

# A RARE FUNGAL BRAIN ABSCESS CAUSED BY CLADOSPORIUM TRICHOIDES. A REVIEW OF THE LITERATURE

Selçuk Palaoglu M.D.,

University of Hacettepe Institute of Neurological Sciences and Psychiatry Sıhhiye 06100 ANKARA

Turkish Neurosurgery 1 : 26 - 29, 1989

## SUMMARY :

*Cladosporium trichoides* is a rarely seen fungal infection of the central nervous system. Since spores are found in nature, the portal entry is still obscure. It has a strong neurotropism which has been proved in experimental studies. In a modified LEVINE preparation, the effects of mannitol. In the central nervous system it mostly produces brain abscess, in some cases multiple. The prognosis is bad in the majority of cases. Fluocytosine seems useful in conjunction with surgery.

## KEY WORDS :

*Cladosporiosis, Fungal cerebral abscesses*

## INTRODUCTION

Fungal brain abscesses due to *Cladosporium trichoides* are very rare. Since the first description of this fungus in 1952 (6), only 37 cases have been reported. This paper is a review of the literature of the infections caused by this neurotropic, non-opportunistic fungus: *Cladosporium trichoides*.

## TERMINOLOGY AND HISTORY

Reported cases in the literature have been termed "*Cladosporium trichoides*", "*Cladosporium bantianum*", "*Hormodendrum*", "*Cladosporiosis*", "*Chromoblastomycosis*" and "*Phaeohyphomycosis*" (6,8,11,12,28,32,33,46,47,51).

In 1952, Binford and co-workers in Maryland, published an unusual brain abscess (6). The aetiological agent was a darkly pigmented fungus which had not been reported before as a cause of disease in man. Dr. Emmons identified that this fungus was different from the previously described species of *Cladosporia* and named it *Cladosporium trichoides*. In 1960, Borelli reported that there is a similarity between *Cladosporium trichoides* and the brown fungus isolated from a brain abscess by Banti in 1911 (3,9). One year later, in 1912, it was named *Torula Bantiana* by Saccardo (41). Borelli revised the name *Cladosporium trichoides* to *Cladosporium Bantianum* but the spores of *Torula Bantiana* were reported to be nearly twice the size of *Cladosporium trichoides* and borne in simple instead of branched chains (9). In 1981, McGinnis and Borelli studied Banti's fungus and *Cladosporium trichoides* and reported that *Cladosporium trichoides* is a synonym of *Cladosporium bantianum* (34). Kwon Chung and co-workers in 1983 revealed that *Cladosporium Ban-*

*tianum* was different from *Cladosporium trichoides* morphologically and physiologically (29).

*Chromoblastomycosis* was used for two clinical forms: first cutaneous *chromoblastomycosis* and the other cerebral *chromoblastomycosis* (46). In this second clinical form, except for a few examples the infection is limited only to the central nervous system and the main causative agent is *Cladosporium trichoides*. Some authors do not agree with this classification (5, 18). *Chromoblastomycosis* is described as a chronic cutaneous infection caused by any one of such fungus and if one of these fungi caused a central nervous system infection, then it is called cerebral *chromoblastomycosis*.

*Hormodendrum* is a synonym of *Cladosporium* and by reason of priority *Cladosporium* is the correct generic name (33,39,49). *Phaeohyphomycosis* is various infectious processes in which the aetiological agent is a brown pigmented fungus (1). *Dematiomycosis* describes all brain infections caused by brown-walled fungus and *Cladosporium trichoides* is one of the dematiaceous fungi (42). In the recent literature this fungus is mentioned as *phaeohyphomycosis* (21, 32, 37, 42).

## HISTOLOGICAL AND CULTURAL ASPECTS

*Cladosporium trichoides* is the only fungus producing brown pigmented septate round bodies and pigmented branching hyphae in tissues (Figure 1) (19,42,43). The round or oval yeast-like forms are 2-2.5x4-20 $\mu$  in diameter (Figure 2). Some of them appear to be budding and producing tube-like extensions into hyphae (Figure 3). The branching irregular hyphae are composed of elongated and chain-arranged cells usually 2-7 $\mu$  wide and 10-12 $\mu$  long.

