

Omphalitis

Clinical Presentation and Approach to Evaluation and Management

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Abstract: Omphalitis is an uncommon but potentially serious infection in neonates. Findings include erythema and induration around the umbilical stump, and purulent drainage may be present. Fever and signs of systemic illness may occur, or there may only be signs of localized soft tissue infection. Until recently, there have been very few cohort studies of omphalitis in high-income countries, and no literature was available regarding the incidence of concurrent serious bacterial infection such as meningitis or urinary tract infection. A recent large, multicenter study suggests that most omphalitis presents as localized soft tissue infection, with very low rates of concurrent serious bacterial infection or adverse outcomes. Underlying urachal abnormalities should be considered in the infant with umbilical drainage. Treatment of omphalitis consists primarily of antibiotic administration, with surgical intervention rarely needed. Although antibiotics are typically administered intravenously, there may be a role for oral antibiotics in some lower risk infants with omphalitis.

Key Words: omphalitis, serious bacterial infection, neonatal fever

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TARGET AUDIENCE

This CME activity is intended for physicians and advanced practitioners who care for infants in the acute care setting, including emergency departments, urgent care, and primary care clinics.

LEARNING OBJECTIVES

After completion of this article, the reader should be better able to:

1. Identify the signs and symptoms of omphalitis and distinguish it from other noninfectious causes of umbilical inflammation.
2. Describe the incidence of concurrent serious bacterial infection and other potential adverse outcomes associated with omphalitis.
3. Discuss the diagnostic evaluation and treatment approach to the infant with omphalitis.

CASE

A 12-day-old girl is brought to the emergency department with concerns regarding her umbilical cord. Parents noticed redness and swelling around the cord 2 days ago, and a small amount of drainage today. She was a term gestation of an uncomplicated pregnancy, with an unremarkable perinatal course. She has had no fevers. She has seemed slightly fussier than usual but is otherwise asymptomatic and has been feeding well. On arrival to the emergency department, her temperature is 37.8°C rectally, and vital

signs are normal. She is nontoxic appearing. Examination is otherwise notable only for some crusting of the umbilical stump with dried drainage, with approximately 2 cm of circumferential surrounding erythema, without fluctuance. Laboratory results demonstrate a normal white blood cell count, absolute neutrophil count, and urinalysis. Ultrasound is consistent with cellulitis, with no abscess and no evidence of underlying urachal anomalies. Blood and urine cultures are sent, and she is admitted to the hospital for treatment with intravenous (IV) antibiotics.

OVERVIEW AND EPIDEMIOLOGY

Omphalitis is a soft tissue infection involving the umbilicus and surrounding tissues, characterized by erythema and induration around the umbilical stump, and may include purulent discharge or fluctuance.¹ Although omphalitis is relatively rare, it has historically been associated with significant morbidity and mortality and carries a risk of adverse outcomes. Advances in cord care and hygiene have led to decreases in the prevalence, mortality, and complication rate of omphalitis.² Estimated incidence in high-income countries is less than 1%, but estimated incidence in low-income countries is as high as 6%,^{3,4} with reported mortality rates between 7% and 15%.⁵ In addition to inadequate cord hygiene, risk factors for the development of omphalitis reported in the literature include premature or prolonged rupture of membranes, maternal infection, low birth weight, history of umbilical catheterization, and home birth.^{4,6} *Staphylococcus aureus*, *Streptococcus pyogenes*, and Gram-negative bacteria are the most commonly reported pathogens,^{5,7} with anaerobes reported as well.⁸ Sepsis is the most common reported complication of omphalitis.⁶ Other reported complications include necrotizing fasciitis, peritonitis, intestinal necrosis, small bowel evisceration, liver abscess, and portal vein thrombosis.^{9,10} Until recently, there were very few cohort studies of omphalitis in high-income countries, with rates of positive blood cultures as high as 13% and mortality as high as 7%.¹

