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Necrotizing Fasciitis and Pyomyositis Caused by *Streptococcus pyogenes*: A Case Report

Sofia Louise Santin Barilli[1]*, Paula Buchs Zucatti[2], Fabiana Henriques Maciel[1], Adriana Alves dos Santos[1], Anaelí Brandelli Peruzzo[1], Rafaela dos Santos Charão de Almeida[1]

ABSTRACT

Objective: To report the case of a patient with streptococcemia caused by *Streptococcus pyogenes* progressing to necrotizing fasciitis and pyomyositis. **Method:** This case report was conducted in the intensive care unit (ICU) of a large public hospital in August 2023. The study was approved by a Research Ethics Committee. **Results:** A 15-year-old female patient was admitted to the emergency department with severe pain, edema, and a bullous lesion on the left upper limb (LUL). She rapidly progressed to septic shock due to necrotizing fasciitis with extensive soft tissue damage, and invasive streptococcemia caused by *Streptococcus pyogenes* was confirmed. The patient was transferred to the ICU, peripheral blood cultures were collected, and broad-spectrum antibiotic therapy was initiated. She was managed by a multidisciplinary team, including general surgery, plastic surgery, intensive care nurses, and wound care specialists. The treatment included fasciotomy and repeated mechanical debridements. Specific wound care strategies were implemented, involving the use of silver hydrofiber dressings, silicone dressings, and hydroactive gel. Subsequently, the patient was electively readmitted for a split-thickness skin graft on the LUL and continued outpatient follow-up with wound care specialists, showing excellent clinical progress. **Conclusion:** Invasive streptococcemia is a challenging condition due to its rapid progression and high mortality, requiring urgent and comprehensive management. Timely diagnosis, appropriate antibiotic therapy, immediate surgical intervention, and intensive multidisciplinary support, including advanced wound care, were crucial to achieving a favorable outcome.

DESCRIPTORS: Case reports. Critical care nursing. Shock, septic. Streptococcus pyogenes. Enterostomal therapy.

Fasceíte e piomiosite por *streptococcus pyogenes*: relato de caso

RESUMO

Objetivo: Relatar o caso de uma paciente com estreptococcemia por *Streptococcus pyogenes* com evolução para fasceíte e piomiosite. **Método:** Relato de caso que ocorreu em uma unidade de terapia intensiva de um hospital público de grande porte, em agosto de 2023. Estudo aprovado por Comitê de Ética em Pesquisa. **Resultados:** Paciente feminina, 15 anos, admitida na emergência com dor intensa, edema e lesão bolhosa em membro superior esquerdo. Evoluiu rapidamente para choque séptico em decorrência de fasceíte necrosante, com lesão grave de partes moles, sendo confirmada estreptococcemia invasiva por *Streptococcus pyogenes*. Foi transferida para a UTI, coletadas hemoculturas e iniciada antibioticoterapia de amplo espectro. Seguiu em acompanhamento com cirurgia-geral, plástica, enfermeiros intensivistas e estomaterapeutas. Foram indicados

[1]Grupo Hospitalar Conceição, Hospital Nossa Senhora da Conceição – Porto Alegre (RS), Brazil.
[2]Hospital de Clínicas de Porto Alegre, Centro de Tratamento Intensivo – Porto Alegre (RS), Brazil.
*Corresponding author: sofiabarilli@gmail.com

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fasciotomia e repetidos desbridamentos mecânicos. Implementaram-se cuidados específicos para a lesão, utilizando hidrofibra de prata, tela de silicone e gel hidroativo. Depois, reinternou para enxertia em MSE e seguiu acompanhamento ambulatorial com estomaterapia e excelente evolução. **Conclusão:** A estreptococcemia invasiva é desafiadora pela rápida progressão e elevada mortalidade, necessitando de tratamento abrangente e urgente. Diagnóstico oportuno, antibioticoterapia adequada, intervenção cirúrgica imediata e suporte multiprofissional intensivo, incluindo cuidado avançado com lesões, foram cruciais para o melhor desfecho.

DESCRITORES: Relatos de caso. Enfermagem de cuidados críticos. Choque séptico. Streptococcus pyogenes. Estomaterapia.

