



Literature Review

A literature review of diagnosing transient synovitis hip disease

Panji Sananta^{1*}, Agung Ismanuworo¹, Eka Noviya Fuzianingsih²

1) Orthopaedic and Traumatology Department, Faculty of Medicine, Universitas Brawijaya, Saiful Anwar General Hospital, Malang, Indonesia

2) Master of Immunology Study Program, Postgraduate School, Universitas Airlangga, Surabaya, Indonesia

ARTICLE INFO

Submitted : 15th September 2023

Accepted : 07th March 2024

Published : 25th July 2024

Keywords:

radiologic examinations, literature review, hip transient synovitis, ultrasonography

*Correspondence:

panjisananta@ub.ac.id

This is an Open access article under the CC-BY license



ABSTRACT

Transient synovitis (TS), an abrupt, non-specific synovium inflammation, is the most prevalent cause of pediatric hip discomfort. Transient synovitis affects 3–10-year-olds. This disease is benign and self-limiting, but clinicians must distinguish it from an acute infection. After ruling out other causes of hip discomfort and limping, clinicians detect transient synovitis. Based on the patient's history, physical examination, and hip radiography, septic arthritis (SA) and TS care are the most likely causes. Clinicians must consider clinical factors and order appropriate lab and imaging tests to rule out alternative illnesses. This review aims to determine how to propose TS hip disease. The databases used were Scopus and PubMed. We included seven articles in our review. Clinical symptoms, lab testing, and radiographs determine the diagnosis. Ultrasound is a useful TS diagnostic tool since it is widely available, and children are not directly exposed to ionizing radiation. If TS and SA illnesses, which are commonly linked, are unclear, detecting bone marrow abnormalities, soft tissue lesions, synovial enhancement, and joint effusion by MRI can be beneficial. Laboratory tests help distinguish TS from SA because there are more extensive evaluations. Additionally, the healthcare provider performs a hip joint aspiration examination under ultrasound or fluoroscopy.



INTRODUCTION

Transient synovitis of the hip is an acute inflammation of the joint's synovial lining. This disease's cause remains unclear. Some writers have hypothesized a viral etiology for parvovirus B-19 and herpes simplex virus six illnesses because of their relationship with past respiratory tract infections. Some writers imply a post-traumatic etiology with chemical synovitis, while others suggest an allergic tendency (Pauroso *et al.*, 2011). An unimportant condition like transient synovitis (TS), sometimes known as "irritable hip," or a more dangerous illness like septic arthritis (SA) can be diagnosed (Koukoulas, 2014). Transient synovitis usually affects children between 3 and 10 years of age, but there have been reports of 3-month-old infants as well as adults (Koukoulas, 2014). Transient synovitis is most common in children aged three to eight (Do, 2000).

Even though the illness is self-limiting and harmless, clinicians must differentiate between transient synovitis and acute infection processes (Do, 2000). Hip pain can be caused by a variety of conditions, such as transient synovitis, septic arthritis, Legg-Calvé-Perthes disease (LCPD), a slipped capital femoral epiphysis, inflammatory arthropathy, fractures, and tumors. When all other causes of hip pain and limping have been ruled out, transient synovitis is diagnosed (Landin *et al.*, 1987; Ryan, 2016).

Imaging and laboratory investigations can be used to confirm TS conditions (Skinner *et al.*, 2002). Based on the patient's history, physical examination findings, and radiology findings of the hip, the two most likely etiologies are SA and TS. Their earliest symptoms are non-traumatic hip pain, weakness, fever, and irritability. Septic arthritis requires immediate hip decompression and intravenous antibiotics, while TS is self-limiting. If treatment is delayed, osteonecrosis of

the femoral epiphysis, osteomyelitis, pyrolysis, systemic sepsis, and secondary osteoarthritis are likely to occur (Sultan & Hughes, 2010).

It's generally accepted that an appropriate diagnosis is important. Septic arthritis of the hip requires surgical drainage and intravenous antibiotics, but TS is self-limiting and can be managed with oral analgesics and observation. Septic arthritis of the hip can cause capital femoral epiphysis osteonecrosis, proximal and pelvic femoral osteomyelitis, chondrolysis, systemic infection, and hip osteoarthritis, unlike TS. Early diagnosis is crucial since early surgical and medicinal treatment improves outcomes (Whitelaw, 2022).

This review aims to determine how to propose TS hip disease. Until now, the diagnosis of TS has been confusing for several parties and has left a gap, one of which is because it has several symptoms that are similar to SA. Several articles discuss the diagnosis of TS, as Nouri *et al.* (2014) focus solely on two diagnostic methods: imaging and hip aspiration. Other work focuses on a single diagnosis, such as the article by Adam *et al.* (2022), which examines MRI in TS and SA, and the article by Zoabi *et al.* (2021), which explores ultrasound in diagnosing TS. This literature study will present many diagnoses of hip transient synovitis. This article is expected to provide a clear picture of the diagnosis of TS and reduce ambiguity.

