

PRIMARY PERITONITIS WITH POCKETED ABSCESS INTRAPERITONEAL CAUSED BY UMBILICAL CATHETER INFECTION IN 22 DAYS OLD BABY

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ABSTRACT

Primary peritonitis defined as a microbial infection of the peritoneum and peritoneal fluid in the absence of a gastrointestinal or visceral perforation. The source of infection is extra abdominal and may arise from lymphatics or blood stream. One of the infection source can be extension from an omphalitis or infected umbilicus. Omphalitis can occur due to complication of Umbilical Vein Catheterization (UVC). UVC are used to provide access for resuscitation, frequent monitoring of blood, administration of fluids, blood and parenteral nutrition. We report a case of primary peritonitis with pocketed intraperitoneal abscess caused by umbilical infection in 22 days old baby. Patient present a clinical sign of peritonitis and severe omphalitis with history of using umbilical catheter. X-ray found a free fluid impression in the abdominal cavity. Patient undergo a laparotomy and pocketed intraperitoneal abscess was found around *ligamentum teres hepatis* area, suspected of infectious complications arising out from the use of umbilical catheter. [MEDICINA 2014;45:193-198].

Keywords: primary peritonitis, umbilical catheter, infection

BAYI USIA 22 HARI DENGAN PERITONITIS PRIMER DAN ABSSES INTRAPERITONEAL AKIBAT PENGGUNAAN KATETER UMBILIKAL

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ABSTRAK

Peritonitis primer adalah adanya infeksi bakteri pada peritoneum dan cairan peritoneal tanpa disertai adanya perforasi saluran pencernaan dan organ dalam. Sumber infeksi ada di luar rongga abdomen yang kemudian masuk melalui aliran limfe atau darah. Salah satu sumber infeksi adalah adanya perluasan dari infeksi pada tali pusat/omfalitis. Omfalitis dapat terjadi akibat komplikasi dari penggunaan kateter vena umbilikal. Kateter vena umbilikal umumnya digunakan untuk memberikan akses resusitasi, pemberian cairan, darah dan nutrisi parenteral pada bayi dengan kondisi yang tidak stabil. Kami melaporkan satu kasus peritonitis primer dengan abses intraperitoneal yang disebabkan oleh infeksi umbilikal pada bayi usia 22 hari. Pasien datang dengan gejala klinis peritonitis dan omfalitis derajat berat dengan riwayat penggunaan kateter vena umbilikal. Pada pemeriksaan rontgen ditemukan adanya gambaran cairan bebas pada rongga abdomen. Pasien kemudian menjalani tindakan laparotomi dan ditemukan adanya abses intraperitoneal di daerah *ligamentum teres hepatis* yang dicurigai disebabkan karena penggunaan kateter umbilikal. [MEDICINA 2014;45:193-198].

Kata kunci: peritonitis primer, kateter umbilikal, infeksi

INTRODUCTION

Primary peritonitis defined as a microbial infection of the peritoneum and peritoneal fluid in the absence of a gastrointestinal or visceral perforation. The route of infection in primary peritonitis is usually not apparent but is thought to be hematogenous, lymphogenous, via transmural migration.¹ In

primary peritonitis, the source of infection is extra abdominal and may arise from blood stream or lymphatics. One of the infection source can be extension from an omphalitis or infected umbilicus.^{2,3}

In some health care facilities, in rural areas especially, the procedures of umbilical catheterization are routine, more specific in newborn infants with emergency cases. Peripheral blood

vessels in neonates are often friable and difficult to access, particularly in the preterm baby. For this reason, umbilical-vein catheters (UVCs) are used to provide much-needed access for resuscitation, emergency vascular access, frequent monitoring of blood, administration of fluids, blood transfusion, and parenteral nutrition in neonates whose condition is unstable.

