CUTANEOUS FUNGAL INFECTIONS IN IMMUNOCOMPROMISED PATIENTS

Thesis
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List of Abbreviations

Abb.	Full term
A.niger	*Aspergllis niger*
AIDs	*Acquired immunodeficiency syndrome*
C-Albicans	*Candida albicans*
C-Krusei	*Candida krusei*
CMV	*Chronic mucocutaneous candidasis*
CVID	*Common variable immunodeficiency*
DNA	*Deoxyribonucleic acid*
DW	*Distilled water*
E. Floccosum	*Epidermophyton Floccosum*
E.Tropicals	*Candida tropicals*
ELiSA	*Enzyme-linked immunosorbent assay*
HIV	*Human immunodeficiency*
HPV	*Human papilloma virus*
IgA	*Polymorphonuclear leucocytes*
IgA	*Immunoglobulin A*
IgG	*Immunoglobulin G*
IgM	*Immunoglobulin M*
IL-1	*Interleukin 1*
IL-2	*Interleukin 2*
IL-3	*Interleukin 3*
IL-4	*Interleukin 4*
IL-5	*Interleukin 5*
IL-6	*Interleukin 6*
IL-8	*Interleukin 8*
IMPDH	*Inosine-t monophosphate dehydregenase*
IVIG	*Intravenous immunoglobulin*
KOH	*Potassium hydroxide*
LPCB	*Lactophenol cotton blue*

M. Canis	*Mycobacterium canis*
M.Audouini	*Mycobacterium audouinii*
mRNA	*Messenger ribonucleic acid*
NDM	*Non dermatophyte-moulds*
P.V	*Pityriasis versicolor*
P45014DM	*P45014 alpha-demethylase*
PMNs	*Polymorphonuclear leucocytes*
S. apiospermum	*Pseudollescheria boydii*
S. Schenckii	*Sporotnichosis schenckii*
S. somaliensis	*Pseudollescheria somaliensis*
SCID	*Severe combined immunodeficiency disease*
SDA	*SaBourad Dextrose*
SPSS	*Statistical package for social science*
T. Capitis	*Tinea capitis*
T. Corporis	*Tinea corporis*
t. Manum	*Tinea manum*
T. Mentagrephytes	*Trichophyton-mentagrophytes*
T. Pedis	*Tinea Pedis*
T. Rubrum	*Trichophyton Rubrum*
T. Schoenleinii	*Trichophyton Schoenleinii*
T. Tonsurans	*Trichophyton Tonsurans*
T. verrucosum	*Trichophylton verrucosum*
T. Violaceum	*Trichophyton violaceum*
T.B	*Tuberculosis*
T.Cruris	*Tinea cruris*
TNF binding protein	*Tumour necrosis factor binding protein*
TNF-α	*Tumour necrosis factor-α*
tRNA	*Transfer Ribonucleic acid*
UVR	*Ultraviolet ray*

INTRODUCTION

Fungal infections are more common in the immunocompromised patients suffering malnutrition, some infections (e.g. AIDS), diabetes mellitus, tumors of the immune system (e.g. leukemia, lymphoma), prolonged administration of corticosteroids, immunosuppressive therapy, splenectomy or autoimmune diseases ***(Brown, 1990).***

There are two main types of fungal skin infection in cancer patients: primary cutaneous fungal infections and cutaneous manifestations of fungemia. Cancer patients at particular risk of these infections are those who are highly immunosuppressed. In general, these are leukemia and lymphoma patients who are neutropenic following high-dose chemotherapy or bone marrow transplantation (BMT) ***(Brown, 1990).***

The main risk factor for all types of fungal infection in cancer patients is severe neutropenia. Severe neutropenia is defined as an absolute neutrophil count of <500/ml that last for >1 week. Other risk factors include: (i) vascular and urinary catheters; (ii) disruption of gastrointestinal (GI) and oropharyngeal mucosa by chemotherapy; (iii) use of broad spectrum antibiotics; and (iv) therapy with high-dose corticosteroids ***(Brown, 1990; Morrison et al., 1993; Nosari et al., 2001).***