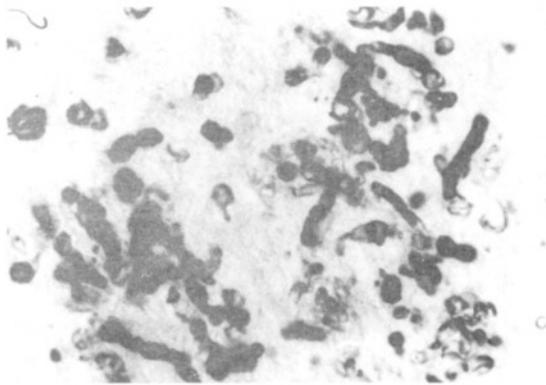


Figure 1 : Fungal hyphae are composed of chained, elongated elements of 4x10 micrometer in size (methenamine-silver stain, x200)

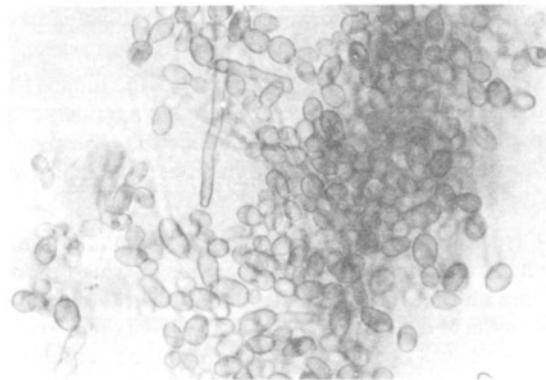


Figure 2 : Chains of budding fungal elements septate and shield shaped buds at two or more points are seen in direct examination (Fresh preparation, x400)

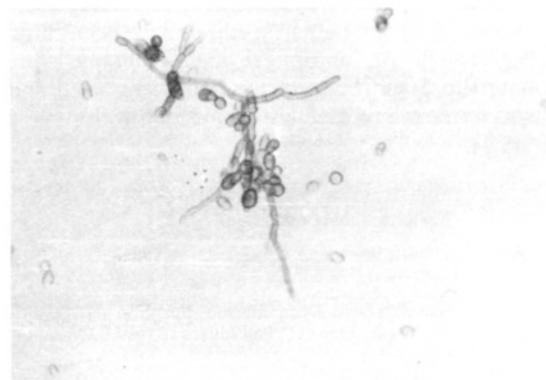


Figure 3 : Chains of budding fungal elements and septate basal spores from Sabouraud's culture are seen in direct examination (Fresh preparation, x200)

The hyphae segments are separated by cross walls (6,32). Although unstained material and hematoxylineosin is enough to demonstrate this fungus, the specimen is also stained with methenamine silver, periodic acid-Schiff, Lillie, GMS, Gridley (31,32). In sections stained with hematoxylin-eosin and in unstained preparations, the hyphae seem to be light brown in colour. Histological examination of the microorganism is not enough to determine the type of the fungus. The second step must be to demonstrate the cultural aspects of the fungus. *Cladosporium trichoides* grows on Sabouraud's media or any other common culture medium at room temperature or at 37°C in approximately six days. It produces dark brown coloured colonies (Figure 4) (6,10,36). Animal inoculation is successful but not an essential step in diagnosis. When inoculated intravenously into mice and rabbits the fungus can be found in various organs but commonly it produces fatal cerebral lesions similar to that seen in human infections (6,18,19,20,33,39,45). Strong neurotropism is an important feature of this fungus as confirmed by experimental studies.

#### CLINICAL FEATURES AND TREATMENT

The age of the reported cases varies between 6 months and 79 years. Onset of the disease is more frequently in the second and third decade. Most of the patients are male in the reported cases and the male: female ratio is about 3:1. This infection has a wide geographical distribution. Cases are reported from all continents (4,14,15,16,23,30,51). *Cladosporium* spores are found commonly in decaying vegetation and on wood (13). Also this fungus has been recovered from soil (17,27). Two cases of brain abscess caused by *Cladosporium trichoides* in cats were reported by Jang et al in 1977 (24). Although there does not appear to be any occupational predisposition, the infection is most common in farmers. The portal entry of *Cladosporium* is most common in farmers. The portal entry of *Cladosporium trichoides* is generally obscure. Kim et al reported a case of traumatic implantation of this fungus due to orbital trauma (25).

