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Tuberculosis of the humerus

Gruźlica kości ramiennej

Abstract

We present a case of 39-year-old man in whom pathologic changes in the left humerus were diagnosed after one year of corticosteroid therapy due to suspicion of lung sarcoidosis. Bone biopsy was carried out with subsequent development of cutaneous fistula with exuding purulent content. Tuberculosis was diagnosed based on histopathological and bacteriological tests. The patient received typical antituberculous therapy for 6 months, which resulted in healing of the fistula. Six months later an abscess developed within the muscles of the left arm. Magnetic resonance revealed lesions suggestive of tuberculosis of the left humerus with the presence of two fistulas and an intramuscular abscess.

The patient received another course of antituberculous treatment and the content of the fistula was removed. After 8 months of therapy, the fistula was healed, although the lesions in the humerus regressed only partially so the therapy was prolonged to 12 months.

Key words: extrapulmonary tuberculosis, tuberculosis of bones and joints, magnetic resonance

Pneumonol. Alergol. Pol. 2011; 79, 6: 437–441

Introduction

Tuberculosis can affect any organ. The most frequent extrapulmonary locations include: pleura, lymph nodes, bones and joints, and urogenital system. Ninety new cases of tuberculosis of bones and joints were registered in Poland in 2009, which represents 15.5% of patients with extrapulmonary tuberculosis [1].

Extrapulmonary tuberculosis often results from haematogenous and lymphogenous spread. During primary infection, mycobacteria are transferred through lymph vessels to regional lymph nodes. Then they are transferred from the lymphatic system with blood to various organs where they can remain dormant. Disorders of the immune response may lead to activation of the disease [2]. Location of lesions in tuberculosis results from the biology of mycobacteria — they are remarkable aerobes, which means that the infection develops more frequently in organs which are supplied well with blood and oxygen [3].

In Poland, extrapulmonary tuberculosis has accounted for many years for less than 10% of newly registered cases of tuberculosis. In 2005 it was 8.8% (821 cases), in 2009 — 7.1% (582 cases). In Western European countries this percentage is higher, it amounts to approximately 20% and tends to increase [3, 4]. This is explained by the increase in HIV-positive patients in whom extrapulmonary tuberculosis occurs 3 times more frequently than in HIV-negative patients [5]. However, increased incidence of bone and joint tuberculosis in HIV-infected patients has not been proven [6].

In the case of extrapulmonary location, tuberculosis is too rarely taken into account in differen-

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Manuscript received on: 18 April 2011.
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ISSN 0867–7077

tial diagnosis. Difficulties in obtaining material for bacteriological examination are an additional obstacle in establishing a firm diagnosis. We present the case of bone tuberculosis to raise awareness of the problem of extrapulmonary tuberculosis and to illustrate the diagnostic capabilities, even in the case of poorly accessible locations of lesions.

Case description

Lesions had been observed in the lungs of a 39-year-old patient, a professional soldier, from December 2006 (enlarged mediastinal lymph nodes and bilateral nodular lesions). Based on the performed tests, tuberculous aetiology of the lesions was not confirmed — mycobacteria were not grown from bronchial washing, and tuberculin skin test was negative. The result of a histopathological examination of specimens of bronchial mucosa taken during bronchoscopy was inconclusive.

In the opinion of the attending physician, the clinical course at that time and results of additional tests, including radiographic imaging of chest organs, suggested sarcoidosis. In March 2007, due to deterioration of respiratory function tests, it was decided to administer treatment. A one-year course of prednisone was administered.

