Isolation Rates and Pathogenicity of Enterococci in Obstetric and Gynecological Operations

Takeyoshi KUBOTA1), Takeshi IWASA1), Hideki SAITO2), Takahiro KANEKO2), Michio TAKADA2) and Toyoko OGURI3)
1) Department of Obstetrics and Gynecology, Juntendo Urayasu Hospital
2) Department of Obstetrics and Gynecology, Juntendo University
3) Central Laboratory in Juntendo University
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Abstract

Isolation of enterococci in patients undergoing obstetric and gynecological operations was studied as well as reviewing the postoperative infection due to this organism during the period from 1985 to 1990.

1) In 126 cases undergoing abdominal total hysterectomy, vaginal specimens were obtained before and after (3rd day) the operation. The isolation rates increased after the operation (before 16.7%, after 35.7%). They increased not only in the group using PIPC, CEZ, CEPR, CMZ, and LMOX by drip infusion but also in the group without prophylactic use of antibiotics. On the other hand in the group using CP vaginal suppositories, the isolation rate decreased. However no statistical proof was obtained as to antibiotics especially in regard to cephem drugs as the reason for the increase.

2) Enterococci were isolated from the surgical field during abdominal total hysterectomy in only 2.0% (n=88).

3) Isolation rates of enterococci inside the transvaginal drain following radical hysterectomy (n=30) reached 86.7%.

4) E. faecalis was isolated in 20.0% of the cases with wound infection (n=25). However isolated Enterococcus strains were not regarded to be the causative organism.

5) There was one case of postoperative enterococcal septicemia in treating stage Ib adenocarcinoma of the uterine cervix.

Introduction

In recent years with the widespread use of 2nd and 3rd generation cephem drugs, gram-positive cocci, which are resistant to these cephem drugs, are often isolated from the sites of infection. Among gram-positive cocci, enterococci are isolated frequently after operation in the field of obstetrics and gynecology. Though enterococci are occasionally pathogenic in the heart and urinary tract, the role of this bacteria after operation is still controversial1).

Therefore in this study
1) Enterococcus isolation rates around the female genital tract were studied in patients undergoing operations.

2) Retrospective analysis of Enterococcus-associated wound infection during the past 6 years was
carried out.

3) A case of septicemia due to enterococci after radical hysterectomy is presented.

Materials and Methods

The study was conducted at the Department of Obstetrics and Gynecology, Juntendo Urayasu Hospital during the period between 1985 through 1990.

1) There are 126 patients undergoing abdominal total hysterectomy included in the first study. Because the vagina is the most important source of postoperative infection, vaginal specimens for culture were obtained immediately before hysterectomy. On the 3rd postoperative day vaginal specimens were taken again to compare the isolation before and after hysterectomy.

In 116 cases antibiotics were used for prophylaxis from immediately after the operation through the 2nd postoperative day. They were

- Piperacillin (PIPC) drip infusion, 1 g × 2/day (31 cases),
- Cefazolin (CEZ) drip infusion, 1 g × 2/day (18 cases),
- Cephapirin (CEPR) drip infusion, 1 g × 2/day (16 cases),
- Cefmetazole (CMZ) drip infusion, 1 g × 2/day (25 cases),
- Latamoxef (LMOX) drip infusion, 1 g × 2/day (10 cases) and
- Chloramphenicol (CP) vaginal suppository, 1 tablet/day (10 cases).

Besides, we had 10 cases in which no antibiotics were used as controls.

No patients had any infection preoperatively and none received antimicrobial agents in advance.

2) Thirty patients underwent radical hysterectomy A transvaginal drain was inserted into the retroperitoneal dead space during the operation as usual, which was removed several days after the operation (mean duration of drain insertion was 5 days). On removal of the drain, specimens were collected from inside the drain and the isolation rate of Enterococcus was calculated.

3) In order to examine Enterococcus-contamination during operation, specimens were collected from the surgical field in 88 patients undergoing abdominal total hysterectomy. After removal of the uterus, specimens for culture were taken from the vaginal stump as well as the pelvic dead space through the abdominal cavity.

4) During the period between 1985 through 1990, there were 25 cases of wound infection. The percentage of Enterococcus-associated wound infection was calculated and pathogenicity of the isolated enterococci was analyzed.