METHODS

This research is a literature review approach in English. The databases used are Scopus and PubMed. A comprehensive search of research journals was conducted on 23 January 2023. The process of journal selection consisted of three distinct stages. The initial step included selecting articles concerning the duplications found in the two sources. Afterward, a comprehensive evaluation is conducted to

evaluate the appropriateness of the title and abstract in the scientific journal. The last stage involves a thorough review to determine whether the research journal primarily centers on the proposed hip transient synovitis diagnosis.

The literature review analyses scholarly articles that fulfill particular criteria for inclusion. The requirements include research publications that focus on diagnosing hip transient synovitis. The articles must be written in English and

available in full-text format. The exclusion criteria consisted of abstract papers, literature reviews, report-type publications, and non-English materials.

The keywords used in the search were “hip transient synovitis” and “hip transient synovitis diagnosis”. The search results found 210 articles from 78 databases on Scopus and 132 databases on PubMed. After going through the selection process, seven papers were obtained and reviewed.

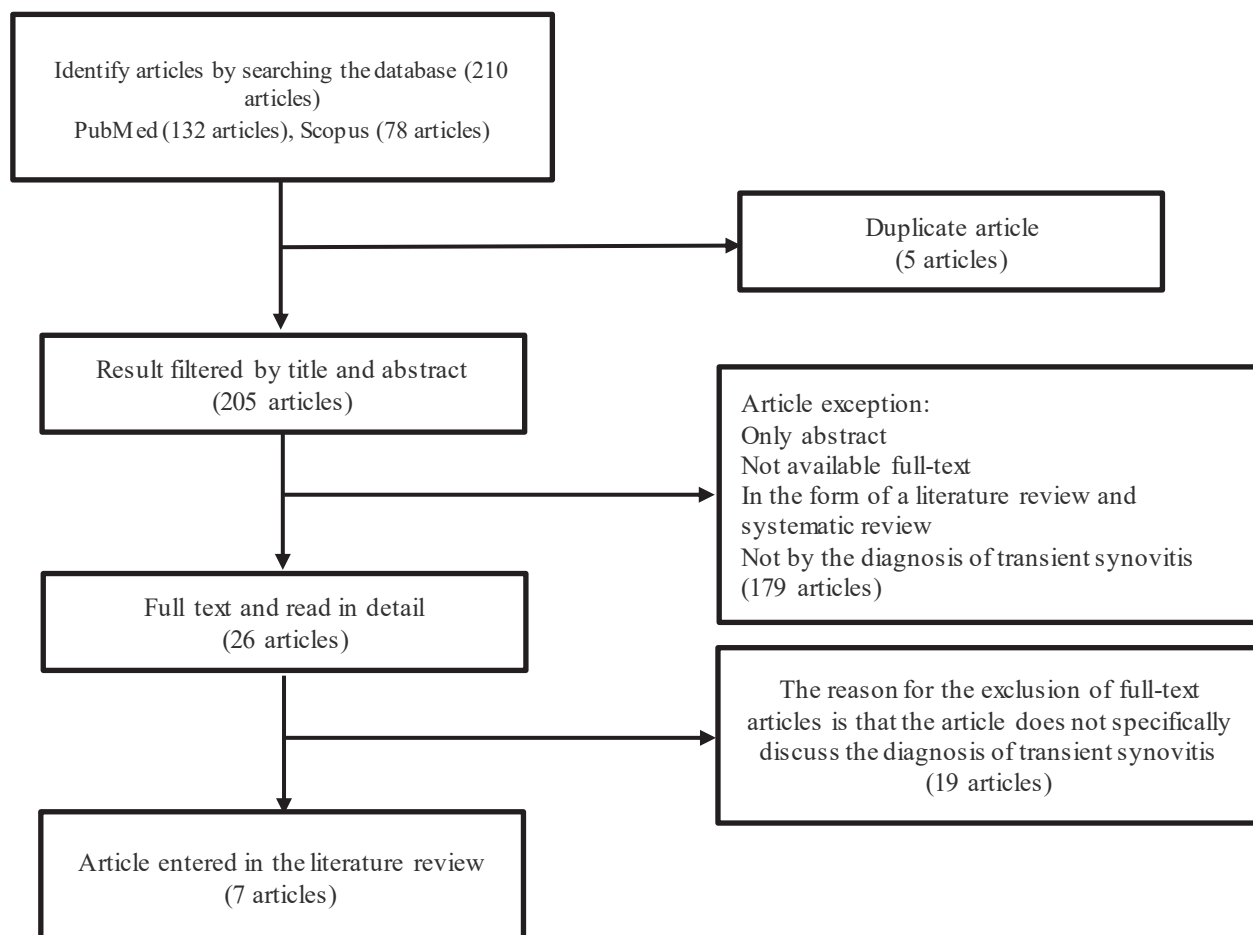


Figure 1. The flowchart of articles selection



RESULTS

Table 1. Reference test for transient synovitis diagnosis

Source	Design	Sample	Reference test for TS	Destination	Results
Watanabe H, Kikkawa I, Hagiwara K, Sugawara R, Inoue H, and Takeshita K (Watanabe <i>et al.</i> , 2015)	Cross-sectional single-center study	Ninety-seven patients complained of joint swelling and pain and showed joint fluid retention on ultrasonography were visited between October 2006 and August 2013.	MRI and Laboratory investigation (WBC count, CRP), contrast enhancement of the synovial membrane and surrounding muscles of the affected joint	To evaluated the practical predictors for differentiation between severe TS and SA at the initial examination	WBC count and platelet differences were significant (P = 0.01 and 0.03, respectively), although CRP was not (P = 0.06). Age, WBC, and platelet count also affected AUC (P = 0.04, 0.01, and 0.01). - MRI results showed a significant difference in contrast enhancement of the muscles surrounding the affected joint (P = 0.01) but not in synovial membrane enhancement or osteomyelitis.
Zoabi M, Kvatinsky N, and Shavit I (Zoabi <i>et al.</i> , 2021)	Retrospective study	The study population consisted of children with nontraumatic hip soreness who met POCUS-DSA criteria from January 1, 2014, to December 31, 2019.	A point-of-care ultrasonography (POCUS) decision-support algorithm (DSA).	Evaluating the efficacy of the POCUS-DSA in diagnosing TS in children presenting to the emergency department (ED) of a pediatric hospital	One thousand four hundred sixty-one children with nontraumatic hip discomfort visited the ED during the trial. A mean (SD) age of 5.5 (1.9) years was applied to 621 patients (429 boys; 192 girls) using POCUS-DSA. 539 ED patients were accurately diagnosed with TS, 22 with non-TS, and 54 with non-TS but correct at follow-up.
