duty during the two weeks before and after the first case was discovered. Of 60 patients identified, four had invasive procedures performed by the same nurse. The four patients remained well. The nurse was removed from direct patient care and a repeat anal swab was still positive for GAS. She was treated with oral clindamycin 300 mg tid and rifampin 600 mg once daily for two weeks with subsequent negative cultures at two weeks, 30 days and six months' follow-up. The nurse returned to regular duty after the first negative culture. No further cases of nosocomial GAS infection have occurred after one year of follow-up.

Microbiological results: All three isolates of GAS (two cases and the carrier) were identical by serological

typing and REA. The three strains were identified as M nontypable, T type B3264 and antiopacity factor-positive. Compared with the two control strains, the three GAS isolates also had identical REA patterns following digestion with *Hind* III (Figure 1) and *Cl*I (data not shown).

DISCUSSION AND REVIEW OF THE LITERATURE

Background: In the 18th and early 19th centuries, GAS disease was feared because of its severity and high risk of death. Ignaz Semmelweis (16) in 1847 demonstrated that the maternal mortality rate was higher in the division of a hospital staffed by medical staff than in the section run by midwives. This was due to the medical staff's participation in autopsies and failure to decontaminate their hands adequately. He ordered that the hands of medical students be washed in chlorinated lime before examining women. The mortality rate fell from 10% to 3%, but it was many years before his colleagues accepted these observations. In 1889 in Paris, Pasteur finally documented that puerperal fever was caused by the presence of microorganisms which he described as occurring in chains (17). He found this organism in the lochia, in the uterus and in the blood of cases and was successful in culturing it. In 1933 in England and Wales, 1016 women died of puerperal sepsis. In 1967, the last year of notification of the disease, no deaths occurred among 1175 cases of puerperal fever and pyrexia.

The incidence of postpartum endometritis is between 1 and 4%. This has not decreased over the past 70 years (18). Postpartum endometritis is usually related to ascension of normal vaginal flora into the endometrium and invasion of the myometrium. This is in contrast to GAS endometritis, in which the source of the organism is usually exogenous, because only 1% of women are colonized. Historically, this subgroup of endometritis has been referred to as 'puerperal fever' or 'childbed fever'.

Clinical manifestation: GAS endometritis has characteristic clinical features such as rapid onset of a high spiking fever (ie, within two to three days postpartum). The patient looks clinically ill with no localizing physical signs, has clear lochia that shows abundant Gram-positive cocci in chains and a slow response to antibiotic therapy with defervescence occurring after 72 h of treatment (8,12,13,19). Although these characteristics are observed in most cases of GAS endometritis, similar presentations are noted in endometritis due to other etiologies (20,21).

Diagnosis: The problem with identifying precisely the bacterial etiology of endometritis has long been recognized. Swabs passed through the vagina will invariably be contaminated by normal vaginal flora making culture results difficult to interpret. However, the identification of organisms such as GAS, *Neisseria gonorrhoeae* or *Chlamydia trachomatis*, which are not considered part

of normal vaginal or cervical flora, should trigger a specific physician response for treatment in the right clinical setting. Positive blood cultures are also helpful in establishing etiology.

Transmission of GAS and outbreaks: Studies have demonstrated that GAS can spread by direct contact with skin or secretions of infected individuals. Experiments with GAS in military recruits suggested that airborne streptococci are not very infectious and rarely, if ever, cause pharyngitis in susceptible persons (22,23). This does not, however, imply that airborne streptococci cannot cause wound infection.

Most reported outbreaks of GAS infection can be traced to a carrier of the organism (usually rectum, vagina or skin lesion) (6-8,11-13,24-31). Aerosolization is postulated as the major route of transmission (6,7,11,24,26,27,31). Evidence to support this includes: lack of direct contact between a case and a carrier; GAS-positive quantitative air cultures obtained in the presence of a carrier; and occurrence of infection in patients undergoing surgery in rooms recently vacated by a GAS carrier. There have been no reported outbreaks of GAS nosocomial infection where the carriage site was the throat. This suggests that throat cultures alone are insufficient to exclude a possible source.

