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Case Report

Simultaneous Fungal and Microbial Infection in Neonate with Multiple Lumbosacral Abscesses: A Case Report

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ABSTRACT

Background: Lumbosacral abscesses in neonates are an uncommon yet significant medical condition, often linked with congenital anomalies or immunodeficiency disorders. The complexity of these infections is exacerbated when they involve multiple abscesses and/or coexist with simultaneous microbial and fungal infections. This report presents a unique case of a neonate who developed multiple lumbosacral abscesses due to mixed bacterial and fungal infections, a scenario not previously documented in the literature.

Case Report: An 8-day-old male neonate was delivered via normal vaginal delivery at 36 weeks and 5 days without reported maternal complications. Initial symptoms included irritation and cutaneous lesions in the genital and lumbosacral areas, which progressively worsened despite topical treatments and antibiotics administered at initial healthcare visits. Upon hospitalization, the patient exhibited multiple lumbosacral abscesses, ranging from 1.5 to 8 cm, alongside systemic signs such as mild fever and irritability. Laboratory analysis revealed elevated inflammatory markers (erythrocyte sedimentation rate=21 mm and C-reactive protein=27 mg/dL) and positive KoH smears indicating potential fungal presence. Pathogen identification through culture showed *Staphylococcus aureus*, *Klebsiella*, and *E. coli*, alongside fungal infection. Imaging studies ruled out spinal canal involvement, and a comprehensive treatment involving antifungal therapy (fluconazole) and broad-spectrum antibiotics (Cefotaxime and Vancomycin) was initiated. The patient's condition improved post-intervention, and he was discharged after two weeks.

Conclusion: This case emphasizes the diagnostic and management challenges posed by simultaneous fungal and bacterial infections in neonates. Co-infections can complicate clinical presentations, prolong hospitalization, and necessitate rigorous diagnostic and therapeutic strategies. Accurate identification of pathogens and the selection of appropriate antimicrobial agents are imperative for effective management. Despite a successful outcome in this instance, the absence of follow-up underscores the necessity for consistent post-discharge monitoring, particularly in vulnerable populations. Continued research is essential to better understand these co-infections and improve clinical outcomes in neonatal care.

Keywords: Bacterial abscesses, Candidiasis, Mycoses, Newborn, *Staphylococcus aureus*

Introduction

Lumbosacral abscesses are a rare condition in neonates, with only a limited number of previously reported cases highlighting their complexity (1). These abscesses can occur in the lumbosacral region, which is an uncommon site for such infections in this age group. When they do arise, these infections are often associated with underlying congenital anomalies—such as spina bifida or other neural tube defects—or immunodeficiency disorders that compromise the neonate's ability to fight infections (2). The coexistence of multiple abscesses with mixed

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microbial and fungal infections further complicates the clinical picture. Therefore, the onset of lumbosacral abscesses in neonates necessitates prompt recognition and appropriate management to mitigate the risk of potentially serious complications. To our knowledge, there are no previous reports of simultaneous fungal and microbial infection in neonates with multiple lumbosacral abscesses. Hence, in this report, we present the case of the abovementioned disease for the first time.

Case report

A-8-days male neonate was born via normal vaginal delivery (NVD) from the mother (G3P2L3Ab0) at gestational age 36 weeks and 5 days without any history of diseases before and during pregnancy. He was attended with the chief complication of irritation and cutaneous lesions on her buttock. His mother reported several pustules in the genital area, which started on the third day of birth. On the fifth day of birth, due to the intensification of redness in the genitalia and lumbosacral area, he went to the doctor and underwent topical treatment (including 2% mupirocin cream and 1% hydrocortisone). As the symptoms worsened on the sixth day of birth, the patient was again treated with cephalexin syrup and 25% zinc oxide cream. However, on the 8th day of birth, due to the lack of improvement and worsening of skin lesions, he was referred to our medical center and hospitalized with a possible diagnosis of cellulitis and skin abscess.