Dubois-Ferriere V, Belaieff W, Lascombes P, de Coulon G,	Retrospective study	Collect medical records from all pediatric patients under the age of 16 years who	Ultrasonography and laboratory investigations (WBC, CRP,	This study examined whether our hospital's investigative	The study found that 383 of 415 patients had TS (CRP <10 mg/dl; WBC count



QANUN MEDIKA
JURNAL KEDOKTERAN FKUM SURABAYA
<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



Ceroni D (Dubois-Ferrière <i>et al.</i> , 2015)		were managed according to a specific protocol for acute nontraumatic hip pain used in research institutions between January 1999 and April 2007	ESR, ASO, Lyme serology)	strategy could exclude all hip diseases after an inconclusive emergency department survey.	>12x10 ⁹ cells/l; ESR <5-40 mm/h; ASO titer <200 U/ml); 1 had SA (CRP 51 mg/l and WBC count 24.0x10 ³ /mm ³); 1 had Lyme arthritis; and 32 had the irritable hip of unknown etiology. Ultrasonography measured the articular effusion in mm between the femoral neck and joint capsule.
Tay GT, Ashik M, Tow B, Lim KBL (Tay <i>et al.</i> , 2013)	Retrospective study	Pediatric patients admitted over 7 years from 1997-2003 (162 patients), for hip pain, regardless of the diagnosis in KK Women's and Children Hospital, Singapore.	Laboratory tests (WBC, ESR, and CRP), ultrasound observations, effusion size, blood cultures, ANA, rheumatoid factor, and anti-streptolysin O titers	This study examines acute hip pain in children and covers the essential symptoms of TS to identify it from other causes, including AS.	The final diagnoses included: 110 TS (WBC 10.8 x 10 ³ , ESR 16 mm/hr, CRP 10.18). 13 hip contusions. 11 hip SA (WBC 15.13 x 10 ³ , ESR 105 mm/hr, CRP 116.6). 28 other causes.
Harrison WD, Vooght AK (Harrison <i>et al.</i> , 2014)	Descriptive observational study	All children with TS between January 2004 and September 200 in the tertiary hospital in Liverpool.	Ultrasound scan	The purpose of this study is to investigate epidemiology to formulate aetiological theories of pathogenesis.	Of the 366 ultrasound-positive patients, 269 had TS, 42 had arthrotomies, and 55 had other diseases. No significant correlation was seen between the seasonality of TS presentation and incidence (χ^2 -test, $p = 0.93$).
Kang MC, Jeon JY, and Park SS (Kang MS, Jeon JY, 2020)	Retrospective study	Between January 2010 and June 2015, healthy children aged <16 years visited Asan Medical Centre Children's Hospital Institute for acute	MRI and laboratory investigations (WBC, ESR, and CRP)	Our study examined the differential MRI results for TS by symptom duration in children with suspected SA	There were 128 SA and 37 TS patients among the 65. Researchers classified patients into two groups: those with symptoms for <2 days and those with