The majority of patients seem to be in good health when infected. Immunological deficiency has rarely been shown (36,44). *Cladosporium trichoides* does not seem to be an opportunistic fungus. The duration of symptoms has also been variously reported from a few weeks to many years. Clinically there has been no reason to suspect such a rare fungal infection. Diagnosis was made in all reported cases after surgery and postmortem examination. The signs and symptoms of central nervous system infection due to this fungus are no different from an increased intracranial pressure signs such as headache and vomiting. In most cases there is an acute onset of the

symptoms. Seizures, hemiparesis, papilledema, ataxia etc. are the most common manifestations. Signs and symptoms of meningeal irritation are reported in some patients (5,15,18,30,31). Generally there is no sign of an infectious disease. Cerebrospinal fluid findings have been reported in relatively few cases and lumbar cerebrospinal fluid culture has never been positive. In one case fungus was isolated from the ventricular fluid (14). In the majority of cases, except diagnosed as meningitis, cerebrospinal fluid pressure, cell count, glucose and protein levels were within normal limits. The computerized tomography scan reveals a well-defined mass with an irregular capsule surrounded by an area of radiolucency (Figure 5) (32,43,44).

*Cladosporium trichoides* causes a central nervous system infection in either the cerebral or meningeal form. The most reported form is cerebral abscess. In a number of cases multiple abscesses are seen in the brain (10,22,26,30,31,33,36,43). The presence of multiple brain abscesses in some cases supports the theory of dissemination of the fungus to the central nervous system by a haematogenous route (22,26,30,31,33,36,43). Usually the surgical specimen is an unencapsulated mass with a firm thick periphery and a soft centre containing grayish-brown pus. At histological examination fungal cells in the non necrotic part of the lesion are seen as an intensely pigmented wall but in the necrotic areas this pigment is less prominent. In some cases meningitis was observed (5,15,18,30,35). Empyema is a rarely seen complication and in one case empyema extended up to the upper thoracic spinal cord (5,15). In two cases intraventricular pus was found (10,14).

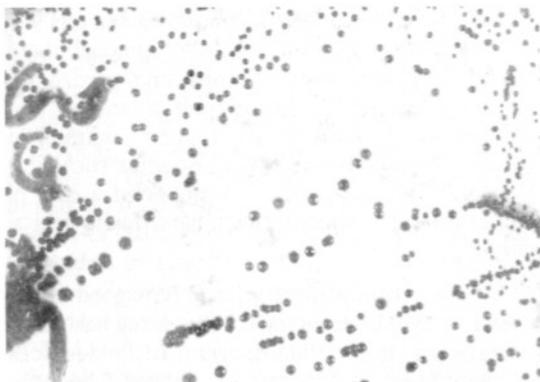


Figure 4 : Fungal colonies not exceeding one centimeter in diameter are seen in Sabouraud's culture (Close-up, x400)

Most abscesses are found in the white substance of the cerebral hemispheres. Unusual localization of the abscesses such as choroid plexus involvement, thalamic abscess and cerebellar abscess have been reported (13,15,18,43). Bennett et al in 1973 reported a case of occlusion of the carotid artery (5). The lesions are usually limited to the central nervous



Figure 5 : Computerized tomography scan showing fungal infection due to *Cladosporium trichoides*.

system because of the great affinity of the fungus for the central nervous system. There are a few reports that the fungus was isolated outside the central nervous system, such as in the lung, ear, paranasal sinus and subcutaneous tissue (4,10,22,38,39,50).

Treatment has been largely unsuccessful and prognosis is bad as only a few patients survived more than one year (5,25,35,43) and most died within few months of diagnosis. Surgical removal of the abscess capsule was the first choice of treatment in the majority of cases. Since there is no distinct capsule, the presence of multiple abscesses and infection of the surrounding cerebral tissue by the fungus makes surgical therapy ineffective. Most antibiotics have been used against this disease. Antifungal chemotherapy has been seriously used in only a few cases and only one patient seems to have been cured (25,32,36,44). As antifungal chemotherapy, Amphotericin B and fluocytosine have been used and fluocytosine seems useful in conjunction with surgery (7,35,44).

Acknowledgement : I am very much grateful to Dr. AYDIN SAV for photographing the lesion.