A few months after finishing treatment, progression of radiological lesions was identified in the lungs in the absence of symptoms from the respiratory tract. Simultaneously, the patient complained of pain in the left arm. An area of 1/3 bone destruction was found in the upper third part of the left humerus on X-ray. Biopsy of the lesion was performed, which revealed diffuse confluent granulomas composed of epithelial and giant cells with extensive areas of eosinophilic necrosis. Staining for the presence of mycobacteria was not performed. Cultures were not made from the collected material either. Over the next 3 months, the biopsy wound did not heal. Purulent content was exuding from the fistula that had formed. During this period, the patient presented for consultation at the Institute of Tuberculosis and Lung Diseases in Warsaw. The Quantiferon-TB test was positive (2.347 U/ml). Chest X-ray showed areas of nodular lesions in both lungs. Bronchoscopy demonstrated scars in the bronchial tree after nodal perforations. Acid-resistant mycobacteria were not identified in bronchial washing. However, genetic material of *M. tuberculosis* was detected in the material from the fistula Tuberculosis mycobacteria sensitive to essential anti-mycobacterial drugs: rifampicin (RMP), isoniazid (INH), ethambutol (EMB), streptomycin (SM), and pyrazinamide (PZA) were cultured. On this basis, tuberculosis of the left humerus with a cutaneous fistula was diagnosed. Under the control of the District Clinic of Tuberculosis and Lung Diseases, the patient received a typical 6-month anti-mycobacterial treatment: RMP, INH, PZA, and EMB. The cutaneous fistula was healed. No follow-up examination of the humerus was performed.

Six months after the treatment, the patient presented again for a consultation at the Institute of Tuberculosis and Lung Diseases due to soreness and redness of the skin at the back of the left arm. Palpation revealed a splashing infiltration within the muscles. The ultrasound examination showed a fluid reservoir with dimensions of 67 × 18 × 48 mm located in the intrafascial layer between the deltoid muscle and to the triceps brachii muscle. Two fistulas penetrating the skin were also visualized. Magnetic Resonance Imaging (MRI) showed extensive infiltrative lesions of the bone marrow cavity involving the proximal 2/3 of the humerus with strong contrast enhancement, and two fistulas to soft tissues leading from trepan biopsy canals. The smaller channel of the fistula led to the skin of the anterior chest wall. The second one, larger, located between the deltoid muscle and the lateral head of the triceps brachii muscle, led to a thick-walled abscess located intrafascially and ending in the subcutaneous tissue of the lateral side of the arm. The subcutaneous tissue showed features of swelling. Channels of fistulas and walls of the abscess showed contrast enhancement (Fig. 1).

The patient received anti-mycobacterial treatment: RMP, INH, PZA, EMB, and SM. After a month, PZA was discontinued due to the gout. Puncture of the fluid reservoir was performed repeatedly and it yielded purulent content, but no genetic material of *M. tuberculosis* was identified in the specimens. After 6 weeks of treatment, a fluid reservoir of 4.1 ml and a fistula in the subcutaneous tissue were shown in ultrasound examination in the upper 1/3 of the left arm.

The treatment was continued with three drugs - RMP, INH, and EMB. In April 2011, after 8 months of treatment, follow-up tests were performed. The patient was in good general condition, and no abnormalities were found in the physical examination.

A follow-up MRI showed regression of the abscess of soft tissue of the arm, with a residual band of swelling within the intermuscular septum, at the site of the channel of the larger fistula. The fistulous channel leading to the front of the chest wall was reduced. Infiltration in the bone marrow cavity underwent partial regression. Contrast en-