Complications associated with UVCs include omphalitis, vein thrombosis, sepsis, peritonitis, portal hypertension, and pneumopericardium.⁴

In this case, a peritonitis which accompanied by signs of acute abdomen when it caused by ruptured abscess around *ligamentum teres hepatis* area as a result of infection and a thrombosis could classified as a complication of umbilical catheter installation. To oversee several risks that exist, there are few things that need to be considered before an umbilical catheter is applied such as a clear indication of presence, medical personnel competencies who will perform the procedure and regular monitoring of the function of it's catheter. Peritonitis in neonates is a case of severe and potentially high level of life threatening so a diagnosing in early signs of emergency and immediate intervention are mandatory.

CASE ILLUSTRATION

A 22 days female infant, referred from private hospital in Tabanan to Sanglah Hospital on June 15th 2013 with diagnosis of necrotizing enterocolitis. Infant presents with her stomach look larger than normal for most infants of her age and skin around the center belly appeared to be reddish. The stomach has started to grow, more or less a week before being transferred to Sanglah Hospital. This condition made her has difficulties in breathing. She also complained of experiencing fever around 4 days before admitted at Sanglah Hospital. Two days before then, she had vomiting of milk as much as 3 to 4 times a day with approximately volume ¼ of mineral water glass. Vomiting occurred prior 30 minutes to 1 hour after a breastfed being given.

The baby was born on May 24th 2013 in delivery room of Tabanan Hospital. She was born spontaneously per vagina with a clear amniotic fluid, preterm (36



Figure 1. Baby with erythema on abdominal skin (A) and abdominal distention (B).

weeks) and did not cry immediately with APGAR score of 3-4-6. A resuscitation action given followed by insertion of umbilical catheter for granting access fluid resuscitation. Her birth weight was 2000 gram and 48 cm of body length. Since the lack of pregnancy age, low birth weight and the baby did not cried immediately at birth, the baby then admitted in neonatal ward.

Baby hospitalized in Tabanan Hospital for around 13 days. During the treatment, the baby uses umbilical catheter as intravenous line straightly from birth until the age of 7th days then replaced with a peripheral venous catheter. During her first 7th days of life, umbilical catheters were used for intravenous fluid therapy and medications. At 7th days of baby's life, the umbilical catheter were jammed, so then it removed and replaced with a peripheral venous catheter. At that time, there were no abdominal distension, no redness found on the skin around the umbilicus and the presence of liquid pus in the umbilicus was also none. After treatment for 13 days, baby was active, she was able to feed, her weight reached 2200 gram and she was allowed to an ambulatory care. At that time, there were no abdominal distension, no redness found on the skin around the umbilicus and the presence of liquid pus in the umbilicus was also none. But during ambulatory care, enlarged abdominal

complaints appeared, with redness on skin around the center of the abdomen, fever and vomiting.

On June 14th 2013 the baby was taken to a private hospital and were cared for 1 day. Baby then referred to Sanglah Hospital to receive further treatment. Physical examination revealed an alert baby and her general appearance looked moderately ill. Her body weight was 2300 gram and length was 48 cm. Abdominal examination revealed a distention with skin erythema around center with 5-6 cm diameter and bowel sound was decreasing. Liver enlargement and splenomegaly were hard to evaluate since distended abdomen occur (**Figure 1**).

An image of free air in right side of abdomen and right subdiaphragma, intestinal distention, an unclear physical appearance of left and right kidney, normal size and contour of liver and spleen and no radioopaque images along urinary tract was found on BOF x-ray (**Figure 2**). From this x-ray, impress a pneumoperitoneum.

Her laboratory examination showed WBC 6.98 x 103/iL, neutrophil 5.37 x 103/iL, lymphocyte 0.77 x 103/iL, HGB 14.03 g/dL, MCV 93.97 fL, MCH 31.62 pg, MCHC 33.65 g/dL, HCT 41.69% and PLT 164.3 x 103/iL, CRP 194,70 mg/L, IT ratio 0,07, AST 13.26 U/L, ALT 5.76 U/L and albumin 3.41 g/dL.

