

INCREASED INCIDENCE OF FUSARIUM INFECTION IN HUMANS

Turda Constanta*, Csep Andrei*

*University of Oradea, Faculty of Medicine and Pharmacy
cturda2003@yahoo.com

Abstract

The frequency and diversity of serious fungal infections are increasing. It is an observation noted by scientists all over the world, including our country. Species in the genus Fusarium are common in soil and organic debris and are frequently the cause of diseases in plants(cereal grains, tomatoes, soybeans) and occasionally cause infection in animals;

They are also present in water worldwide. In humans, the clinical manifestations are diverse and depend largely on the immune status of the host. Persons who are severely immunocompromised are particularly vulnerable to infection.

We have 2 case reports of children 2 and 3 years old respectively living in countryhood, in the same area, presented for dermatological examination; clinical aspect was onychomycosis, confirmed by mycological examination and culture-.Fusarium. Sistemic investigations revealed immunocompetent status.

There seems to be a distinct seasonal peak and geographic distribution of invasive fusariosis. Specifically, the majority of the cases occur during the rainy summer season. Future studies are needed to identify reservoirs of Fusarium spp. in the community that promoted the emergence of superficial fusariosis in immunocompetent patients as well as preventive measures for patients at high risk for disseminated disease.

Hygiene is very important, as well as all public health measures for environmental health.

Key words: fungal infections, Fusarium, fusariosis, immunocompetent, host, onychomycosis, rainy summer season

INTRODUCTION

Fusarium spp. have long been recognized as soil saprophytes and plant and bacterial pathogens. The most frequent species causing infection in humans are *F. solani*, *F. oxysporum*, and *F. moniliforme*. In humans, the clinical manifestations are diverse and depend largely on the immune status of the host. In the normal host, Fusarium may cause localized infections of the nails: onychomycosis(Calado NB et al,2006) and cornea: keratitis(Centers for Disease Control and Prevention (CDC),2005-2006), allergic diseases(Michail S et al, 2004), and mycotoxicosis following ingestion of food contaminated by toxin-producing Fusarium species. Persons who are severely immunocompromised are particularly vulnerable to infection(Consigny S, et al,2003, Nucci M,E. Anaissie, 2007). Clinical manifestations range from colonization of airways(Jay B. Varkey,2008) to

chronic localized lesions to acute invasive or disseminated disease(fusariosis). More commonly fusariosis occurs in persons with hematological malignancy, prolonged neutropenia, and bone marrow transplant recipients.(Nucci M,E. Anaissie , 2002, Raad I, et al, 2006).

There seems to be a distinct seasonal peak and geographic distribution of invasive fusariosis. Specifically, the majority of the cases occur during the rainy summer season, when the dispersion of fusarial conidia in the air is more pronounced(Apostolidis J,M.et al, 2003).

The morphology of the macroconidia is the key characteristic for characterization not only of the species but also of the genus *Fusarium*.

Macroconidia of *Fusarium* species are of various shapes and sizes, but the shape of the macroconidia formed in sporodochia for a given species is a relatively consistent and stable feature when the fungus is grown on natural substrates under standard conditions .

The presence or absence of macroconidia is the primary character of *Fusarium* taxonomy(Liu K et al,1998).

In culture, the characteristic feature of *Fusarium* is the production of sickle-shaped multiseptate macroconidia.

MATERIAL AND METHODS

We have 2 case reports of children 2 and 3 years old respectively living in the countryside, in the same area, near Oradea, presented for dermatological examination 2 days apart one for another; they do not belong to the same family, just the same community; clinical view revealed dystrophic toenails, thickened, opaque, yellow-brown nails, which become roughened and crumbles easily, localised on both feet, asimmetrically.

First diagnosis was traumatic onycholysis considering age and no family history for dermatological diseases; on this occasion I found out that children are full of joy, playing in the garden, yard, but they do not like to wear any kind of shoes, so, skin, foot, nails are in direct contact with soil, dust, sand, plants, water. Onychomycosis had to be considered.



