Transient Bacteremia Due to Suction Abortion: Implications for SBE Antibiotic Prophylaxis

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Received June 17, 1977

The incidence and character of the bacteremia associated with elective suction abortion was investigated in volunteer subjects aged 19 to 35 years who were to undergo first trimester abortion by suction curettage. One hundred and forty-four blood cultures were obtained from thirteen pregnant and four non-pregnant (control) subjects matched for age. Transient bacteremia occurred during or soon after suction abortion in 11 of 13 (84.7%) study subjects. Four of these patients were bacteremic after bimanual pelvic examination, just prior to initiation of the abortion procedure. Seven others developed bacteremia temporally related to cervical dilatation and suction abortion. The bacteremia was intermittent in some, persistent in others, existed as long as one hour after the procedure, and was transient in all patients. Microorganisms isolated from the blood were all normal genital tract flora and were predominantly anaerobes, although alpha hemolytic streptococci were also recovered. Mixed bacteremia occurred in six patients. In contrast, blood cultures from four non-pregnant women were sterile. This study indicates that the systemic circulation–uterine cavity barrier is significantly disrupted during abortion by suction curettage permitting endogenous genital tract microorganisms to gain access into the bloodstream. These observations also suggest that there may be some risk of developing endocarditis during suction abortion in patients with cardiac deformities, and lend some support to the current practice of giving antibiotic prophylaxis to abortion patients with cardiac lesions which predispose them to endocarditis.

INTRODUCTION

Bacterial endocarditis continues to be a devastating disease. Even though we have learned much about the antibiotic treatment of bacterial endocarditis, it continues to be associated with significant morbidity and mortality as well as with the staggering costs of prolonged hospitalization. Therefore, it is important to attempt to prevent this disease whenever possible, particularly in patients whose conditions predispose them to contract subacute bacterial endocarditis, i.e., patients with congenital, rheumatic, arteriosclerotic or syphilitic intracardiac deformities and those with intracardiac prostheses. Earlier work by other investigators has demonstrated that the prophylactic use of antibiotics can reduce the incidence of transient bacteremia in patients undergoing dental extractions, and by this mechanism, hopefully, decrease the risk of subacute bacterial endocarditis [1].

It is important to identify the medical and surgical procedures by which microorganisms indigenous to the site of manipulation gain access to the bloodstream. Transient bacteremia has been demonstrated following dental and gingival manipulation, urologic instrumentation, massage of infected tonsils and boils and sigmoidoscopic examinations [2,3]. With the advent of liberalized abortion laws there has been a sudden increase in the number of women obtaining suction abortion. It has been the practice in abortion clinics, including the Dana Clinic and the Women's Health

1Submitted in partial fulfillment of the requirements for the degree of Doctor of Medicine, Yale University School of Medicine, 1977

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Services in New Haven, to administer prophylactic antibiotics to any woman with questionable heart sounds or a significant history of cardiac disease. A careful search of the literature reveals no published studies on the incidence of transient bacteremia after abortion by suction curettage. The literature on transient bacteremia following any type of manipulation of the healthy female genital tract is scant, consisting of three studies of the puerperal period with reported incidences of bacteremia varying from 0 to 2.3% to 11% [4-6].

The present investigation was undertaken to attempt to determine the incidence and character of the bacteremia associated with elective suction abortion.

METHODS

Subjects. Fourteen subjects aged 19 to 35 years who were to undergo first trimester abortion by suction curettage at the Dana Clinic gave informed consent to participate in the study. None of these women had systemic disease, a history of heart disease or murmurs detected on routine physical examination by the attending physician, nor had any of the subjects received antibiotics within the preceding ten days. These subjects had bimanual pelvic examinations one to three hours before the abortion procedure. Four healthy non-pregnant women of child-bearing age who volunteered to have their blood sampled served as control subjects.

Blood sampling procedure. The patient's forearm was scrubbed with betadine solution and wiped with 70% alcohol. A 21-gauge scalp-vein-infusion set was introduced into a forearm vein and secured with tape. A volume of 7.5 cc of blood was withdrawn into a sterile, heparinized syringe and 1.5 cc of blood was flushed back into the infusion set to heparinize the line. The syringe was removed and replaced with a second heparinized syringe. Of the withdrawn sample, 5 cc were injected into a bottle containing 45 ml of thioglycollate broth supplemented with 0.05% liquoid and 10% sucrose. A one cc aliquot was saved in the syringe and was pour-plated in the laboratory.