The presence of abdominal



Figure 2. Radiologic examination on abdominal area.

distention was suspected by peritonitis which already causing respiratory distress signs; made orogastric tube insertion and peritoneal aspiration by abdominal paracentesis was taken. These actions were performed by paracentesis under processus xiphoideus with G16 abbo cath then followed by laboratory tests of bacterial culture and sensitivity test of antibiotics. Macroscopic appearance of samples obtained in the form of yellowish colored liquid with thick consistency (**Figure 3**).

Baby then undergo a laparotomy. From the laparotomy, an existence of pocketed abscess intraperitoneal around the *ligamentum teres hepatis* were found and were suspected caused by infection originating from the use of umbilical catheter. On a leak test, there was no perforation from gaster to the distal part of the colon by massaging (milking procedure). Baby later diagnosed with peritonitis generalisata + pocketed abscess intraperitoneal et causa omphalitis grade III + suspected

late onset neonatal sepsis.

The baby then entered an Neonatal Intensive Care Unit treatment and given parenteral fluid therapy and enteral feeding which starts minimal and increased gradually, empirical antibiotics for sepsis and peritonitis; combination of cefoperazone sulbactam, amikacin, and metronidazole without a ventilator assistance. From culture examination of pus, obtained a significant *enterobacter georgiviae* organism as the cause of infection and it was sensitive to the ciprofloxacin antibiotics, amikacin, cefepime, gentamycin, and cefoperazone sulbactam while no growth of organism obtained in the blood cultures examination. Unfortunately, during postoperative treatment, she experienced worsening for several times and after treatment for 20 days, the baby eventually died with sepsis as a cause of death.

DISCUSSION

Primary peritonitis defined as a microbial infection of the peritoneum and peritoneal fluid in the absence of a gastrointestinal or other visceral perforation, abscess, or other localized intraabdominal infection.¹ One of the cause is omphalitis.^{2,3} In this case, the clinical sign of omphalitis was erythema around the center of abdomen skin accompanied by abdominal distension which lead to a peritonitis. The use of umbilical catheter for 7 days had risen to a suspicion that there has been an omphalitis complications such as peritonitis and sepsis. The presence of acute abdomen which are distention and respiratory distress lead to a decompression procedure with an insertion of orogastric tube and peritoneal aspiration under prosesus xiphoideus where later a thick yellow pus aquired. Patient undergo a laparotomy as a definitive therapy of peritonitis, to find an abscess around *ligamentum teres hepatis* area as



Figure 3. Abdominal paracentesis below processus xiphoideus (A) and purulent discharge from peritoneal aspiration (B).

the source of pus and as the cause of peritonitis.

Case of peritonitis in neonates are extremely rare. As stated in South Africa research from 1967 to 1971, there were only 32 of peritonitis in neonates cases found. Twelve of them or 37.5% are primary peritonitis where 2/3 caused by infection in umbilicus area which then spread out and cause peritonitis.¹ This case was the only peritonitis in neonates recorded in Sanglah Hospital for the last 1 year.

The risk of omphalitis is increased by a number of maternal factors (prolonged rupture of membranes, maternal infection, amnionitis), factors at delivery (nonsterile or home delivery); neonatal factors (low birth weight, delayed cord separation, leukocyte adhesion deficiency, neonatal alloimmune neutropaenia) and nursing factor (umbilical catheterization and inappropriate cord care).^{2,3} In this case, the infection was caused of umbilical catheterization action which not followed by distinctive care and observation. The devitalised umbilical stump is an excellent media that supports bacterial growth, and the umbilical vessels provide direct access to the blood stream. And if it was not taken care of, the colonising bacteria may invade the wound and spread through the blood vessels or the connective tissues to cause phlebitis or arteritis.

Peripheral blood vessels in neonates are often friable and difficult to access, particularly in the preterm baby. For this reason, umbilical-vein catheters are used to provide much-needed access for resuscitation, emergency vascular access, frequent monitoring of blood, administration of fluids, blood transfusion, and parenteral nutrition in neonates whose condition is unstable.⁴ In this case, venous access used through an umbilical catheter within consideration the infant was preterm born, had low birth

weight and required a resuscitation immediately after birth.