The fungi include Aspergillus, Fusarium, Rhizopus, and Mucor spp., which are generally non-pathogenic in the immunocompetent host. Severely neutropenic patients are also at risk of invasive infections caused by Candida, which is a component of the normal human GI flora ***(Brown, 1990; Morrison et al., 1993; Stein et al., 1989).***

Fungal infections in cancer patients can be further divided into five groups: (i) superficial dermatophyte infections with little potential for dissemination; (ii) superficial candidiasis; (iii) opportunistic fungal skin infections with distinct potential for dissemination; (iv) fungal sinusitis with cutaneous extension; and (v) cutaneous manifestations of disseminated fungal infections **(*Grossman, 1995*).**

In dermatophyte infections; Microsporum, Epidermophyton and Trichophyton species may cause superficial infections of the nails, hair, and stratum corneum. The most common presentations are tinea pedis and onychomycosis ***(Grossman, 1995).***

In superficial candidiasis the infections include Candida intertrigo, vaginitis, balanitis, perlèche, and paronychia. In the oncology population, dermatophyte infections and superficial candidiasis have similar presentations to those seen in immunocompetent host ***(Grossman, 1995).***

Primary cutaneous mould infections are especially caused by Aspergillus, Fusarium, Mucor, and Rhizopus spp. These infections may invade deeper tissues and cause disseminated fungal infections in the neutropenic host ***(Wolfson et al., 1985).***

In some patients with an invasive fungal sinusitis there may be direct extension to the overlying skin, causing a fungal cellulitis of the face. Aspergillus, Rhizopus, and Mucor spp. are the most common causes ***(Iwen et al., 1997; DeShazo et al., 1997).***

In disseminated fungal infections; the most common causes are Candida, Aspergillus, and Fusarium spp. Although Fusarium is not the most common cause of fungemia, 75% of patients with Fusarium manifest with skin lesions, a much high prevalence than for any of the other fungal pathogens ***(Bodey et al., 2002).***

Therapy is with systemic antifungal therapy like amphotercin B, fluconazole, itraconazole, voriconazole, and caspofungin. Recovery from disseminated fungal infections is unlikely, however, unless the patient's neutropenia resolves ***(Bodey et al., 2002).***

AIM OF THE WORK

The purpose of this study is to study the types of fungal skin infections in the patients with immunosuppression and comparison between them and the patients without immunosuppression regarding types of fungal skin infection.

Chapter (1)

FUNGI

Definition:

The fungal kindom is defined by a number of features—some shared with other organisms, others unique to the fungi:

Fungi typically grow as hyphae, which extend at their tips. This apical growth form is shared with the structurally similar oomycetes and is in contrast with other filamentous organisms, like filamentous green algae, which grow by repeated cell divisions within a chain of cells (intercalary growth) ***(Zabriskie et al., 2000).***

Some species grow as single-celled yeasts which reproduce by budding, and dimorphic fungi can switch between a yeast phase and a hyphal phase in response to environmental conditions. Fungal cell wall contains glucans also found in plants, but also chitin not found in the plant kingdom, but in the exoskeleton of arthropods. In contrast to plants and the oomycetes, fungal cell walls do not contain cellulose ***(Cole and Samon, 1979).***

Morphology:

- ***Microscopic structures***

Most fungi grow as thread-like filamentous microscopic structures called hyphae, and an assemblage of intertwined and interconnected hyphae is called a mycelium ***(Stevens et al., 2006).*** Hyphae can be septate, i.e. divided into compartments separated by a septum, each compartment containing one or more nuclei, or can be coenocytic, i.e. lacking hyphal compartmentalization. However, septa have pores, such as the doliporus in the basidiomycetes that allow cytoplasm, organelles, and sometimes nuclei to pass through. Coenocytic hyphae are essentially multinucleate supercells. Several species have developed specialized structures for nutrient uptake from living hosts ***(Rippon, 1988).***

- ***Macroscopic structures***

Fungal mycelia can become visible macroscopically, for example, as concentric rings on various surfaces, such as damp walls, and on other substrates, such as spoilt food, and are commonly and generically called mould. Mycelia grown on solid agar media in laboratory petri dishes are usually referred to as colonies, exhibiting characteristic macroscopic growth shapes and colors, due to spores or pigmentation ***(Parniske, 2008).***