

Sporotrichosis: An Infectious Emerging Mycosis of Zoonotic Potential

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ABSTRACT

Mycotic diseases are being recognized as an important global public health problem of considerable dimension. These diseases occur in sporadic as well as in epidemic form, resulting in high morbidity and mortality. Among several mycoses, sporotrichosis, caused by a thermo-dimorphic fungus *Sporothrix schenckii*, has emerged as an infectious disease in certain regions of the world. The pathogen infects a wide variety of animals, but the cat is recognized as the pertinent source of sporotrichosis to humans. Humans usually acquire infection following traumatic inoculation of fungal contaminated materials or through bites and scratches by diseased cat. It is predominantly a disease of young people who have frequent contact with saprobic reservoirs. Males are more affected than females. The isolation of fungus from clinical specimens remains the 'gold standard' for confirming an unequivocal diagnosis of disease. A number of drugs including potassium iodide, amphotericin B, terbinafine, ketoconazole, and itraconazole are used to treat the cases of sporotrichosis. Early diagnosis and prompt treatment help in the management of the disease. The prognosis of the disease is favourable, provided an early treatment is instituted before the dissemination of the infection. There is a need to create awareness among the dermatologists and physicians about sporotrichosis so that disease is not misdiagnosed. Further research on the ecology, epidemiology, pathogenesis, diagnosis and chemotherapy is recommended. It is emphasized that 'Narayan' stain should be widely employed in microbiology and public health laboratories for morphological studies of fungi.

Keywords: Dimorphic fungus, Emerging mycosis, Narayan stain, Public health, Sporotrichosis, Zoonotic potential

INTRODUCTION

Sporotrichosis (Berumann's disease, peat moss disease, rose gardener's disease, Schenck's disease) is an infectious, subcutaneous or chronic granulomatous mycotic disease of humans as well as animals [1,2]. It is a life-threatening disease in immune compromised patients. Sporotrichosis is considered as an emerging zoonotic fungal disease in many regions of the world. An American researcher Benjamin Schenck is credited to identify the organism for the first time in 1898. The presence of asteroid bodies in pus from cutaneous lesions was first time noticed by Slendore in 1908 [3]. In 1920, Ghosh described the first case of sporotrichosis from Kolkata, which established the endemic focus of infection in the North-eastern belt of India. The disease is endemic in many regions of the world including India [4,5]. Sporotrichosis is a disease of occupational risk, affecting agricultural workers, farmers, gardeners, and mine workers [1]. Laboratory workers can also acquire the infection [6]. The disease is mostly noticed in immune compromised hosts, particularly affected with AIDS [7]. The diagnosis of sporotrichosis is confirmed by employing mycological, immunological and molecular techniques [8,9]. Itraconazole is considered the safe chemotherapeutic agent for the therapy of disease. The disseminated infection in the absence of treatment carries a grave prognosis. The aim of this communication is to delineate the epidemiology, diagnosis, and management of sporotrichosis, which has emerged an infectious emerging mycosis with potential zoonotic implications.

Etiology

The disease is caused by the dimorphic fungus *Sporothrix schenckii*, which is worldwide in distribution. Currently, *S. schenckii* comprises *S. brasiliensis* (Clade I), *S. schenckii*, *S. sensu strictu* (s.str) (Clade II), *S. globosa* (Clade III) and *S. luriei* (Clade VI) [10]. It produces mycelia growth in natural substrates and in culture on Sabouraud medium at 25°C and grows in a yeast phase in the host tissue and in culture on brain heart infusion (BHI) agar at 37°C [11]. The fungus

is ubiquitous in nature and is recovered from a variety of environmental materials such as vegetation, timber, thorn, hay, straw, wood, sphagnum moss, soil, etc. [12]. The fungus cannot survive the higher temperature above 39°C [13].

Host

The disease is recorded in humans and also in many species of animals such as armadillo, bird, camel, cat, cattle, chimpanzee, dog, donkey, dolphin, goat, hamster, horse, mice, mule, pig and rat [11]. Among the various animals, the cat is considered as an important species with the greatest zoonotic potential [12].

