

# Diagnosis and Initial Management of Musculoskeletal Coccidioidomycosis in Children

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## Introduction

- Coccidioidomycosis is an invasive fungal infection caused by inhalation of aerosolized spores of *Coccidioides* spp., which grow in the arid soil of the southwestern United States.
- Approximately 80% of all reported cases of coccidioidomycosis occur in Arizona, where the incidence has increased over the last decade.
- Primary coccidioidomycosis is asymptomatic in 60% of patients, the remaining 40% commonly present with vague flu-like symptoms.
- Hematogenous dissemination occurs in 1% to 5% of patients, and can lead to extrapulmonary manifestations including meningitis (most commonly), osteomyelitis, and skin and soft-tissue involvement.
- Musculoskeletal coccidioidomycosis is rare, and requires long-term medical therapy and often aggressive surgical debridement.
- There have not been any previous studies specifically examining musculoskeletal coccidioidomycosis in the pediatric population.
- Purpose of study: To retrospectively examine musculoskeletal coccidioidomycosis and characterize the initial presentation and management of a disease in a population that has received little study as compared to adults.

## Subjects and Methods

- Retrospective chart review of patients who were seen and treated at Phoenix Children's Hospital from 1997 to 2010 for musculoskeletal coccidioidomycosis
- Patients were included if they were under age 17, and had an ICD-9-CM discharge diagnosis code of at least one of the following: primary extrapulmonary coccidioidomycosis (114.1), other forms of progressive coccidioidomycosis (114.3), and coccidioidomycosis, unspecified (114.9).
- Patients with only pulmonary disease or meningitis were excluded.
- Information gathered included patient age, gender, method of diagnosis, clinical presentation, serologic and microbiologic findings, and initial management.

## Results

- Twenty children were identified, including 13 males and 7 females.
- The mean age was 12.3 (range, 2 to 17) at the time of diagnosis.
- Locations of infection included the foot and ankle (24%), knee (14%), spine (19%), forearm (10%), lower leg (7%) and other sites (26%).
- All patients complained of bone pain (100%) on presentation.
- 3 patients (15%) had pulmonary symptoms and 3 patients (15%) were febrile ( $\geq 38.1^\circ\text{C}$ ) on presentation.
- Only 2 patients (5%) had an initial white blood cell count  $>15 \times 10^9/\text{L}$ .
- Surgical Debridement required – 40% (8 patients)
- All patients were treated with oral antifungal agents. Fluconazole was used in 15 patients (75%), itraconazole in 2 patients (10%), voriconazole in 2 patients (10%), and amphotericin B in 1 patient (5%).

Figure 1. Patient 14



Figure 2. Patient 17



Figure 3. Patient 20



Figure 4. Patient 4



## Results Continued

Case #	Age (years)	Gender	Immunocompetence	Location of disease
1	17	Male	Competent	Right femur
2	15	Female	Competent	Spine T12
3	13	Female	Competent	Left navicular bone, cuboid bone
4	5	Male	Competent	Spine L5, T6, calvarium
5	12	Male	Competent	Right knee
6	15	Female	Competent	Left proximal ulna
7	12	Male	Competent	Right radius and ulna
8	2	Male	Competent	Right knee
9	5	Male	Competent	Right third and middle phalanx, spine T6, T7, T10, T11
10	12	Female	Competent	Right cuboid bone
11	10	Male	Competent	Right knee
12	7	Male	Pre-B-cell ALL	Spine T7
13	17	Female	SLE, hemolytic anemia	Left sternum
14	11	Female	Competent	Right wrist, Left fibula, Right tibial metaphysis, calcaneus, base of the 5 <sup>th</sup> and 1 <sup>st</sup> metatarsals, Left patella, Left cuboid, Left olecranon, Left 5 <sup>th</sup> metacarpal, Left 1 <sup>st</sup> metatarsal
15	16	Male	Competent	Right tibial epiphysis
16	5	Male	Competent	Right cranium, Left lateral 4 <sup>th</sup> rib
17	16	Male	Pre-B-cell ALL	Left distal femur, Left knee
18	16	Female	Competent	Right knee, Left knee
19	10	Male	Competent	Left knee
20	7	Male	Competent	Right hip

## Discussion

- This is the first study specifically examining disseminated musculoskeletal coccidioidomycosis in children.
- Although a primary pulmonary infection, all of these patients had musculoskeletal complaints as their primary presenting feature of disseminated coccidioidomycosis.
- Initial laboratory findings may be misleading, and accurate diagnosis may require a comprehensive approach, incorporating microbiologic, histopathologic, immunologic and radiographic evidence.
- The surgical burden of this disease in the pediatric population is significant, with nearly half requiring debridement.

## Summary

- Our data demonstrate the importance of having a high level of suspicion in order to diagnose this infection and manage these children appropriately.
- Pediatric orthopaedic surgeons should consider this diagnosis when faced with a musculoskeletal infection in children from endemic areas or with a positive travel history.

## Selected References

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