

Cutaneous sporotrichosis on a tattoo: two simultaneous unusual case reports

Esporotricose cutânea em tatuagem: dois relatos de casos incomuns simultâneos

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ABSTRACT

Sporotrichosis, a fungal infection caused by the *Sporothrix* genus, is the most important implantation mycosis worldwide. The infection can develop from traumatic contact with the fungus, inoculation via contaminated soil or fomites, animal scratches or bites, exudates from feline lesions, and respiratory droplets expelled from cat sneezing. Objective: To highlight the peculiarities of two cases that developed from an unusual route of sporotrichosis infection, as well as the disease epidemiology and characteristics. Case Report: The authors describe two cases of sporotrichosis in which it is believed that the skin rupture from the tattooing process enabled contamination by fungal propagule from the infected cat. Given the absence of previous trauma caused by the animal at the infection site, clinical suspicion and the patient's epidemiological context were pivotal in investigating sporotrichosis. The typical clinical presentation of the disease involves the emergence of a papule at the trauma site, progressing into a painless ulcer, followed by subcutaneous nodules along the lymphatic course. In the cases described here, this manifestation occurred, although no nodules were identified. Conclusion: The diagnosis should be considered even in the absence of a history of contact with cats or any other plausible source of infection, as non-zoonotic routes of infection have been documented in endemic areas. The gold standard for diagnosis is the use of microbiological cultures. The patients presented here were successfully treated with itraconazole.

Keywords: Mycosis; Sporotrichosis; Zoonoses.

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RESUMO

Introdução: A esporotricose, infecção fúngica subcutânea causada pelo complexo *Sporothrix*, é a micose de implantação mais importante no mundo. As espécies de interesse clínico não estão distribuídas de maneira homogênea e o agente etiológico mais comumente relatado é o *Sporothrix sp.* A infecção pode se desenvolver a partir do contato traumático com o fungo, inoculação via solo contaminado ou fômites e arranhões ou mordidas de animais. **Objetivo:** Destacar as peculiaridades de dois casos que evoluíram a partir de uma via incomum de infecção por esporotricose, bem como a epidemiologia e características da doença. **Relato de Caso:** Os autores descrevem dois casos de esporotricose nos quais se acredita que a ruptura da pele proveniente do processo de tatuagem possibilitou a contaminação por esporos de fungos do gato infectado. Dada a ausência de trauma prévio causado pelo animal no local da infecção, a suspeita clínica e o contexto epidemiológico foram fundamentais na investigação da esporotricose. A apresentação clínica típica da doença envolve o surgimento de uma pápula no local do trauma, progredindo em uma úlcera indolor, seguida de nódulos subcutâneos ao longo dos vasos linfáticos. Nos casos descritos aqui, tais manifestações ocorreram, à exceção da formação de nódulos subcutâneos. **Conclusão:** O diagnóstico deve ser considerado mesmo na ausência de histórico de contato com gatos ou qualquer outra fonte plausível de infecção; já a infecção por rotas não zoonóticas tem sido documentada em áreas endêmicas. O padrão-ouro para o diagnóstico é o uso de culturas microbiológicas. Ambos os pacientes descritos aqui tiveram sucesso no tratamento com itraconazol.

Palavras-chave: Micose; Esporotricose; Zoonoses.

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INTRODUCTION

Sporotrichosis is the most important implantation mycosis worldwide caused by *Sporothrix* genus, which includes *S. schenckii*, *S. brasiliensis*, *S. mexicana* and *S. globosa*, a dimorphic fungus^{1,2}. The genus *Sporothrix* is present in diverse environments such as soil, marine animals, moss, wood, and decaying vegetation. Virulence factors, which are characteristics of the organism that promote microbial growth, play a crucial role in the pathogenicity of the fungus. Notable virulence factors for this fungus include thermotolerance, ergosterol peroxide, and melanin. Specifically, the ergosterol peroxide produced by the fungus serves as a mechanism to evade reactive oxygen species during phagocytosis².

The infection can develop from traumatic contact with the fungus, and inoculation via contaminated soil or fomites. Infrequently, the inhalation of fungal propagules and hematogenous spread, with or without cutaneous manifestations. In the context of zoonotic transmission, the fungus is introduced into the skin through contact

with animals that carry the fungus. The principal animal involved in this process is the domestic cat, although other animals such as parrots, birds, squirrels, rodents, fish, dogs, and insects have been associated with transmission. In cats afflicted with sporotrichosis, the skin lesions exhibit a significant presence of parasitic fungal structures³.