The exact pathogenesis of the bacteremia cannot be demonstrated. It is possible that organisms present on the umbilical stump introduced by the catheter into the umbilical vein. On the other hand there is some experimental evidence that the initial event is a mechanical shearing of the endothelial lining of the umbilical vein by the inevitable motion of the catheter; this is followed by the formation of a small fibrin clot, which serves as a locus for trapping and multiplication of bacteria inserted by the catheter.⁵ Known factors associated with the initiation and propagation of thrombosis include endothelial damage during catheter placement, composition of the infusate, catheter characteristics, and the duration and location of catheter placement. Patient variables that can increase the complications caused by umbilical catheterization include low birth weight, low flow state, hypercoagulation disorder, and hypoxia.¹ In this case, the tip of umbilical catheter was possible to be in the ductus venosus area around *ligamentum teres hepatis* leads to endotel damage and thrombus formation in the area corresponding where abscess was found. The presence of endotel damage and thrombus is locus for trapping and multiplication of bacteria which later creates abscess. Also in this case, prematurity factors, low birth weight and hypoxic conditions were found facilitate the occurrence of infectious complications and thrombosis as a result of the use of umbilical catheter.

The clinical presentation of omphalitis is variable and depends on the severity of infection. It may range from erythema and swelling of varying degrees, warmth, purulent discharge, tenderness, and/or foul odour from the umbilical stump.^{6,7} Patients may

also have systemic signs of sepsis, including lethargy, irritability, poor feeding, and fever or hypothermia.³ Based on clinical symptoms, omphalitis can be divided into mild omphalitis (also referred as local umbilical cord infections or limited); as if the umbilical cord is tender, producing pus, or foul smelling, but the redness limited to an area less than 1 cm around the base of the umbilical cord. Omphalitis is categorized moderate mild symptoms when the involved area is more than 1 cm. While severe omphalitis when infection symptoms has wide spread such as abdominal distension leading to peritonitis accompanied with or without sepsis symptoms.³ In this case, erythema was found on skin around the umbilicus with a diameter of 5-6 cm accompanied by abdominal distension, respiratory distress, fever, and irritability leading to omphalitis with systemic symptoms of peritonitis and sepsis.

Although the diagnosis of primary peritonitis can be established with certainty only after thorough laparotomy to exclude a primary intraabdominal site of infection, it can usually be surmised from examination of the peritoneal fluid. Fluid obtained at peritoneal aspiration should be analyzed for a gram stain and culture should be performed.¹ In this case, a *georgiviae enterobacter* organism was found in pus culture test; which is a gram negative bacteria and one of the bacteria originates from a hospital environment. The discovery of this bacteria in intraabdominal pus fluid provides information that this type of bacteria has become the source of infection which originates from the hospital environment.

Management case principle of peritonitis in neonates is divided into five initial diagnostic; initial diagnostic evaluation, resuscitation, timing of initiation of antimicrobial therapy,

appropriate intervention and microbiologic evaluation. The correct diagnosis made as soon as possible will help to reduce the mortality.⁸ In this case, the presence of peritonitis has suspected from the beginning of patient arrives. Resuscitative measures must be applied early and the infant rendered normothermic and maintained in this state, for many of these babies are markedly hypothermic when first seen, and will not stand surgery well. Nursing in an incubator at a controlled temperature is important, as well as the maintenance of a normal body temperature during operation, and the prevention of heat loss. Adequate oxygenation, intravenous therapy and gastric aspiration should be started early to treat shock, dehydration, and to reduce abdominal distension. Any underlying acidemia, often present in shocked, ill infants, should be corrected by using sodium bicarbonate intravenously in the appropriate dose. Antibiotic therapy should be started early to counter infection.⁸ The initial choice of antimicrobial drug is often empirical, based on the most likely pathogens.³ In this case, empirical antibiotic therapy has been administered since the patient arrives.