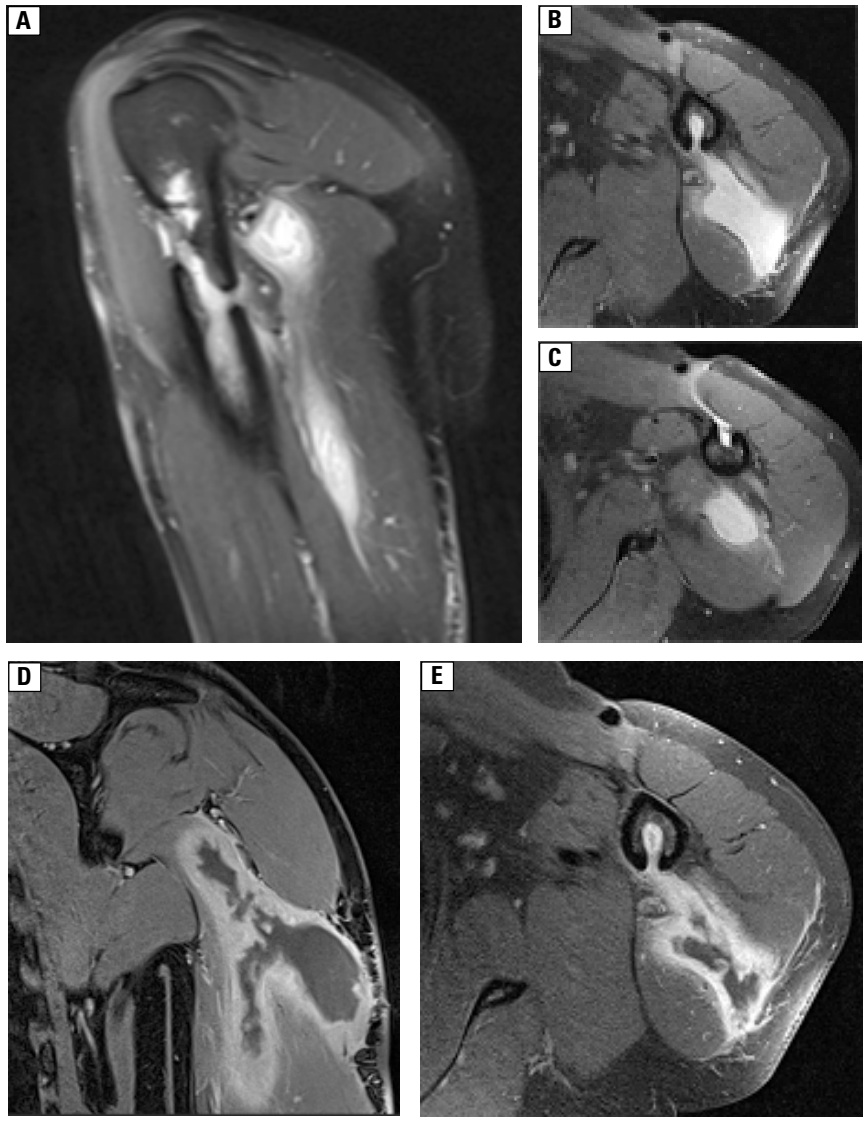

Figure 1. Initial MRI examination of the brachium. **A–C** — sagittal and axial PD-weighted images with fat saturation; **D, E** — coronal and axial T1-weighted contrast-enhanced images

PD-weighted images demonstrate a high-signal bone-marrow infiltration and two soft-tissue fistulae leading from trepanobiopsy canals. Irregular-shaped, contrast enhanced, thick-walls abscess among humeral muscles. Contrast-enhancement of fistulae canals and bone-marrow infiltration was revealed

hancement of the lesions was still present. In addition, a follow-up X-ray of the humerus confirmed partial regression of humerus lesions (Fig. 2).

The obtained improvement confirmed the validity of the previously used treatment. However, persistent inflammation suggested that the treatment could not be terminated after 9 months. Continuation of the therapy was scheduled for up to 12 months.

Discussion

Tuberculosis of bones and joints occurs with equal frequency in men, women, and people of different races. In countries with a high prevalence of tuberculosis, osteoarticular lesions are found mostly in children and young adults. In countries with an established epidemiological situation of tuberculosis, it occurs more frequently in the elderly [7–9].

Lesions localized in bones and joints often coexist with tuberculosis at other locations. Tuberculosis can affect any joint or bone. In 40-60% of cases, it affects the spine, in 13–15% — hips, and in 10–15% — knee joints. Lesions in the humerus are rare and occur in 1–2% of patients with tuberculosis of bones and joints [9, 10]. They usually have a single location and rarely multifocal [8].

