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Case Report

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Cellulitis complicated by Streptococcus pneumoniae abscess in a preschooler

Celulite complicada com abscesso por Streptococcus pneumoniae em pré-escolar

Celulitis complicada con absceso causada por Streptococcus pneumoniae en un niño pré-escolar

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ABSTRACT

Introduction: Pneumococcal cellulitis is a rare form of invasive disease caused by Streptococcus pneumoniae or pneumococcus, with facial location being the most common and gluteal location very uncommon. **Objective:** To describe an atypical case of gluteal cellulitis complicated by abscess with isolation of S. pneumoniae in a previously healthy child. **Case description:** A 2-year-and-5-month-old female patient, with no relevant personal history and up-to-date vaccinations, presented with edema, hyperemia, and pain in the right gluteal region one week before hospital admission. The inflammatory signs appeared ten days after receiving an intramuscular injection at the site and worsened despite a previous course of antibiotics to control otitis media. On examination, she presented with a hardened swelling and phlogosis. Ultrasound confirmed the presence of a subcutaneous abscess (5.2 x 4.4 x 3.9 cm). She underwent surgical drainage with drain placement. The secretion culture was positive for S. pneumoniae, while the blood culture was negative. After drainage and initiation of antibiotic therapy, she had good clinical progress and was discharged after eight days. **Discussion:** This case demonstrates a rare presentation of invasive pneumococcal disease, a condition preventable by vaccination. S. pneumoniae should be considered an etiological agent of cellulitis, even without an adjacent infectious focus. Intramuscular injection trauma is a likely risk factor, serving as a portal of entry through inoculation or facilitating infection during bacteremia. Surgical drainage was crucial for etiological diagnosis and effective treatment.

Keywords: Pneumococcal Infections; Cellulitis; Abscess; Child; Streptococcus pneumoniae; Pneumococcal Vaccines.

RESUMO

Introdução: A celulite pneumocócica é uma forma rara de doença invasiva por Streptococcus pneumoniae ou pneumococo, sendo a localização facial a mais comum e a localização em glúteo muito incomum. **Objetivo:** Descrever um caso atípico de celulite glútea complicada com abscesso com isolamento de S. pneumoniae numa criança previamente saudável. **Descrição do caso:** Paciente do sexo feminino, com dois anos e cinco meses, sem antecedentes pessoais relevantes e com vacinação atualizada, apresentou edema, hiperemia e dor no glúteo direito uma semana antes da admissão hospitalar. Os sinais inflamatórios apareceram dez dias após ter recebido uma injeção intramuscular no local e evoluiu com agravamento, apesar de um curso prévio de antibióticos para otite média. Ao exame, apresentava uma tumefação endurecida e flogose. A ultrassonografia confirmou a presença de um abscesso subcutâneo (5,2 x 4,4 x 3,9 cm). Foi submetida à drenagem cirúrgica com colocação de dreno. A cultura da secreção foi positiva para S.pneumoniae, enquanto a hemocultura foi negativa. Após drenagem e início da antibioticoterapia, teve boa evolução clínica e recebeu alta após oito dias. **Discussão:** Este caso demonstra uma apresentação rara de doença pneumocócica invasiva, uma condição imunoprevenível. O S. pneumoniae deve ser considerado um agente etiológico de celulite, mesmo sem foco infeccioso adjacente. O trauma por injeção intramuscular é um fator de risco provável, servindo como porta de entrada por inoculação ou facilitando a infecção durante uma bacteremia. A drenagem cirúrgica foi crucial para o diagnóstico etiológico e tratamento eficaz.

Palavras-chave: Infecções Pneumocócicas; Celulite; Abscesso; Criança; Streptococcus pneumoniae; Vacinas Pneumocócicas.