QANUN MEDIKA
JURNAL KEDOKTERAN FKUM SURABAYA
<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



<p>Tompkins M, Bruce BG, Eberson CP (Tompkins M, Bruce M, Bruce BG, 2014)</p>	<p>Retrospective study</p>	<p>traumatic hip pain or limping. Before invasive procedures like arthrocentesis were done, a gadolinium-enhanced MRI of both hips and radiographs were used to make sure there were no underlying diseases or problems. A level I children's hospital's ED database was searched for all kids with septic hips or TS who had been seen in the past three years. All 211 charts were then reviewed in detail, and several variables were recorded for each, including the patient's age, duration of symptoms, assessment results using the 4 Kocher criteria, ketorolac or other NSAID use, total ED time, hospitalization, OR admission, and OR findings.</p>	<p>MRI</p>	<p>(acute atraumatic hip pain and inflammatory markers). This study investigated if ketorolac can distinguish transitory hip synovitis from septic hip in pediatric patients with a challenging diagnosis.</p>	<p>symptoms for >3 days. A total of 30 individuals (16 TS and 14 SA) showed signs within two days. The symptom group for >3 days included 21 TA and 14 SA patients. Kocher criteria were positive in 13 of 211 septic hip or TS patients. Two individuals developed septic hips. Two more individuals had hip aspiration and drainage. Three patients were readied for the OR after an ED workup for a septic hip. However, the three patients received ketorolac before leaving the ED. After preoperative assessment, these three patients showed substantial improvement and no longer needed surgery.</p>
---	----------------------------	---	------------	--	---



QANUN MEDIKA

JURNAL KEDOKTERAN FKUM SURABAYA

<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



DISCUSSION

Transient synovitis (TS) is the most common cause of hip pain in children (Do, 2000). The differential diagnosis for pediatric hip pain is broad, ranging from benign diseases to surgical emergencies. Furthermore, despite being the most prevalent of these illnesses, TS remains an exclusionary diagnosis with potentially debilitating disorders if not promptly diagnosed, such as septic arthritis, osteomyelitis, LCPD, slipped capital femoral epiphysis (SCFE), and primary or metastatic lesions. Other differential diagnoses include juvenile rheumatoid arthritis, pyogenic sacroiliitis, and Lyme arthritis. To exclude other diagnoses, it is important to take a systematic approach to pertinent clinical factors and obtain appropriate laboratory and imaging studies (Nouri *et al.*, 2014; Alomar, 2012; British Medical Journal, 1973).

Ultrasonography

Apart from using the two tests above, the diagnosis of TS can also be made using ultrasound, which can help distinguish between TS and SA. Ultrasound is a non-invasive diagnostic imaging study that can be used to confirm the presence of joint effusion and track its natural history (Kim *et al.*, 2012). An ultrasound examination for hip transient synovitis aims to detect effusion in the hip joint's anterior recess. Research conducted by Kwack *et al.* (2007) said that if the diagnosis of transient synovitis is only given to children with positive ultrasound scans, the symptoms disappear spontaneously and no further diagnosis can explain the initial symptoms. In a study conducted by Zoabi *et al.* (2021), point-of-care ultrasonography (POCUS) was performed after the initial examination (temperature, age, weight-bearing, concerns started 7 days ago or earlier, absence of paleness, splenomegaly, and generalized lymphadenopathy). If the result is positive for hip joint effusion, then it is categorized as

TS. If the results are negative, further tests will be carried out, namely laboratory tests, MRIs, and follow-up clinics for children. Bone scintigraphy isn't sensitive or detailed enough to tell the difference between TS and SA, so it can't be used regularly. However, it can cause some muscle and bone problems (Koukoulas, 2014). Clinical, laboratory, and radiographic criteria differentiate between SA and TS. Still, no single number can be used to diagnose either condition for sure (Kwack *et al.*, 2007). Ultrasound (U/S) is a beneficial, non-invasive diagnostic imaging study that can prove the presence of joint effusion and track its natural progression. But false-negative measurements may be seen if the test is done early in the disease's course. So, a negative scan cannot rule out an SA, and it is unsafe to tell the difference between TS and SA. So, using U/S does *let als* avoid joint desire that isn't always necessary (Koukoulas, 2014; ZamZam, 2006). When it comes to finding intracapsular effusions, ultrasound is very precise. Ultrasound-guided hip suction decreases pain, limits movement, and often gives quick relief from AS. Ultrasound-guided hip aspiration should be done on everyone whose ultrasonography shows signs of an effusion. Someone experiences bleeding if the temperature is above 99.5 F, the ESR is greater than or equal to 20 mm/hour, and experiences severe hip pain and spasms when moving (Whitelaw, 2022).

According to Mellow, several examination criteria indicate transient synovitis. On radiographic results, watch for low sensitivity for hip joint effusion, a convex gluteal fat pad, and medial joint space enlargement. On ultrasound, it is simple to find joint fluid, synovial hypertrophy, hyperemia, and swelling of the joint capsule due to anechoic, hypoechoic, or complex fluid. Clinical issues in TS manifest between 3 and 8, with an average



age between 4.7 and 5.5 years. With many positive parameters, such as fever, non-weight bearing, a high WBC count, and a high ESR, the likelihood of septic arthritis over transient synovitis is increased according to Kocher's criteria. In addition, TS is self-limiting, lasting between 7 and 10 conservative treatments with bed rest and nonsteroidal anti-inflammatory drugs.