Onychomycosis due to *Fusarium* infection in children(descripted cases).

RESULTS AND DISCUSSION

I performed dermoscopy, examination useful to distinguish distal subungual onychomycosis from traumatic onycholysis. To these patients "aurora borealis" pattern was found(the proximal border of the onycholytic area is jagged owing to the presence of yellow-white spikes that project into the proximal nail plate), suggesstive for onychomycosis. Onychomycosis is caused by 3 main classes of fungi: dermatophytes, yeasts, and nondermatophyte molds. Dermatophytes are by far the most common cause of onychomycosis. Two major pathogens are responsible for approximately 90% of all onychomycosis cases. *Trichophyton rubrum* accounts for 70% and *Trichophyton mentagrophytes* accounts for 20% of all cases. Onychomycosis caused by nondermatophyte molds (*Fusarium* species, *Scopulariopsis brevicaulis*, *Aspergillus* species) is becoming more common worldwide, accounting for up to 10% of cases. Studies indicate that adults are 30 times more likely to have onychomycosis than children. Onychomycosis has been reported to occur in 2.6% of children younger than 18 years but as many as 90% of elderly people(Girmenia C,2000).

Mycological examinations were needed: Direct microscopy- a 20% potassium hydroxide (KOH) preparation in dimethyl sulfoxide (DMSO) obtained from the nail bed by curettage and fungal culture for identification of incriminated organism.Clinical suspicion of onychomycosis, was confirmed by mycological examination and culture:.*Fusarium*. *Fusarium* species can cause superficial infections as onychomycosis in immunocompetent hosts, as well as locally invasive and disseminated infections in immunocompromised patients. Despite their healthy image and good appetite, these children had to be investigated for their immunological status. Systemic examination and lab tests showed an immunocompetent status. Might be the habit of naked soles the only cause of onychomycosis with *Fusarium*?



Dermoscopy of distal subungual onychomycosis showing irregular margin of the onycholytic area with spikes projecting into the proximal nail plate, reported as the "aurora borealis" pattern. Handyscope at 20X(Gupta AK, 2000)

CONCLUSION

The frequency and diversity of serious fungal infections are increasing worldwide, as in our country. *Fusarium* spp. have long been recognized as soil saprophytes and plant and bacterial pathogens.

Fusarium may cause localized infections of the nails (onychomycosis) and cornea (keratitis), allergic diseases, mycotoxicosis following ingestion of food contaminated by toxin-producing *Fusarium* species.

Persons who are severely immunocompromised are particularly vulnerable to infection. Our findings, 2 cases of onychomycosis caused by *Fusarium* infection in immunocompetent children may have implications for future research, in particular, determining the environmental reservoirs of *Fusarium* spp. in the community that promoted the emergence of superficial fusariosis in immunocompetent patients, as well as preventive measures for patients at high risk for disseminated disease. Hygiene is very important, as well as all public health measures for environmental health.

The theme is more important as treatment for onychomycosis is a systemic one, with liver toxicity; so, we have to think twice before administering it, especially for children. Better prevent, than treat!

REFERENCES

- Anaissie E, R.Kuchar ,J. Rex , et al. 2001, Fusariosis and pathogenic *Fusarium* species in a hospital water system: a new paradigm for the epidemiology of opportunistic mould infections. Clin Infect Dis 2001;33:1871-1878
- Apostolidis J,M. Bouzani , E. Platsouka, et al.2003, Resolution of fungemia due to *Fusarium* species in a patient with acute leukemia treated with caspofungin. Clin Infect Dis 2003; 36:1349-1350
- Calado NB, F.Sousa Jr.,NO Gomes , FR Cardoso , LC Zaror , EP Milan, 2006, *Fusarium* nail and skin infection: a report of eight cases from Natal, Brazil Departamento de Infectologia, Universidade Federal do Rio Grande do Norte -- UFRN Rua Cônego Monte, 110 Quintas Natal, CEP: 59037-170, RN, Brazil, , Mycopathologia. 2006 Jan;161(1):27-31.
- Centers for Disease Control and Prevention (CDC).2005-2006, Update: *Fusarium* keratitis: United States, 2005-2006. MMWR Morb Mortal Wkly Rep 2006;55:563-564
- Consigny S,N Dhedin , A Datry , S Choquet , V Leblond , O Chosidow, 2003,. Successful voriconazole treatment of disseminated *Fusarium* infection in an immunocompromised patient. Clin Infect Dis 2003;37:311-313.