RESUMEN

Introducción: La celulitis neumocócica es una forma rara de enfermedad invasiva causada por Streptococcus pneumoniae o neumococo, siendo la localización facial la más común y la localización glútea muy infrecuente. **Objetivo:** Describir un caso atípico de celulitis glútea complicada por absceso con aislamiento de S. pneumoniae en un niño previamente sano. **Descripción del caso:** Una paciente de dos años y cinco meses, sin antecedentes personales relevantes y vacunaciones al día, presentó edema, hiperemia y dolor en el glúteo derecho una semana antes del ingreso hospitalario. Los signos inflamatorios aparecieron diez días después de recibir una inyección intramuscular en el área y empeoraron a pesar de un tratamiento previo con antibióticos para la otitis media. En la exploración, presentó hinchazón e inflamación endurecidas. La ecografía confirmó la presencia de un absceso subcutáneo (5,2 x 4,4 x 3,9 cm). Se le sometió a drenaje quirúrgico con colocación de un drenaje. El cultivo de secreciones fue positivo para S. pneumoniae, mientras que el hemocultivo fue negativo. Tras el drenaje y el inicio de la antibioterapia, el paciente presentó una buena evolución clínica y fue dado de alta a los ocho días. **Discusión:** Este caso demuestra una presentación poco frecuente de enfermedad neumocócica invasiva, una afección inmunoprevenible. S. pneumoniae debe considerarse un agente etiológico de la celulitis, incluso sin un foco infeccioso adyacente. El traumatismo por inyección intramuscular es un probable factor de riesgo, ya que actúa como puerta de entrada por inoculación o facilita la infección durante la bacteriemia. El drenaje quirúrgico fue crucial para el diagnóstico etiológico y la eficacia del tratamiento.

Palabras clave: Infecciones neumocócicas; Celulitis; Absceso; Niño; Streptococcus Pneumoniae; Vacunas neumocócicas.

INTRODUCTION

Invasive pneumococcal disease (IPD) is defined as the isolation of S. pneumoniae (or pneumococcus) from blood, cerebrospinal fluid, or other normally sterile sites (pleural, peritoneal, or joint fluid). Cellulitis accounts for a small percentage of all IPDs, and facial location (periorbital and buccal) accounts for almost all cases, with peripherally located cellulitis being extremely rare.[1]

There are more than ninety known serotypes of S. pneumoniae, and each produces a unique polysaccharide capsule that protects the bacterium against the host's immune defense mechanisms. The most strongly encapsulated serotypes tend to have a higher prevalence of carriers and greater virulence.[2] Pneumococcal conjugate vaccines (PCV) were developed for the prevention of IPD caused by highly virulent serotypes. Despite the effective reduction in invasive pneumococcal disease (IPD) after the introduction of PCV, there has been a rapid increase in the incidence of IPD caused by non-vaccine serotypes.[2]

Globally, despite the equally significant reduction in mortality after the introduction of PCV, S. pneumoniae remains one of the leading causes of morbidity and mortality in young children. According to estimates by the World Health Organization, pneumococcal diseases were responsible for approximately 300,000 deaths in children under five years of age in 2015, highlighting the significant burden of this pathogen.[3] The main form of prevention is vaccination. In Brazil, the National Immunization Program (Programa Nacional de Imunizações - PNI) of the Unified Health System (Sistema Único de Saúde - SUS) includes the 10-valent pneumococcal conjugate vaccine (PCV10) in the childhood immunization schedule. For specific risk groups, the 23-valent pneumococcal polysaccharide vaccine (PPSV23) is also available through the SUS. In the private healthcare network, broader-spectrum conjugate vaccines are available, such as PCV13, PCV15, and PCV20, which offer protection against additional serotypes.

Next, we will describe a case of cellulitis, complicated by abscess, in a previously healthy two-year-and-five-month-old preschooler, with isolation of S. pneumoniae in the culture of secretions obtained after surgical drainage.