Sporotrichosis was initially documented in 1898 by Benjamin, a medicine student at Johns Hopkins Hospital in Baltimore, USA. The fungus, obtained from cutaneous lesions on the right upper limb of a patient, underwent examination by a pathologist who subsequently identified it as a species within the genus *Sporotrichum*⁴. In Brazil, the first recorded case of sporotrichosis was in 1907, in the state of São Paulo. Since 1990, the disease has become epidemic in the state of Rio de Janeiro and spreading to other regions of the country⁵. In 2013, the mandatory notification of cases to the health authorities was established in the Rio de Janeiro state. This also happened in other states as Pernambuco, Minas Gerais, and Paraíba, and in Salvador, the capital city of the state of Bahia⁶.

According to the Epidemiological Bulletin from the Vector-Borne and Zoonotic Diseases Management of the Rio de Janeiro State Health Department, a total of 2,499 cases of sporotrichosis were reported in the database of the National System of Notifiable Diseases of the State of Rio de Janeiro (Sinan/RJ) in 2016 and 2017. It is observed that the number of cases has been increasing for more than 17 years, resulting in a total of over 5,000 records at the Evandro Chagas National Institute of Infectious Diseases (INI)⁵. In 2019, there were 1,693 notifications of suspected cases of sporotrichosis in the state of Rio de Janeiro, with 1,586 confirmed patients. In 2020, the number of notifications for human sporotrichosis was 1,032, with 1,030 confirmed by clinical-epidemiological or laboratory criteria⁷. In 2022, according to DATASUS, there were 14 deaths due to sporotrichosis recorded in Brazil⁸.

The updated clinical classification of human sporotrichosis involves the following forms: cutaneous, mucosal, osteoarticular, systemic, immunoreactive, and mixed localized. Lymphocutaneous (LC) sporotrichosis represents the most prevalent clinical form, constituting 46% to 92% of reported cases. Clinically, its onset occurs days to months following trauma, manifesting as a small erythematous papule or pustule at the site of fungal inoculation. Termed sporotrichosis or inoculation chancre, this initial lesion is typically asymptomatic, gradually increasing in size over weeks and transforming into a nodular structure. Subsequently, central liquefaction ensues, leading to either fistulization or ulceration and the discharge of purulent material, often referred to as a “gummy lesion.” Within days to weeks, additional papulonodular, erythematous, rosary-like lesions emerge along the regional lymphatic pathway, exhibiting an ascending or descending pattern contingent on regional drainage³.

The gold standard for the Sporotrichosis diagnosis involves the fungal culture of clinical specimens (secretions and biopsies, for instance). The direct exam (KOH) and cytological examination of the material are associated with difficult direct examinations. When it comes to immunological, molecular, spectrometric, and combination diagnostic methods it is relevant to underscore that ELISA (Enzyme Linked ImmunonoSorbent Assay) can provide cross-reactions with other fungal species. Furthermore, the molecular diagnostic methods and gene sequencing and methods that employ the matrix-assisted laser desorption (MALDI-FTOFI MS) have a high cost associated⁶.

The differential diagnosis for cutaneous sporotrichosis encompasses nocardiosis, blastomycosis, paracoccidioidomycosis, chromoblastomycosis, lobomycosis, psoriasis, and pyoderma gangrenosum. Notably, the lesions associated with these conditions may exhibit similarities to the plaque observed in sporotrichosis. Additionally, consideration should be given to other potential etiologies, such as cutaneous Leishmaniasis, *Francisella tularensis*, *Fusarium* infections, and mycobacterial infections, including *Mycobacterium marinum*, *Mycobacterium kansasii*, and *Mycobacterium tuberculosis*².

Itraconazole is considered the drug of choice due to its effectiveness, safety, and posological convenience, and it is classified as having an IIa scientific evidence level. It may be used in healthy patients with limited lesions, as well as in immunosuppressed patients and in the systemic form, but not in life-threatening cases of dissemination/sepsis. It is available in 100mg capsules and must be administered along with the main meals for better absorption. The dose ranges from 100 to 400mg/day, depending on the disease severity. The treatment should be initiated with 100mg/day, which is effective in most cases⁴.

Recently, new cases have been reported highlighting the existence of alternative non-zoonotic routes of infection in endemic areas. Illustrating that, two cases of the disease were reported after tattooing, without a history of contact with cats or any other plausible source of infection. The suspected origin of the infection is believed to be the materials utilized during the procedure, including instruments, ink, or water¹⁰.

