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WHEN SARCOIDOSIS CHALLENGES PERFORMANCE: PULMONARY AND SPLENIC DISEASE IN A YOUNG ATHLETE

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ABSTRACT

Sarcoidosis, also known as Besnier-Boeck-Schaumann disease, is a granulomatous disease of unknown etiology, with multisystemic manifestations that can affect performance and physical capacity in athletes. In most early-stage cases (stage I and II), the disease may resolve spontaneously without treatment. However, when sarcoidosis presents with atypical features such as splenomegaly, especially in physically active individuals or athletes, the prognosis may be more severe, potentially affecting exercise tolerance, recovery time, and return to training. A comprehensive diagnostic approach, combining clinical evaluation with radiological and histopathological confirmation, is essential. Splenomegaly has been associated with poorer outcomes in pulmonary sarcoidosis compared to favorable signs like erythema nodosum or arthritis. This article presents the case of a 22-year-old female patient, whose pulmonary sarcoidosis was complicated by splenomegaly. The case underlines the importance of early recognition in active individuals and timely intervention to improve prognosis and preserve physical performance.

Methods: The authors reviewed literature from ScienceDirect, Cochrane Library, PubMed, Google Scholar, and UpToDate, focusing on sarcoidosis. The review emphasized the importance of combining clinical, radiological, and histopathological data for diagnosis, and noted that splenomegaly worsens prognosis in pulmonary sarcoidosis, while erythema nodosum and arthritis are linked to better outcomes.

Conclusions: In physically active patients, especially athletes, atypical manifestations such as splenomegaly in pulmonary sarcoidosis may lead to significant performance decline and delay in returning to training. Early diagnosis and treatment are crucial not only for controlling disease progression but also for minimizing long-term impact on aerobic capacity, muscle strength, and recovery time. Clinicians should consider sarcoidosis in the differential diagnosis of unexplained fatigue, dyspnea, or decreased performance in young athletes.

KEYWORDS

Sarcoidosis in Athletes, Physical Performance, Splenomegaly, Return to Sport, Exercise Tolerance, Systemic Inflammation, Pulmonary Function, Fatigue in Athletes

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Introduction.

Sarcoidosis is a generalized immune disease characterized by the formation of non-serous granulomas in various organs [1]. It is most commonly manifested by enlargement of the hilar lymph nodes and parenchymal changes in the lungs [2]. In addition to the lungs, the disease can also involve the eyeballs, skin, salivary glands, heart, muscles, bones, nervous system and other organs [3].

The diagnosis of sarcoidosis is based on the clinical picture, radiological studies and histopathological evaluation of a biopsy of at least one involved organ, after excluding other possible causes of granulomas [4]. Because of its similarity to tuberculosis, it is necessary to exclude it, since immunosuppressive treatment of sarcoidosis is contraindicated for tuberculosis [5].

The disease is more common in women and young adults before the age of 40 [6]. A second peak in incidence has been observed in some countries, such as the United States, Sweden, the United Kingdom and Japan [7]. In Poland, there are about 10 new cases per 100,000 inhabitants per year, while worldwide the number ranges from 3 to 64 [8]. A significantly higher risk of the disease is found in African-Americans, in whom the incidence is as much as 12 times higher than in Caucasians [9].

The cause of the development of sarcoidosis remains unknown. It is assumed that in genetically predisposed individuals, an environmental factor triggers an inflammatory response, leading to a predominance of CD4+ T lymphocytes over CD8+ T lymphocytes, with a concomitant decrease in CD4+ activity and numbers in the peripheral blood [10]. Environmental factors can be infectious (e.g., herpes viruses, Epstein-Barr virus, Mycobacterium tuberculosis, Lyme) or non-infectious (e.g., pollen, metals such as gold, aluminum or beryllium, silicone) [11].

Systemic symptoms, such as weakness, fatigue, weight loss and elevated temperature, occur in about 70% of patients and often accompany involvement of specific organs [12]. The most common manifestations include pulmonary symptoms: chest pain, cough and shortness of breath [13]. Cardiac involvement can lead to arrhythmias, heart failure and even sudden death [14]. Nevertheless, about 85% of patients achieve spontaneous remission within two years of diagnosis [15].