Timing of samples. To demonstrate that the bloodstream was free of bacteria prior to the abortion procedure a baseline sample was drawn from each experimental subject before the procedure was begun. Blood samples were then withdrawn from the heparinized infusion set at the following times: during cervical dilatation, during suction curettage, at the conclusion of the abortion procedure (hereafter referred to as 0 minutes), at 2 minutes, 5 minutes, 10 minutes, 20 minutes, 30 minutes and when the patient was ready to dress, usually 35 to 60 minutes after the abortion procedure had been completed. Samples were drawn from the control subjects at similar intervals. According to this schedule, ten samples were to be obtained from each subject.

Laboratory procedures. The pour plates, made from 1 cc of each blood sample mixed with nutrient agar, were incubated aerobically at 37°C for 48 hours. The thioglycollate broth cultures were incubated for seven days at 37°C, at which time each bottle was subcultured to blood agar plates for aerobic incubation and chocolate agar plates for anaerobic incubation. (The chocolate agar was made by adding 15% sheep cells to Proteose #3 Agar [Difco Lab, Detroit, Michigan] while at a temperature of 95°C.) This was further enriched by adding 1.2% Supplement B and 1 ug/ml menadione. Plates were incubated for 48 hours. The chocolate agar plates were incubated in anaerobic jars with Gas Paks (Baltimore Biological Laboratories, Cockeysville, Maryland). Colonies were selected from plates showing growth, and in most cases identification was accomplished by gram stain, morphology, colonial appearance and oxygen requirements. In the case of Propionobacterium acnes
TRANSIENT BACTEREMIA DUE TO SUCTION ABORTION

The culture results were examined to determine the incidence of bacteremia, its time of onset, and its duration. The organisms isolated are considered both in terms of the frequency with which they were isolated and the isolation of more than one species from a subject. Because of the small number of patients in the study formal statistical analysis of the data was not performed.

RESULTS

A total of 154 blood samples for culture were obtained from 14 volunteer subjects undergoing suction abortion and 4 control subjects. Nine of the 14 abortion patient subjects had baseline blood samples that yielded no bacteria on culture. A total of 71 blood samples were obtained from these 9 women. Four of the 14 experimental subjects had organisms isolated from their baseline blood cultures. A total of 35 blood samples were drawn from these women. The culture results from these latter samples will be reported separately from the results of the 9 patients in the study group with negative baseline cultures. Ten blood specimens obtained from one experimental subject (Patient H) were inadvertently destroyed and were lost from the study. Thirty-eight blood samples were obtained from the 4 control subjects (Table 1).

Of the nine experimental subjects in the study group, with negative baseline cultures, seven (77.7%) developed at least one positive culture (Table 2). The number of samples per subject yielding positive cultures ranged from one of eight (12.5%) to five of ten (50%) and three of five (60%). The first positive cultures occurred as early as the time of dilatation and as late as the last sample which was obtained forty to sixty minutes after the end of the abortion procedure (Table 2). Four of these nine patients (B, D, E, and I) had positive cultures from samples drawn during the abortion procedure or within five minutes of its conclusion. In three patients, (C, K, and M) the first evidence of bacteremia occurred twenty minutes or longer after the conclusion of the suction curettage and bacteremia was present even at the final period of study in three subjects (I, K, and M). Three of the experimental subjects in the study group (Patients B, E, and I, Table 2) had intermittently positive cultures. For example, Patient I, from whom blood samples were obtained, had a positive blood culture at the time of dilatation. Her next sample, drawn during the suction curettage, was negative. The three samples drawn at the conclusion of the suction abortion and at two and five minutes post abortion were all positive. The next three samples were sterile but the final culture was positive.

Eight microorganisms were isolated from the blood samples of the experimental subjects with negative baseline blood cultures: *Fusobacteria* (3 patients), *Peptostreptococcus* (2 patients), *Microaerophilic streptococcus* (2 patients), *Peptococcus* (2 patients), *Lactobacillus* (2 patients), *Veillonella* (1 patient), *Corynebacterium vaginale* (1 patient), *Bacillus species* (1 patient). Four subjects with negative baseline cultures but with positive later cultures had more than one organism isolated: Patient D had four organisms recovered from her cultures, Patient I had three, and Patients B and E each had two organisms isolated (Table 3).