CASE DESCRIPTION

A two-year-and-five-month-old female patient presented with a history of pain, edema, and hyperemia in the right gluteal region, beginning one week prior to hospital admission. She reported that, eighteen days prior, she had received intramuscular medication at the site of the inflammatory signs. During this period, she had used amoxicillin for seven days to treat acute otitis media, which had ended four days prior. The patient experienced a worsening of inflammatory signs in the 24 hours prior to hospital admission, at which point oral cephalexin was prescribed by the attending pediatrician. Her past medical history was unremarkable, and she had up-to-date vaccinations according to the national immunization schedule.

On examination, the patient was in good general condition, afebrile, well-hydrated, with inflammatory signs in the upper lateral quadrant of the right gluteus, in addition to a hardened swelling in the area, without fluctuation. The diagnostic hypothesis was cellulitis complicated by an abscess in the gluteal region, and hospital admission was indicated for laboratory and imaging tests, in addition to intravenous antibiotic therapy and possible surgical intervention. The soft tissue ultrasound examination identified a cystic formation in the subcutaneous tissue with irregular contours, containing debris, measuring 5.2 x 4.4 x 3.9 cm, consistent with an abscess. The main laboratory and imaging findings at hospital admission are summarized in Table 1.

The patient received intravenous antibiotic therapy with oxacillin, in addition to treatment with surgical drainage of the abscess under general anesthesia, with placement of a Penrose drain. The blood culture was negative, and the culture of the drained secretion isolated *Streptococcus pneumoniae* (susceptible

to the antibiotics tested). The patient had good clinical progress after the surgical approach and medication. She was discharged from the hospital after eight days for outpatient follow-up with the attending pediatrician.

Table 1. Laboratory and imaging results at admission

Parameters	Result	Reference value
Hemoglobin	12.2 g/dL	11.0-14.0 g/dL
Hematocrit	34.6 %	33.0-41.0 %
Leukocytes	16,000 /mm³	6,000-17,500 /mm³
Neutrophils	56%	-
Lymphocytes	31%	-
Platelets	458,000 /mm³	150,000-450,000 /mm³
C-reactive protein (CRP)	1 mg/dL	< 0.5 mg/dL
Ultrasonography	A cystic formation in the subcutaneous tissue with irregular contours, containing debris, measuring 5.2 x 4.4 x 3.9 cm, consistent with an abscess.	-

Source: The authors.

ETHICAL CONSIDERATIONS

The study was conducted in accordance with ethical principles and respected patient confidentiality. The research protocol was submitted to and approved by the Research Ethics Committee (CEP) linked to the responsible institution, under the CEP's Substantiated Opinion registered under number CAAE 92227625.3.0000.5249 on the Plataforma Brasil.

DISCUSSION

The case reinforces that even children who have been previously immunized with PCV remain vulnerable to developing invasive pneumococcal diseases. It was not possible to perform serotyping to determine if the serotype of the bacteria was covered by PCV-10.

According to an Australian study that analyzed clinical and demographic data from children with cellulitis caused by S. pneumoniae, as in the case described, 90% were under 36 months of age, while only 74% of cases with other foci of IPD were in this age group. All cases of cellulitis in this series were located on the face.[1]

Unlike what is observed in the adult population,4-7 pneumococcal cellulitis in children is rarely associated with comorbidities, and is almost always located on the face, unless there is an adjacent infectious focus such as septic arthritis, mastoiditis, or tonsillitis.[1]

The clinical aspects of cellulitis caused by S. pneumoniae may be indistinguishable from those seen in cellulitis caused by S. aureus and Group A Streptococcus (GAS). In many cases, erythema, edema, induration, and tenderness were consistently reported. In others, changes such as a well-defined

appearance, purplish discoloration of the skin, and the presence of blisters were described.[4,6]

On the other hand, unlike cellulitis caused by S. aureus and GAS, a concomitant extracutaneous focus (pneumonia, sinusitis) was detected in more than half of patients with pneumococcal cellulitis, suggesting that hematogenous dissemination of S. pneumoniae from the respiratory tract is one of the pathophysiological mechanisms.[5]

Isolation of the bacteria is usually done from samples obtained from the site of infection, with bacterial identification through blood culture being rare in cases of facial cellulitis.1 This can make it difficult to estimate the incidence of cellulitis caused by S. pneumoniae when it does not progress to abscess formation.