In our outbreak, the diagnosis of both cases was consistent with postpartum endometritis, which includes: either the isolation of an organism from the endometrium, or purulent drainage from the uterus plus fever, abdominal pain or uterine tenderness (32). The interpretation of bacteriuria (which was present in both cases) in the postpartum patient is difficult because puerperal discharge often contaminates mid-stream urine samples causing a high number of false-positive specimens (33). Both cases were treated with ceftizoxime because it was the cephalosporin used for empirical therapy of pelvic infections at our hospital.

The investigation carried out by the infection control service revealed that both patients were initially admitted six days apart (for delivery), and they were in different rooms in the same ward. We did not do throat and rectal cultures for GAS on the two cases of endometritis and no screening of other patients was done, but no GAS had been identified over several years in the obstetrical unit. Of the 10 obstetrical care personnel who performed invasive procedures on both cases, only one was found to be colonized with a similar GAS strain in the rectum. The GAS isolated was M nontypable, T type B3264 and opacity factor-positive; this is a rare isolate. In one study of 1648 consecutive GAS strains, only 1% had this typing pattern (34). Thus, the colonized nurse seems likely to have been the source of the outbreak, although the route of transmission is not entirely clear. No breaks in infection control techniques in this nurse's practices were noted.

An investigation by the infection control service should be initiated after two cases of nosocomial GAS

postpartum endometritis are identified because this could indicate an outbreak (35). The patients should be placed on wound and skin isolation precautions for 24 h after starting effective antimicrobials. This should be followed by careful review of the patients' charts and identification of personnel who were involved in their direct care. These personnel should be questioned about practices, about recent history of sore throat, skin lesions or rectal or vaginal symptoms, examined, and surveillance cultures taken from skin (if there are skin lesions present), rectum and vagina. The history and physical examination are important in identifying the possible site of colonization. In many reports the carrier reported symptoms related to the colonization site such as perineal ulcers, chronic diarrhea and external hemorrhoids (26,28). Positive cultures from a health care worker for GAS does not, however, prove a source of the outbreak. Thus, confirmation by serological or DNA typing methods, such as REA, is required. The purpose of the infection control outbreak investigation is not to lay blame but to prevent subsequent cases. This was accomplished in our outbreak, as no new cases have been identified in the subsequent year. In a few published reports, recurrence of the outbreak was traced to colonization of family members of the index case (6,25,27). Thus, surveillance of family members should also be considered. In our outbreak the family members of the carrier nurse were tested and were negative.

If all involved health care workers are screened and are negative, environmental sources should be considered. In one report, a shower head was identified as the source of the outbreak, although only nasal and throat swabs were taken from health care workers (36).

Treatment and follow-up: GAS endometritis is classically treated with penicillin, but clindamycin is also effective. Some authors have suggested routine penicillin prophylaxis to all personnel and patients in the presence of a GAS outbreak (6,7,26,37,38). Such an indiscriminate approach may, however, delay identification of a common source and only temporarily halt rather than extinguish the epidemic if the carrier is incompletely treated. The eradication of GAS carriage in a health care worker is controversial. Failures with penicillin, tetracycline and cephalosporins have been reported (6,7,11,26). Failure with penicillin has been attributed to beta-lactamase production by other organisms in the gastrointestinal tract (39,40). Oral vancomycin, which is not absorbed from the gastrointestinal tract, has also been used, with negative cultures at follow-up of up to two years (6,7). The duration of treatment and follow-up is not standardized, but the health care worker can usually resume working as soon as follow-up cultures are negative. The need for repeat cultures has not been determined, unless new cases are identified. Recurrence as long as one year after the initial outbreak has been reported (30).

The addition of rifampin to penicillin has proven to be more efficacious in eradicating GAS from the throat (41,42). Clindamycin has been shown to be superior to penicillin in eradicating the GAS carrier state and preventing recurrent infection in selected patients (43,47). Although the combination of rifampin and clindamycin has not been studied, it was effective here as no new cases appeared after one year of follow-up. More data are, however, required to guide physicians in the choice of antibiotics, duration of treatment and frequency of follow-up in the optimal management of GAS carrier transmitters.

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