The four abortion patient subjects whose baseline blood cultures were positive had bacteremia with: *Alpha hemolytic streptococcus* (Patient L), *Lactobacillus*, *Peptostreptococcus*, and *Peptococcus* (Patient G), *Lactobacillus* (Patient J), and tiny gram negative rods which were not viable on subculture and could not be identified.
TABLE 1
Number of Subjects and Blood Samples Drawn

| Subjects | Blood Samples |
|----------|--------------|
| Experimental Subjects | 14 | 116 |
| Baseline culture negative | 9 | 71 |
| Baseline culture positive | 4 | 35 |
| Blood samples lost | 1 | 10 |
| Control Subjects | 4 | 38 |

TABLE 2
Incidence of Positive Cultures in Study Group and Control Group

| Patients | Baseline | Dilute | Suc- tion | 0 min. | 2 min. | 5 min. | 10 min. | 20 min. | 30 min. | End | Total Cultures |
|----------|----------|--------|-----------|--------|--------|--------|--------|--------|--------|-----|----------------|
| Study Group: | | | | | | | | | | | |
| Baseline culture negative: | | | | | | | | | | | |
| A | - | - | - | - | - | - | - | - | - | 0/8 |
| B | - | - | - | + | - | - | + | - | - | 2/8 |
| C | - | - | - | - | - | + | + | - | - | 3/10 |
| D | - | + | + | - | + | 3/5 |
| E | - | - | - | + | + | - | - | + | 5/10 |
| F | - | - | - | + | - | + | 2/10 |
| G | - | - | - | - | - | + | 1/8 |
| N | - | - | - | - | - | 0/4 |
| Baseline Culture positive: | | | | | | | | | | | |
| H | + | + | + | + | + | 6/10 |
| I | + | + | + | + | + | 7/9 |
| J | + | - | - | - | + | 3/7 |
| L | + | + | + | + | + | 8/9 |
| Control group: | | | | | | | | | | | |
| O | - | - | - | - | - | - | - | - | - | 0/8 |
| P | - | - | - | - | - | - | - | - | - | 0/10 |
| Q | - | - | - | - | - | - | - | - | - | 0/10 |
| R | - | - | - | - | - | - | - | - | - | 0/10 |

(Patient F) (Table 4). The organisms isolated from the baseline blood samples of these four patients were also isolated from at least one subsequent blood sample in each patient. Alpha hemolytic streptococcus was isolated from eight of nine blood samples drawn from Patient L, who was asymptomatic at the time of the abortion. Organisms different from the organism isolated from the baseline sample were isolated from later samples in Patients F and L. In Patient L later samples grew Peptococcus, Veillonella, and a microaerophilic gram positive coccus. Peptococcus was isolated from one of Patient F’s later blood samples (Table 4). A pattern of intermittent positive and negative cultures were also found in these four patients who had positive baseline cultures and is similar to the pattern described above for the study group subjects with negative baseline cultures (Table 2). The thirty-eight blood samples obtained from the control subjects yielded no growth when cultured. The


**TABLE 3**

Number of Organisms Isolated from the Blood of Experimental Subjects with Negative Baseline Cultures

| Subject | Number of organisms isolated |
|---------|-----------------------------|
| Patient B | 2 |
| Patient C | 1 |
| Patient D | 4 |
| Patient E | 2 |
| Patient I | 3 |
| Patient K | 1 |
| Patient M | 1 |

**TABLE 4**

Microorganisms Isolated from the Blood of Experimental Subjects with Positive Baseline Cultures

| Subject | Baseline Sample | Later Samples |
|---------|-----------------|---------------|
| Patient F | Tiny gram negative rods (not viable for culture) | Tiny gram negative rods (not viable for culture) Peptococcus |
| Patient G | Peptostreptococcus | Peptostreptococcus |
| | Peptococcus | Peptococcus |
| | Lactobacillus | Lactobacillus |
| Patient J | Lactobacillus | Lactobacillus |
| Patient L | Alpha hemolytic streptococcus | Alpha hemolytic streptococcus Peptococcus Veillonella Microaerophilic gram positive cocci |

pour plates from both the experimental and control subjects repeatedly demonstrated no growth.