Differently, in the cases presented here, the involvement of the cat was evident. It is believed that the skin rupture from the tattooing process enabled contamination by fungal spores from the infected cat. To the best of our knowledge, there are only few cases in the literature where a sick cat also transmitted the infection using the tattoo as a gateway¹¹. In cats affected by the illness, the skin lesions harbor a substantial quantity of parasitic fungal structures, indicating a significant potential for zoonotic transmission. The infection is likely to occur due to the inoculum load associated with breaches in the skin³.

The prolonged treatment regimens necessary for patients, even in cases of mild forms such as cutaneous and lymphocutaneous sporotrichosis, coupled with the abandonment of afflicted animals – especially cats – by their caretakers due to the conspicuous nature of cutaneous lesions, the arduous and protracted therapeutic protocols, substantial associated costs, and apprehension about potential fungal transmission have collectively resulted in deficiency in disease control. This challenge is notably pronounced in metropolitan regions, where the manifestation of epidemics and outbreaks has become a prominent concern. Moreover, in Brazil, the recognition of sporotrichosis as an emerging and neglected disease, with significant socioeconomic implications for the country's development, hinders the identification of risk factors and affected populations. This, in turn, contributes to the absence of a robust definition of pertinent and timely prevention and control measures, further exacerbating the challenges associated with the disease⁶.

CASE REPORT

Two male patients (brothers), aged 17 and 23 years, received similar tattoos on their left legs. Approximately 10 days later, they presented multiple ulcers 1-3 cm in diameter, clustered around the tattoo. These lesions exhibited irregular and erythematous borders with a ragged base. No purulent secretions drainage was present (Figures 1A and 1B).



Figure 1. A and B. Patient 1 before and after treatment; C and D. patient 2 before and after treatment

The patients did not have fever or any other systemic symptoms. The first diagnosis was either a bacterial infection or a hypersensitivity reaction to the pigments. The patients were treated with antibiotic regimens for 23 days, along with oral prednisone, but they showed no improvement. A skin biopsy was then performed on both patients, and the material was sent for culture and histopathological testing, which

revealed evidence of acute necrosis and ulceration. Fungal structures were not present. Histochemical testing for acid-fast bacilli was negative. The culture for mycobacteria was negative. The bacterial culture was positive for multidrug-sensitive *Enterococcus* species, and the fungal culture was positive for *Sporothrix* species (Figure 2).

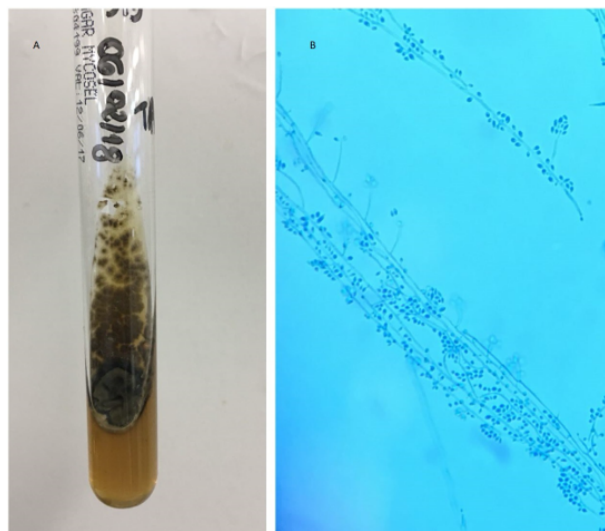


Figure 2. Mycology. A. Macroculture; B. Microculture.

The patients were initiated on 200 mg/day of itraconazole, and the lesions healed completely after 120 days (Figure 1C and 1D). The patients reported contact with a housecat that had recently been diagnosed with sporotrichosis by a veterinarian and that was being treated with itraconazole.

DISCUSSION

Sporotrichosis is a subcutaneous fungal infection caused by the *Sporothrix* complex, which is most commonly represented by *Sporothrix schenckii*¹². Since the late 1990s, the disease has taken epidemic proportions in the state of Rio de Janeiro, particularly in its coastal region with a warm and humid climate. This marks one of the most significant outbreaks of sporotrichosis in both humans and animals ever recorded. While the exponential increase in cases is observed in the Southeast, various regions have started to report cases in recent years. Between 1998 and 2009, around 2,200 cases of the disease were reported in humans, along with 3,244 cases in cats. This signifies the most substantial epidemic ever documented globally, involving both human and animal populations⁵.