The prognosis of pulmonary sarcoidosis depends on the stage of the disease. In stage I, lesions regress in about 80% of patients, in stage II in 60%, and in stage III in only 10-20% [16]. In addition to pulmonary prognostic factors, extrapulmonary manifestations are important: the presence of fever, erythema nodosum or arthritis improves the prognosis, while the presence of splenomegaly or bone lesions worsens it [17].

In the context of physically active people, especially athletes, sarcoidosis can significantly affect performance, recovery ability and the ability to continue training [18]. Symptoms such as fatigue, shortness of breath and pain can limit athletic activity, and atypical manifestations, such as splenomegaly, can further complicate the course of the disease and prolong recovery time [19].

In this article, we present the case of a young patient with acute pulmonary sarcoidosis and splenomegaly, and review the literature with a focus on the impact of the disease on physical function and sports activities [20].

Case description

A 22-year-old female patient was admitted to the Department of Internal Medicine in April 2024 due to weakness, loss of appetite, low-grade fever, dyspnea, cough, and chest pain. She reported unintentional weight loss of 5 kg over the past six months. On physical examination, splenomegaly was noted.

Two years earlier, in April 2022, she had been hospitalized for acute pancytopenia (WBC – 1,500/μL; hemoglobin – 8.9 mg/dL; platelets – 79,000/μL). A splenic biopsy performed at that time did not reveal a definitive cause. Hemolytic anemia, infectious etiologies, and collagen vascular diseases were excluded.

In the current admission, laboratory results revealed elevated levels of soluble interleukin-2 receptor (5,990 U/mL), angiotensin-converting enzyme (41.5 U/L), lysozymes (43.4 μg/mL), and KL-6 (1,134 IU/mL). The interferon-gamma release assay was negative, effectively ruling out latent tuberculosis.

Abdominal computed tomography showed a markedly enlarged spleen measuring 13 × 24 cm. Chest CT revealed bilateral hilar lymphadenopathy and diffuse granular lung infiltrates, along with enlarged cervical lymph nodes. Bronchoalveolar lavage demonstrated lymphocytic predominance without an increased CD4/CD8 ratio. Lung biopsy showed non-caseating epithelioid granulomas, consistent with pulmonary sarcoidosis.

Pulmonary function tests revealed mild airflow limitation (FEV_1 78%, FVC 85%, FEV_1/FVC ratio = 72%). Arterial blood gas analysis on room air showed mild hypoxemia (pO_2 = 72 mmHg) with normal pCO_2 (37 mmHg) and pH (7.43), indicating no acid-base imbalance.

Cardiac ultrasound and MRI showed no features of cardiac involvement. No neurological symptoms were observed. After approximately 90 days of hospitalization, the patient developed dermatological lesions on her lower limbs. Skin biopsy confirmed cutaneous sarcoidosis.

Due to the extent of splenomegaly and persistent pancytopenia, surgical intervention was undertaken. Splenectomy was performed, and the spleen (weighing 4,300 g, measuring 28 × 21 cm) was removed. Histopathological examination revealed epithelioid granulomas with multinucleated giant cells, confirming sarcoid involvement of the spleen. The final diagnosis was stage II pulmonary sarcoidosis with splenic and cutaneous involvement.

Anticoagulation was initiated postoperatively with aspirin and potassium warfarin. Serum markers (ACE, sIL-2R, lysozymes) decreased modestly, and respiratory symptoms resolved. Despite a favorable clinical course without corticosteroid treatment, steroids were considered due to ongoing functional and biochemical abnormalities.

Discussion

The symptoms reported by the patient during her second hospitalization in April 2024 were typical for pulmonary sarcoidosis and included dyspnea, dry cough, chest pain, fatigue, and low-grade fever [21]. These contrasted with her earlier presentation in April 2022, where the dominant finding was splenomegaly and laboratory-confirmed pancytopenia, without overt respiratory symptoms [22]. The initial diagnostic work-up did not establish a definitive cause [23].