#### REFERENCES

1. Ajello L: Phaeohyphosis. Definition and etiology in mycosis. Sci Publ no 304, Washington D.C. Pan American Health Organization 1975, p 126-130
2. Bagchi AK, Aikat BK, Barva D: Granulomatous lesion of the brain produced by *C. trichoides*. J Indian Med Assoc 38:602-604, 1962
3. Banti G: Spora un caso di oidiomicosi cerebrale. Atti Accad Med-Fis Fiorent 49, 1911
4. Barnola J, Ortega AA: Cladosporiosis profunda. Mycopathol Mycol Appl 15: 422-428, 1961
5. Bennet JE, Bonner H, Jennings AE, et al: Chronic meningitis caused by *C. trichoides*. Am J Clin Pathol 59:398-407, 1973
6. Binford CH, Thompson RK, Gorhan ME, et al: Mycotic brain abscess due to *C. trichoides*, a new species: Report of a case. Am J Clin Pathol 22:535-542, 1952

7. Block ER, Jennings AE, Bennet JE: Experimental therapy of cladosporiosis and sporotrichosis with 5-Fluorocytosin. *Antimicrob Agents Chemother* 3:95-98, 1973
8. Bobra ST: Mycotic abscess of the brain probably due to *Cladosporium trichoides*: Report of the fifth case. *Canad M A J* 79:657-659, 1958
9. Borelli D: Torula Bantiana, apente di un granuloma cerebrale. *Riv Anat Patol Oncol* 17:615-622, 1960
10. Brown JW, Nadell J, Sanders CV, et al: Brain abscess caused by *cladosporium trichoides* (Bartianum): A case with paranasal sinus involvement. *S Med J* 69:1519-1521, 1976
11. Chevrel ML, Javalet A, Doby-Dubois M, et al: A propos d'une observation de cladosporiose cerebrale. *Ann Anat Pathol* 7:607-614, 1962
12. Coudert J, Allegre G, Tommasi M: Une cas lyonnais de mycose cerebrale due a *cladosporium trichoides*. *Rev Lyon Med* 11:51-62, 1962
13. Chrichlow DK, Enrile FT, Memon MY: Cerebellar abscess due to *cladosporium trichoides* (Bantianum): Case report. *Am J Clin Pathol* 60:416-421, 1973
14. Dastur HM, Chaulker AP, Rebello MD: Cerebral chromoblastomycosis due to *C. trichoides* (Bantianum): Part I. *Neurol India* 14:1-5, 1966
15. Dereymaeker A, De Somer P: Arachnoidite fibro-purulente cerebello-cervicale due a une moisissure (*Cladosporium*). *Acta Neurol et Psychiatry (Belg)* 55:629-632, 1955
16. Desai SC, Bhatikar ML, Mehta RS: Cerebral chromoblastomycosis due to *C. trichoides* (Bantianum): Part II. *Neurol India* 14:6-8, 1966
17. Dixon DM, Shadomy HS, Shadomy S: Dematiaceous fungal pathogens isolated from nature. *Mycopathologia* 70:153-161, 1980
18. Duque O: Meningoencephalitis and brain abscess caused by *Cladosporium* and *Fonsecaea*. Review of 2 cases and experimental studies. *Am J Clin Pathol* 36:505-517, 1961
19. Felger CE, Friedman L.: Experimental cerebral chromoblastomycosis. *J Infect Dis* 3:1-7, 1962
20. Garcin R, Martin G, Menigand S, et al: Mycose cerebrale a *Cladosporium trichoides*. *Sem Hop paris* 33:2282-2283, 1957
21. Hironaga M, Watanabe S: Cerebral phaeohyphomycosis caused by *cladosporium Bantianum*: A case of a female who had cutaneous alternariois in her childhood. *Sabouraudia* 18:229-335, 1980
22. Horn IH, Wilansky DL, Harland WA, et al: Neurogenic hypernatremia with mycotic brain granulomas due to *cladosporium trichoides*. *Canad Med Ass J* 83:1314-1317, 1960
23. Jaffe B, Barnola J, Martinez A, et al: Cladosporiosis cerebral. quoted by Campins H: Sintesis de las investigaciones micologicas realizadas en Venezuela durante los anos 1946-1956. *Mycopath et Mycol Appl* 9:152-175, 1958
24. Jang SS, Biberstein EL, Rinaldi MG, et al: Feline brain abscesses due to *cladosporium trichoides*. *Sabouraudia* 15:115-123, 1977
25. Kim RC, Hodge CD Jr, Lakberson HW jr, et al: Traumatic intracerebral implantation of *cladosporium trichoides*. *Neurology* 31:1145-1148, 1981
