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Establishing the diagnosis of fournier gangrene using the modified laboratory risk indicator for necrotizing fasciitis (LRINEC) score in children: A case report

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ABSTRACT

Fournier's gangrene (FG) is a form of necrotizing fasciitis that affects the genital and perineal areas. It is rare case in children and is often difficult to diagnose early, contributing to high morbidity and mortality. Prompt diagnosis and aggressive management are essential to reduce life-threatening complications. We report 2 mo. male infant presented with fever and an abrupt onset of rapidly spreading erythematous rash. Laboratory examinations showed leukocytosis, anemia, neutrophilia, hyponatremia, and elevated C-reactive protein (CRP) levels. An evaluation was performed using the pediatric laboratory risk indicator for necrotizing fasciitis (P-LRINEC), a modified version of the LRINEC score. The patient had a total score of 10, indicating a high risk of necrotizing fasciitis. The patient underwent immediate debridement and empirical antibiotic therapy. A 2 wk post-therapy evaluation showed significant clinical improvement. Fournier's gangrene in children often resembles other skin infections, making early diagnosis difficult. The 3 main characteristics of FG are sudden onset, rapid progression, and lack of a clear specific cause. The P-LRINEC score is a diagnostic tool that can aid in the early detection of FG in children. This case highlights the importance of early recognition and management of Fournier's gangrene in children using the P-LRINEC score, which is more appropriate for pediatric patients, to enable timely intervention. Increased clinical awareness and further validation through larger-scale studies are needed.

ABTRAK

Fournier gangrene (FG) adalah bentuk fasciitis nekrotikan yang mengenai area genital dan perineum. Penyakit ini jarang terjadi pada anak-anak dan sering kali sulit didiagnosis secara dini, yang berkontribusi terhadap tingginya angka morbiditas dan mortalitas. Diagnosis cepat dan tata laksana agresif sangat penting untuk mengurangi komplikasi yang dapat mengancam jiwa. Dilaporkan seorang bayi laki-laki berusia 2 bulan dengan demam dan munculnya ruam eritematosa secara mendadak yang menyebar dengan cepat. Pemeriksaan laboratorium menunjukkan leukositosis, anemia, neutrofilia, hiponatremia, serta peningkatan kadar C-reactive protein (CRP). Evaluasi menggunakan *pediatric laboratory risk indicator for necrotizing fasciitis* (P-LRINEC), suatu modifikasi skor LRINEC. Pasien mendapatkan total skor 10, yang mengindikasikan risiko tinggi fasciitis nekrotikan. Pasien segera menjalani debridemen dan terapi antibiotik empiris. Evaluasi dua minggu pasca-terapi menunjukkan perbaikan klinis yang signifikan. Fournier gangrene pada anak sering kali menyerupai infeksi kulit lainnya, sehingga mempersulit diagnosis dini. Tiga karakteristik utama FG adalah onset mendadak, progresi cepat, dan tidak adanya penyebab spesifik yang jelas. Skor P-LRINEC merupakan alat bantu diagnostik yang dapat meningkatkan deteksi dini FG pada anak. Kasus ini menekankan pentingnya pengenalan dan penanganan dini Fournier gangrene pada anak menggunakan P-LRINEC yang lebih sesuai sehingga dapat diberikan intervensi tepat waktu. Peningkatan kewaspadaan klinis dan validasi lebih lanjut diperlukan melalui studi berskala lebih besar.

Keywords:
fournier gangrene;
P-LRINEC;
necrotizing fasciitis;
pediatrics;
debridement

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INTRODUCTION

Fournier's gangrene (FG) is a life-threatening infection that severely impacts the perineum, perianal area, and external genitalia. It falls under the category of necrotizing fasciitis and shares similar causes and treatment strategies with this broader condition. Men aged 30 to 60 yr, along with older individuals, are most at risk. The condition is worsened by underlying health issues such as diabetes, excessive alcohol consumption, or other medical complications.[1] Fournier's gangrene is exceptionally rare in children. When it does occur, it is often associated with trauma, conditions causing immune system suppression, or nephrotic syndrome. These factors can result in significant swelling in the perineal area and deterioration of the skin.[2] The study included 30 patients with FG, identified through clinical examination and patient history. Among them, 29 (96.6%) were males, while only one (3.3%) was female.[3] The primary causes of FG are commonly reported in the following order: gastrointestinal infections, including perianal and perirectal abscesses, genitourinary tract infections, and skin injuries in the perineal area due to local trauma.[4]