Transmission

Human beings usually acquire the infection following traumatic implantation of *S. schenckii* into the skin by the wooden splinter, thorn, plant etc. [13]. Direct contact of an open wound with fungus-contaminated object such as sphagnum peat moss, hay, mulch also initiates infection. The infection can also result through inhalation of infectious cells of *S. schenckii* from saprobes environment. Zoonotic transmission can occur from infected animals to their animal handlers. The fungus spreads from the initial lesion along the lymphatic channels, producing indolent nodules and ulcers. Sometimes the infection may disseminate by haematogenous route. The most common extracutaneous sites are the joints, bones, bursae and tendon sheath.

There are reports, which mentioned that the bite of infected cat may produce disease in humans. Transmission of infection from the cat to human beings without the evidence of trauma is also described [14-16].

Clinical spectrum

In humans, the incubation period of the disease may vary from 21 to 90 days [1]. Many clinical forms of sporotrichosis such as fixed cutaneous, mucocutaneous, lymphocutaneous, pulmonary, osteoarticular and disseminated are observed in human beings [3]. Papule, pustule, ulcerative, varicose, acne form, erythematic plaques occur on the arm, face, neck or trunk. The lymph nodes are swollen and discharge thin, seropurulent exudates. The adjacent lymphatics show cord like thickening and indurations. In disseminated sporotrichosis, the lesions may occur in the nose, mouth, kidney, lung, bone, joint, prostate, and gastrointestinal tract. The pulmonary form may contribute to the decline in pulmonary function of patients with the chronic obstructive pulmonary disease. Prognosis is good in the cutaneous and lymphocutaneous form of the disease. Disseminated disease may carry considerable morbidity and also mortality, particularly in immunocompromised patients. The involvement of meninges and central nervous system is more common in AIDS patients. The pulmonary and disseminated form is seen more commonly in patients with a history of alcoholism. The patients with immunosuppressant with HIV develop disseminated cutaneous sporotrichosis [5].

Epidemiology

Sporotrichosis is considered a neglected fungal disease of humans and animals. It is an occupational mycosis of gardeners, laborers, farmers, mine workers, carpenters, florists, horticulturists, nurserymen, forest employees, and cat handlers [17-20]. The individual is exposed to the infected plant material and soil, which can be considered as the point source of infection [21]. Sphagnum moss was identified as the source of infection in ten horticultural workers [22]. Sporotrichosis can occur in sporadic as well as epidemic form [22-25]. The disease has been reported from Australia, Brazil, Japan, India, Mexico, South Africa, Uruguay, USA [26-28]. In South America, several countries such as Brazil, Columbia, Peru, Uruguay, and Venezuela are endemic for sporotrichosis. It is the most common subcutaneous fungal disease in Latin America. In India, sporotrichosis is mainly reported from Assam where the people work in the tea garden and other agricultural occupation. The disease has also been recorded from Himachal Pradesh region of India [29]. Itoh et al. [11] described 260 cases of sporotrichosis. In South Africa, 3000 persons who worked in the gold mines, contracted sporotrichosis from the fungus contaminated timber [1]. Read and Sperling [20] are credited to elucidate for the first time the zoonotic potential of *S. schenckii* by investigating an outbreak of the disease in five persons who were exposed to an infected cat. Later, this observation was substantiated by Welsh [28]. The disease is slightly more common in males than in females presumably due to frequent exposure to environmental materials rather than to a sex difference in susceptibility. There is no evidence of transmission of infection from man to man. In the developed countries, infection usually is recognized in adult persons. However, in tropical regions and in areas of hypersensitivity, children and adolescents are more commonly affected. There is no racial predilection for sporotrichosis. The disease has been reported in patients with AIDS [16]. Marimon et al. [12] described that *S. brasiliensis*, *S. gubosa* and *S. mexicana* are three new species of medical interest. *Sporothrix globosa* is prevalent in Asia and Europe and *S. brasiliensis* is restricted to South and Southeast regions of Brazil. However, in Africa, Australia and USA, *S. schenckii* s. str is prevalent [11].