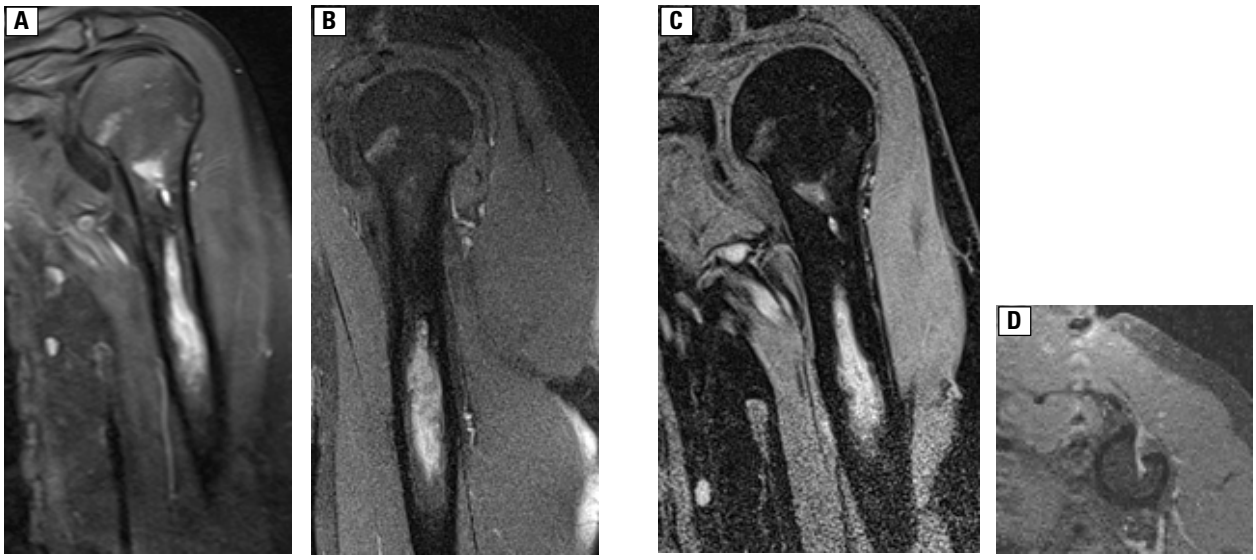

Figure 2. Follow-up MRI examination of the brachium. **A, B** — coronal and sagittal PD weighted images with fat saturation; **C, D** — axial and coronal T1-weigted CE images with fat saturation

Regression of soft-tissue abscess, partial regression of bone-marrow infiltration and fistulae was revealed. There is contrast-enhancement of inflammation changes

The first lesions appear in the most vascularized areas (vertebral bodies, bone epiphyses, and metaphyses). Formation of granulomas is accompanied by destruction of bones by osteoclasts and perfusion disorders. Focal necrosis occurs as well. The infection spreads to the surrounding tissues, causing their destruction and formation of gravity abscesses [10]. The course of the disease is slow; it takes months and years [11]. It begins with pain in the affected tissue. In the initial period, pain is diffuse; it radiates along the nerves and may occur only at night. Then swelling appears, accompanied by increased warmth. Reduction or blocking of mobility, or forced position of the limb may occur. The surrounding muscles begin to disappear or become distorted [12, 13]. Abscesses or fistulas appear. In some cases, a painless cold abscess is the only symptom of tuberculosis infection [12]. In the period of healing, swelling decreases and the pain subsides. Restoration of joint mobility depends on the degree of destruction that took place during the illness.

In the early period of the disease, periarticular lesions and lesions of the bones and joints can be visualized with computed tomography of bones and MRI. Radiological examination detects advanced lesions such as diffuse bone atrophy, joint space narrowing, destruction and deformity of bone epiphyses, foci in epiphyses and metaphyses, lesions in vertebral bodies and intervertebral discs, destruction of the adjacent edges of the vertebrae, and narrowing of intervertebral space [7].

Bacteriological confirmation of osteoarticular lesions can be difficult. Bacteriological confirmation of tuberculosis from the material from bone lesions can be obtained in 20–25% of cases. Therefore, bacteriological examinations should be performed with other materials, such as pus obtained during the puncture of an abscess. As in every case of extrapulmonary tuberculosis, examination of the material from the bronchial tree (sputum/bronchial discharge/ bronchoalveolar lavage) should always be performed. Histopathological examination is also helpful in establishing the diagnosis [9, 13]. In patients with bone and joint tuberculosis, tuberculin skin test is usually positive [7].

Treatment of tuberculosis of bones and joints does not differ from the treatment of tuberculosis in a different location. The use of 4 drugs is recommended (RMP, INH, PZA, and EMB) for 2 months, and then INH and RMP for 4 months. In total, the treatment should last for 6 months, and if the spine is affected, the second phase of treatment can be extended to 7 months [14].