Fournier's gangrene is an extremely uncommon disease with an incidence of approximately 1.6 cases per 100,000 men per year. The mean age of affected patients is 50.9 yr, and the male-to-female ratio is 10:1.[5] Fournier's gangrene cases are rarely reported in children. Pediatric necrotizing fasciitis has an incidence of 0.08 per 100,000 children per year. Pediatric cases of FG are often encountered in children younger than 3 y.o., where the possible cause is secondary infection due to dermatitis caused by baby diapers.[6] Fournier's gangrene is more common in adults with comorbidities like diabetes and hypertension. However, in children, it may arise from trauma, insect bites, circumcision, burns, anorectal or periurethral disease, systemic infections, immunosuppression, or the use of antiinflammatory drugs.[2]

In 1883, Jean Alfred Fournier described a case involving five healthy young men who suddenly developed gangrene in their genital area. He identified 3 key features of the condition: sudden onset, rapid progression, and unknown cause.[3] Unlike the adult population, FG in children is mainly associated with *Streptococcus* and *Staphylococcus* species, with *Escherichia coli*, *Pseudomonas*, *Bacteroides*, and anaerobes.[2] The diagnosis of FG can generally be made through clinical examination, but sometimes requires additional supporting examinations, such as radiology, for atypical clinical presentations.[7] The laboratory risk indicator for necrotizing fasciitis (LRINEC) scoring system was developed through a cohort study in adults, while its usage in children is rarely reported. Laboratory parameters in the LRINEC score used for adult patients are often inappropriate for children and lead to delayed diagnosis.[7]

Delayed therapy is associated with a 10 to 60% increase in mortality among children. Most deaths are caused by sepsis or multiorgan failure.[7] Fournier's gangrene is a rapidly progressing necrotizing fasciitis of the perineal region with a polymicrobial origin. Successful treatment requires early diagnosis, aggressive fluid resuscitation, broad-spectrum antibiotics, prompt surgical exploration, and repeated debridement.[2] This paper reports a case of a 2 mo. boy with FG. The discussion focused on the patient's diagnosis and therapeutic therapy. The purpose of this case study was to describe the clinical outcomes and steps in the diagnosis of FG in children using the pediatric laboratory risk indicator for necrotizing fasciitis (P-LRINEC) score to provide immediate

therapy and reduce the mortality rate associated with FG in pediatric patients.

The P-LRINEC score is a modified version of the original LRINEC score and was developed to aid in the early identification of necrotizing fasciitis in children, including FG. Unlike the LRINEC, which uses six laboratory parameters, the P-LRINEC uses two markers—serum CRP and serum sodium—making it more feasible for use in pediatric settings. The goal is to improve diagnostic accuracy while simplifying clinical decision-making, particularly when rapid intervention is critical for patient survival. Putnam *et al*.[8] developed the P-LRINEC score through a case-control study that compared pediatric NF patients to those with severe soft tissue infections requiring surgical consultation but not necrotizing in nature. The study found that CRP levels >20 mg/L had a sensitivity of 95% (95% CI: 79–100%), while serum sodium levels <135 mEq/L had a specificity of 95% (95% CI: 82–100%) for detecting NF. The area under the ROC curve (AUC) for the P-LRINEC was 0.84, compared to 0.70 for the original LRINEC, suggesting a higher discriminative ability in pediatric populations.