CLINICAL PRESENTATION

A recent large, multicenter cohort of infants described the clinical presentation and evaluated the rates of concurrent serious bacterial infection (SBI) and adverse outcomes in infants with omphalitis.¹¹ In this cohort, most cases of omphalitis presented with mild, localized disease. The median age was 16 days, with a range of 8 to 22 days. The majority had no fever and were described as well-appearing. Rates of positive blood, urine, and cerebrospinal fluid (CSF) cultures among the entire cohort were 0.9%, 0.5%, and 0.4%, respectively. The incidence of any adverse event, defined as a positive blood, urine, or CSF culture, clinical diagnosis of sepsis or shock, necrotizing soft tissue infection (NSTI), endotracheal intubation, vasopressor use, or death, was 3.7%, including one death in the cohort of 566 infants. Although most had laboratory studies performed, there were no statistically significant associations between peripheral white blood cell count, absolute neutrophil count, or C-reactive protein values and the presence of concurrent SBI or adverse outcomes. Surface cultures from the site of infection most commonly grew methicillin-sensitive *S. aureus*, with methicillin-resistant *S. aureus* in 11%. *Escherichia coli*, other

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Gram-negative bacteria, and *Enterococcus* accounted for the remaining minority. Approximately one quarter had ultrasound performed, and of these, approximately one quarter had underlying urachal anomalies, representing 7% of the cohort. The majority were admitted to the hospital and treated with IV antibiotics, with 6% undergoing some form of surgical intervention.

APPROACH TO EVALUATION

As omphalitis is a clinical diagnosis, evaluation begins with a thorough history and physical examination. Special attention should be paid to risk factors and signs and symptoms of systemic illness. History of fever should be documented, as well as nonspecific symptoms that may be suggestive of systemic illness in neonates, such as excessive fussiness or irritability, lethargy, and poor feeding. Assessment of vital signs and general appearance, including airway status and perfusion, are of primary importance, as infants with omphalitis are at risk for sepsis. Examination of the umbilical region should document the presence of erythema and induration, as well as amount and quality of drainage and fluctuance. If erythema and induration are not present, alternative noninfectious cord conditions, such as local irritation or umbilical granuloma, should be considered.

Diagnostic evaluation of the infant with omphalitis may be tailored to the specific clinical scenario. If fever is present, or if there is clinical concern for systemic illness, the most recent American Academy of Pediatrics neonatal fever guidelines¹² should be followed. As most infants with omphalitis are younger than 21 days old, this would include inflammatory markers and cultures of blood, urine, and CSF. In afebrile well-appearing infants, blood cultures may be prudent given the small risk of bacteremia, but routine CSF cultures may not be indicated. Inflammatory markers do not appear to be correlated with risk of adverse outcomes. As urachal anomalies may present with abnormal appearance or drainage from the umbilicus,¹³ urine cultures should be considered in all patients with omphalitis, and ultrasound should be considered if umbilical drainage is present or there is clinical concern for abscess formation. When possible, surface cultures from the site of infection should be obtained.

MANAGEMENT

Febrile or ill-appearing infants ≤ 21 days of age should be admitted to the hospital and treated with IV antibiotics. Typical antibiotic regimens target the most reported organisms, specifically *S. aureus* and Gram-negative bacteria. Empirical methicillin-resistant *S. aureus* coverage should be considered depending on local resistance patterns. Surgical consultation should be obtained if there is concern for abscess formation or NSTI as incision and drainage or surgical debridement may be indicated. Although most infants with omphalitis have historically been admitted for IV antibiotics, there may be a group of lower-risk, afebrile, well-appearing infants who may not require admission, and outpatient treatment with oral antibiotics may be reasonable if close follow-up is assured.

SUMMARY

This review article discusses the epidemiology, clinical presentation, and approach to evaluation and management of omphalitis, an uncommon but potentially serious infection in neonates. Although most infants with omphalitis present with mild, localized disease, they may be at risk for complications such as sepsis and NSTI. The incidence of concurrent SBI is very low. Blood and urine cultures should be considered in all infants with omphalitis, and surface cultures from the site of infection should be obtained if possible. Ultrasound should be considered given the association with urachal anomalies. Surgical consultation is indicated if abscess or NSTI is present. Febrile infants with omphalitis should be evaluated and managed according to accepted neonatal fever guidelines, with admission for IV antibiotics. Although treatment of omphalitis has historically included admission for IV antibiotics in most cases, a trial of outpatient treatment with oral antibiotics may be appropriate in some afebrile well-appearing infants.

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