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CORRELATION BETWEEN SKIN TISSUE CULTURE AND HISTOPATHOLOGY IN THE DIAGNOSIS OF DEEP CUTANEOUS FUNGAL INFECTIONS

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Abstract

BACKGROUND: The incidence of fungal infections is rising consistently on a global scale. Elderly folks and those who are immunocompromised are at risk of acquiring this condition. Fungal infections, whether cutaneous or invasive, often present as cutaneous lesions. Fungal illnesses are often diagnosed by correlating clinical symptoms with histopathological analysis, with confirmation achieved by culture. This study was conducted to determine the association between skin tissue cultures and histopathological evaluation in the diagnosis of DCFI.

MATERIALS AND METHODS: This is a 2 year retrospective review of patients with a diagnosis of DCFI seen at a tertiary care hospital. Tissue cultures and histopathologic findings were reviewed.

RESULTS: A total of 30 cases were found from the case records. The mean age was 47.76 ± 4.78 years. There were 21 Males and 9 females. 23 of 30 patients were in an immune suppressed state and 7 of 30 patients were healthy. 9 of 23 immunosuppressed patients were having Lymphoproliferative disorders and 9 of 23 immunosuppressed patients were transplanted patients. Routine histopathologic sections revealed fungal components in 8 of 33 cases, but skin cultures were negative.

CONCLUSION: We conclude that, despite a negative skin tissue culture, a diagnosis of DCFI should be considered in the differential diagnosis of nonspecific cutaneous lesions with supportive histopathology to avoid the negative consequences associated with delays in diagnosis and treatment, particularly in immunocompromised patients.

Keywords: Deep cutaneous fungal infections (DCFI), Tissue culture, Dermatophytes, Histopathology.

INTRODUCTION:

Fungus infections are increasing at a steady rate as a result of increased exposure and advanced treatment modalities that allow for longer survival of at-risk populations, which include patients who have undergone transplant surgeries, those on chemotherapeutic and immunosuppressive drugs, AIDS patients, diabetic and elderly people, and so on [1, 2]. Some fungal diseases have been linked to changes in climate and human environments, as well as frequent travel and population relocations [3, 4]. Fungus may cause infections that manifest as cutaneous or invasive lesions. Cutaneous infections are far more prevalent than deep or invasive mycosis, which is uncommon and often occurs in immunocompromised people. The majority of cutaneous mycosis is caused by dermatophytes and candida. Aspergillosis, chromoblastomycosis, pheohyphomycosis, and eumycosis all produce deep cutaneous mycosis [5, 6].

They often cause persistent morbidity. These may present to the dermatologist in a variety of ways, including nodulo-pustular lesions, cysts, indurated masses with surface alterations such discharged sinuses or verrucosity, and ulcers. The

varied clinical appearance might make diagnosis difficult.[7,8] Many instances of deep mycosis are misdiagnosed or detected late, resulting in a variety of local and systemic consequences. Deep mycosis, such as mycetoma, may penetrate deeply and affect the underlying bones, resulting in irreparable skeletal deformity and handicap. By the time a patient is identified with deep mycosis, the problems are typically irreparable. Early diagnosis and treatment are thus usually required.[7,8]

Fungal infections are often diagnosed by comparing clinical features to histology, with confirmation achieved by culture in selective media. A histopathological analysis of materials is essential in all instances of deep and cutaneous fungal infection.

The present study was conducted to determine the association between skin tissue cultures and histopathological evaluation in the diagnosis of DCFI

MATERIALS AND METHODS:

We conducted a two-year retrospective analysis of all histopathological specimens identified as having DCFIs and their associated skin culture results at a tertiary care hospital from 2020 to 2022. Thirty patients diagnosed with DCFI were included. The electronic medical records for the included patients were examined, and the following data were extracted: patient age, sex, underlying medical comorbidities, histopathologic interpretation, histochemical stains, skin microbiological findings. A group of cases exhibiting discordance between the pathological diagnosis and tissue culture data was found. Discordant instances were characterized by the presence of fungal organisms recognized by histology, while exhibiting no growth of fungal organisms in skin tissue culture.

RESULTS:

A total of 30 cases were found from the case records. The mean age was 47.76 ± 4.78 years.. there were 21 Males and 9 females. 23 of 30 patients were in an immune suppressed state and 7 of 30 patients were healthy. as shown in Table 1.