- Dragos Serban, 2011, Avertizare privind raspandirea infectiilor cu *Fusarium* (fusarioza), *Phytophthora* (mana), *Septoria* (septorioza), *Leveillula* (fainare) si *Botritis* (putregai cenuziu) in Ilfov si judetele limitrofe, Publicat la data de 28 Sep. 2011 in: Avertizari Fitosanitare
- Girmenia C, L. Pagano, L. Corvatta, L. Mele, A del Favero, P. Martino, 2000, The epidemiology of fusariosis in patients with haematological diseases. *Gimema Infection Programme. Br J Haematol* 2000;111:272-276
- Gupta AK, R. Baran, R. C. Summerbell, 2000, *Fusarium* infections of the skin. *Curr Opin Infect Dis* 2000;13:121-128
- Ho D, Lee J, Rosso F, J. Montoya, 2007, Treating disseminated fusariosis: amphotericin B, voriconazole or both? *Mycoses* 2007;50:227-231
- Jay B. Varkey, MD, John R. Perfect, MD, 2008, Rare and Emerging Fungal Pulmonary Infections, *Semin Respir Crit Care Med.* 2008;29(2):121-131.
- Liu K, D. Howell, J. Perfect, W. Schell, 1998, Morphologic criteria for the preliminary identification of *Fusarium*, *Paecilomyces*, and *Acremonium* species by histopathology. *Am J Clin Pathol* 1998;109:45-
- Michail S. Lionakis, M.D., P. Dimitrios, Kontoyiannis, M.D., Sc.D., F.A.C.P., 2004, *Fusarium* Infections in Critically Ill Patients, *Semin Respir Crit Care Med.* 2004;25(2)
- Nelson P, M. Dignani, E. Anaissie, 1994, Taxonomy, biology, and clinical aspects of *Fusarium* species. *Clin Microbiol Rev* 1994; 7:479-504
- Nucci M, E. Anaissie, 2007, *Fusarium* infections in immunocompromised patients. *Clin Microbiol Rev* 2007; 20:695.
- Nucci M, E. Anaissie, 2002, Cutaneous infection by *Fusarium* species in healthy and immunocompromised hosts: implications for diagnosis and management. *Clin Infect Dis.* 2002 Oct 15;35(8):909-20. Epub 2002 Sep 18. University Hospital, Universidade Federal do Rio de Janeiro, Brazil
- Nelson P E, M C Dignani, and E J Anaissie, 1994, Taxonomy, biology, and clinical aspects of *Fusarium* species, *Clin Microbiol Rev.* Oct 1994; 7(4): 479–504. PMID: PMC358338
- Raad I, R. Hachem, R. Herbrecht, et al., 2006, Posaconazole as salvage treatment for invasive fusariosis in patients with underlying hematologic malignancy and other conditions. *Clin Infect Dis* 2006;42:1398-1403
- Stanzani M, N. Vianelli, G. Bandini, et al., 2006, Successful treatment of disseminated fusariosis after allogeneic hematopoietic stem cell transplantation with the combination of voriconazole and liposomal amphotericin B. *J Infect* 2006;53: e243-e246
- Winn RM, A. Maloukou, C. Gil-Lamaignere, C. Panteliadis, E. Roilides, 2001, The Eurofung Network. Interferon-gamma and granulocyte-macrophage colony stimulating factor enhance hyphal damage of *Aspergillus* and *Fusarium* spp by human neutrophils. Abstracts of the 41st Interscience Conference on Antimicrobial Agents and Chemotherapy. Chicago, IL: 2001: Abstract J-134
- www.emedicine.medscape.com