Fascitis y piomiositis por *Streptococcus pyogenes*: reporte de caso

RESUMEN

Objetivo: Reportar el caso de una paciente con estreptococemia por *Streptococcus pyogenes* con evolución a fascitis y piomiositis. **Método:** Reporte de caso ocurrido en una unidad de cuidados intensivos (UCI) de un hospital público de gran porte, en agosto de 2023. Estudio aprobado por el Comité de Ética en Investigación. **Resultados:** Paciente femenina, de 15 años, admitida en urgencias con dolor intenso, edema y lesión ampollar en el miembro superior izquierdo (MSI). Evolucionó rápidamente a choque séptico debido a fascitis necrotizante, con lesión grave de tejidos blandos, confirmándose estreptococemia invasiva por *Streptococcus pyogenes*. Fue trasladada a la UCI, se realizaron hemocultivos y se inició antibioterapia de amplio espectro. Se realizó seguimiento con cirugía general, cirugía plástica, enfermeros intensivistas y estomaterapeutas. Se indicaron fasciotomía y desbridamientos mecánicos repetidos. Se implementaron cuidados específicos para la lesión, utilizando hidrofibra de plata, malla de silicona y gel hidroactivo. Posteriormente, fue reingresada para injerto en el MSI y continuó con seguimiento ambulatorio en estomaterapia, con excelente evolución. **Conclusión:** La estreptococemia invasiva es un desafío, debido a su rápida progresión y alta mortalidad, requieriendo tratamiento integral y urgente. El diagnóstico oportuno, la antibioticoterapia adecuada, la intervención quirúrgica inmediata y el apoyo multidisciplinario intensivo, incluido el cuidado avanzado de las heridas, fueron cruciales para lograr un desenlace favorable.

DESCRIPTORES: Informes de casos. Enfermería de cuidados críticos. Choque séptico. Streptococcus pyogenes. Estomaterapia.

INTRODUCTION

Streptococcus pyogenes (Group A streptococcus) is a Gram-positive bacterium responsible for a wide range of human infections, varying from pharyngitis to severe conditions such as septicemia. This pathogen also causes skin and soft tissue infections, including impetigo, erysipelas, cellulitis, necrotizing fasciitis, myositis, and myonecrosis. Additionally, it is the causative agent of streptococcal toxic shock syndrome[1,2] a systemic inflammatory response in which exotoxins act as superantigens, leading to massive cytokine release and increased capillary permeability, resulting in shock and multiple organ failure[2].

Despite a considerable reduction in the incidence of *Streptococcus pyogenes* infections during the twentieth century, genetic changes in pathogen strains and/or alterations in host susceptibility can lead to significant increases in the rates of specific diseases[3]. Group A streptococcal infections affect individuals of all age groups but are more prevalent among children due to higher exposure in settings such as daycare centers and schools, as well as host immune factors. Pharyngeal infections are considered critical in school-aged individuals[4].

Streptococcemia caused by *Streptococcus pyogenes* is a potentially severe condition that can lead to systemic alterations, dissemination of the pathogen through tissues and the lymphatic system, and local suppurative complications, depending on the severity of the infection and tissue susceptibility[5].

Conditions of this magnitude present challenges for the multidisciplinary healthcare team, as illustrated by the case of a patient seen in the emergency department with severe pain, edema, and a bullous lesion on the left upper limb (LUL). The clinical course rapidly progressed to septic shock with extensive soft tissue damage, requiring transfer to the intensive care unit (ICU).

The purpose of reporting this case is to enhance healthcare professionals' knowledge by providing detailed insights into diagnosis and management while simultaneously raising awareness among those involved in skin lesion care about the critical importance of early diagnosis.

OBJECTIVE

To report the case of a patient with streptococcemia caused by *Streptococcus pyogenes* progressing to fasciitis and pyomyositis.

METHODS

This is a descriptive, narrative, and reflective study in the form of a case report, prepared according to the Case Report Guidelines (CARE)[6].

The case occurred in August 2023 in an adult ICU, level III complexity[7], of a large public hospital in Porto Alegre (Rio Grande do Sul, Brazil). The unit has 59 beds and provides care for both medical and surgical patients.

Data and images were collected from the electronic medical record. The analysis was conducted in a reflective manner, considering clinical data and evidence from the literature regarding the condition and its complications.