On examination, the baby was alert but a little restless. Numerous pustules were seen in the genital (Figure-1A) and also redness and warmest of skin on the lumbosacral and buttock regions were observed. In addition, multiple lumbosacral abscesses were noted; however, the exact number of them was not identified, and their size was from 1.5 to 8 cm (Figure-1B). Heart and lung auscultation examinations were normal. Except for a mild fever (37.7 ˚C, axillary), the baby's vital signs were within normal limits. Also, the umbilical cord was not separated at the time of hospitalization and was clean.

Laboratory tests, including erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), blood culture (×2) as well as a smear of pustules in terms of microbial culture and KoH smear were performed in the standard manner. All the samples from pustules and blood were taken via sterile condition via expert staff and it was repeated for three separate samples. Also, all the cultures were prepared as standard methods.

Briefly, via sterile syringe a sample of pustules was applied to blood agar, EMB, and chocolate agar plate separately and stored incubator for 3-5 days. To perform a Gram stain on blood samples, first prepare a thin smear on a clean microscope slide using a drop of well-mixed anticoagulated blood. Once dry, fix the smear by passing it through a flame or immersing it in methanol. Stain with crystal violet for 1 minute, then apply Gram's iodine for another minute before decolorizing with ethanol or acetone until the solvent runs clear. Rinsed them with water, counterstained with safranin for 30 seconds, and rinsed again. Allow the slide to dry, then examine it under a microscope. Gram-positive bacteria appear purple, while Gram-negative bacteria appear pink/red, aiding in their identification and classification.

All the laboratory findings were in normal value (Table-1); however, ESR=21mm, CRP=27mg/dL, and KoH smear (fungal smear) were positive, which led to the initial diagnosis of a fungal abscess.

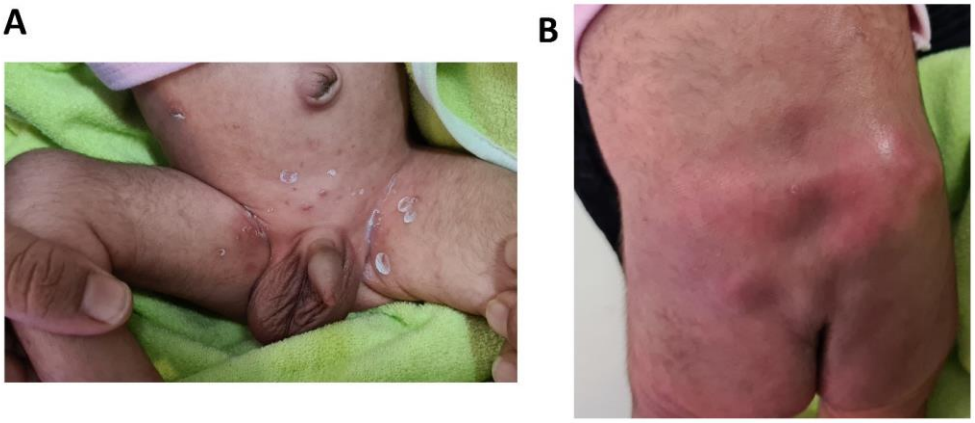

Figure1. The physical examination of the patient revealed some pustules on his genitalia (A) and multiple abscesses (B) on his lumbosacral and buttock areas.

Table 1. Laboratory findings of the patient

Variables		Normal value	Laboratory results
CBC			
WBC ($10^3/\mu L$)	Absolute count	5000-15000	11.3
	Neutrophil (%)		39
	Lymphocyte (%)		34.7
	Mixed(%)		26.3
HCT		(32-49)	39.7 %
Hb (dL)		14-18	12.3
Plt$10^3/\mu L$		150-450	384
Urea (mg/dL)		15-45	47
Creatinine (mg/dL)		0.44-0.666	0.1
CRP (mg/dL)		0-6	27
ESR (mm)		1-10	21
BS (mg/dL)		60-110	67
Bill total (mg/dL)			10.7
Bill Direct (mg/dL)			0.7
PT (Sec)		10-15.3	12.3
PTT (Sec)		26.9-74.1	36
KOH smear			
Abscess			Positive
Genitalia lesions			Positive
Microbial Culture			
Abscess			*Staphylococcus aureus, Klebsiella*
Genitalia lesions			*E.coli, Klebsiella*