**DISCUSSION**

Transient bacteremia occurred during or soon after a suction abortion in eleven of thirteen study group subjects, seven of nine who were abacteremic and in all four who were bacteremic at the initiation of the abortion procedure. The results of this study indicate that transient bacteremia is a common sequella of suction abortion. The bacteremia was detected within five minutes of the completion of the procedure in just over half of the patients whose baseline cultures were sterile, closely relating the bacteremia to the instrumentation of the uterus. However, in one patient, the first positive culture was obtained more than thirty minutes after the suction curettage was finished. This suggests that seeding of the blood stream may occur across the raw surface of the endometrium even after instrumentation has stopped. The bacteremia, as demonstrated by positive blood samples, was intermittent in three patients which might indicate clearing of organisms from the blood stream and reseeding, or possibly because of a large dilution factor. Organisms might not be detected in every 5 cc sample of blood if only a very small number had gained access to the blood stream. The latest time for drawing blood samples for this study was determined by the time at which the subject was ready to dress and go home, generally forty to sixty
minutes after the completion of the abortion procedure. Positive cultures were obtained from samples drawn at this time from three patients. The bacteremia following suction abortion would therefore appear to exist as long as one hour after the procedure and may possibly last longer.

In the present study, the microorganisms isolated from the blood of the women who were undergoing suction abortion were predominantly anaerobes and were all normal genital tract flora [8–13]. Also, more than one organism was isolated from the blood of six study group subjects. Anaerobic isolates from the female genital tract are typically mixed cultures and may contain facultative organisms, particularly Lactobacillus [8]. These observations support the theory that the genital tract may be the site of origin of the organisms isolated from the blood of these abortion patients.

Organisms were isolated from the baseline blood samples, drawn before the initiation of the abortion procedure, in four of the experimental subjects. The organisms isolated from the baseline blood samples of these subjects were also recovered from later samples as well suggesting that these patients were bacteremic and that the onset of the bacteremia preceded the abortion instrumentation. It is unusual to find such a large incidence of positive blood cultures in patients with no known focus of infection [14]. All patients at the abortion clinic undergo bimanual pelvic examination one to three hours prior to the abortion procedure. Possibly the manipulation of the gravid uterus and the vaginal and cervical mucosa during the bimanual exam caused the bacteremia in these women. Alpha hemolytic streptococcus, normal genital tract flora in some women [10,11] was isolated from eight of nine blood cultures obtained from one patient including the baseline culture. Although this patient was asymptomatic, she had many large uterine fibroids.

Both the bimanual pelvic examination and the abortion procedure may have been responsible for the alpha hemolytic streptococcal bacteremia in this patient. An alpha hemolytic streptococcal bacteremia following pelvic examination or an abortion procedure would pose a real risk to the patient with intracardiac deformities.

The pour plates made from 1 cc of blood from each sample were intended to allow quantitative analysis of the bacteremias demonstrated. However, these pour plates, incubated aerobically, were persistently without growth. This probably indicates the bacteremias, demonstrated by the positive subcultures from the bottles of inoculated thioglycollate broth, were the result of a very small number of organisms gaining entry into the blood. Our primary concern was to document the presence or absence of those bacteria most frequently implicated as pathogens in subacute bacterial endocarditis. In retrospect, the predominance of anaerobic organisms isolated in the present study suggests that anaerobic incubation of our pour plates may have provided additional information.

To our knowledge this is the only study of the incidence of transient bacteremia following elective suction abortion. The abortion procedure is comparable to a normal obstetric delivery since the raw surfaces of the uterus are exposed to whatever bacterial flora harbor in the genital tract. There are three studies of puerperal bacteremia available for comparison. In 1958, Burwell and Metcalfe [4] reported an unpublished study by Ramsey and Swartwout at the Boston-Lying-In-Hospital in which a series of 74 blood cultures from 17 women were obtained at intervals during and after labor. None of these cultures was positive. However, the culture techniques are not described. In 1959, Redleaf and Fadell [6] obtained simultaneous aerobic and anaerobic blood cultures from 101 consecutive patients by taking one specimen immediately after delivery and a follow-up culture on the morning of the first postpartum day, and observed an 11% incidence of bacteremia. In 1966, Baker et al.
[15] studied 1,779 blood cultures obtained from 396 patients at delivery and at 12, 24, 48, and 72 hours postpartum. A transient bacteremia was detected in 1.5% of the patients studied. In 1967, Baker and Hubbell [5] repeated this study altering the sampling schedule to obtain specimens immediately after delivery of the placenta and at 15 and 30 minutes, and 12 and 24 hours postpartum. Two thousand five hundred and eighty-three blood cultures were drawn from 519 patients. Bacteremia was demonstrated in twelve patients, a 2.3% incidence. Our study suggests that the barriers between the systemic circulation and the uterine cavity may be more significantly disrupted during the suction abortion procedure than during delivery. In our study, 11 of 13 patients (84.7%) developed bacteremia following suction abortion, compared to the 11% observed by Redleaf and Fadell [6] and 2.3% observed by Baker and Hubbell [5], and the absence of bacteremia observed by Ramsey and Swartwout [4] in the parturient patient.

