

Transient synovitis of the hip: a comprehensive review

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Transient synovitis is a benign, self-limiting condition that is diagnosed after the exclusion of more serious causes of acute hip pain in children. Although its etiology remains unclear, it is largely believed to be viral in nature. Transient synovitis typically presents as an acute onset of thigh pain with a limp or an unwillingness to bear weight. It can be distinguished from similar conditions by the absence of fever, as well as unremarkable bloodwork (WBC, CRP, ESR), radiographs, and hip aspiration. Conservative treatment and observation are the mainstay of management. Resolution of symptoms generally occurs by 1 week and may be accelerated by NSAIDs. Although numerous papers have emerged over the years with an effort to advance our understanding, many

questions remain about its pathomechanics, etiology, and how to exclude other more serious conditions that present similarly. *J Pediatr Orthop B* 23:32–36 © 2013 Wolters Kluwer Health | Lippincott Williams & Wilkins.

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Introduction

The first description of transient synovitis (TS) was published in 1892, in which it was noted as a 'short-lived and ephemeral form of hip disease which presents at first the characteristics of common hip disease, but the symptoms of which disappear in a few months instead of continuing for years' [1]. Despite the fact that over a century has gone by, much remains unknown about this clinical entity.

Over the years, various researchers have proposed a number of possible etiologies including trauma, hypersensitivity, and perhaps most notably, infections of both viral and bacterial origin [2–5]. However, none of the postulated hypotheses have been conclusively substantiated and its pathophysiology remains unclear. This ambiguity has likely contributed to the numerous other names by which TS has been referred to, including transitory coxitis, acute transient epiphysitis, coxitis fugax, coxitis serosa seu simplex, phantom hip disease, toxic synovitis, and observation hip [6].

The purpose of this review was to concisely discuss the findings collected over the years, to include new developments since its last review, and to provide the most succinct analysis of what is currently known about this benign, yet peculiar, clinical entity.

Epidemiology

The average annual incidence of TS and lifetime risk of development has been estimated at ~0.2 and 3%, respectively [7]. TS is particularly prevalent in children aged between 3 and 8 years [8,9]. According to a recent study from the Netherlands, the mean and median age of onset was estimated at 4.7 and 4 years, respectively [10]. However, case reports with similar clinical presentations

have been described in adults [11,12]. There is also a significant difference in incidence between sexes, with an estimated male-to-female ratio described in the literature ranging between 1.7–2.8:1 [7,13,14].

The development of TS has been shown to predispose to an increased chance for relapse, with an annual incidence of recurrence estimated at 4%, a 20-fold increase in risk over the general population [7]. However, strong epidemiological data are scarce, vary widely, and have been predominantly obtained from the European countries and thus their generalizability is limited.

Bilateral involvement has also been described and although its incidence has not been well documented, it may occur 1–4% of the time [15].

Etiology

The exact etiology of TS has not been established; however, a number of studies have assessed a possible association between a viral infection and TS [2,4,7]. According to Kastrissianakis and Beattie [2], patients diagnosed with TS are more likely to have experienced preceding viral symptoms of vomiting or diarrhea and common cold symptoms. This is supported by the findings of Leibowitz *et al.* [4], who reported that patients with TS have a higher serum interferon concentration and are more likely to be in an antiviral state compared with controls. Furthermore, Landin *et al.* [7] noted a seasonal variation in the incidence of TS, with more cases presenting in October and fewer cases in February. However, studies that have assessed possible pathogen candidates, including parvovirus B-19 and human herpes simplex virus-6, have not been successful [7,16].

Other proposed causes include allergic reaction and trauma [3,5,7]. Edwards [17] noted an improvement in symptoms with antihistamine treatment in two patients with a history of allergy, whereas Hermel and Albert [3] reported that 17–30% of patients diagnosed with TS had a preceding history of trauma without evidence of fracture. However, both of these studies are fairly outdated and their current applicability is questionable.

Differential diagnosis

There is a broad differential for pediatric hip pain, ranging from benign conditions to surgical emergencies. Therefore, despite being the most common of these disorders [7], TS remains a diagnosis of exclusion. Potentially devastating conditions, if not diagnosed expeditiously, include osteomyelitis, septic arthritis, primary or metastatic lesions, Legg–Calve–Perthes disease (LCPD), and slipped capital femoral epiphysis (SCFE) [13]. Other differential diagnoses include Lyme arthritis, pyogenic sacroiliitis, and juvenile rheumatoid arthritis [18]. Recent case reports have also shed light on the misdiagnosis of TS in patients with tibia torus and Toddler's fracture as well as a patient with a pelvic abscess [19,20]. Finally, it is also noteworthy that a labral tear should also be excluded because of its similar clinical presentation, particularly when both radiographs and ultrasonography (US) are negative. An MRI arthrogram is the most accurate diagnostic tool for this and can be utilized when suspected [21].

An organized approach to relevant clinical variables and the use of appropriate laboratory investigations and imaging studies are essential to exclude other diagnoses. Emphasis by a number of researchers has been on differentiating TS from septic arthritis as these two presentations have been encountered to be particularly challenging to discern [18,22].