CASE

A 2 mo. boy was brought to the emergency room of Wates District Hospital, Kulon Progo, Yogyakarta due to redness and swelling of the genitals. Twenty-three days before the visit (PRS), the patient's parents complained that the child had a fever and was brought to the emergency room of the hospital. At that time, he was given fever-reducing drugs and then taken home, but the fever persisted. Twenty days before PRS, the fever persisted, and an initial reddish spot appeared on the right thigh, then spread quickly to the lower abdomen area and caused swelling of the genitals. The child was then brought back to the emergency room of the hospital and diagnosed by the pediatric department for observation of fever and cellulitis. The patient was hospitalized and treated with intravenous fluids D5 ¼ NS 12.5 cc per hr, cefotaxime injection 265 mg per 8 hr, metronidazole injection 40 mg every 8 hr, paracetamol drops 0.6 cc if feverish, and topical medication from the dermatologist with mupirocin cream applied twice daily.

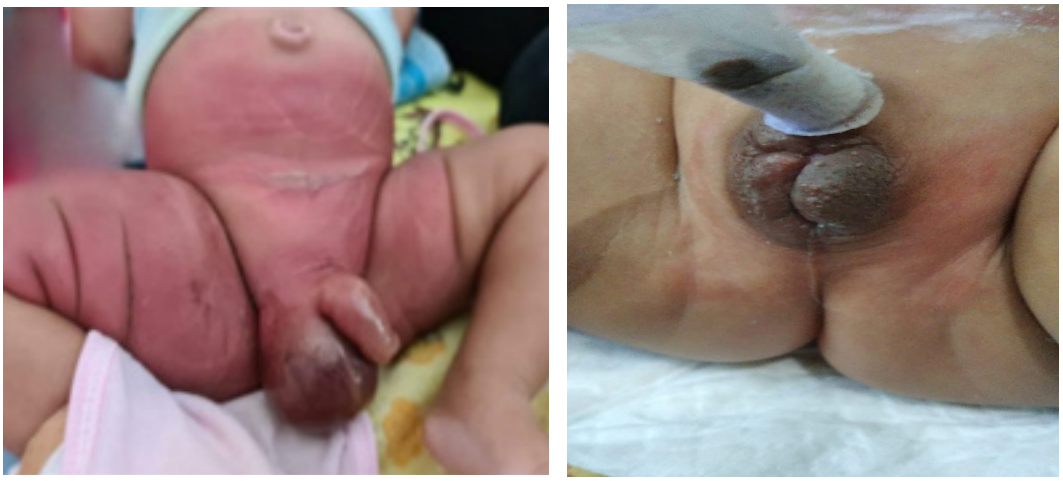
Eleven days before PRS, the redness had decreased, but pus appeared on the scrotal skin. The patient was then debrided by the surgery department and received 0.9% NaCl compress therapy once daily for 15 min, followed by application of Intrasite® gel. One week after debridement, the lesion was felt to be getting smaller, and the reddish spots were reduced. A history of previous similar complaints was denied by the patient's parents, a history of using diapers (Sweety®, only at the beginning of the first fever complaint), and a history of insect bites or previous wounds was denied by the patient's parents, and a history of contact with bath soap using soap (Cussons®). The child is the second of two children, born vaginally with a gestational age of 40 wk and, birth weight of 3520 g. The history of antenatal care did not reveal any complaints. A history of similar complaints in the family was denied by the patient's parents, and no history of consanguinity was found.

On physical examination, the general condition was conscious and alert (compos mentis), the child appeared fussy, pulse frequency 195 times per min, respiratory frequency 30 kpm, temperature increased 40,1°C, SpO2 96%, body weight 5.3 kg, and no enlarged lymph node. Dermatovenereologic examination revealed erythematous patches with multiple erosions on the lower abdomen, lower back, right and left upper thighs. On the scrotum and penis, there was edema with partial erythematous patches as well as bullae

and erosions. Based on the history and physical examination, the differential diagnosis included FG, cellulitis, and pyoderma gangrenosum. Supportive examinations were then performed, including routine blood tests, blood sugar level, electrolytes, blood chemistry, routine urine, CRP, and blood culture. The CRP level, blood culture, peripheral blood smear (PBS), and Gram stain were conducted to assist in confirming the patient's diagnosis.