The research of Zaobi *et al.* (2021), which uses POCUS (point-of-care ultrasonography) and DSA (decision-support algorithm), which is regularly used to identify TS in the pediatric emergency department of Rambam Health Care Campus, shows that it has accuracy for TS diagnosis with a sensitivity of 90.9% and a specificity of 78.6%. Meanwhile, in the Zamzam (2006) study, the sensitivity, specificity, and positive predictive value of ultrasonography for the diagnosis of SA were 86.4%, 89.7%, and 87.9%, respectively. Ultrasonography cannot be used to differentiate between TS and SA. Predictive algorithms that use clinical, laboratory, and ultrasound findings may be useful.

Laboratory test

The majority of the articles chosen for this review use retrospective research to explain how hip transient synovitis is diagnosed. Sultan J. and Huges (British Medical Journal, 1973) used MRI as well as laboratory tests such as WBC, erythrocyte sedimentation rate (ESR), and CRP. There were significant differences between the TS and SA groups when temperature and CRP levels were compared as continuous variables. The difference was also significant when fever and elevated CRP were compared as positive versus negative predictors. Age, gender, WBC, ESR, and ability to bear weight were not statistically significant between groups, whether categorical (Fisher's exact test) or continuous

between TS and SA. Likewise, the research conducted by Dubois-Ferrière *et al.* (2015), who also have the same diagnosis to determine TS, found that there are several additional types of tests, namely antistreptolysin-O (ASO), Lyme disease serology, and the use of ultrasonography. Patients diagnosed with TS through laboratory results have a CRP range of <10 mg/dl, a WBC count range of >12 x 10⁹ cells/l, an ESR range of 5–40 mm/h, and an ASO titer range of <200 U/ml. The results of the study showed that, out of 417 patients, 383 had TS. After being treated, there was one patient who conducted clinical and biological parameters (CRP of 51 mg/l and WBC count of 24x10³/mm³) by SA. One patient had Lyme arthritis with positive Lyme serology results, and another 32 patients had hip pain of unknown origin.

Laboratory tests are essential when facing possible cases of toxic arthritis (Rutz, 2013). Blood tests, and more specifically, C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), and serum WBC, are considered very useful (Koukoulas, 2014). According to Whitelaw (2022), several test result criteria for TS can differentiate it from SA; namely, the WBC criteria for TS disease are 5,644–15,388 cells/mm³, while for SA are 105,432–260,214 cells/mm³; the ESR in TS is 21–33 mm/day, while in SA it is 44–46 mm/day; CRP for TS is below 2 mg/dl, while for SA it is greater than 2 mg/dl.

Apart from these two studies, there was another study conducted by Watanabe *et al.* (2015) that used laboratory test methods and MRI to determine TS and distinguish it from SA. Laboratory results on TS science showed a WBC range of 13.2 x 10³ cells/ μ and a CRP range of 3.9 mg/dL, both lower than SA. On MRI, a significant difference between TS and SA was observed in the contrast enhancement of the muscles around the affected joint (P = 0.01). Still, there was no significant



QANUN MEDIKA

JURNAL KEDOKTERAN FKUM SURABAYA

<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



difference between the contrast enhancement of the synovial membrane and the absence of osteomyelitis around the affected joint. M. S. Kang *et al.* (2020) conducted a study to identify TS patients when SA was suspected through laboratory tests and MRI. The test results showed that the WBC value was $>12 \times 10^3$ cell/ μ , the ESR range was <40 mm/h, and the CRP was >2 mg/dl. In the short-term subgroup (<2 days duration), the presence of study effusion contralateral to MRI was significantly associated with TS compared with SA. Whereas in the long-term subgroup (>3 days), there was no change in SI around the soft tissue, which was a significant indicator of TS.

Magnetic Resonance Imaging (MRI)

The significance of MRI in assessing musculoskeletal infections in children has increased. In contrast, when SA and TS are ambiguous, MRI is superior to conventional imaging techniques for accurately diagnosing. To our knowledge, no study has evaluated the MRI characteristics of SA and TS in minors regarding symptom duration or disease progression (Kang & Koo, 2017). MRI findings can help with the diagnosis of SA, early detection of complications, and early treatment of TS conditions to prevent serious complications (Adam *et al.*, 2022) In septic coxitis, magnetic resonance imaging revealed alterations in signal intensity in the bone marrow. Based on these findings, this diagnostic modality has proven helpful in differentiating between SA of the hip and TS, with the limitations of high cost and difficult cooperation, particularly in younger children. Recent research investigations (Kim *et al.*, 2012) have demonstrated the utility of MRI with dynamic contrast for this purpose. The radiologist hypothesized that transient synovitis-affected hips did not show decreased perfusion in the femoral caput, whereas hips affected by sepsis did. So, (Kwack *et al.*, 2007) did a retrospective analysis of hip MRIs

of people with septic hips and confirmed TS to examine the decreased blood flow to the femoral head and find the radiologic differences between the two conditions.