The study followed ethical principles of privacy, confidentiality, and human dignity, in accordance with Resolution No. 466 of the Brazilian National Health Council[8]. The study was approved by the Research Ethics Committee of the Conceição Hospital Group (Approval No. 7.174.456). The patient and her legal guardian signed the informed consent form and provided authorization for the use of images.

RESULTS

A 15-year-old female patient with a history of asthma but no known drug allergies or continuous medication use was admitted to the emergency department via the Mobile Emergency Care Service on August 13, 2023, due to pain, edema, and absence of pulse in the LUL. The condition began with elbow pain three days earlier, with no reported insect bite, and progressively evolved with edema, increasing pain, and the appearance of a bullous lesion at the site.

Upon admission, the patient was alert but lethargic, tachypneic (26 breaths per minute), hypotensive (blood pressure 83/46 [58] mmHg), and tachycardic (171 bpm). She presented with an approximately 8 cm bullous lesion in the medial epicondyle region of the LUL, with serosanguineous discharge (Figure 1), diffuse edema extending to the wrist, and scattered petechiae, more concentrated over the lateral epicondyle.

Initial laboratory tests revealed a left shift in the white blood cell count (35% band forms), elevated C-reactive protein (209 mg/L), increased creatine kinase (1,732 U/L), thrombocytopenia (82,000/μL), prolonged prothrombin time and activated partial thromboplastin time (17.7 seconds, international normalized ratio 1.6, and 49 seconds, respectively), hyperbilirubinemia (4.6 mg/dL total bilirubin), mildly elevated creatinine (1.3 mg/dL), elevated D-dimer (16,435 ng/mL FEU), low bicarbonate (14.9 mmol/L), and hyperlactatemia (5.5 mmol/L), supporting the initial impression of septic shock due to necrotizing fasciitis.

Within less than one hour of admission, peripheral blood cultures were collected, and empirical antibiotic therapy was initiated with piperacillin-tazobactam (4.5 g every 8 hours) and vancomycin (1,000 mg every 12 hours). An electrocardiogram and a non-contrast computed tomography (CT) scan of the LUL were performed, and consultations were requested with the intensive care and general surgery teams.

Figure 1. Initial appearance of the lesion (posterior surface of the left upper limb) at the time of hospital admission. Rio Grande do Sul, Brazil, 2023.

Twelve hours later, the patient required vasopressor support (0.06 mcg/kg/min) and was transferred to the ICU. The patient's mother provided additional history, reporting that the patient had experienced odynophagia five days earlier, had taken ibuprofen, and developed hyperthermia (39°C) the following day.

In the ICU, clindamycin (900 mg every 8 hours) was added to the existing antibiotic regimen. Contrast-enhanced CT angiographies of the chest and LUL were ordered, along with a vascular surgery consultation to rule out possible vascular complications.

Imaging studies did not confirm the primary diagnostic hypothesis of necrotizing fasciitis and excluded vascular pathologies. There was significant infiltration of the soft tissues in the arm, forearm, and chest, with heterogeneous muscle appearance and perifascial infiltration, but without collections, gas, arterial ischemia, or deep vein thrombosis.

On August 15, the patient remained tachycardic and dependent on vasopressors (0.15 mcg/kg/min), with severe pain, left-hand paresthesia, and non-palpable pulses due to edema. Laboratory tests showed profound lymphopenia (139/μL), marked bandemia (2,300/μL) with toxic granulations and cytoplasmic vacuolization in neutrophils, elevated creatine kinase (1,856 U/L), and hyperlactatemia (4.9 mmol/L).

Given these findings and a review of recent literature indicating the possibility of gas-free fasciitis on imaging[9], the probable diagnosis of invasive streptococcal infection due to Group A *Streptococcus* with associated fasciitis, pyomyositis, and compartment syndrome was reconsidered. A surgical procedure was recommended for definitive diagnosis (initial plan of surgical exploration with the possibility of fasciotomy and debridement). On the same day, the patient underwent fasciotomy performed by the vascular surgery team (Figure 2) and received six units of platelets and two units of fresh frozen plasma.

