Repeated furunculosis in adult male with abnormal neutrophil activity

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SUMMARY

A 21 years old male suffered from repeated furunculosis in different regions of the body over the last two years. This coincided with the start of professional activities in hospital surroundings. The purulent secretions all showed growth of *Staphylococcus aureus.* All laboratory tests were normal except for a decrease of the neutrophil phagocytic ingestion phase.

Before the diagnosis of defective phagocytosis was made, antibiotic treatment was started about 4 to 5 days after the appearance of the infectious process and the furunculosis led to abscess formation with difficult healing and cellulitis. After the diagnosis of defective phagocytosis ingestion phase, personal hygiene was intensified during and after work shifts at the hospital and antibiotic treatment was started at the first signs of folliculitis, which showed healing.

Key words: Furunculosis. Defective phagocytosis. Hospital. *Staphylococcus aureus*.

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INTRODUCTION

Defective phagocytic activity by neutrophils is usually diagnosed in children. The most frequently encountered is chronic granulomatous disease (CGD) with an incidence of 1 in 181.000 live births (1, 2).

The deficiency in CGD is at the neutrophil digestion phase. CGD is a genetic syndrome characterized by increased susceptibility to serious infections associated to dysfunction of the NADPH oxigenase system and phagocytic function with normal B and T cell function. Clinically, there are serious infections, which usually start during the first year of life, with abscess formation especially in lungs, lymph nodes, skin and liver. There are case reports where diagnosis was made as late as the sixth decade of life (3). The infections are usually caused by a relatively narrow spectrum of catalase positive micro-organisms like *Staphylococcus aureus, Serratia marcenscens, Escherichia coli, Pseudomonas* and *Aspergillus species.* The prognosis of CGD is related to early diagnosis and treatment with antibiotics, sulfametoxazol-trimethopim and antifungus itraconazol if necessary and gamma interferon and bone marrow transplantation, if possible (4-11).

Few case reports of adults with deficient ingestion phase or defective phagocytic digestion have been described in the literature (12).

CASE REPORT

A 21 year old male, without previous recurrent infection, who presented recurrent furunculosis over the last two years. The first lesion developed in the nasal region and progressed to facial cellulitis. Two months later, a similar infection developed in the right calf region with a similar lengthy duration. At this stage, immunologic investigation showed deficiency in the phogocytic ingestion phase (table I) with normal nitroblue tetrazolin (NBT) test (table II).

After identification of the alteration in phagocytosis, the furunculosis developed in the left superior eyelid, the right and then the left inguinal region and the left leg (twice). Culture in all these infections demonstrated *Staphylococcus aureus* as causative agent. Antibiotics were administered

Table I

Results of chemotaxis and phagocytosis evaluation of polymorphonuclear neutrophils

Neutrophils	Chemotaxis	Phagocytosis
Control	28 micra	21%
With homologous serum	69 micra	53%
With autologous serum	73 micra	55%

immediately after the first signs of folliculitis, which resulted in fast and uncomplicated resolution of the infections.

DISCUSSION

Zimosan particle phagocytosis used in our methodology, assesses the ingestion phase by neutrophils and is similar to that used previously for monocytes (13), seeing that monocytes and neutrophils present analogous receptors for phagocytosis. Incubation with serum allows compliment activation by the zimosan, resulting in C3b and C5b component activation which unite to these particles, allowing ingestion to take place. The first control verifies spontaneous cell migration without chemotactic stimuli. The fact of there not being any significant difference between the second test (cells incubated with Zy and human "pool" serum) and the third test (cells, Zy and patient's serum) in the presence of normal complement level in this patient, indicates that the decrease in phagocytosis is due to an intrinsic problem of the neutrophils.

Nitroblue tetrazolium, a soluble yellow dye, captures liberated electrons during oxidative neutrophil metabolism. After reduction, the particles become dark blue, called formazana, which are deposited inside the neutrophil cytoplasm. The NBT test becomes more evident when stimulated by substances like lipopolysaccharides. This test can evaluate electron liberation which occurs during the digestion phase by oxidative metabolism of neutrophils (14-16).

Table II

Result of NBT evaluation

Nitroblue tetrazolium (NBT) test
Spontaneous: 6%.
With bacterial lipopolysaccharide: 13%.