Initial routine blood examination results showed leukocytosis 43.45x10^3/UL, anemia with Hb 10.5 g/dL, decreased erythrocyte count 3.13x106/UL, and neutrophilia 85.8%. Electrolyte examination revealed hyponatremia 130.9 mmol/L, and random blood sugar examination showed hyperglycemia 85 mg/dL (normal value 50 - 80 mg / dL with GOD PAP method)[25,9] The CRP examination showed an increase of 139.90 mg/L. Blood culture results found no bacteria. Gram smear examination of the lesion revealed polymorphonuclear (PMN) cells but no bacteria. Peripheral blood smear examination showed a leukoerythroblastic morphology, possibly due to infection or hemolytic anemia. Urinalysis results are within normal limits. The results of supporting examinations were included in the P-LRINEC criteria to assess the risk of developing necrotizing fasciitis in patients, and a total score of 10 was obtained.

The patient was diagnosed with FG, and the last treatment from the pediatric department was to receive an antibiotic injection of ampicillin 250 mg every 6 hr, paracetamol drop 0.6 cc orally if fever occurred. After debridement by the surgical department, the patient received 0.9% NaCl compress therapy twice daily for 15 min, Intrasite® gel post-compress, and Topicare® from the Department of Dermatovenereology. A one-week follow-up after debridement showed improvement: the lesions on the scrotum were healing and shrinking, and the reddish lesions on the lower abdomen, lower back, and both thighs were reduced. The patient was then discharged and scheduled for routine follow-ups with the Department of Pediatric and the Department of Dermatovenereology to monitor lesion healing.



A B

FIGURE 1. Comparison: Before and after the debridement process. (A) Condition before debridement. (B) The result after debridement

This case study potentially serves as a cornerstone in the literature as it could highlight the successful diagnosis and treatment of a rare yet devastating condition in the pediatric population. This report contributes valuable insight into the utility of the P-LRINEC score in facilitating timely diagnosis and intervention, which are critical for reducing morbidity and mortality. By documenting the clinical progression, diagnostic process, and therapeutic approach in a 2 mo. infant, this case adds to the limited literature on pediatric FG and supports the need for heightened awareness and early recognition strategies in similar cases.

DISCUSSIONS

The term FG is derived from the French venereologist, Jean Alfred Fournier, who in 1883 found a case of gangrene with sudden onset and rapid development in the genital area in young adult men.[5] The cause of FG is often a polymicrobial infection caused by multiple organisms, including aerobic and anaerobic bacteria. The most common aerobic microorganisms identified are *E. coli*, *Klebsiella pneumonia*, and *S. aureus*. The most frequently encountered anaerobic microorganism is *Bacteroides fragilis*. Other organisms that have been reported in FG cases include *Candida albicans* and *Lactobacillus gasseri*.[10] The FG is often linked to underlying medical conditions that increase vulnerability. Diabetes is a common factor, affecting 20–70% of patients, while excessive alcohol consumption is reported in 25–50%. Among the studied cases, 66.6% had diabetes, 16.6% were over 70 y.o., 10% were immunocompromised, and 6.7% were on long-term steroid therapy. Less common factors included pelvic irradiation (3.3%) and colonic carcinoma (3.3%), with no cases linked to alcoholism or chemotherapy in that particular study.[3]

Fournier's gangrene infection occurs due to an imbalance between host immunity and the virulence level of the causative microorganism. Microorganisms enter through the portal of entry in the perineal area; then, due to the weakened immune system, the spread of disease or bacteremia can occur quickly. Polymicrobial infections produce a synergistic effect through enzyme production that promotes bacterial multiplication and spread. Thrombosis in the blood vessels causes a reduced supply of nutrients, reduced tissue oxygen intake and tissue hypoxia occurs. This tissue hypoxic condition triggers the growth of anaerobic bacteria and microaerophilic organisms, which will produce lecithinase and collagenase enzymes. These enzymes will then trigger further tissue destruction in the fascia (with a rate reaching 2-3 cm per hr), which causes the rapid spread of infection from the genital area to the abdominal wall and vital organs.[10]