DIAGNOSIS

The disease should be differentiated from chromoblastomycosis, chronic staphylococcal erythema, cutaneous leishmaniasis, histoplasmosis, blastomycosis, nocardiosis, leprosy, sarcoidosis, pinta, syphilis, tularemia, rheumatoid arthritis and paracoccidioidomycosis [2-5]. Definitive diagnosis requires the isolation of *S. schenckii* from the pus, synovial fluid, CSF, sputum, bone drainage, tissue biopsy etc. on Sabouraud dextrose agar with chloramphenicol and brain heart infusion agar [1]. The microscopy morphology of culture can be easily studied in a newly developed stain designated as Narayan. It contains 4.0 ml of glycerin, 6.0 ml of dimethyl sulphoxide and 0.5 ml solution of 3% solution of methylene blue. As the number of organisms in cerebrospinal fluid (CSF) and synovial fluid is low, repeated large volume cultures are imperative to confirm the diagnosis of sporotrichosis. The cytological examination of smears of the exudates/aspirate for circular, oval, cigar shaped yeast cells with Giemsa or Wright or PAS staining techniques also helps in diagnosis. Asteroid bodies may also be observed in direct smear examination of clinical material. These bodies are best detected on histopathological examination with haematoxylin and eosin method. The organism can also be demonstrated by periodic acid Schiff (PAS), Gomori methanamine silver or immunohistological stain in biopsied tissue specimens. Latex agglutination and tube agglutination tests are useful to diagnosis systemic sporotrichosis. The skin test is performed by injecting sporotrichin by intradermal route, and an induration of 5 mm diameter with erythema after 24 to 48 h is considered positive. The intradermal test may be employed to carry out epidemiological surveys of the disease. Animal pathogenicity is performed in the male Swiss albino mice by inoculating 0.5 ml of a saline suspension containing yeast cells or conidia from filamentous culture. The laboratory mice show orchitis and an autopsy is performed after one week. Heavy infection is recorded in the testes of experimentally inoculated mice by observing cigar shaped cells and large spherical bodies. Molecular techniques are helpful in identifying the source of the epidemic. It is recommended that cytological examination of smear with Giemsa stain can be easily performed in field area where facilities for isolation of fungi are not available.

TREATMENT

Antifungal therapy is the mainstay of treatment for all forms of sporotrichosis. The cutaneous form can be treated with oral administration of ketoconazole (5-10 mg/kg) and potassium iodide (1 g/ml, total dose should not exceed 5-10 ml per day). Amphotericin B (0.2 to 1.0 mg/kg, IV) and itraconazole (400 mg per day orally) have been tried in extracutaneous sporotrichosis. It has been observed that AIDS patients with disseminated sporotrichosis require life-long maintenance therapy with itraconazole after induction therapy with Amphotericin B [19-23]. Terbinafine at the dosage rate of 250 mg twice daily has also showed encouraging results in the management of cutaneous sporotrichosis [26]. A case of lymphocutaneous sporotrichosis of ring finger of the left hand of a 34 year old male from Assam region was successfully treated with itraconazole (Pratibha Dave, Personal Communication). Presently, itraconazole remains the drug of choice for the chemotherapy of lymphocutaneous and visceral form of the disease. The surgical technique is also tried for the management of chronic sporotrichal arthritis [11]. It is advised that therapy should be continued for some time after the clinical cure to prevent the relapse of infection [6]. Due to low cost and good clinical efficacy, potassium iodide is recommended for the treatment of cutaneous and mucocutaneous types of sporotrichosis, particularly in poor resource nations.

PREVENTION AND CONTROL

Certain measures such as care in handling of diseased animals and infected materials, wearing of full length during examination of infected animals, avoiding penetrating injury to the skin with thorn or other plant objects, frequent washing of hands with povidone iodine, treatment of wood, timber with fungicides in industries, and avoidance by immunocompromised patients in handling the cat with ulcerative and suppurative lesions will certainly prove effective in reducing the incidence and prevalence of this mycotic zoonosis.

CONCLUSION

Sporotrichosis is an emerging fungal saproozoonosis and direct zoonosis, which is caused by *Sporothrix schenckii*, a unique dimorphic fungus with worldwide distribution. Domestic cat remains an important source of infection to humans. The Lymphocutaneous form is the common clinical presentation of disease. The infection is recorded in immunocompetent as well as in immunocompromised hosts. The outbreaks of disease are reported from several countries. Sporotrichosis is prevalent more frequently in tropical and subtropical regions of the world having high humidity and moderate temperature. Laboratory help is imperative to establish the correct diagnosis of disease. There is a need to undertake comprehensive studies to elucidate the exact environmental niche of *S. schenckii*. It is emphasized to investigate the role of other animals in the zoonotic transmission of sporotrichosis. Further work

on the development of cheap, safe, and effective chemotherapeutic agents and also a novel vaccine for the better management of disease will be rewarding.

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