In the immediate postoperative period, the patient presented with an extensive exudative lesion on the anterior surface of the LUL (51 × 13 cm), involving the entire arm, with approximately 50% of the wound bed showing viable tissue and areas of necrosis near the upper edge (15 × 4 cm), along with exposure of structures including muscles, fascia, tendons, and adipose tissue. The posterior surface lesion measured approximately 19 × 4 cm, contained viable tissue,

Figure 2. Posterior and anterior surfaces of the left upper limb; immediate postoperative period following fasciotomy. Rio Grande do Sul, Brazil, 2023.

and was less exudative; however, there was also exposure of muscle, fascia, tendon, and adipose tissue. Paraffin gauze was applied to both wound beds to maintain temperature and prevent adhesion to the lesions. The perilesional area remained intact.

The patient returned to the ICU on invasive mechanical ventilation and vasopressor support (0.27 mcg/kg/min). Following discussion with the Hospital Infection Control Committee, the antibiotic regimen was maintained with clindamycin (900 mg every 8 hours), ceftriaxone (2,000 mg every 12 hours), and linezolid (600 mg every 12 hours), which was discontinued on August 18, 2023. Throughout the hospitalization, the wound was managed by intensive care nurses and wound care specialists.

The patient was extubated the day after surgery and showed hemodynamic improvement, allowing discontinuation of vasopressor support. On August 17, peripheral blood cultures revealed Gram-positive cocci in chains and *Streptococcus pyogenes*, the same bacterium identified in the lymph node/soft tissue biopsy of the LUL.

On August 18, due to increased exudate and ongoing infectious process, silver-based antimicrobial dressing was chosen as the primary wound coverage, which was used for 13 days. Dressing changes occurred every three days for the antimicrobial dressing and once per shift for the secondary dressing. During this period, mechanical debridements were performed in the operating room by both the general surgery and plastic surgery teams on four occasions (August 21, 23, 25, and 31). On the last date, wound edge approximation was performed (Figure 3). Subsequently, a silicone dressing was applied to maintain temperature and manage wound moisture. At this stage, a hydroactive gel was occasionally used.

On September 12, a distal skin graft was performed. The patient showed satisfactory clinical and laboratory progress, with good wound appearance and adequate pain control. She was discharged from the hospital on September 14, with outpatient follow-up by the plastic surgery and wound care teams.

Later, on September 26, she was electively admitted for a split-thickness skin graft on the LUL, which proceeded without complications. The patient was discharged the following day (September 27) and continued with outpatient follow-up.

During outpatient wound care, the silicone dressing combined with hydroactive gel was maintained. The lesion presented with a hyperpigmented and hypertrophic scar. The graft areas showed mild superficial necrosis near the approximated wound margins (Figure 4), and the perilesional area exhibited mild edema.

Figure 3. Appearance of the lesions on the posterior and anterior surfaces of the left upper limb after treatment with silver-based antimicrobial dressing, mechanical debridements, and wound edge approximation. Rio Grande do Sul, Brazil, 2023.