The present study also demonstrates a striking incidence of anaerobic bacteremia following suction abortion and supports the previous observations of Gorbach and colleagues [8] that these organisms represent genital tract flora. The risk of endocarditis secondary to anaerobic bacteremia is unknown. In a recent review, Weinstein and Rubin [16] observed that both microaerophilic and anaerobic streptococcal species are currently more commonly implicated in infections of the endocardium than in the past. Gorbach and Bartlett [17] reviewed 1,498 cases of endocarditis of which only 55 (3.8%) were caused by anaerobes. Peptostreptococcus and microaerophilic streptococcus accounted for 53 of these cases. Although anaerobic streptococci may be associated with endocarditis more frequently than in the past, the overall incidence is still low. Both Fusobacteria and Veillonella, which were recovered in the present study, have on rare occasions been isolated as causative agents in endocarditis [18]. Nevertheless, the low incidence of anaerobic endocarditis as well as its occurrence primarily in debilitated patients [17,18] implies that anaerobes have a limited pathogenicity for the endocardium. Since most abortion clinic patients are not severely ill, the risk of anaerobic endocarditis occurring in the abortion clinic patient would appear to be minimal.

Streptococci are probably the more important potential commensal pathogens in assessing the risk of subacute bacterial endocarditis ensuing from a transient bacteremia after instrumentation of the genital tract. Facultative streptococci have been recovered from the cervical mucous of 53% of healthy women [8]. Although alpha hemolytic streptococci are not consistently recovered from the flora of the female genital tract [10–12], White and Koontz [13] recovered these organisms from 14.3% of patients studied. In the present study an alpha hemolytic streptococcus was recovered from eight of nine blood samples from one patient including the baseline culture.

The enterococcus is found in the vaginal and cervical flora in approximately 25% of women [9–13]. This organism has been responsible for 10% of the cases of subacute bacterial endocarditis [16], including women with a history of abortion, pregnancy, caesarian section, and genito-urinary instrumentation [19,20]. Even though enterococci were not recovered from the blood of our patients, the frequency with which it may be cultured from the female genital tract, its pathogenicity for the endocardium, and its relative resistance to antimicrobial therapy suggest that it should also be considered as a potential pathogen in the abortion patient since she may be exposed to a transient bacteremia as a consequence of the abortion procedure.

We are unaware of any reports of bacterial endocarditis as a consequence of a legally performed abortion, although there are several studies, both prospective and
retrospective, which have reviewed the complications of abortions performed since
the relaxation of the legal prohibitions on abortion [21-24]. The patient follow-up
in these reports is quite short, about two weeks, although in one report [23]
patients were contacted two months after the procedure. Subacute bacterial endocar-
ditis may be missed in patients followed for relatively short periods. For example,
two cases of bacterial endocarditis detected months following insertion of an intra-
uterine contraceptive device, have been reported [25,26].

The results of the present study indicate that endogenous genital tract microorgan-
isms gain access to the bloodstream of women having abortions, and suggests that
there may be some risk of developing endocarditis following an abortion procedure
in those patients with cardiac deformities. However, hundreds of thousands of
abortions have been performed in this country since legalization of this procedure
[27] and no cases of endocarditis associated with elective legal abortion have been
reported to date. This latter observation suggests that either endogenous genital tract
microorganisms which enter the bloodstream of women undergoing abortion are of
very low pathogenicity, or that antibiotic prophylaxis routinely given abortion
patients who have a history or physical signs that suggest that they are at risk for
endocarditis may be effective in reducing the incidence of this infectious complica-

ACKNOWLEDGEMENTS
The technical assistance of Ruth Adams and Susan Marino is gratefully appreciated.

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