Generally it is difficult to analyze pathogenicity of isolated enterococci, because in most cases, they were polymicrobial infections. In some cases isolated enterococci may have no meaning to the infection, but sometimes they play an important role in infection. Even when this bacteria is not the direct causative bacteria, it may act synergistically in polymicrobial infections\(^2\). So, the following criteria were used here to analyze enterococcal pathogenicity. Isolated Enterococcus strain was not regarded as the causative organism, when

- ① the wound was cured without specific treatment of infection such as administration of antimicrobial agents, incision and puncture or
- ② it was cured with antimicrobial agents which are known to be ineffective against Enterococcus (these were cephem drugs\(^3\)). The isolated Enterococcus strain was regarded to be the causative organism, when
- ③ it was isolated from the closed space of abscess accompanied by no other bacteria or
- ④ improvement was observed with the use of effective drugs against Enterococcus such as
Imipenam/Cilastatin (IPM/CS), PIPC, Ampicillin (ABPC), Amoxicillin (AMPC), Minocycline (MINO) and CP3,4).

5) We noted postoperative septicemia and the case was analyzed.

Clinical material was obtained by the usual method. Specimens from the vagina, the vaginal stump and the pelvic dead space were collected with sterile cotton swabs. Specimens from the drain were obtained by aspirating fluid with syringes.

Bacterial cultures, identification, and sensitivity tests were all performed at the Central Laboratory in Juntendo University4).

Results

1) Enterococcus isolation rate in the vagina before the operation was 16.7% (21/126), and it became 35.7% (45/126) on the 3rd postoperative day (Table 1). As is shown in Table 1 and Fig. 1 the isolation rate increased from 6.5 to 22.6% for PIPC (n=31), from 11.1 to 33.3% for CEZ (n=18), from 12.5 to 50.0% for CEPR (n=16), from 28.0 to 48.0% for CMZ (n=25) and from 30.0 to 60.0% for LMOX (n=10). And the rate also increased from 10.0 to 40.0% in the group without antibiotics (n=10). On the other hand, in the group using CP vaginal suppositories (n=16), the isolation rate decreased from 25.0 to 12.5%.

Table 2 shows the change in Enterococcus-isolation before and after abdominal total hysterectomy. There were 21 positive cases for enterococci in the vagina before hysterectomy. In 4 of 21 cases enterococci

Table 1 Isolation rate of enterococci in the vagina before and after abdominal total hysterectomy

<table>
<thead>
<tr>
<th>prophylaxis</th>
<th>before</th>
<th>3rd postoperative day</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIPC drip infusion</td>
<td>2/31(6.5%)</td>
<td>7/31(22.6%)</td>
</tr>
<tr>
<td>CEZ drip infusion</td>
<td>2/18(11.1%)</td>
<td>6/18(33.3%)</td>
</tr>
<tr>
<td>CEPR drip infusion</td>
<td>2/16(12.5%)</td>
<td>8/16(50.0%)</td>
</tr>
<tr>
<td>CMZ drip infusion</td>
<td>7/25(28.0%)</td>
<td>12/25(48.0%)</td>
</tr>
<tr>
<td>LMOX drip infusion</td>
<td>3/10(30.0%)</td>
<td>6/10(60.0%)</td>
</tr>
<tr>
<td></td>
<td>16/100(16.0%)</td>
<td>39/100(39.0%)</td>
</tr>
<tr>
<td>CP vaginal suppo.</td>
<td>4/16(25.0%)</td>
<td>2/16(12.5%)</td>
</tr>
<tr>
<td>without antibiotics</td>
<td>1/10(10.0%)</td>
<td>4/10(40.0%)</td>
</tr>
<tr>
<td>total</td>
<td>21/126(16.7%)</td>
<td>45/126(35.7%)</td>
</tr>
</tbody>
</table>

Fig. 1 Isolation rates of enterococci in the vagina before and after abdominal total hysterectomy

(%)
Enterococcal infection in obstetrics and gynecology

Table 2 Change in Enterococcus isolation before and after abdominal total hysterectomy