This condition is extremely rare in children and is often linked to trauma, immune deficiencies, or nephrotic syndrome, which can lead to severe perineal swelling and skin damage.[2] Skin changes early in the course of the disease are subtle, with erythema, pain, and edema resembling classic cellulitis. As the disease progresses, the symptoms become more pronounced with darker discoloration of the lesions (dark or purplish erythema), bullae, and necrosis in the skin or subcutaneous tissue.[6] The most common clinical symptoms in patients diagnosed with FG are swelling of the external genital organs, pain, and high fever. The average time from the onset of symptoms to hospital admission is 5.1 ± 3.1 d. Moreover, delays in diagnosis after the onset of symptoms can lead to skin necrosis. Erythema can rapidly progress along anatomical fascial planes, with the potential to spread from the perineum to the clavicles along the anterior abdominal wall.[11] In this case,

the 2 mo. patient looked irritable with initial symptoms of fever and the sudden appearance of red spots that spread widely in a short time.

Fournier's gangrene is a polymicrobial necrotizing fasciitis that affects the genital, perineal, perianal, and surrounding areas. Its diagnosis is mainly clinical, relying on symptoms such as intense pain, redness, swelling, and crepitus in the affected regions. CT scans typically reveal subcutaneous emphysema, thickened fascia, and fluid accumulation. Laboratory tests and histopathological examination can be performed to assist in the diagnosis of FG.[12] Laboratory examination may show leukocytosis or leukopenia, neutrophilia, anemia, and lymphopenia. Other findings, such as electrolyte abnormalities with hyponatremia or metabolic acidosis, and impaired renal function, may also be found.[5] Blood and urine cultures, wound bed culture, blood gas analysis, and coagulation factors may also be performed.[13] In our patient, routine blood and electrolyte examinations showed results in the form of leukocytosis, anemia, neutrophilia, and hyponatremia. Renal examination results were within normal limits. Blood cultures were performed on the patient, but no bacteria were found. These findings may have occurred because the cultures were taken after the patient had been given antibiotics for 7 days.

Radiological examinations can include X-rays, ultrasonography (USG), computed tomography scans (CT-Scan), and magnetic resonance imaging (MRI). X-ray examination can show hyperlucency, which indicates the presence of gas in the soft tissue in the scrotal or perineal region, and edema in the soft tissue of the scrotum. Wall thickening with hyperechoic foci resembling artifacts, indicating the presence of gas in the scrotal wall, as well as a hydrocele, can be found on ultrasound examination. A CT-scan examination can show thickening of the soft tissue and inflammation.[13] MRI examination is rarely done because of the limited availability of equipment in each hospital. This tool can provide a broader picture of the spread of infection, so it is useful for more severe lesions. Subcutaneous emphysema, scrotal wall thickening, and fluid accumulation can be seen through MRI examination.[14] Radiological examination was not performed on our patient.

Gram staining of infected tissue or blood culture may help in the identification of the causative organism and the selection of antibiotics. Although microorganisms are not always present in all patients, *E. coli*, *Bacteroides*, *Streptococcus*, *Peptostreptococcus*, and *Clostridium spp* are the most common causative organisms in polymicrobial infections. The most common organism in adults is *E. coli,* while in children it is *Streptococcus*.[15] The histopathologic features of necrotizing fasciitis often correlate with the patient's clinical outcome, with progression ranging from moderate-to-severe neutrophilic infiltration without bacteria (Stage I), to the presence of bacteria with varying degrees of neutrophilic response (Stage II), and ultimately to extensive bacterial invasion with minimal or absent neutrophilic infiltration (Stage III).[16] The presence of ulceration of the epidermis, neutrophilic exudates, vasa thrombosis, areas of necrosis, and bacteria can be found in this case.[17] In this case, the Gram smear examination revealed only polymorphonuclear (PMN) cells without detectable bacteria, likely due to the sample being taken after seven days of antibiotic therapy.