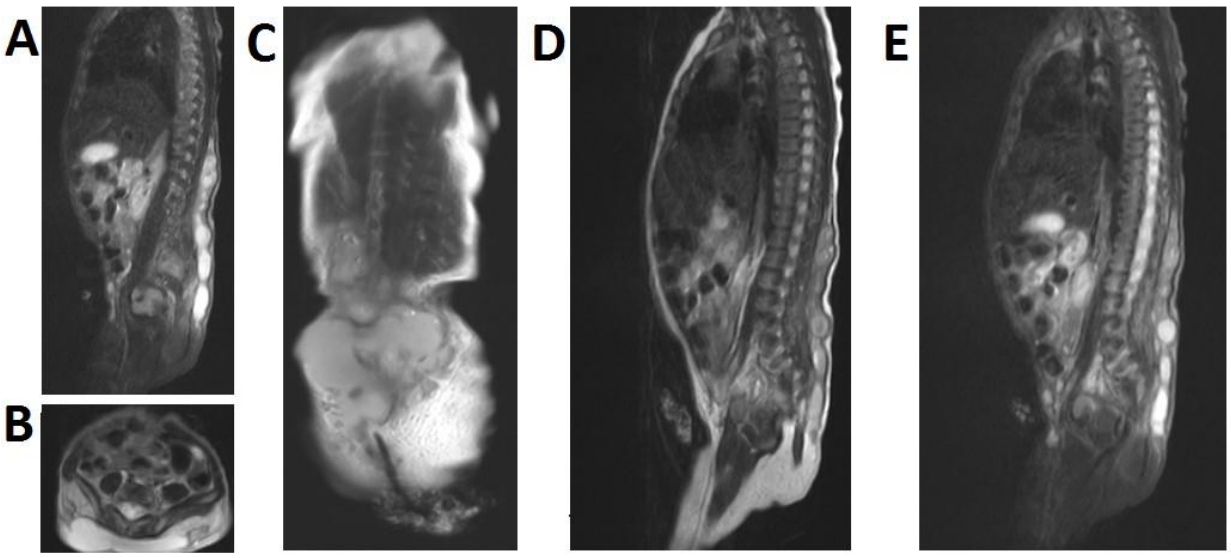

Figure-2. Lumbosacral MRI of patient. The sagittal T1-weighted (A) and T2-weighted axial (B), coronal (C), and sagittal (D) views as well as STIR sequences (E) demonstrated multiple variable size solid and cystic lesions in the soft tissue area of the waist (Since T11 till below the level of coccygeal bone) with no sign of significant invasion of vessel, nerve, and muscle. Edematous change is shown in the mentioned soft tissue and right side gluteus medius and is less likely in the medial aspect of bilateral gluteus maximus

Therefore, he underwent empirical anti-fungal treatments (fluconazole) and imaging investigations such as lumbosacral MRI, cardiac echography, chest x-ray, and sonography of soft tissue of the buttock. In the ultrasound of the soft tissue of the lumbosacral region, the image of the iso and hetero echoic subcutaneous region without clear vascular flow was seen with the extension to the back region, which looks like an accumulation of thick fluid. Also, lumbosacral MRI revealed that there was no connection between abscesses and any abscesses with the spinal cord canal (Figure-2). Initially, abscesses were removed using needle aspiration, and a sample was taken from the white puss-like liquid and sent for smear, analysis, and culture. Then, he underwent abscess removal via drainage in a sterile condition. Smears of genitalia and abscesses were positive for fungal infection and *Staphylococcus aureus*, *Klebsiella*, and *E. coli*, respectively. Although there was no risk factor in the baby and his mothers, he assessed in terms of

immune disorders that revealed no positive findings.

He was treated with antibiotics (Cefotaxime 160 mg every 8 hours and Vancomycin 32 mg every 8 hours) and fluconazole (19 mg/daily) for two weeks, and discharged in good condition. Despite the patient's parents were advised to return in another week for the assessment of the treatment outcome and the final condition, unfortunately, the return visit was not made and the patient was not followed up after discharge.

Ethical Approval

The study was approved by the Ethics Committee of Hormozgan University of Medical Sciences (IR.HUMS.REC.1401.229).