The most common route of infection is by traumatic contact with the fungus through an infected source, such as plant thorns^{13,14}. Recently, Boechat et al. (2018)¹⁴ described the increased transmission of this disease between humans and animals, particularly, through cat scratches. Thus, the increase in the number of disease cases is influenced by the sizable feline population in Brazil. According to the

National Health Survey by IBGE (2013), 44.3% of Brazilian households have at least one dog, and 17.7% have at least one cat, indicating a high percentage of pets⁵.

In these two simultaneous cases, clinical suspicion and the patient's epidemiological context were the keys to investigating Sporotrichosis. These cases were unique for the unusual route of sporotrichosis infection determined, and particularly for the lack of previous trauma caused by the animal at the site of infection. We believe that the skin rupture from the tattooing process enabled contamination by fungal spores from the infected cat.

The most common clinical presentation includes the appearance of a papule at the site of the trauma. This papule develops into a painless ulcer, followed by subcutaneous nodules along the course of lymphatics. This was how the cases presented herein manifested, except that no nodules were detected.

Despite the increase in the use of tattoos in human cultures, there seem to be only a few cases in the literature of sporotrichosis associated with a tattoo. Additionally, although tattoos can be associated with a variety of acute or late-onset skin reactions, there is a lack of studies to analyze the frequency of cutaneous complications related to tattooing. There have been only a few cohort studies on this topic, and the prevalence of tattooed individuals in industrialized countries ranges from 10 to 20%¹⁵.

Definitive confirmation is obtained by culturing skin samples, from which the fungus is isolated and identified. The gold standard for diagnosis is the use of microbiological cultures. Serological methods, histopathological, and molecular testing have been used as auxiliary tools. In the cases reported herein, a culture provided the definitive diagnosis.

The selection of treatment for sporotrichosis is contingent upon the clinical manifestation of the disease, the immunological condition of the host, and the specific *Sporothrix* species responsible. Itraconazole is considered the first choice being selected for treatment. This medication successfully resolved the infection and no other alternative drugs as terbinafine or amphotericin B were necessary¹.

Generally, the prognosis is favorable, and a cure is attainable, although the process may be slower in patients with immunosuppression and other underlying health conditions. Sequelae can vary, encompassing common outcomes like hyper or hypopigmented, hypertrophic, or keloid scars, to more uncommon ones such as ankylosis or amputation of extremities in cases of osteoarticular involvement³.

Recently, there has been a rise in unusual clinical and disseminated forms that demand extended hospitalization and treatment. This has been specially seen in individuals infected with *S. schenckii* and, notably, in those infected with *S. brasiliensis*, primarily through zoonotic transmission, particularly by cats, in endemic areas of Brazil like the Southeast and South regions⁶.

This case report aims to describe a disease that is epidemiologically relevant in Brazil and underscore the

involvement of felines in disease transmission, which is emerging as a transmission route in the current scenario. However, the absence of prior feline trauma makes such cases unique, emphasizing the concept of tattooing as a facilitator for the specific fungal infection. In the presented cases, the patient's medical history played a crucial role, along with the pattern of skin lesions and culture for definitive diagnosis. The adopted approach involved the use of the recommended first-line pharmacological choice, with itraconazole being the drug of choice. Both patients exhibited a satisfactory and appropriate response to the established therapy.

CONCLUSION

The cases of Sporotrichosis presented here were transmitted unusually. The skin lesions manifested as papules that developed into painless ulcers. This presentation, coupled with the epidemiological context, prompted an investigation into the disease, which was confirmed through culture of material collected from the lesion. Treatment was conducted with itraconazole and proved successful. Recognizing the disease is particularly crucial, given that Sporotrichosis is considered a neglected epidemic in Brazil with socioeconomic implications for Brazilian public health.

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AUTHORS' CONTRIBUTION:

We describe contributions to the papers using the taxonomy (CRediT) provided below: *Conceptualization, Investigation, Methodology, Visualization & Writing – review & editing*: Mônica de Albuquerque Costa, Isabella Boa Sorte Costa, Daniela de Oliveira Werneck Rodrigues, Nádia Rezende Barbosa Raposo, Isabela Lima dos Santos; *Project administration, Supervision & Writing – original draft*: Nádia Rezende Barbosa Raposo, Érika Santos Freire, Rodrigo Daniel de Souza, Maria Cristina Vieira de Andrade; *Validation & Software*: Mônica de Albuquerque Costa. *Resources & Funding acquisition*: Author DD. *Data curation & Formal Analysis*: Mônica de Albuquerque Costa, Daniela de Oliveira Werneck Rodrigues e Nádia Rezende Barbosa Raposo.

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