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Usefulness of CT in diagnosis of lung mycosis in children with acute leukemia

Przydatność TK w diagnostyce zakażeń grzybiczych płuc u dzieci z ostrą białaczką

During the treatment of acute leukemia in children, 20–30% of infections that threaten life are caused by pathogenic fungi. Most of these infections are caused by fungi of *Candidia* and *Aspergillus* spp. geni.

The most significant predispositions towards the development of mycosis are: immunosuppressive treatment, prolonged neutropenia, antibioticotherapy, colonization and central venosus catheter (1, 10). Although the risk factors are known, difficulties in early diagnosis of lung mycosis still occur. These difficulties are mainly responsible for frequent failures during therapy. In this paper, we describe interesting cases of lung mycosis in children with acute leukemia in which CT examinations have shown lung abnormalities which were not visible on chest radiography.

OBJECTIVE

The present paper shows an analysis of the results of radiological examinations and clinical symptoms of fungi infection invading the lungs and occurring in children during acute leukemia therapy.

MATERIAL

In the years 1994–1998 at Clinic of Pediatric Hematology and Oncology of Lublin, 52 children with acute leukemia were treated. Among them, in 4 cases, lung fungi infections developed.

RESULTS

In the Department of Pediatric Radiology, diagnostic examinations were performed. Radiography and CT scans point out to lung mycosis. In 2 cases, the findings were visible only in CT scan, while the classical X-ray imaging was normal. In both cases, the serological and histopathological investigations of the mass obtained after bronchofiberoscopy confirmed the diagnosis of mycosis.

CASE 1

A 15-year-old girl, in whom in the course of chemotheraphy inducing remission, hyperthermia and thoracalgia appeared, in spite of antibioticotherapy. A week later she developed dry and non-productive cough. Radiological examination of the chest revealed lung parenchyma infiltration in the apico-posterior segment.

The girl undervent bronchofiberoscopy. Serological and histopathological investigations confirmed the suspicion of mycosis. After 21 days of the Amfotericine B treatment, her condition radically improved, and changes seen on lung X-ray disappeared. Because of the proliferative activation process and the neccesity of a cytostatic treatment, CT examination was performed again. CT scan showed pulmonary cavity containing mycelium in the apico-posterior segment. (Fig. 1 a, b)

CASE 2

A 16-year-old girl in whom hyperthermia, dry non-productive cough and thoracalgia appeared during chemiotherapy in the profound aplasia phase. These symptoms remained for 4 days in spite an antibiotics therapy. Conventional chest radiography did not show any abnormalities. On acount of the existence of risk factors for the development of a lung mycosis infection, CT examination was performed. The CT scan showed small, oval subpleural infiltration. (Fig. 2 a, b). Application of an Amfotericine B therapy caused a regression of these symptoms from the respiratory system.

DISCUSSION

In this paper we present cases of lung fungal infection which developed in children at profound aplasia phase following intensive chemiotherapy that induces remission. Coexistence of lung fungal infection was recognised as highly probable, because of the existing clinical symptoms and changes in the appearance in lung radiological image. Clinical examinations demonstrate: non-productive cough, thoracalgia, and hyperthermia resistant to antibiotics. These non-characteristic clinical symptoms are usually observed in the course of general candidiasis (2).

On account of a tendency of fungi from *Aspergillus genus* to cause hypertrophy of the walls of blood vessels and bronchi, in such mycosis, hemoptysis can appear. Hemoptysis is considered the most typical symptom of these infections (4). In lung fungi infections, the changes in radiological pictures are rather of low specificity, and those could imitate the picture of infections of other etiologies. There usually occur: disseminated or clustered parenchymal density, large and focal infiltrations, focal breakdown of lung and single or bilateral mycelium (5, 10). In the second case presented, small