<table>
<thead>
<tr>
<th>result of culture</th>
<th>before operation</th>
<th>after operation</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+</td>
<td>+</td>
<td>−</td>
</tr>
<tr>
<td>PIPC drip infusion</td>
<td>1</td>
<td>1</td>
<td>6(1)</td>
</tr>
<tr>
<td>CEZ drip infusion</td>
<td>2</td>
<td>0</td>
<td>4(2)</td>
</tr>
<tr>
<td>CEPR drip infusion</td>
<td>2</td>
<td>0</td>
<td>6(3)</td>
</tr>
<tr>
<td>CMZ drip infusion</td>
<td>7</td>
<td>0</td>
<td>5(4)</td>
</tr>
<tr>
<td>LMOX drip infusion</td>
<td>3</td>
<td>0</td>
<td>3(5)</td>
</tr>
<tr>
<td>CP vaginal suppo.</td>
<td>1</td>
<td>3</td>
<td>1(6)</td>
</tr>
<tr>
<td>without antibiotics*</td>
<td>1</td>
<td>0</td>
<td>3(7)</td>
</tr>
</tbody>
</table>

Note. Data are presented as the number of cases (cultures).
*control
1, 2, 3, 4, 5, 6—7) not significant (χ²-test)

Fig. 2 Septicemia due to E. faecalis after radical hysterectomy
(T. K. 47, † adenocarcinoma of the uterine cervix, stage Ib)

<table>
<thead>
<tr>
<th>postoperative day</th>
<th>temperature (°C)</th>
<th>Arterial infusion</th>
<th>Radical hysterectomy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>LMOX 2g</td>
<td>CMZ, CAZ, AZX</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ABPC 2g</td>
<td>CTM, FMOX, TOB, ANB, GM, MINO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>IPM 1.5g MINO 100mg</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SM 160mg Prednimase 50mg</td>
</tr>
</tbody>
</table>

E. faecalis

<table>
<thead>
<tr>
<th>blood</th>
<th>+(+)(+)(+)</th>
<th>(+)(+)(+)</th>
<th>(−)(−)</th>
</tr>
</thead>
<tbody>
<tr>
<td>vagina</td>
<td>+</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Arterial infusion via uterine artery (CDDP)

were eliminated postoperatively. They were in the PIPC group (1 case) and in the CP group (3 cases). χ²-test was applied to 105 cases in which enterococci were negative before hysterectomy. Some of the 105 cases were found to have enterococci in the vagina after hysterectomy. The comparison was made between each prophylactic group (PIPC, CEZ, CEPR, CMZ, LMOX and CP) and control (group without antibiotics). However there was no significant difference between control and each prophylactic group.

2) Enterococcus-contamination during abdominal total hysterectomy was studied in 88 cases. Enterococci were isolated in the vaginal stump only in 2.0% (2 cases) of the cases. And in the pelvic dead space they were isolated also in 2.0% (2 cases) of the cases.

3) Isolation rates of enterococci in the drain following radical hysterectomy (n=30) reached as high as 86.7% (26 cases).

4) There were 25 cases of wound infection. E. faecalis was isolated in 5 of 25 cases (20.0%). Other kinds of Enterococcus group (E. faecium, E. avium etc.) were not found. Of the 5 two cases were polymicrobial infection (No. 1; Pseudomonas aeruginosa + Staphylococcus epidermidis + E. faecalis, No. 2; S. epidermidis + E. faecalis + Corynebacterium + Bacteroides) and three were monomicrobial. According to our criteria isolated Enterococcus strains in the 5 cases were not regarded to be the causative organism.

平成 4 年 4 月20日
5) Case T.K. 46 years old (Fig. 2)

In treating Stage Ib adenocarcinoma of the uterine cervix, arterial infusion with an anticancer drug (cis-diammine dichloroplatinum; CDDP) was performed 14 days before the operation. After radical operation the patient developed a high fever and *E. faecalis* was found in the blood culture. Though many kinds of antibiotics were used, the high fever continued and the patient was transferred to our clinic. The bacteria were found repeatedly until the 61st postoperative day and finally disappeared with the use of IPM/CS + MINO + Gentamicin (GM).

Since no cardiac abnormality had been observed in preoperative examination (chest X-ray and ECG), she was suspected of having retroperitoneal space infection (pelvic cellulitis after radical hysterectomy) as a focus of septicemia. But later, echocardiography revealed vegetation in the aortal valve, and the diagnosis of infectious endocarditis was made. In this case the white blood cell count before detection of *E. faecalis* was as low as 1,400/mm$^3$, so that the patient was a compromised host, and the genital tract was thought to be the source of infection.