The LRINEC score has been developed since 2004 and is used to detect early cases of necrotizing fasciitis for appropriate treatment. This score consists of a combination of CRP value, leukocyte count, hemoglobin level, sodium status, creatinine, and glucose

as predictive markers for necrotizing fasciitis (TABLE 1). An LRINEC score ≥ 6 can establish the diagnosis of necrotizing fasciitis. The use of the LRINEC score was developed for adult patients, and its study in pediatric patients is still not widely conducted. LRINEC score parameters often produce normal values for children and risk delaying the diagnosis of necrotizing fasciitis. A modification of the LRINEC score for children, P-LRINEC, is used to evaluate necrotizing fasciitis in children.[8]

In a previous study, 20 pediatric NSTI cases were compared with 20 non-NSTI controls over a 5 yr period across two children's hospitals, conduct laboratory evaluations were conducted among various parameters. Only serum CRP and sodium were significantly associated with NSTI in multivariate analysis. CRP >20 mg/L had the highest sensitivity and negative predictive value (NPV = 93%), while sodium <135 mEq/L had the highest specificity. These findings justified their inclusion in the P-LRINEC model. Importantly, CRP remained the only laboratory variable independently associated with NSTI after adjusting for age and other factors, with an odds ratio of 43 (95% CI: 4.2–435; p = 0.002).

The variability in LRINEC performance across studies has highlighted its limitations, especially in diverse patient populations. Factors such as age, race, bacterial etiology, and timing of lab tests significantly influence its reliability. Moreover, conditions like immunosuppression and hematological malignancies, which can drastically alter laboratory results (e.g., leukopenia in sepsis), may reduce the accuracy of standard scoring systems. As a result, future efforts should focus on tailoring diagnostic tools like P-LRINEC to specific subgroups and improving real-time, point-of-care risk stratification through both laboratory and clinical integration.

TABLE 1. Comparison LRINEC and P-LRINEC score[8,18]

Laboratory test	Value (LRINEC)	Value (P-LRINEC)	Score
CRP (mg/L)	< 150	< 20	0
	≥ 150	≥20	4
	< 15	< 15	0
Leukocyte count (10^9/L	15 – 25	15 – 25	1
	> 25	> 25	2
	> 13.5	> 13.5	0
Hemoglobin (mmol/L)	11-13.5	11-13.5	1
	<11	<11	2
Sodium (mmol/L)	≥135	≥135	0
	< 135	< 135	2
Creatine (μmol/L)	≤ 141	≤ 141	0
	> 141	> 141	2
Glucose (mmol/L)	≤ 180	≤ 180	0
	> 180	> 180	1
	otal		13

A score of ≥6 points is thought to be consistent with necrotizing fasciitis

In this case, a 2 mo. male child presented to the emergency department with complaints of fever and the sudden appearance of red spots. These red spots rapidly spread, originating from the right thigh, extending to the genital area, lower abdomen, and lower back. The patient's scrotum and penis appeared swollen. The results of the supportive examinations showed leukocytosis, anemia, hyponatremia, and increased CRP, resulting in a total LRINEC score of 6, while the P-LRINEC score was 10. Therefore, based on the medical history, physical examination, and supportive tests, the diagnosis was consistent with FG.

The first differential diagnosis considered was cellulitis. Cellulitis is a skin infection involving the dermis and subcutaneous tissue. Cellulitis is caused by the entry of bacteria through a broken skin barrier. *Streptococcus pyogenes* is the most common type of bacteria found in non-purulent cellulitis cases, while *S. aureus* is the most common type of bacteria found in purulent cellulitis cases. Clinical manifestations of cellulitis include acute erythema with indistinct borders, edema, pain, and warmth on touch, and may be accompanied by or without purulence. Fever may occur in 22 to 77% of cases. Cellulitis can affect any area of the body, although the lower extremities are the most commonly affected area in adults.[19] Necrotizing cellulitis is a necrotizing infection with or without formation that is limited to the skin and subcutaneous tissue but does not affect the fascia or underlying muscle.[6]

Supporting tests for cellulitis may show leukocytosis in ≤50% of patients and an increase in inflammatory markers. Gram stain and culture tests can be performed for purulent cellulitis but are not recommended for non-purulent cellulitis. The histopathological appearance of cellulitis is nonspecific, characterized by edema in the dermis, dilated lymphatic vessels, and neutrophil infiltration around blood vessels.[19,20] In this case, a 2 mo. patient presented with fever and red spots in the perineum area with a sudden onset, spreading rapidly to the lower abdomen, both thighs, and lower back. The results of the supporting tests showed an increase in CRP, anemia, leukocytosis, hyponatremia, and a total P-LRINEC score of 10, which ruled out the differential diagnosis of cellulitis.