Currently, MRI is increasingly important for diagnosing musculoskeletal infections because of its higher sensitivity in identifying alterations in bone marrow, lesions, soft tissue, synovial enhancement, and joint effusion (Hopkins and Li, 1995; Lee *et al.*, 1999). Previous reports have indicated that hips affected by SA have reduced blood flow in the femoral head and bone marrow, while hips affected by TS do not. However, research has demonstrated that joint effusion can occur in both SA and TS patients, and there is no substantial difference in joint effusion between these two groups of individuals (Kwack *et al.*, 2007; Yang *et al.*, 2006). Nevertheless, a higher incidence of contralateral hip joint effusion was observed in individuals with TS compared to those with SA (Yang *et al.*, 2006; M. S. Kang *et al.*, 2020).

In a systematic review and meta-analysis by Adam *et al.* (2022), the pooled sensitivity and specificity for MRI findings of synovial enhancement were 94.2% and 60.6%, respectively. Soft tissue changes had a sensitivity and specificity of 75% and 69.9%, respectively. Femoral head changes were 41.5% and 87.3%, respectively. In comparison, bone marrow changes were 70% and 99.9%, respectively. These findings, especially bone marrow changes, are useful in differentiating SA from TS in children with hip pain. Meanwhile, the research of Kwack *et al.* (2007) showed that the sensitivity and specificity for the diagnosis of SA were 89% and 82%, respectively.

Hip Joint Aspiration

To avoid negative consequences, individuals with a moderate to high likelihood of SA (effusion, >2 of Kocher criteria fulfilled) should have hip aspiration guided by ultrasonography



QANUN MEDIKA

JURNAL KEDOKTERAN FKUM SURABAYA

<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



or fluoroscopy (Kocher *et al.*, 1999). An accurate method for diagnosing septic arthritis of the hip joint (SAHJ) involves quantifying the white blood cells and estimating the bacterial load in the aspirated hip fluid using ultrasound guidance (Gordon *et al.*, 2002; Givon *et al.*, 2004). According to a study conducted by (Lieberman *et al.*, 2013), hip joint aspiration has been identified as a beneficial treatment technique. Performing hip joint suction in patients with TS is linked to improved and expedited relief from pain and limping and reduced hospital stay duration.

Hill *et al.* (1990) previously documented that ultrasound-guided hip aspiration in a sample of 15 patients resulted in no complications, notable alleviation of symptoms, and a generally swift recovery. Hill *et al.* did not compare the suction group and children who received treatment just with NSAIDs. Kesteris *et al.* (1996) have shown that hip joint suction led to clinical improvement in 12 kids, but nine un-aspirated children did not have the same improvement. The study findings indicated an average decrease of 49% in hip joint width following aspiration. The width of the lower hip capsule remained unchanged for four days following aspiration, in contrast to patients who did not have aspiration.

According to Lieberman *et al.* (2013), doing hip aspiration on all patients with TS is not recommended due to the continuous possibility of infection. Hip suction should only be performed on patients who are fully incapable of bearing weight or have diagnostic issues, such as a strong suspicion of septic arthritis of the hip joint or rheumatologic diseases. Implementing this uncomplicated technique will enhance results, reduce worries regarding joint sepsis, and prevent unnecessary expenditures.

The presence of SA in an individual can be confirmed through a positive culture, synovial fluid with white blood cell levels above 50 x 10⁹/l, or positive gram staining (as stated by Nouri *et al.*, 2014). The hip joint aspiration technique, which is painful and intrusive, is typically carried out under general anesthesia. As a result, Nouri *et al.* (2014) stated that it was only reserved for patients with a high pretest probability.

This study has several limitations, including that there is still little literature on hip TS in the last 10 years. It is hoped that future researchers can explore more varied literature. Each journal used in this review has several different diagnostic procedure options, such as ultrasound with laboratory tests, MRI and laboratory tests, or even just using MRI or ultrasound alone. Some of the tests performed depend on the need to rule out other, more serious diseases, such as SA. This is because SA goes undetected in children and can cause serious complications. That's why some journals use different diagnosis methods depending on the purpose.

CONCLUSION

We examine four modalities that can help clinicians diagnose hip TS: ultrasonography, MRI, laboratory tests, and hip joint aspiration. The advantage of using ultrasound is that the patient is not exposed to ionizing radiation directly. In addition, ultrasound is widely available in hospitals and is more appreciated and approved by parents because patients are usually aged 3–10 years. Meanwhile, according to research, MRI is superior to conventional imaging techniques if SA and TS are ambiguous. MRI's advantage is its high sensitivity for bone marrow changes, soft tissue lesions, synovial enhancement, and joint effusion. It is hoped that the use of laboratory tests will be very helpful in distinguishing between TS and SA because they provide more detailed results regarding



QANUN MEDIKA

JURNAL KEDOKTERAN FKUM SURABAYA

<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



the body's condition of patients. The hip joint aspiration examination is carried out under ultrasound or fluoroscopy guidance. However, examination is not recommended for all TS because of the possibility of persistent infection. This procedure is performed if the patient has diagnostic problems, such as a strong suspicion of SA of the hip joint or rheumatological disease.

