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# A case of *Clostridium perfringens* sepsis in the 29 week pregnant woman with diagnosed fetal omphalosele

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**Abstract:** Although not common, postpartum and post-abortion infections caused by clostridia can be severe. Clostridial uterine infections start as localized chorioamnionitis as a result of an infection from the fetus and/or placental tissues. The infection may spread to the uterine wall and endometrial tissues, and, in the most severe cases, uterine necrosis accompanied by sepsis ensues. In this paper we report the presence of *Clostridium perfringens* isolated from blood culture and placental specimen after the termination of a 29 gestational week pregnancy. The woman had a history of having omphalocele fetus and premature membrane rupture. Fetal omphalocele is a congenital defect of the abdominal wall that allows some of the abdominal organs to protrude through it. In order to find the focus of infection, blood and placental specimen of the patient were examined. Blood cultures of the patient were evaluated by the BACTEC 9120 system. The identification of the bacteria was performed conventionally and confirmed by the automatized API 20A system. Antibiotic susceptibility testing was performed by E-test according to the recommendations of Clinical Laboratory and Standards Institute (CLSI). Although *Clostridium spp* is rarely isolated from blood cultures, anaerobically evaluation of blood cultures in the infections of abdominal and genital sites could be life-saving, as in this report.

**Keywords:** *Clostridium Perfringens*, Blood Culture, Placental Specimen, Fetal Omphalocele

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## 1. Introduction

*Clostridia* can be isolated from the genital tract of approximately 10% of women as part of the normal vaginal microflora. Clostridia are present in up to 20% of non-sexually transmitted diseases (STD) and may be present as part of bacterial vaginosis. Although not common, postpartum and post-abortion infections caused by clostridia can be severe. Clostridial uterine infections start as localized chorioamnionitis as a result of infection of the fetus and placental tissues. The infection may spread to the uterine wall and endometrial tissues, and, in the most severe cases, uterine necrosis accompanied by sepsis ensues <sup>(1)</sup>.

Although obligate anaerobes are infrequently isolated from bacteremic patients, *Clostridia* are second only to *Bacteroides* among anaerobes isolated from blood cultures, accounting for approximately 1% of all positive cultures. Patients undergoing treatments that render them neutropenic are also at increased risk for clostridial bacteremia. *C. perfringens* followed by *C. septicum* is the most common species isolated from blood. If not treated promptly the toxins

produced by clostridia during septicemia can result in severe disease and devastating clinical outcomes <sup>(1)</sup>. It's reported that *C. perfringens* was the most frequently isolated microorganism in clostridial septicemias, but *C. septicum* was associated with more complications and a higher mortality rate <sup>(7)</sup>.

Fetal omphalocele is a congenital defect of the abdominal wall that allows some of the abdominal organs to protrude through it. A translucent membrane or sac covers the protruding organs. The severity of the condition varies from child to child. In a normal baby, the intestines grow and develop outside the abdomen in the umbilical cord until about the tenth week of pregnancy. After this time the intestines return into the abdomen; when this fails to happen, a fetal omphalocele occurs <sup>(9)</sup>. Omphalocele is a defect of the abdominal wall affecting 1 in 4000 to 7000 live births. Abnormal development of the abdominal muscles, fascia and skin leads to the herniation of abdominal viscera in a sac consisting of amnion and peritoneum. The embryologic process accounting for omphalocele is unclear <sup>(5,9)</sup>.

In this paper we report *C. perfringens* isolated from blood

culture and placental specimen after the termination of a 29 gestational week pregnancy.

## 2. Case

A 34 years old, 29 gestational week pregnant women was admitted to emergency services with abdominal pain and fever. The woman had a history of having omphalocele (but with neither any diagnostic tests like amniocentesis nor cordocentesis was performed) fetus and with a history of premature membrane rupture for a five days. In physical examination abdominal tenderness, foul-smelling vaginal discharge with 38.9°C fever and tachycardia (118 beats/min) was diagnosed. Obstetrical ultrasonography showed an omphalocele mort fetus. In complete blood count white blood cells (WBC) were 20.000 cells/ml and C-reactive protein (CRP) level was 95. Blood and urine cultures were made. Cesarean section was performed because of pre-diagnosis of chorioamnionitis. The fetus was born dead with a non-ruptured omphalocele sac. Preoperative blood, urine samples and sample of placenta were sent to the microbiology laboratory. Postoperatively, due to the declining blood parameters (hematocrits -HTC- level decreased from 36 to 24, international normalised ratio -INR- level increased from 1.00 to 2.1 lactate dehydrogenase -LDH- level also rised up to 900) of the patient was admitted to intensive care unit with a prediagnosis of disseminated intravascular coagulation (DIC) caused by sepsis. The patient was treated with imipenem and doxycycline. Urine culture of the patient was sterile. *C. perfringens* was isolated from blood culture and placental samples of the patient who had neither an immune deficiency nor a previously diagnosed disease. The isolated microorganism was sensitive to penicillins. On the seventh day of therapy, inflammatory parameters of the patient decreased. And patient was discharged on the postoperatively fifteenth day with normalized complete blood count parameters and inflammation parameters (WBC: 7800 cells/ ml, HTC: 30.6, CRP: 4.7 and INR: 1.2)