The second differential diagnosis was pyoderma gangrenosum (PG). Pyoderma gangrenosum is a sterile neutrophilic inflammatory disease characterized by recurrent skin ulcerations with mucopurulent or hemorrhagic exudate. Ulcers in PG are extremely painful with bluish-red edges. The peak incidence of PG is between the ages of 20 and 50 yr, with more cases occurring in women than men. This condition can also affect children and young adults, accounting for 4% of all PG cases. Pyoderma gangrenosum is often associated with underlying systemic conditions (50% of cases) such as inflammatory bowel disease (IBD), rheumatoid arthritis, and hematological malignancies. The pathogenesis of PG is still not clear, but neutrophils play a significant role in the disease process.[21]

Pyoderma gangrenosum commonly occurs on the lower legs, especially in the pretibial area, although it can affect any part of the body. Common clinical manifestations include highly painful erythematous lesions that can develop into blisters or necrotic ulcers with erythematous or violaceous borders. The lesions can be precipitated by minor trauma, a phenomenon known as "pathergy" PG lesions are often mistaken for non-healing ulcers, leading to debridement procedures that worsen the condition due to a pathergy response in the patient. The majority of cases (85% of total cases) are of the classic ulcerative type, presenting as rapidly progressive and painful ulcers with irregular purple borders. Histopathological examination of the classic type reveals epidermal and dermal ulcerations with an inflammatory infiltrate predominantly

composed of neutrophils, sometimes forming abscesses. The diagnosis of PG can be established based on the criteria proposed by Su *et al.*, which consist of 2 major criteria and 2 minor criteria (TABLE 2).[21] In this case, the patient presented with early erythematous lesions on the thigh with a sudden onset and rapidly spreading spots. Based on the results of the supporting tests, the patient met the P-LRINEC score with a total value of 10, and the patient improved after receiving antibiotics and undergoing debridement. However, the patient did not meet the diagnostic criteria for PG, thus ruling out PG as a differential diagnosis.

Fournier's gangrene is an emergency condition that requires immediate hospitalization and surgical intervention combined with antibiotic therapy. Radical debridement should be performed immediately to remove necrotic tissue and stop the progression of infection. Delaying this intervention by a few hr may increase the risk of death in the patient. The use of broad-spectrum antibiotic combinations should be initiated before surgery and may be changed or continued based on the results of tissue culture.[14]

Fournier's gangrene is a severe, rapidly progressing necrotizing infection of the scrotum and perineum caused by both aerobic and anaerobic bacteria. Prompt diagnosis and treatment are critical to prevent life-threatening complications. In a case involving a 7 y.o. boy, immediate surgical debridement under general anesthesia was performed to remove necrotic tissue. The patient underwent multiple surgeries for further debridement and wound irrigation. After 7 d, the wound was closed, and the boy was discharged 2 wk later, demonstrating the necessity of aggressive surgical intervention and postoperative care in managing FG effectively.[23] Surgical interventions in pediatric patients can be more conservative, considering the milder disease course compared to adult patients. Post-debridement care can be performed every 6 to 8 hr with saline solution and topical antibiotic administration afterward. Autolytic debridement is the most conservative type of debridement. This type of debridement relies on the natural process where endogenous phagocytic cells and proteolytic enzymes break down necrotic tissue. Autolytic debridement requires a moist environment and a well-functioning immune system.[24] Carboxymethyl cellulose (CMC) is a cellulose derivative that has been used in wound healing and skin regeneration due to its ability to maintain wound moisture.[25] Once the wound is clean and granulation tissue has developed, reconstructive surgery can be performed, or the wound can be left to close by secondary intention.[12] Patients with an early diagnosis, complete debridement, and appropriate antibiotic administration have a survival rate of ≥ 70%.[14]

TABLE 2. Criteria for PG diagnosis[22]