**Discussion**

Enterococci are part of the normal flora of the human large intestine, cervix, vagina, urethra and oral cavity, and they are isolated from the genital tract in approximately 10% of the asymptomatic women. In this study, 16.7% of the women had this organism in the vagina before hysterecomy.

It has been noted that enterococci are frequently found in the female genital tract after operation. And they are found in approximately 25% of the women with postoperative infection after cesarean section. In our study the isolation rate in the vagina after hysterectomy was 35.7%, and the isolation rate inside the transvaginal drain was 86.7%. Thus we also noted a high isolation rate, but the question is why this organism increases after operations.

Since the *Enterococcus*-contamination rate during abdominal total hysterectomy (2.0%) was low in this study, a reason other than intraoperative contamination should be considered for this increase. The widespread use of cephem drugs appears to be the main reason for the increase. It is obvious from our study that the isolation rate in the vagina increased when cephem drugs are used by drip infusion. However it also increased when PIPC (1 g × 2/2/day) was used by drip infusion. PIPC is not a cephem drug and is proven to have a definite effect against enterococci. Though enterococci were eliminated in one case of the PIPC group in this study, the drug concentration of PIPC in the vagina may not be sufficient for the elimination of enterococci in most cases when standard doses of PIPC are given by the usual way. In addition, the increase was also observed in the group in which no antimicrobial agent was used. It seems that *Enterococcus* isolation rates from clinical material have been increasing with the recent widespread use of cephem drugs. However the mechanism of the increase cannot simply be explained on the basis of the effects of cephem drugs. Not only cephem drugs but also various factors must be involved in the increasing isolation rate of this organism.

As mentioned above, enterococci were isolated at a high rate in the vagina and transvaginal drain after operation, none of the cases developed infection. In addition, though we had 5 cases of wound infection associated with enterococci, there was no case in which enterococcal pathogenicity was proven according to our criteria.

Thus, enterococci have little meaning even when they are isolated after obstetric and gynecological operations, if the patients are not in a state of immunosuppression. However we have to bear in mind that if the patient is a compromised host, this organism may produce a severe infection. We experienced a typical case of postoperative septicemia in treating adenocarcinoma of the uterine cervix. If enterococci are found in the genital tract at the time of leucopenia accompanying cancer chemotherapy, it is advisable to
initiate treatment. Though statistical proof could not be obtained in this study. The *Enterococcus* isolation rate in the vagina after hysterectomy decreased in the group using CP vaginal suppositories. Local administration seemed to produce sufficient concentrations of the drug for the elimination of this organism.

References

産婦人科手術における腸球菌の検出状況および病原性に関する検討

久保田武美 岩佐 剛
順天堂大学医学部産婦人科

齊藤 英樹 金子 隆弘 高田 道夫
順天堂大学医学部産婦人科

小栗 豊子

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（平成 3年11月11日受理）

要旨
近年、臨床材料からの Enterococcus 分離率の増加が指摘されているので、産婦人科手術症例における Enterococcus の検出率を検討するとともに、1985～1990年の期間中の本菌による術後感染症の実態について調査した。

1）126例の腹式単純子宮全摘例を対象として術前と術後3日目の腔内 Enterococcus の検出率を比較した。感染予防の目的で PIPC, CEZ, CEPR, CMZ, LMOX を点滴静注した群では術後において検出率は上昇したが、抗生剤非投与群においても検出率は上昇した。一方, CP 腔内を用いた群では検出率は下降した。ただし、本菌の術後における增加はセフェム系を中心とする薬剤の影響であるという統計学的証明はなされなかった。

2）Enterococcus による術中汚染を88例の腹式単純子宮全摘例について調べた結果では、その2.0%に術後血清由来菌を分離したにすぎなかった。

3）広汎子宮全摘後 (n=30) の骨盤死腔性腔ドレーン中の細菌培養を試みると、本菌陽性症は66.7%に達していた。

4）術創感染例25例中の20%に本菌が分離されたが、これら分離菌は起炎菌とはみなされなかった。子宮頸部腺癌 Ib 期の治療中に本菌による術後敗血症を経験した。