Our results show a decrease in the ingestion phase of phagocytosis, with normal oxidative metabolism of polymorphonuclear neutrophils (17, 18).

These findings are coherent with the clinical observation of more frequent infections by *Staphylococcus aureus* and the progress of folliculitis to abscesses and cellulitis, which occurred in this patient.

Polymorphonuclear neutrophils are important cells in the defense against pyogenic bacteria like *Staphylococcus aureus.* They represent the cells of the initial defense against these microorganisms. Neutrophils, in the presence of infectious agents, start expressing greater numbers of adhesive molecules. Under these circumstances, they leave the center of blood vessels and start moving more slowly at the periphery of these vessels (they marginate). After the union between adhesion molecules of neutrophils (LFA-1 and VLA-1) and their receptors on endothelial cells (ICAM-1, ICAM-2 and VCAM), neutrophils leave the bloodstream and enter tissues where immunologic defense occurs.

In the presence of chemotactic agents like lipopolysaccharides of bacterial walls and cytokines (IL-8) and leukotriene B4 produced by monocytes and macrophages, chemotaxis of neutrophils occurs to the infection sites.

When confronted with an infectious agent, the polymorphonuclear neutrophil attempts to phogocytize it. At an initial stage, ingestion of the agent occurs through receptors forming a phagocytic vacuole which contains the antigen. The neutrophil's cytoplasmatic granules are then thrown into the phagocytic vacuole forming a phogosome, where digestion will occur.

When the first phase of phagocytosis is deficient, that is, the ingestion phase, the whole process of phagocytosis will be impaired even in the presence of a normal digestion phase and there will be recurrent infections by microorganisms dependent of polymorphonuclear neutrophil defense. The O_2 to O_2- reduction is an important intracellular reaction in the digestion of the ingested bacteria (NADPH oxigenase system). In CGD there is inability to form O_2- and H in phagocytosis, so there is no digestion of bacteria, fungi and especially catalase-positive microorganisms. These microorganisms remain alive within phagocytes, leading to granuloma formation (19, 20).

This patient started to present folliculitis after initiating work at a hospital. Classical treatment of folliculitis with topical antibiotics was adopted at first. As there was no improvement, systemic antibiotics were prescribed with unsatisfactory outcome and progress of infection to facial cellulitis and large abscess formation. Culture of secretion revealed *Staphylococcus aureus,* the same agent encountered

in resistant hospital infections, frequently leading to very serious systemic infections. *Staphylococcus aureus* is a frequently encountered microorganism within hospital surroundings and is described as an important causative agent in resistant hospital infections in Brazil (21-25). The fact that this patient had not presented recurrent folliculitis before starting work in hospital must be due to lack to exposure to the causative organism.

After the diagnosis in the phagocytosis ingestion phase, personal hygiene was intensified during and after work shifts at the hospital and antibacterial treatment was started with sulfametoxazole-trimethroprim at the first signs of folliculitis, which showed healing.

This case brings to light the possibility of phagocytosis deficiency in adults with recurrent furunculosis after starting work at hospitals. People working in these contaminated surroundings should be benefited by perfect defense forces of normal neutrophil phagocytosis.

RESUMEN

Un varón de 21 años de edad padeció furunculosis de repetición en regiones diferentes del cuerpo durante los dos últimos años. Esto coincidió con el comienzo de las actividades profesionales en ambiente hospitalar. Las secreciones purulentas mostraron crecimiento de *Staphylococcus aureus*. Todas las pruebas del laboratorio eran normales salvo una disminución de la fase de ingestión de los neutrófilos-fagocitos.

Antes de que se diagnosticara el déficit de la fagocitosis, se había efectuado tratamiento durante 4 ó 5 días con antibióticos, sin éxito, ya que la furunculosis evolucionó hacia un absceso y celulitis, de difícil solución. Después del diagnóstico la higiene personal se intensificó durante y después de los turnos de trabajo en el hospital y el tratamiento del antibiótico comenzó a las primeras señales de reaparición de la foliculitis con mejora inmediata.

Palabras clave: Furunculosis. Fagocitosis deficiente. Hospital. *Staphylococcus aureus*.

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