Major criteria	Minor criteria
Rapid progression of a painful necrolytic cutaneous ulcer with an irregular, violaceous and undermined border	History of pathergy or cribriform scarring clinically
Other causes of cutaneous ulceration excluded	Associated systemic disease (inflammatory bowel disease, arthritis, IgA gammopathy or underlying malignancy)
	Classic histopathological findings
	Treatment response (rapid response to systemic steroid treatment-50% improvement in one month)

In this case, the patient received a combination of antibiotics with cefotaxime injections of 265 mg every 8 hr and metronidazole injections of 40 mg every 8 hr for 7 d. However, the supportive test results still showed leukocytosis, so antibiotic administration continued and was switched to ampicillin injections of 250 mg every 6 hr for 7 d. Ampicillin was continued due to the persistently high leukocyte count in the patient, which is consistent with *Streptococcus* bacteria, the most commonly found in pediatric FG cases. The patient also underwent sharp debridement and continued with Intrasite® gel application containing 2.3% CMC to maintain hydration in the lesion and trigger wound healing while serving as autolytic debridement. After 2 wk of post-surgery and antibiotic administration, the lesion evaluation showed that the child was no longer feverish, the lesion had reduced in size with visible granulation tissue, and the red spots on the body had improved. The patient was then discharged and educated about follow-up visits to the pediatric and dermatology departments for wound healing evaluation.

From this case, it was found that the case of FG in children is a rare condition and difficult to detect early. One of the main challenges in establishing a diagnosis is the nonspecific initial symptoms. Fournier's gangrene has a sudden onset and rapid progression, but does not always show typical signs on initial examination. Clinical manifestations that resemble other skin diseases, such as cellulitis or pyoderma gangrenosum, also often cause delays in diagnosis and therapy. In addition, the limited use of the standard LRINEC score in children is an obstacle to recognizing necrotizing fasciitis early. The modified P-LRINEC is a useful tool in this case, where a score of 10 indicates a high risk of FG and helps accelerate intervention decisions.

Another difficulty faced in the diagnosis in this case is that the blood culture did not show any bacteria, most likely because the patient had received antibiotics before the examination was performed. This shows that the diagnosis of FG cannot rely entirely on culture results, but must consider other clinical and supporting features, including increased inflammatory parameters such as CRP and leukocytosis.

Another difficulty is in the main treatment, in this case, in providing appropriate antibiotics. Initially, the patient received antibiotic therapy with cefotaxime and metronidazole, but the evaluation showed that leukocytosis was still high, so the antibiotic was changed to ampicillin, which is more appropriate for the possibility of *Streptococcus* infection, a bacterium that is more commonly found in pediatric FG.

Overall, this case highlights critical lessons in the early detection and management of FG in pediatric patients, emphasizing the importance of heightened clinical suspicion despite its rarity. Early symptoms are often non-specific and mimic other skin conditions like cellulitis or pyoderma gangrenosum, leading to diagnostic delays that can lead to rapid disease progression and increased morbidity. Blood culture was negative—likely due to prior antibiotic use—highlighting that diagnosis should not rely solely on microbiological results but also on clinical judgment and supportive findings such as elevated CRP and leukocytosis. The traditional LRINEC score underestimated disease severity, while the P-LRINEC score effectively indicated high risk (score of 10), enabling timely intervention. This underscores the P-LRINEC's utility in pediatric settings, reinforcing the need for early recognition, appropriate antibiotic selection, and prompt surgical treatment to improve outcomes.

CONCLUSION

Fournier's gangrene is a rare necrotizing fasciitis in children, often

difficult to diagnose and carrying a high mortality rate. Early diagnosis and proper management are crucial. In this case, diagnosis was based on history, physical exam, and supportive tests. The P-LRINEC score was 10, indicating high risk and prompting immediate surgical and antibiotic intervention, whereas the traditional LRINEC score would have been only 6, potentially underestimating the severity. This underscores the P-LRINEC's superior sensitivity in pediatric cases. The patient underwent debridement and broad-spectrum antibiotics, with significant wound improvement after 2 wk. This case highlights the importance of using the P-LRINEC score to aid early diagnosis of FG, emphasizing the need for greater clinical awareness despite its rarity in infants. Further multicenter and longitudinal studies are needed to validate P-LRINEC and assess long-term outcomes.

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