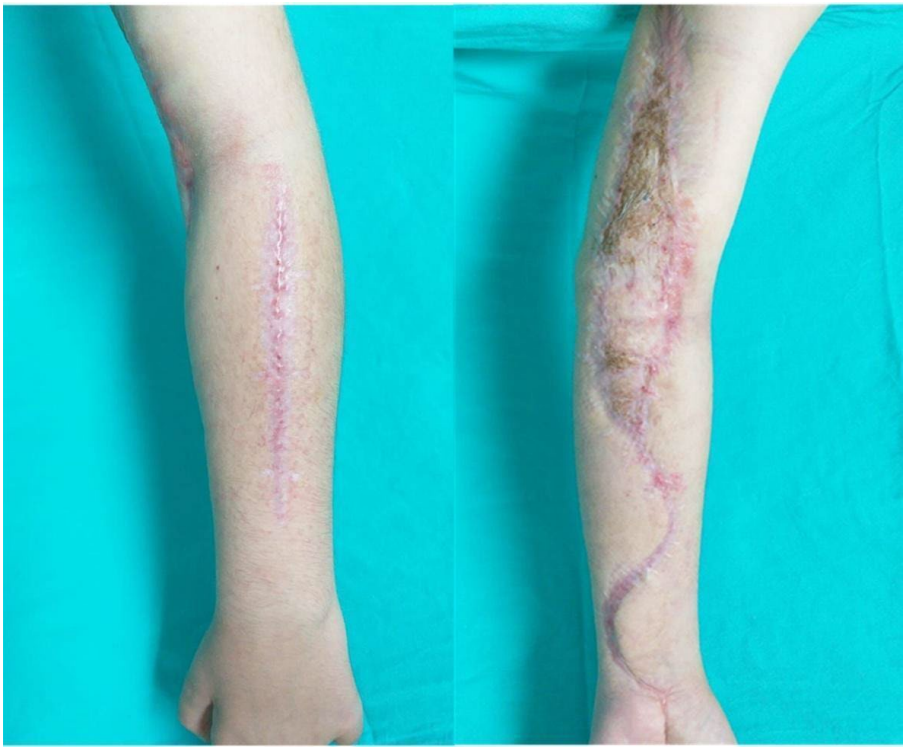

Figure 4. Appearance of the lesions on the posterior and anterior surfaces of the left upper limb after grafting and outpatient treatment. Rio Grande do Sul, Brazil, 2023.

The donor site showed good healing progress, requiring only hydration and sun protection (Figure 5).

Figure 5. Donor site on the right lower limb. Rio Grande do Sul, Brazil, 2023.

DISCUSSION

Streptococcus pyogenes is an important human-specific bacterial pathogen that causes a wide range of manifestations, from mild localized infections to potentially fatal invasive infections. Ineffective treatment may result in post-infectious sequelae, such as acute rheumatic fever and post-streptococcal glomerulonephritis. Additionally, it causes invasive infections such as necrotizing fasciitis and toxic shock syndrome[10]. Severe infections caused by *Streptococcus pyogenes* with shock and organ failure have been increasingly reported, especially in North America and Europe[11].

Necrotizing soft tissue infection (NSTI) is a serious condition with a three-month mortality rate of up to 25%, characterized by fulminant tissue destruction and systemic signs of toxicity[9,12]. NSTI results in the progressive destruction of the muscle fascia and the overlying subcutaneous fat. It typically spreads along the muscle fascia due to its relatively poor blood supply, with the muscle tissue often being spared because of its abundant vascularization[10]. NSTIs encompass a wide variety of presentations, including necrotizing cellulitis, type I (polymicrobial) and type II (monomicrobial) necrotizing fasciitis, as in the reported case, and myositis.

Regardless of the infection category, accurate diagnosis and appropriate treatment must include early surgical intervention, broad-spectrum antibiotic therapy, and organ support as key pillars of management[2,9], as exemplified in the reported case. Prognosis depends on the timely implementation of these measures, given the abrupt clinical course. However, despite significant advances, morbidity and mortality remain high, and survivors' quality of life is often compromised[13].

Given the severity of toxic shock from streptococcemia, most patients require intensive care. The rapid deterioration is attributed to the high virulence of the pathogen and the production of superantigens, leading to multiple organ failure and toxic shock[14]. In the reported case, once clinical suspicion was raised, the patient was promptly transferred to the ICU,

which is justified by the fact that although nearly 50% of patients initially present with normal blood pressure, continuous monitoring and resuscitation are indicated since hypotension may develop within 4 to 24 hours[14].

In this case, the entry point for streptococcal infection was the pharynx. Other possible entry points include the skin, vagina, and other mucous membranes, although in at least 45% of cases the origin cannot be identified. Group A *Streptococcus* necrotizing fasciitis can occur following skin injury (resulting from acute varicella infection, trauma, or other causes) or in association with transmission from an individual with acute pharyngitis. When the portal of entry is uncertain, pathogenesis may result from hematogenous translocation of the bacteria from the throat (with or without symptomatic pharyngitis) to a site of blunt trauma or muscle strain[11].

The patient's initial symptoms are supported by the literature: unexplained and progressive pain, with or without local or diffuse erythema, which may develop or darken, often accompanied by blistering within 24 to 48 hours. Fever, tachycardia, malaise, and myalgia can also occur within the first 24 hours, along with initial or evolving hypotension[11]. The patient's laboratory findings (normal leukocyte count but with circulating immature neutrophils, thrombocytopenia, elevated liver enzymes and creatinine, and coagulation abnormalities) are consistent with the literature and indicative of multiple organ failure[15].