IPD is generally characterized by three stages: transmission, colonization, and invasion. Pneumococci are transmitted to the host from the nasal secretions of carriers. Pneumococci transmitted colonize the mucosa of the host's upper respiratory tract and then, through hematogenous dissemination, invade sterile sites.[2]

The invasion of S. pneumoniae into subcutaneous tissue, as in this case, is an intriguing issue, since, despite being preceded by intramuscular drug administration, S. pneumoniae is not considered a habitual skin colonizer. Its identification from skin samples is, therefore, difficult to interpret.

Contrary to this assumption, a study conducted by Ndiaye et al., using molecular identification by qPCR, found that Streptococcus pneumoniae was detected on the palms of the hands in 33.06% (203/614) of healthy participants in a rural population in Senegal. Higher rates (39.40%, 47/119) were observed in the younger age groups, between 0-5 years.[8] The molecular identification method used in this study did not allow distinguishing whether the bacteria were viable or not, unlike isolation by culture. However, the high detection rates observed suggest that the skin may also be a reservoir for the pathogen.[8]

A review of cases reported in the literature found that, as in the case described, suppurative complications are common in pneumococcal cellulitis in adults, with surgical interventions performed in half of the cases. The procedures performed included debridement, fasciectomy, amputation, and skin grafting.[7]

The formation of abscesses after the administration of intramuscular medications is a well-documented complication in medical literature, although it is considered infrequent. Among hospitalized patients followed by the Boston Collaborative Drug Surveillance Program, 12,134 received at least one intramuscular administration of medication. The observed complication rate was 0.4% (48 patients), with abscess formation being the most common (15 patients).[9]

Local trauma from intramuscular drug administration can also create a niche for organisms to establish themselves in the bloodstream during an episode of bacteremia.[4] Cases of gluteal abscess with isolation of S. pneumoniae after intramuscular drug administration have been previously reported in both children10 and adults,11 both with concomitant respiratory infection.

S. pneumoniae is one of the main bacteria causing acute otitis media (AOM), and bacteremia is found in a very small percentage of febrile young children with AOM (3%). The risk of bacteremia increases when temperatures are higher (5%, when the axillary temperature is above 40 °C) and in infants under 12 months (3.7%).12 Considering that there was a previous diagnosis of AOM, despite it being an infrequent complication, and the blood culture was negative, it is not possible to state with absolute certainty that bacteremia was not the pathophysiological mechanism of the reported IPD.

This study has limitations inherent to a case report. The causal relationship between intramuscular injection and infection, although temporally plausible and supported by literature, cannot be definitively proven. Without serotyping of the isolated S. pneumoniae, it was not possible to determine whether the serotype was vaccine-preventable, which would have added significant value to the discussion on vaccine coverage and effectiveness. Furthermore, since this is a single

case, it does not allow for generalizations about the incidence or clinical profile of this rare presentation.

Although the role of S. pneumoniae as a colonizer and cause of respiratory infections, as well as potentially serious invasive diseases such as meningitis, is well known, this bacterium is not normally considered a cause of subcutaneous tissue infections. This report shows that, despite its rarity, pneumococcus should be considered a potential etiological agent in cases of cellulitis in children, even in the absence of another infectious focus or comorbidities. This suspicion becomes particularly relevant when there is a history of recent intramuscular injection at the site, which may act as a risk factor. This case also reinforces the importance of etiological investigation through culture of purulent material, whenever possible, since the clinical presentation can resemble infections by more common agents, such as Staphylococcus aureus. Finally, it is noteworthy that invasive pneumococcal disease can occur in vaccinated children, making it necessary to be aware of the potential for replacement by non-vaccine serotypes.

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