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## Kocher Criteria for Septic Arthritis

The Kocher criteria for septic arthritis are used to distinguish between septic arthritis and transient synovitis in a child with an inflamed hip.

### Points & Pearls

- The Kocher criteria were derived to identify the variables that are important in distinguishing between septic arthritis (SA) and transient synovitis (TS).
- In the appropriate clinical setting, patients who fall on either probability extreme (0 criteria or 4 criteria) can be readily ruled in or out for SA.
- Patients with an intermediate probability of SA (1-3 criteria) may need further workup or intervention.
- Although the Kocher criteria did not perform as well in the validation study as in the original study, the prediction rule may still be clinically useful for patients falling on either extreme, with either 0 or 4 predictors.

### Critical Actions

Patients who meet none of the Kocher criteria can potentially be discharged; those who meet all 4 of the criteria require urgent orthopedic consultation for washout. Patients who meet some but not all of the Kocher criteria (1-3 predictors) may require hip arthrocentesis.

### Advice

Diagnostic hip aspiration should be considered when there is a clinical concern for septic arthritis along with the presence of at least 1 predictor. If there is high clinical suspicion for SA, orthopedic consultation should not be delayed. Observation

and/or discharge with close follow-up should be considered for well-appearing patients when there is low clinical suspicion for SA and no predictors are present.

### Why to Use

Differentiating between SA and TS of the hip in children can be difficult. The Kocher criteria can be used to quickly identify subsets of patients who need urgent orthopedic consultation and those who can be observed.

### When to Use

The Kocher criteria can be applied to all pediatric patients with an acutely irritable hip for whom SA and TS are in the differential diagnosis.

### Next Steps

- A thorough history and physical examination should be obtained for all pediatric patients who present with an acutely irritable hip. Clinicians should pay particular attention to the presence or history of fever and inability to bear weight.
- CBC count, ESR, and CRP level testing should be ordered for any patient in whom there is clinical concern for SA or TS.

Abbreviations: CBC, complete blood cell; CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; SA, septic arthritis; TS, transient synovitis.

### CALCULATOR REVIEW AUTHOR

**Calvin Hwang, MD**

Department of Orthopaedic Surgery, Stanford University, Palo Alto, CA

## Evidence Appraisal

In 1999, Kocher et al published a retrospective chart review of 282 patients who had been evaluated between 1979 and 1996 for an acutely irritable hip, and for whom the differential diagnosis included TS and SA. SA was diagnosed by a positive joint fluid culture or by a white blood cell (WBC) count in the joint fluid of  $\geq 50,000$  cells/mcL. Eighty-two patients were diagnosed with SA, while 86 were diagnosed with TS (defined as a WBC count of  $< 50,000$  cells/mcL, with a negative joint fluid culture and resolution of symptoms without antimicrobial therapy).

The study identified 4 independent multivariate predictors for differentiation between SA and TS: (1) history of fever; (2) non-weight-bearing; (3) ESR  $> 40$  mm/hr; and (4) serum WBC count  $> 12,000$  cells/mcL. The probabilities for SA based on the number of predictors were as follows: 0 predictors =  $< 0.2\%$ ; 1 predictor =  $3\%$ ; 2 predictors =  $40\%$ ; 3 predictors =  $93.1\%$ ; and 4 predictors =  $99.6\%$ .

In a 2004 study, Kocher et al prospectively applied the criteria to patients with an acutely irritable hip who had presented to a major tertiary-care children's hospital between 1997 and 2002. The cohort included 213 consecutive patients, 51 of whom were diagnosed with SA and 103 with TS. In this study, the probabilities for SA based on the number of predictors were as follows: 0 predictors =  $2\%$ ; 1 predictor =  $9.5\%$ ; 2 predictors =  $35\%$ ; 3 predictors =  $72.8\%$ ; and 4 predictors =  $93\%$ .

Other authors have retrospectively applied the Kocher criteria to their study populations. Luhmann et al (2004) found that having all 4 predictors yielded a probability for SA of just  $59\%$ , but they did not publish the rate of SA found when no predictors were present. Sultan et al (2010) retrospectively applied the Kocher criteria and found a predicted probability for SA of  $59.9\%$  when all 4 predictors were present, although the study was limited by having only 5 patients with SA, and no cases of SA in a patient with no predictors present.

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## Calculator Creator

Mininder S. Kocher, MD, MPH

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## References

### Original/Primary Reference

- Kocher MS, Zurawski D, Kasser JR. Differentiating between septic arthritis and transient synovitis of the hip in children: an evidence-based clinical prediction algorithm. *J Bone Joint Surg Am.* 1999;81(12):1662-1670.

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### Validation Reference

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### Other References

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#### Contact EB Medicine:

Phone: 1-800-249-5770  
or 678-366-7933  
Fax: 770-500-1316  
PO Box 1671  
Williamsport, PA 17703



#### Contact MD Aware:

MDCalc  
Phone: 646-543-8380  
12 East 20th Street  
5th Floor  
New York, NY 10003

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