Based on the blood culture results (Gram-positive cocci in chains and *Streptococcus pyogenes* sensitive to clindamycin), treatment with this antibiotic was initiated, consistent with current literature recommending clindamycin in combination with penicillin as first-line therapy[16]. In the reported case, clindamycin was combined with piperacillin-tazobactam, a systemic beta-lactam antibacterial agent from the penicillin class[17]. Recently, concerns have arisen regarding increasing bacterial resistance to this drug. In vitro evidence suggests that linezolid, an oxazolidinone that also inhibits protein synthesis via the 50S ribosomal subunit, may effectively reduce streptococcal toxin production, similar to clindamycin[16].

Concurrently with early broad-spectrum antimicrobial treatment and the immediate removal of infected tissue, as recommended in the literature[12], the lesion was managed by a multidisciplinary team from the time of admission. Acute wounds, such as the one described in this case, can progress rapidly. It is imperative that healthcare professionals assess both the patient and the wound, taking into account the type, location, shape, level and type of exudate, comorbidities, nutritional status, and available diagnostic findings to select the appropriate treatment strategy. Choosing the ideal dressing will provide the best environment for the wound while addressing the underlying etiology and factors affecting healing, potentially reducing treatment duration, minimizing the biological burden, and improving quality of life[18].

Following the initial debridement, given the abundant exudate and the ongoing infectious process, silver hydrofiber dressings were chosen. These have been increasingly used alongside systemic antibiotic therapy because they provide adjunct antimicrobial treatment for clinically infected wounds or wounds at risk of infection[19,20]. Such dressings are effective against many bacteria, fungi, and viruses and can be used in critically colonized wounds or those with clinical signs of infection. They maintain a moist wound environment, preventing bed desiccation, and can absorb up to 30 times their weight while maintaining structural integrity, making them suitable for wounds with moderate to heavy exudate[18]. In the presence of this type of secretion, the hydrofiber transforms into a soft gel, maintaining moisture at the wound surface while absorbing excess fluid and keeping it away from the surrounding skin. Moreover, this gel has been shown to promote autolytic debridement of nonviable tissue and simultaneously trap bacteria present on the wound surface[21].

With reduced exudate and lesion improvement during the healing process, a silicone dressing (a soft, perforated layer that gently conforms to the skin and allows for easy application of topical treatments) was used. Due to its transparency, this material allows for assessment of healing progress and enables secondary dressing changes without unnecessary removal of the wound's superficial layer. Additionally, the dressing seals the wound edges to protect the surrounding skin from harmful exudate leakage and maceration, resulting in less pain and promoting faster, more natural healing[22,23].

During the healing phase, a hydroactive gel was occasionally used to maintain moisture and rehydrate the wound bed, promote mild autolytic debridement, and provide pain relief. It can be applied to wounds with low to moderate amounts of exudate[18].

According to the literature, in patients who achieve spontaneous skin edge approximation following instituted therapies, fasciotomy-related wounds may be closed with sutures. In cases of residual skin defects where closure is not possible due to tissue loss from debridement, split-thickness skin grafting or local flaps may be necessary[24]. In the reported case, the patient was electively readmitted for a split-thickness skin graft on the LUL approximately 15 days after hospital discharge.

Limitations

As this is a case report, the study presents inherent methodological limitations, such as low representativeness and the inability to generalize the results.

Recomendations

Although this is a case report, it is recommended that it be used as a training tool for professionals who are part of the multidisciplinary team involved in the care of such patients, as it provides a detailed understanding of the clinical condition and the necessary interventions to achieve better outcomes.

CONCLUSION

Streptococcus pyogenes infection in NSTI represents a serious therapeutic challenge due to its rapid progression and high mortality, requiring urgent and comprehensive treatment. The use of antibiotics, such as beta-lactams and clindamycin, is crucial, but the increasing resistance to clindamycin highlights the need for alternatives like linezolid. Immediate surgical intervention, combined with intensive support from the multidisciplinary team, is essential, with specialized nursing playing a critical role in recovery, particularly in wound care and monitoring for complications. Despite a multimodal management approach, complications remain frequent, underscoring the need for integrated strategies to improve clinical outcomes and the quality of life of survivors.

Wound treatment should be based on a deep understanding of the patient, the underlying cause, and therapeutic goals. It is not merely about applying dressings but about diagnosing and treating the root cause, with the dressing serving to help manage the wound environment, not its origin.

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