TABLE 1: PATIENT CHARACTERISTICS

characteristic	n (%)
Mean Age (years)	47.76 ± 4.78
Gender	
Male	21 (70%)
Female	9 (30%)
Immunologic state	
immunosuppressed	23(77%)
Nonimmunosuppressed	7(23%)

9 of 23 immunosuppressed patients were having Lymphoproliferative disorders and 9 of 23 immunosuppressed patients were transplanted patients as shown in Table 2

TABLE 2: COMORBID CONDITION

Comorbid condition	n (%)
Lymphoproliferative disorders	9 (30%)
Organ transplant	9 (30%)
Iatrogenic immunosuppression	2 (7)
Sarcoidosis	1 (3.3%)
diabetes	1 (3.3%)
HIV/AIDS1	1 (3.3%)
TOTAL	23(77%)
Healthy individuals	7 (23%)

18 of 30 patients had a primary cutaneous mycosis, while 12 of 30 patients had a systemic mycosis with secondary cutaneous involvement as shown in table 3

TABLE 3: TYPE OF DEEP CUTANEOUS INFECTION

Type of deep cutaneous infection	n (%)
Primary deep cutaneous mycosis	18 (60%)
Systemic mycosis with secondary	12 (40%)

cutaneous involvement	

Clinical presentations encompassed nodules (22/33), ulcerated nodules (4/33), plaques (4/33), ulcers (2/33), and erythematous macules in 1 patient. Nine of 33 patients presented with clinical evidence of tissue necrosis as shown in Table-4

TABLE 4: CLINICAL PRESENTATIONS

Clinical presentations	n (%)
Primary deep cutaneous mycosis	18 (60%)
Systemic mycosis with secondary cutaneous involvement	12 (40%)

In all cases (30/30), fungal elements were identified on routine hematoxylineeosin (H&E) stained skin sections. The predominant histopathologic patterns were granulomatous inflammation, pseudoepitheliomatous hyperplasia , perivascular and interstitial inflammation without granulomas, small vessel vasculitis (1/33), and necrosis (1/33). In 9 of 30 cases, a mixture of histopathologic patterns was seen as shown in Table 5

TABLE 5: HISTOPATHOLOGIC FEATURES

Histopathologic Pattern	n (%)
Granulomatous inflammation	15(50%)
Pseudoepitheliomatous hyperplasia	3 (10%)
Perivascular and interstitial inflammation without granulomas	1 (3.3%)
Vasculitis	1(3.3%)
Necrosis	1(3.3%)
Combination of histopathological patterns	9(30%)

In 23 of 30 cases, the skin tissue culture revealed fungal growth, while in 7 of 30 cases skin cultures were negative. Organisms identified in tissue cultures included Blastomyces dermatitidis, Alternaria, Rhizopus, Fusarium, Acremonium, Pseudoallescheria, Trichophyton mentagrophytes, Coccidioides immitis, and Aspergillus. as shown in Table 6.

TABLE 6: SKIN CULTURE

Skin Culture Result	n/N (%)
Positive skin culture	23/30 (77%)
Blastomyces dermatitidis	8/23 (35%)
Alternaria spp	4/23 (17%)
Rhizopus spp	3/23 (13%)
Fusarium spp	2/23 (9%)
Acremonium spp	1/23 (4%)
Pseudoallescheria	1/23 (4%)
Trichophyton mentagrophytes	1/23 (4%)
Aspergillus	1/23 (4%)
Negative skin culture	7/30 (23%)

Discordant cases: Skin tissue cultures were negative in six out of thirty cases, despite the presence of fungal pathogens on histopathology. 4 of 6 patients were immunosuppressed, with equal numbers of cases with systemic mycosis and secondary cutaneous involvement (2/4) and primary cutaneous mycosis (2/4). 2 of 6 patients were not immunosuppressed, and both had primary cutaneous mycosis.

DISCUSSION:

A histopathologic diagnosis of a deep cutaneous fungal infection was made in 30 patients over the study period, and it was found that this condition was more common in the immunocompromised patients. In our study, immunologic impairment was the most prevalent concomitant condition. Half of our patients had undergone bone marrow or stem cell transplantation and had either had solid organ transplants or had underlying hematologic malignancies.Diabetes mellitus, renal failure and kidney transplantation, long-term corticosteroid medication, and immunosuppressive therapy are risk factors for immunocompromised people. [9–11]

Histopathologic findings in DCFIs may vary, and a thorough examination of serial sections may be required to identify the causative organism(s). A granulomatous inflammatory pattern is often cited as the most prevalent histopathologic trait [12]. This was corroborated in our investigation, in which the majority of instances (18/33) followed this trend. Guarner and Brandt [9] ascribed the discordance between histology and tissue culture to the following: (1) alteration of fungal characteristics due to antifungal medications or host responses; (2) lack of pathologist experience in fungal identification; (3) differences in fungal morphology caused by fragmentation of fungal elements during tissue processing; (4) inflammatory response obscuring fungal morphology; (5) similarities between different fungal species; and (6) only one fungus growing in culture in a dual infection where one is more abundant [13].

CONCLUSION:

We conclude that, despite a negative skin tissue culture, a diagnosis of DCFI should be considered in the differential diagnosis of nonspecific cutaneous lesions with supportive histopathology to avoid the negative consequences associated with delays in diagnosis and treatment, particularly in immunocompromised patients

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