The gross abdominal distension, may sometimes impede respiration and endanger life; peritoneal aspiration of air may then be life-saving. Diagnostic and therapeutic peritoneal aspiration may occasionally be helpful in establishing the diagnosis of peritonitis and to reduce intraabdominal tension. The actual surgical treatment is that of the underlying cause, overcoming obstruction, closing perforations, cleansing and draining the peritoneal cavity.⁸ In this case, the presence of abdominal distension which followed with respiratory distress need to managed promptly with decompression action such as

orogastric tube insertion and peritoneal aspiration.

Umbilical cord infection can be prevented by doing a right and proper treatment, within principle of the dry and clean. In babies who are cared at home, apply antiseptics on umbilical cord is not necessary. In contrast to babies who are hospitalized, especially those with umbilical catheterization, the use of topical antiseptics might needed to reduce the occurrence of nosocomial infection in the umbilical cord.⁶ Umbilical catheterization for resuscitative measures, as in a cardiac or respiratory arrest, an umbilical vein is only cannulated to approximately 2 to 4 cm beyond the mucocutaneous junction and only until adequate blood return is obtained. In non-emergencies, the catheter is advanced until it is in the inferior vena cava above the level of the ductus venosus and hepatic veins, and below the level of the right atrium. Length of catheter in cm can be calculated using the formula $1.5 \times \text{birth weight (kg)} + 5.5 \text{ cm}$.⁹ In observation, ensure UVC is secure, dry and record measurement of catheter insertion and validate position. Observe the umbilical area for signs of local infection. Observe colour of abdomen and report any abdominal distension or discomfort.¹⁰ Umbilical vein catheter durations beyond the current Centers for Disease Control and Prevention recommended limit of 14 days may be reasonable. Removal of the catheter as soon as possible are recommended after detection of an infection or obstruction sign.¹¹ In this case, hospitalized babies using umbilical catheter. During the baby care in hospital, umbilical cord and catheter should be cared and monitored properly; including the position of the catheter, its function and the presence of early signs of local or systemic infection.

Complications of omphalitis include umbilical phlebitis, portal vein thrombosis, liver abscesses,

peritonitis, and sepsis.¹¹ The overall mortality of omphalitis is estimated at 7–15% and is significantly higher (37–87%) if complicated by sepsis or peritonitis.^{2,3} In this case, the patient's baseline prognosis was good where peritonitis was early diagnosed and immediately followed with laparotomy surgery. Unfortunately, during the postoperative treatment, she experienced worsening for several times and after treatment for 20 days, the baby eventually died with sepsis as a causes of death.

SUMMARY

A 22 days infant, referred to Sanglah Hospital with diagnosis of necrotizing enterocolitis. Her stomach look larger than normal, skin around the center belly appeared to be reddish and also experiencing fever and vomiting. The stomach has started to grow, more or less a week before being referred. She was born spontaneously per vagina at 36 weeks of gestation age, with APGAR score of 3-4-6. Her birth weight was 2000 gram. A resuscitation given followed by insertion of umbilical catheter for fluid resuscitation. She stayed in hospital for around 13 days. She used umbilical catheter as intravenous line straightly from birth until the age of 7th days then replaced with a peripheral venous catheter. Abdominal examination revealed a distention with skin erythema and decreasing bowel sound. Free air image in right side of abdomen and right subdiaphragma on X-ray impressed a pneumoperitoneum. Orogastric tube insertion and peritoneal aspiration by abdominal paracentesis is taken, followed by laparotomy. An existence of pocketed abscess intraperitoneal around the *ligamentum teres hepatis* were found and were suspected caused by infection originating from the use of umbilical catheter. On a leak test, there was no perforation from

gaster to the distal part of the colon. Baby diagnosed with peritonitis generalisata with pocketed abses intraperitoneal et causa omphalitis grade III and suspected late onset neonatal sepsis. Unfortunately, during the postoperative treatment, she experienced worsening and after 20 days, she died with sepsis as a cause of death.

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