In the presented case, extrapulmonary tuberculosis developed after one year of corticosteroid therapy. Bone abnormalities were preceded by lesions in the lungs, although their tuberculous aetiology was not proven. The clinical course and radiological image of lesions in the bone and surrounding tissues was typical for tuberculosis. The diagnosis was confirmed by the results of histopathological and microbiological examinations of the abscess material. However, in spite of the sensitivity of mycobacteria to the drugs used, a typical 6-

month treatment did not result in permanent cure. Six months after its completion, a relapse requiring further treatment occurred. After 8 months of retreatment, a significant improvement was achieved, but the lesion was still not fully healed. For this reason, the extension of the anti-mycobacterial treatment was justified.

The presented case illustrates difficulties with diagnosis and treatment of tuberculosis of bones, but also reminds us about the need to strive to establish the diagnosis, especially before starting treatment. In patients with sarcoidosis, the diagnosis is based on the confrontation of a typical clinical and radiological image with biopsy results [15].

References

1. Korzeniewska-Koseła M. (ed.). Gruźlica i choroby układu oddechowego w Polsce w 2009 roku. Instytut Gruźlicy i Chorób Płuc, Warszawa 2010.
2. Szczuka I. (ed.). Gruźlica i choroby układu oddechowego w Polsce w 2005 roku. Instytut Gruźlicy i Chorób Płuc, Warszawa 2006.
3. Iseman M.D. A Clinician's Guide to Tuberculosis. Lippincott, Williams and Wilkins, Philadelphia 2000.
4. Ormerod P. Non-respiratory tuberculosis. W: Davies P.D.O. (ed.). Clinical tuberculosis. Wyd. 4. Hodder, London 2008; 163–188.
5. Yang Z., Kong Y., Wilson F. et al. Identification of risk factors for extrapulmonary tuberculosis. Clin. Infect. Dis. 2004; 38: 199–205.
6. Siemion-Szcześniak I. Gruźlica kości i stawów. Postępy Nauk Med. 2007; 20: 561–563.
7. Palmer P.E.S. The imaging of tuberculosis. Springer, Berlin 2001.
8. Fraser R.S., Müller N.L., Colman N., Paré P.D. Fraser and Pare's diagnosis of diseases of the chest. Fourth Ed. W.B. Saunders, Philadelphia 1999; 798–873.
9. Leonard M.K., Blumberg H.M. Musculoskeletal tuberculosis. W: Schlossberg D. (ed.). Tuberculosis and nontuberculous mycobacterial infections. Wyd. 5. McGraw-Hill, New York 2006; 242–263.
10. Tuli S.M. Tuberculosis of the skeletal system (bones, joints, spine and bursal sheaths). Third Ed. Jaypee Brothers, New Delhi 2004.
11. Talavera W., Miranda R., Lessnau K.D., Klapholz A. Extrapulmonary tuberculosis. In: Friedman L.N. (ed.). Tuberculosis current concepts and treatments. Second Ed. CRC Press, Boca Raton 2001; 139–190.
12. Hopewell P.C., Bloom B.R. Tuberculosis and other mycobacterial diseases. In: Murray J.F., Nadel J.A. (ed.). Textbook of respiratory medicine. Second Ed. W.B. Saunders, Philadelphia 1994; 1094–1160.
13. Kramer S.B., Lee S.H.S., Abramson S.B. Nonvertebral infections of the musculoskeletal system by Mycobacterium tuberculosis. In: Rom W.N., Garay S.M. (ed.). Tuberculosis. Wyd. 2. Lippincott, Williams and Wilkins, Philadelphia 2004; 577–586.
14. Jakubowiak W., Korzeniewska-Koseła M., Kuś J. et al. Podręcznik gruźlicy — zalecenia NPZG. Instytut Gruźlicy i Chorób Płuc, Warszawa 2001.
15. Rowińska-Zakrzewska E., Bestry I. Choroby śródmiąższowe płuc. In: Szczeklik A. (ed.). Choroby wewnętrzne, stan wiedzy na 2011. Med. Prakt. Kraków 2011; 656–675.