REFERENCES

- Adam, M., Ibrahim, B., Khidir, R., Elmahdi, E., Ahmed, S., & Ahmed, A. (2022). Usefulness of MRI findings in differentiating between septic arthritis and transient synovitis of hip joint in children: A systematic review and meta-analysis. *European Journal of Radiology Open*, 9(August), 100439. <https://doi.org/10.1016/j.ejro.2022.100439>
- Alomar, M. J. (2012). Transient synovitis of the hip as a complication of chickenpox in infant : Case study. *Saudi Pharmaceutical Journal*, 20(3), 279–281. <https://doi.org/10.1016/j.jsps.2011.12.008>
- British Medical Journal. (1973). Transient Synovitis and Perthes's Disease. *Br Med*, 14, 62–63.
- Do, T. T. (2000). Transient synovitis as a cause of painful limps in children. *Current Opinion in Pediatrics*, 12(1), 48–51.
- Dubois-Ferrière, V., Belaieff, W., Lascombes, P., De Coulon, G., & Ceroni, D. (2015). Transient synovitis of the hip: Which investigations are truly useful? *Swiss Medical Weekly*, 145(August), 1–8. <https://doi.org/10.4414/smw.2015.14176>
- Givon U, Liberman B, Schindler A, Blankstein A, G. A. (2004). Treatment of septic arthritis of the hip joint by repeated ultrasound-guided aspirations. *Journal of Pediatric Orthopedics*, 24(3), 266–270.
- Gordon JE, Huang M, Dobbs M, Luhmann SJ, Szymanski DA, S. P. (2002). Causes of false-negative ultrasound scans in the diagnosis of septic arthritis of the hip in children. *Journal of Pediatric Orthopedics*, 22(3), 312–316.
- Harrison, W. D., Vooght, A. K., Singhal, R., Bruce, C. E., & Perry, D. C. (2014). The epidemiology of transient synovitis in Liverpool, UK. *Journal of Children's Orthopaedics*, 8(1), 23–28. <https://doi.org/10.1007/s11832-014-0556-5>
- Hill SA, MacLarnon JC, N. D. (1990). Ultrasound-guided aspiration for transient synovitis of the hip. *Journal of Bone and Joint Surgery*, 72(5), 852–853. <https://doi.org/doi:10.1302/0301-620X.72B5.2211770>
- Hopkins KL, Li KC, B. G. (1995). Gadolinium-DTPA-enhanced magnetic resonance imaging of musculoskeletal infectious processes. *Skeletal Radiology*, 24(5), 325–330.
- Kang, M. S., Jeon, J. Y., & Park, S. S. (2020). Differential MRI findings of transient synovitis of the hip in children when septic arthritis is suspected according to symptom duration. *Journal of Pediatric Orthopaedics Part B*, 29(3), 297–303. <https://doi.org/10.1097/BPB.0000000000000671>
- Kang MS, Jeon JY, P. S. (2020). Differential MRI findings of transient synovitis of the hip in children when septic arthritis is suspected according to symptom duration. *Journal of Pediatric Orthopaedics*, 29(3), 297–303. <https://doi.org/doi:10.1097/BPB.0000000000000671>.
- Kang, Y. R., & Koo, J. (2017). Ultrasonography of the pediatric hip and spine.