26. King AB, Collette TS: Brain abscess due to *cladosporium trichoides*: Report of the second case due to this organism. *Bull Johns Hopkins Hosp* 91:298-305, 1952
27. Klite PD, Kelley HB, Diercks FV: A new soil sampling technique for pathogenic fungi. *Am J Epidemiol* 81:124-130, 1965
28. Küllü S, Onol B, Kuştimur S, et al: Cerebral Cladosporiosis. *Surg Neurology* 24:437-440, 1985
29. Kwon-Chung KJ, de Vries GA: Comparative study of an isolate resembling Banti's fungus with *Cladosporium trichoides*. *Sabouraudia* 21:59-72, 1983
30. Lucasse C, Chardome J, Magis P: Mycose cerebrale par *cladosporium trichoides* chez un indigene de Congo Belge, et note mycologique sur *cladosporium trichoides*. Emmons, 1952, par R. Vanbrenseghem. *Ann Soc Belge Med Trop* 34:475-484, 1954
31. Manson MD: Chromoblastomycotic brain abscess in a south African Bantu. Report of a case. *South African J Lab E Clin Med* 4:283-288, 1958
32. Masini T, Riviera L, Capricci E, et al: Cerebral phaeohyphomycosis. *Clin Neuropathol* 4:246-249, 1985
33. McGill HC, Brueck, JM: Brain abscess due to *Hormodendrum* species. Report of Third Case. *Arch. Path.* 62:303-311, 1956
34. McGinnis MR, Borelli D: *Cladosporium bantianum* and its synonym *Cladosporium trichoides*. *Mycotaxon* 13:127-136, 1981
35. Middleton FG, Jurgenson, PF, Utz JP, et al: Brain abscess caused by *C. trichoides*. *Arch Intern Med* 126:444-448, 1976
36. Musella RA, Collins GH: Cerebral chromoblastomycosis: case report. *J Neurosurg* 35:219-222, 1971
37. Naim-Ur-Rahman, el Sheikh Mahgoub, Abu Aisha H, et al: Cerebral Phaeohyphomycosis. *Bull soc Pathol Exot Filiales* 80:320-328, 1987
38. Nsanzumuhire H, Vollum D, Poltera AA: Chromomycosis due to *Cladosporium trichoides* treated with 5-fluorocytosine: a case report. *Am J Clin Pathol* 61:257-263, 1974
39. Riley O, Mann SH: Brain abscess caused by *C. trichoides*. Review of 3 cases and report of a 4th case. *Am J Clin Pathol* 33:525-531, 1960
40. Riviera CL, Puccetti U, Scarlato Y: Nodular form of cerebral mycosis probably due to *cladosporium trichoides*. *Eur Neurol* 3:161-167, 1970
41. Saccardo PA: *Notae mycologicae*. I. Fungi ex Gallia, Abyssinia, Japonia, Mexico, Canada, Amer Bor ET Centr. *Ann Mycol* 10:310-322, 1912
42. Salaki JS, Lauria DB, Chmel H: Fungal and Yeast Infections of the Central Nervous System Medicine (Baltimore) 63:108-32, 1984
43. Sandhyamani S, Bhatia, R, Mohapatra LN, et al: Cerebral Cladosporiosis. *Surg Neurol* 15:431-434, 1981
44. Seaworth BJ, Kwon-Chung KJ, Hamilton JD, et al: Brain abscess caused by a variety of *Cladosporium Trichoides*. *Am J Clin Pathol* 79(6):747-52, 1983
45. Segretain G, Mariat F, Drouket E: Sur *cladosporium trichoides* isole d'une mycose cerebrale. *Ann Inst Pasteur* 89:465-470, 1955
46. Symmers WS: A case of cerebral chromoblastomycosis (*Cladosporiosis*) occurring in Britain as a complication of polyarteritis treated with cortisone. *Brain* 83:37-51, 1960
47. Tommasi M, Coudert J, Fan R, et al: Mycose cerebrale a *cladosporium trichoides*. *Arch Anat Pathol* 12:48-50, 1964
48. Warot P, Golibert P, Meignie S, et al: Mycose cerebrale a symptomatologie tumorale (*Cladosporium trichoides* probable). *Rev Neurol (Paris)* 105:489-496, 1961
49. Watson KC, Lines GM: Brain abscess due to the fungus *Hormodendrum*. *S Afr Med J* 31:1081-1082, 1957
50. Watson KC: Cerebral chromoblastomycosis. *J Pathol Bacteriol* 84:233-237, 1962
51. Wilson E: Cerebral abscess caused by *cladosporium Bantianum*: Case Report. *Pathology* 14:91-96, 1982