Discussion

Simultaneous fungal and bacterial infections in infancy carry significant clinical and diagnostic implications (3). The coexistence of these two types of infections is rare, but is uncommon and mostly observed in vulnerable populations such as neonates and infants with compromised immune systems (2).

Understanding the importance of simultaneous fungal and bacterial infections in infancy is crucial for accurate diagnosis, appropriate treatment, and successful management of these complex cases (4). Firstly, the presence of simultaneous fungal and bacterial infections poses a diagnostic challenge. Indeed, symptoms such as fever, irritability, poor feeding, and respiratory distress can be seen in both fungal and bacterial infections, making it difficult to differentiate between the two based solely on clinical presentation (5). Accurate diagnosis often requires laboratory tests such as blood cultures, fungal cultures, and molecular diagnostics, which may not be readily accessible in all healthcare settings (6).

Another diagnostic challenge lies in identifying the specific pathogens causing the dual infection. Culturing both fungal and bacterial pathogens from clinical samples can be time-consuming, and rapid diagnosis is crucial in guiding appropriate treatment (7). Additionally, distinguishing between colonization and true infection can be challenging, especially in cases where both fungi and bacteria are detected but only one is causing clinical symptoms (8). This complexity emphasizes the importance of thorough clinical evaluation and close collaboration between medical teams, including infectious disease specialists and microbiologists (9).

Secondly, the combination of fungal and bacterial infections can significantly influence disease progression and treatment outcomes (7). The interplay between these two types of pathogens can lead to synergistic or antagonistic interactions, impacting the severity of the infection, response to treatment, and potential for complications (8). The presence of both types of infections may contribute to increased tissue destruction, delayed wound healing, and the development of resistant strains (10). Therefore, a thorough understanding of the underlying microbial interactions is essential in managing these complex cases effectively.

Therapeutically, managing simultaneous fungal and bacterial infections requires a comprehensive and targeted approach. One of the challenges lies in selecting appropriate antimicrobial agents that can effectively eradicate both types of pathogens (10). Certain antifungal and antibiotic agents may have synergistic or antagonistic effects, making drug selection and dosing crucial in achieving optimal clinical outcomes (11-13). Additionally, factors such as drug interactions, potential toxicity, and age-appropriate dosing further complicate the therapeutic decision-making process (14).

Furthermore, the duration of therapy can be challenging to determine. In some cases, fungal and bacterial infections may resolve at different rates, requiring a tailored treatment plan that considers the specific patient's response, eradication of pathogens, and the risk of relapse (15).

Finally, simultaneous fungal and bacterial infections in infancy may have long-term implications for the affected individuals. In severe cases, these infections can result in chronic complications, such as recurrent infections, impaired growth and development, and long-lasting organ damage (17).

Additionally, the immune response in infants differs from that in adults, further complicating the management of simultaneous fungal and bacterial infections (17). Immature immune systems in infants may have impaired recognition and response to pathogens, making them more susceptible to infections (18). Moreover, inappropriate or exaggerated immune responses can result in collateral tissue damage. Consequently, physicians need to consider the delicate balance between controlling the infections and minimizing immune-mediated injuries when designing treatment plans for

infants with dual infections.

In our patient, the skin lesions initially resembled diaper dermatitis and a simple rash, which was treated with topical antibacterials. However, due to the lack of response to treatment, cutaneous candidiasis, as well as *staphylococcal* cellulitis, were considered more important differential diagnoses. Therefore, additional diagnostic measures such as smear and culture were performed to investigate bacterial and fungal infection. Although blood cultures were negative, a smear and culture of both lesions and abscess samples indicated fungal and bacterial infections.

Studies have suggested some factors, such as age below 37 weeks, low birth weight, premature rupture of the membranes, etc., as risk factors for fungal infection in newborns (11, 14, 18). However, none of these risk factors were present in our patient. Also, all investigations to determine the status of the immune system and any possible disorders were negative.

Conclusion

Overall, successfully managing simultaneous fungal and bacterial infections in infancy necessitates careful clinical assessment, timely and accurate diagnostics, interprofessional collaboration, and a nuanced therapeutic approach. Continued research and understanding of these co-infections are necessary to address the diagnostic and therapeutic challenges encountered in the management of such cases.

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Conflicts of interest

The authors declare no conflicts of interest.

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