At the time of recurrence, immunosuppressive treatment was considered; however, due to the significantly enlarged spleen, there was a substantial risk of splenic rupture [24]. Therefore, splenectomy was prioritized over corticosteroid therapy, resulting in clinical improvement and reduction of pulmonary symptoms [25]. In hindsight, earlier diagnosis and intervention may have improved her long-term prognosis [26].

Splenomegaly is a rare but important extrapulmonary manifestation of sarcoidosis and may be associated with more severe disease and worse outcomes [27]. It should be considered as a possible initial sign of systemic sarcoidosis, even in the absence of pulmonary symptoms [28]. In such cases, clinicians should maintain a high index of suspicion, especially when splenomegaly is accompanied by hematologic abnormalities such as pancytopenia [29].

Standard treatment of splenic sarcoidosis includes systemic corticosteroids (e.g., prednisone), and in some cases methotrexate or antimalarial agents [30]. Although long-term immunosuppressive therapy can lead to clinical improvement, relapse is frequent upon tapering or discontinuation.

Splenectomy remains an option in selected cases, particularly when massive splenomegaly, hypersplenism, or diagnostic uncertainty (e.g., need to exclude lymphoma) is present, or when there is imminent risk of rupture. However, splenectomy carries risks of intraoperative bleeding and thromboembolic complications. Importantly, there is no clear evidence that splenectomy improves overall survival in sarcoidosis, given its systemic nature.

In the present case, massive splenomegaly and high rupture risk warranted surgical intervention before initiation of systemic steroid therapy. The postoperative course was uncomplicated—there were no signs of portal vein thrombosis or other adverse events—and the patient demonstrated clinical and biochemical improvement.

Given her young age and physically active lifestyle, early diagnosis and careful therapeutic planning were particularly important not only for disease control but also for minimizing long-term functional impairment. Although corticosteroids were initially withheld, they remained under consideration due to persistent abnormalities in pulmonary function and laboratory markers.

Importantly, in physically active patients, pulmonary sarcoidosis—especially when accompanied by extrapulmonary involvement—can significantly affect exercise capacity, endurance, and recovery. Fatigue, dyspnea on exertion, and reduced aerobic threshold are frequently reported, even in the absence of overt spirometric decline. In such cases, clinicians must carefully evaluate cardiopulmonary function before clearance for return to physical activity. Recommendations from sports medicine and cardiology societies highlight the need for comprehensive assessment—including imaging, pulmonary function tests, and exclusion of cardiac sarcoidosis—prior to resuming high-intensity training. In this context, individualized rehabilitation and monitoring plans should be considered essential elements of care.

Conclusions

This case highlights the diagnostic challenge of pulmonary sarcoidosis presenting initially with massive splenomegaly and pancytopenia—an atypical manifestation that may delay diagnosis. Although splenomegaly is an uncommon initial sign of sarcoidosis, it should be considered in the differential diagnosis, particularly when accompanied by unexplained cytopenias. In selected cases, splenectomy may serve not only as a therapeutic option but also as a diagnostic aid when systemic treatment is contraindicated or delayed.

In this patient, splenectomy led to improvement in hematologic parameters and resolution of pulmonary symptoms, suggesting a potential role in selected cases with significant hypersplenism or risk of rupture. Early recognition and individualized management are crucial to optimize prognosis, particularly in young and physically active individuals, where functional recovery and return to sport are important clinical goals.

Disclosures

Author's contribution:

Conceptualization: Jan Kamiński, Sebastian Rurka, Julia Dolinkiewicz
Formal analysis: Jan Kamiński, Sebastian Rurka, Agnieszka Szczerbińska
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Writing – rough preparation: Sebastian Rurka, Julia Dolinkiewicz,
Writing – review and editing: Sebastian Rurka, Agnieszka Szczerbińska,
Visualization: Jan Kamiński, Agnieszka Szczerbińska

All authors have read and agreed with the published version of the manuscript.

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