Pediatric Lyme Arthritis Mimicking Traumatic Knee Effusion in a Non-Endemic Region: A Case Report

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Introduction

Lyme disease is a tick-borne illness caused by *Borrelia burgdorferi* that commonly affects the musculoskeletal system. Lyme arthritis is a late manifestation and typically presents as a monoarticular knee effusion characterized by significant swelling with minimal pain and preserved function, particularly in pediatric patients. In non-endemic regions, this presentation is frequently misattributed to traumatic injury, especially in athletic populations, leading to delayed diagnosis. This case highlights Lyme arthritis presenting as a traumatic knee effusion to emphasize the importance of maintaining a broad differential diagnosis in orthopedic practice.

Case Description

An 8-year-old female with left knee swelling following a minor tumbling injury (front head spring maneuver), initially concerning for musculoskeletal injury.

Initial course
- Transient anterior shin pain at time of injury
- Remained weight-bearing and functionally intact
- Completed a 4-mile hike in Gatlinburg, Tennessee without symptoms

Symptom progression
- Delayed knee swelling (~3 weeks post-injury)
- Activity limited after abnormal knee appearance noted
- Denied fever, rash, systemic symptoms, or tick exposure

Physical examination
- Large knee effusion without erythema or warmth
- ROM: full extension, flexion to ~90° with mild discomfort
- Stable ligamentous exam (negative McMurray, anterior drawer, pivot shift)
- Able to squat without pain
- Neurovascularly intact

Clinical Concern
- Effusion disproportionate to mechanism of injury
- Minimal pain with preserved function which raises concern for non-traumatic etiology

Evaluation & Management

Laboratory Studies
- ESR: 43 mm/hr (**elevated**)
- CRP: 1.04 mg/dL (**elevated**)
- WBC: 7.0 ×10⁹/L (normal)
- Rheumatoid factor: 10.7 IU/mL (normal)

Lyme serology - Positive for *Borrelia burgdorferi*
Western blot - Positive antibodies against Lyme proteins
Arthrocentesis
- deferred given reassuring clinical findings

Radiographs
- showed joint effusion without osseous abnormality

Management
- Treated with oral amoxicillin
- Resulted in marked improvement & ~ 75% reduction in effusion at two-week follow-up.

Imaging

Figure 1. Representative lateral knee radiograph demonstrating suprapatellar joint effusion without acute osseous abnormality. Image adapted from *Pediatric Imaging* (CC BY-NC-SA 4.0).

Discussion

Lyme arthritis classically presents as monoarticular knee involvement in pediatric patients and is characterized by significant effusion with minimal pain, preserved range of motion, and elevated inflammatory markers, often without systemic symptoms. These features distinguish it from Septic arthritis, which typically presents with severe pain, fever, and functional limitation.

Minor trauma in active children may suggest a musculoskeletal cause, particularly in regions where Lyme disease is less suspected. In this case, a tumbling injury supported a traumatic explanation despite findings inconsistent with significant intra-articular pathology. The disproportionate effusion and preserved function prompted further evaluation.

Although Tennessee is traditionally considered a non-endemic region, surveillance data indicate a low but present disease burden, with 39 reported cases in 2023. This highlights the potential for diagnostic delay when Lyme disease is not initially considered. Early recognition prevents unnecessary imaging or invasive procedures. Knee effusions disproportionate to the reported mechanism and associated with limited pain should prompt consideration of Lyme disease, even without known tick exposure, as timely diagnosis enables appropriate antibiotic therapy.

Conclusion

Lyme arthritis should remain an important consideration in pediatric knee effusions following minor trauma. Even in non-endemic regions, maintaining clinical suspicion supports early treatment and avoids unnecessary orthopedic intervention.

References

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