## 3. Microbiological Methods

The placental sample obtained from the patient was inoculated onto sheep-blood agar, Schaedler agar, Schaedler broth and Gram stain was performed. Gram positive rods were seen in Gram stain of the placental sample, but not polymorphnuclear leukocyte. The blood samples of the patient were inoculated into aerobic and anaerobic blood culture bottles (bioMerieux, France). Aerobic and anaerobic blood cultures were evaluated by the BACTEC 9120 system (bioMerieux, France). While the aerobic cultures of the samples were negative, a Gram positive basil was recovered from Schaedler agar on which placental sample was inoculated and from the anaerobic blood culture bottle after a 48 hour incubation. The bacteria that demonstrated twice zone-hemolysis and had positive for spor-forming test were identified as *Clostridium spp* by classical methods. The identification was confirmed as *C. perfringens* (99.9%

confidence level) by the API 20A system (bioMerieux, France). Antibiotic susceptibility testing was performed by E-test (bioMerieux, France) according to recommendations of Clinical Laboratory and Standards Institute (CLSI) <sup>(2)</sup>. Resistance of the bacteria to penicillin was not found. The bacteria indicated positive reactions for glucose, lactose, saccarrose, maltose, mannose and trehalose fermentation, and hydrolysis of gelatin. Acid producing from mannitole, indol production, hydrolysis of urea, hydrolysis of esculin were negative.

## 4. Conclusion

The majority of cases of clostridial sepsis originate from the female genital tract and follow septic abortion. Introduction of a foreign body is a common antecedent event. In the uterus, residual necrotic fetal and placental tissues and traumatized endometrium may allow the growth of clostridia. There is often evidence of disseminated intravascular coagulation (DIC)<sup>(10)</sup>.

*C. perfringens*, the most commonly recovered *Clostridium* spp, is an inhabitant of soil and of intestines of humans and animals, and is the most frequently encountered histotoxic *Clostridium* species. This microorganism is easily isolated and identified in the clinical laboratory. It can be characterized by the presence of stout Gram- variable rods of varying length, frequently surrounded by a capsule. It's one of the anaerobic bacteria causing genital tract infections in female <sup>(8)</sup>. Although *Clostridia* are isolated in up to 20% of non-STD genital infections, *C. perfringens* is rarely isolated from blood culture. According to the data of blood culture over a 5-year period from a large Boston teaching hospital, more than 20.000 positive blood cultures were detected with over 200 (1%) positive for obligate anaerobes. Of the positive cultures, 58 (0.3%) were positive for *Clostridium spp*. Of the *Clostridium spp* isolated, *C. perfringens* accounted for 42 isolates. Significant risk factors associated with isolation of clostridia from blood include hemodialysis, intestinal malignancy and inflammatory bowel disease <sup>(1)</sup>. Fujita *et al*, 18 *C. perfringens* bacteremias (0,13 %) among 14.190 blood samples were detected in a period of eight years in Japan <sup>(6)</sup>. In Turkey the rate of anaerobic bacteria isolated from blood cultures is approxiamately 1%. Only one *C. perfringens* strain was isolated from blood cultures in our department in last year.

The further remarkable side of our case is that the patient had a diagnosis of fetal omphalocele (level 2). Omphalocele is an anterior abdominal wall defect in which abdominal organs protrude into the umbilical cord. The area of the defect is covered by a membrane consisting of the peritoneum, mesenchymal connective tissue and amnion. The diagnosis is commonly made during a routine fetal examination in the second trimester. Omphalocele is easily recognizable using ultrasound examination. Although the exact mechanism leading to omphalocele is controversial, the developmental failure can occur in the second or third trimester in embryonic or fetal life. Omphalocele affects 1 in

4000 fetuses and has a birth prevalence of 1 in 6000<sup>(3,4)</sup>.

Cancer and immunosuppressive conditions are known to be the main underlying diseases in individuals infected with *C. perfringens*, but Fujita et al reported that the most frequent underlying conditions were diseases of the hepatobiliary tract system<sup>(6)</sup>. In this case, the patient whose blood culture *C. perfringens* was isolated from, had a diagnosis of fetal omphalocele.

The therapeutic regimens in genital tract infections in female include doxycycline or a macrolide in combination with cefoxitin, cefotetan, clindamycin or metronidazole<sup>(8)</sup>. Our patient started to take doxycycline and imipenem before culture results was available. She had continued on taking doxycycline according to blood and placental specimen culture results.

Intra-amniotic infection syndrome (IAIS), also referred to as chorioamnionitis, is a clinically detectable infection of the amniotic fluid and fetal membranes during pregnancy. Most cases of IAIS originate when vaginal microorganisms ascend into the intrauterine cavity after rupture of the membranes<sup>(11)</sup>. So it's considered that the cause of dissemination of *C. perfringens* to blood may be an ascendent transmission from maternal bowel flora, which then passes through the placenta and omphalocele fetus. Due to the thickened abdominal layers, the fetus is increasingly sensitive to infections. Patients whose blood cultures were positive for *C. perfringens* had a mortality rate of 27% at 30 days<sup>(6)</sup>. Accurate microbiological diagnosis and early treatment provided to survival of the patient in this paper.

In conclusion, although *Clostridium spp* is rarely isolated from blood cultures, anaerobically evaluation of blood cultures in the infections of abdominal and genital sites could be life-saving.

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