QANUN MEDIKA

JURNAL KEDOKTERAN FKUM SURABAYA

<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



- Ultrasonography*, 36(3), 239–251. <https://doi.org/10.14366/usg.16051>
- Kesteris U, Wingstrand H, Forsberg L, E. N. (1996). The effect of arthrocentesis in transient synovitis of the hip in the child: a longitudinal sonographic study. *Journal Pediatry Orthopedics*, 16(1), 24–29. <https://doi.org/doi:10.1097/00004694-199601000-00006>. PMID: 8747350
- Kim, E. Y., Kwack, K. S., Cho, J. H., Lee, D. H., & Yoon, S. H. (2012). Usefulness of dynamic contrast-enhanced MRI in differentiating between septic arthritis and transient synovitis in the hip joint. *American Journal of Roentgenology*, 198(2), 428–433. <https://doi.org/10.2214/AJR.11.6937>
- Kocher MS, Zurakowski D, K. J. (1999). Differentiating between septic arthritis and transient synovitis of the hip in children: an evidence-based clinical prediction algorithm. *Journal Bone Joint Surgery*, 1(12), 1662–1670. <https://doi.org/doi:10.2106/00004623-199912000-00002>
- Koukoulas D, A. A. (2014). Hip Pain in Children, a Diagnostic Challenge: Transient Synovitis or Septic Arthritis in Early Stage? *Emergency Medicine: Open Access*, 04(04). <https://doi.org/10.4172/2165-7548.1000195>
- Kwack, K. S., Cho, J. H., Jei, H. L., Jae, H. C., Ki, K. O., & Sun, Y. K. (2007). Septic arthritis versus transient synovitis of the hip: Gadolinium-enhanced MRI finding of decreased perfusion at the femoral epiphysis. *American Journal of Roentgenology*, 189(2), 437–445. <https://doi.org/10.2214/AJR.07.2080>
- Landin, LA, LG Danielsson, C. W. (1987). Transient synovitis of the hip. Its incidence, epidemiology and relation to Perthes' disease. *The Journal of Bone and Joint Surgery*, 69(2), 238–242.
- Lee, S. K., Suh, K. J., Kim, Y. W., Ryeom, H. K., Kim, Y. S., Lee, J. M., Chang, Y., Kim, Y. J., & Kang, D. S. (1999). Septic arthritis versus transient synovitis at MR imaging: preliminary assessment with signal intensity alterations in bone marrow. *Radiology*, 211(2), 459–465. <https://doi.org/10.1148/radiology.211.2.r99ma47459>
- Liberman, B., Herman, A., Schindler, A., Sherr-Lurie, N., Ganel, A., & Givon, U. (2013). The value of Hip aspiration in pediatric transient synovitis. *Journal of Pediatric Orthopaedics*, 33(2), 124–127. <https://doi.org/10.1097/BPO.0b013e31827268b8>
- Nouri, A., D. Walmsley, B. Pruszczyński, M. S. (2014). Transient synovitis of the hip: a comprehensive review. *Journal Pediatry Orthopedics B*, 23(1), 32–36. <https://doi.org/doi:10.1097/BPB.0b013e328363b5a3>
- Pauroso, S., Di Martino, A., Tarantino, C. C., & Capone, F. (2011). Transient synovitis of the hip: Ultrasound appearance. Mini-pictorial essay. *Journal of Ultrasound*, 14(2), 92–94. <https://doi.org/10.1016/j.jus.2011.03.003>
- Rutz e, S. M. (2013). Septic arthritis of the paediatric hip - A review of current diagnostic approaches and therapeutic concepts. *Acta Orthopaedica Belgica*, 79(2), 123–134.
- Ryan, D. D. (2016). Differentiating Transient Synovitis of the Hip from More Urgent Conditions. *Pediatry Ann*, 1(45), 209–213. <https://doi.org/doi:10.3928/00904481-20160427-01>.
- Skinner, J., S. Glancy, T. F. Beattie, G. M. H. (2002). Transient synovitis: is there a need



QANUN MEDIKA

JURNAL KEDOKTERAN FKUM SURABAYA

<http://journal.um-surabaya.ac.id/index.php/qanunmedika>



- to aspirate hip joint effusions? *European Journal of Emergency Medicine: Official Journal of the European Society for Emergency Medicine*, 9(1), 15–18. <https://doi.org/DOI: 10.1097/00063110-200203000-00005>
- Sultan, J., & Hughes, P. J. (2010). *Septic arthritis or transient synovitis of the hip in children THE VALUE OF CLINICAL PREDICTION ALGORITHMS*. 92(9), 1289–1293. <https://doi.org/10.1302/0301-620X.92B9.24286>
- Tay, G., Ashik, M., Tow, B., & BL Lim, K. (2013). Hip Pain in The Paediatric Age Group - Transient Synovitis Versus Septic Arthritis. *Malaysian Orthopaedic Journal*, 7(2), 27–28. <https://doi.org/10.5704/moj.1307.011>
- Tompkins M, Bruce BG, E. C. (2014). Septic Hip, Or Transient Synovitis? Assessing The Diagnostic Utility Of Ketorolac Administration In Children. *Pain Medicine (United States)*, 13(12).
- Watanabe, H., Kikkawa, I., Hagiwara, K., Sugawara, R., Inoue, H., & Takeshita, K. (2015). *Severe Transient Synovitis Differential Dianosis from Septic Arthritis*. 24(2), 1–6.
- Whitelaw CC, V. M. (2022). Transient Synovitis. In *Transient Synovitis*. StatPearls Publishing LLC. <https://www.ncbi.nlm.nih.gov/books/NBK459181/>
- Yang, W. J., Im, S. A., Lim, G. Y., Chun, H. J., Jung, N. Y., Sung, M. S., & Choi, B. G. (2006). MR imaging of transient synovitis: Differentiation from septic arthritis. *Pediatric Radiology*, 36(11), 1154–1158. <https://doi.org/10.1007/s00247-006-0289-9>
- ZamZam MM. (2006). The role of ultrasound in differentiating septic arthritis from transient synovitis of the hip in children. *Journal Pediatri Orthopedics B*, 15(6), 418–422.
- Zoabi, M., Kvatinsky, N., & Shavit, I. (2021). Evaluation of a Point-of-Care Ultrasonography Decision-Support Algorithm for the Diagnosis of Transient Synovitis in the Pediatric Emergency Department. *JAMA Network Open*, 4(7), 2021–2023. <https://doi.org/10.1001/jamanetworkopen.2021.16915>