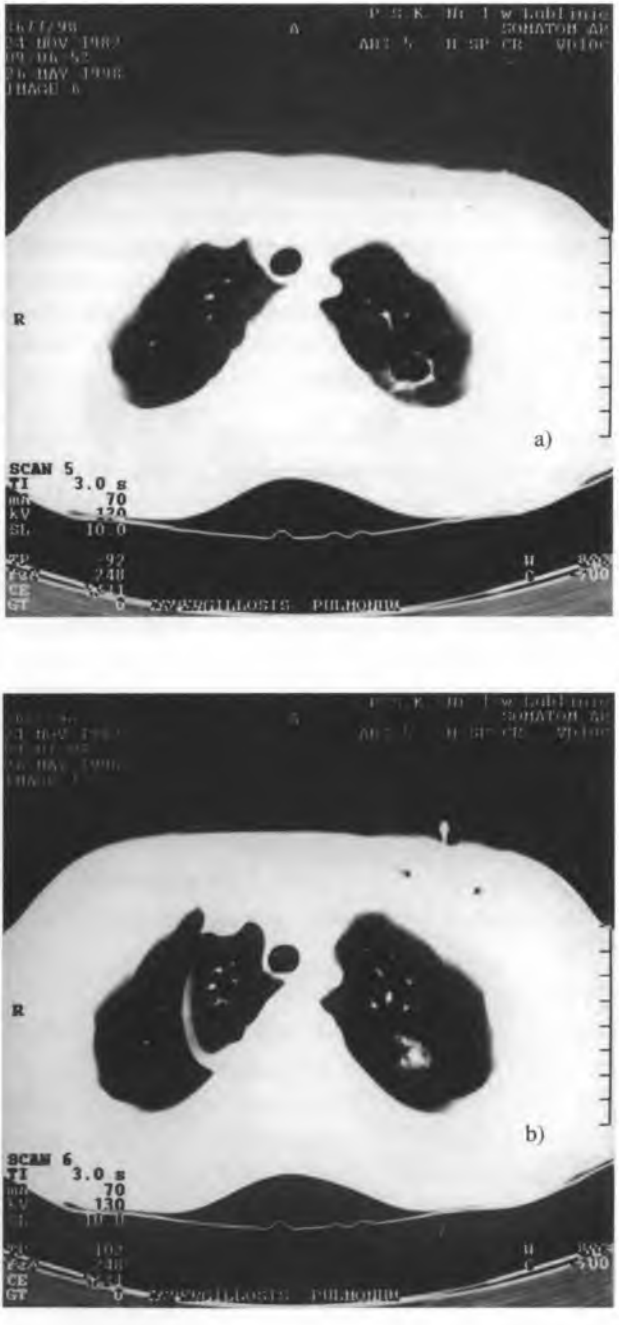

Fig. 1. CT scans of lung mycosis in a girl with acute leukemia.
In apico-posterior segment of left lung cavity (a)
and mycelium (b) infiltrations are visible

Fig. 2. CT scans of lung mycosis in a girl with acute leukemia. Small, oval subpleural infiltrations are visible

oval subpleural infiltrations occurred, which were visible only in CT examination. Such a situation may be explained by the fact that in the early period of lung fungi infection, a focal necrosis of lung tissue occurred. In patients with neutropenia, in the course of treatment of acute leukemia, focal necrosis lung tissue was not associated with the existence of an inflammatory infiltration. These pathological focals have not a proper density and are not visible at conventional radiological examination. This is why computer tomography is the most sensitive and specific imaging method in the diagnosis of lung fungi infection (3, 5). In both cases described above, blood culture tests to find fungi and bacteria were negative. It is difficult to confirm the existence of mycosis. Positive results of blood cultures in patients with neutropenia and general candidiasis are achieved only in 50% cases. Similar isolation of fungi after an intensive antibioticotherapy, from oral cavity, pharynx, saliva, excrement and urine did not confirm a general mycosis. However, the isolation of fungi pathogen from two or more places and in the significant amount, or in the multiple blood cultures have diagnostic value in neutropenic patiens (3, 7).

Confirmation of the diagnosis of fungi infection can be obtained by histopathological and serological examination of tissue bioptate (3, 7). In both cases, confirmation is obtained from a histopathological examination of the mass obtained during bronchofiberoscopy. Obtaining hematological remission is the basic requirement of the efficiency in the treatment of mycosis in children. In the case of the necessity of the repetition of the cytostatic treatment, we ought to consider the possibility of the reactivation of infection in the neutropenic period (6). In the first case described above, the activation of the proliferative process was considered, and although in classical radiological examination no pathological changes were shown, a CT examination was executed. It showed in the lungs the presence of changes threatening the reactivation of infection. Some authors suggest that in such cases a surgical resection of lung fungi focal is necessary (8, 9).

CONCLUSIONS

1. In spite of our knowledge of the risk factors of lung fungi infection in children undergoing antileukemic therapy, difficulties in proper early diagnosis of mycosis still exist.

2. Diagnosis of lung mycosis in children in the course of leukemia therapy, are made more difficult because of non–specific clinical and radiological symptoms.

3. Proper interpretation of radiological findings together with clinical symptoms is very useful in diagnosis of lung fungi infections.

4. CT examination ought to be performed in children when lung mycosis is suspected, even if radiological pictures of chest show no changes.

5. After the treatment, control CT examination should be made to rule out the presence of pathological changes.

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STRESZCZENIE

Infekcje grzybicze u dzieci z obniżoną odpornością stanowią poważny problem diagnostyczny i terapeutyczny. W okresie głębokiej aplazji szpiku po intensywnej chemioterapii 20–30% zagrażających życiu infekcji spowodowanych jest zakażeniami grzybiczymi. Istnieją trudności we wczesnym rozpoznaniu grzybicy płuc, spowodowane niecharakterystycznymi objawami klinicznymi i radiologicznymi, mogącymi odpowiadać zmianom o innej etiologii. W pracy przedstawiamy przypadki grzybicy płuc u dzieci w trakcie leczenia białaczki. Analizujemy objawy kliniczne i wyniki badań diagnostycznych przeprowadzonych u tych dzieci. Podkreślamy rolę badań TK, ujawniających zmiany patologiczne w płucach, niewidoczne na zdjęciach rentgenowskich klatki piersiowej.