Diagnosis

Clinical presentation

TS typically presents with an acute onset of groin or thigh pain and a limp or an unwillingness to bear weight [2]. The affected hip presents with variable amounts of flexion, abduction, and external rotation in the comfortable resting position on examination and presents with limited passive range of motion upon manipulation [2,5]. This position may be more comfortable as a result of lower intracapsular pressure [23,24]. In a minority of patients, bilateral involvement may occur [15]. Diagnosis is complicated by the absence of specific laboratory markers, negative laboratory tests, as well as the fact that pain originating from the knee or lumbar spine must be excluded [14].

Owing to the wide-ranging hypothesized etiologies, a number of differing histories may be significant before presentation. Landin *et al.* [7] suggest that a history of upper respiratory, gastrointestinal, or urinary tract infection or minor trauma may be appreciated.

Investigations

Kocher *et al.* [18] suggested an algorithm for predicting the probability of septic arthritis on the basis of fever (temperature > 38.5°C), inability to weight bear, ESR more than 40 mm/h, and serum WBC more than 12.0×10^6 cells/l. In this subset of patients, the predicted probabilities of septic arthritis on the basis of one, two, three, and four predictors were 3.0, 40.0, 93.1, and 99.6%, respectively [18]. C-reactive protein (CRP) more than 1 mg/dl was later added to this algorithm [25,26]. Caird *et al.* [22] prospectively utilized this altered algorithm and found the predicted probabilities of three, four, and five factors to be 83, 93, and 98%, respectively. Furthermore, they also suggested that the algorithm could be applied to other patient populations [22]; yet, further studies did not reproduce the same predictive accuracy of these variables when different patient populations were assessed that had a lower percentage of children eventually diagnosed with septic arthritis [27,28]. Fever (temperature > 38.0°C) was found to be the most significant predictor, followed by elevated CRP [28]. More recently, Singhal *et al.* [29] found that CRP more than 20 mg/l was the strongest independent risk factor for septic arthritis.

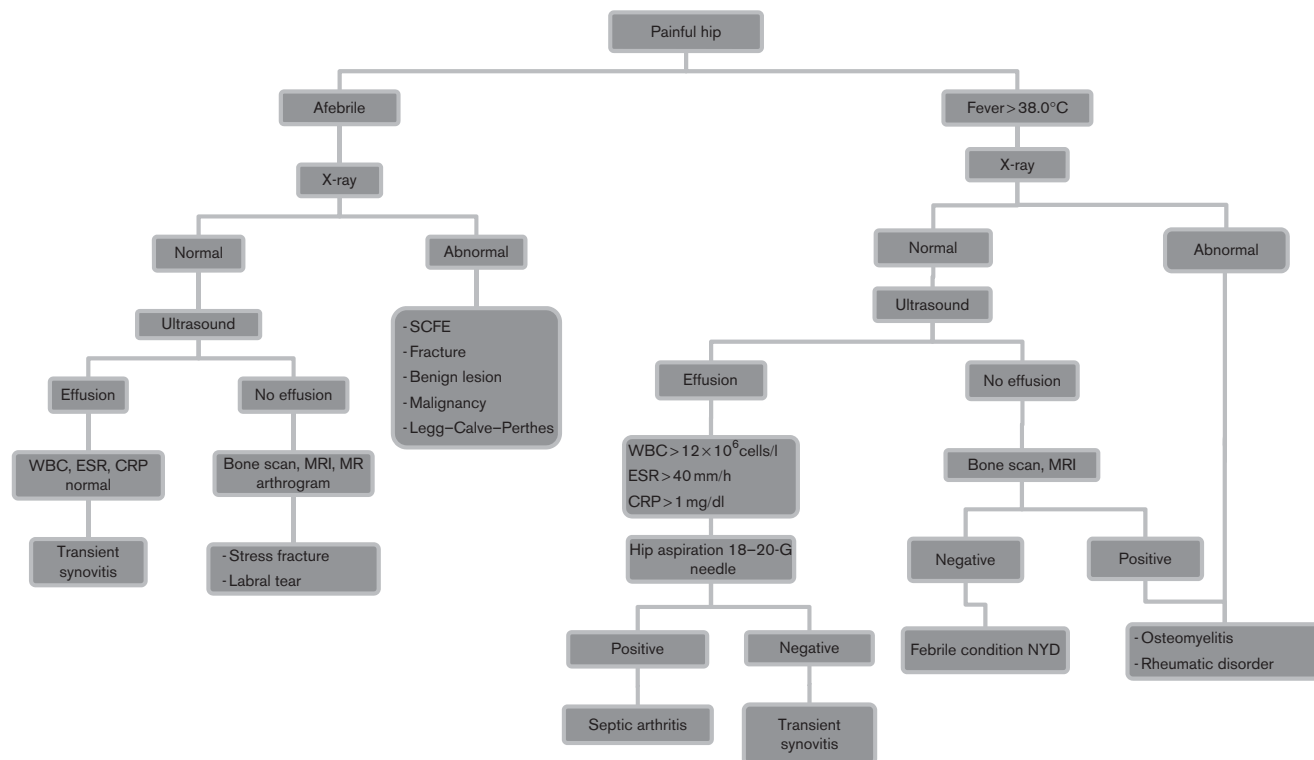
Using the aforementioned findings, we have devised a clinical diagnostic algorithm flowchart to offer guidance for managing patients presenting with an irritable hip, presented in Fig. 1.

Imaging

Plain radiographs in patients suspected of having TS are typically normal but may show medial joint space widening [9]. They also serve to exclude other acute diagnoses such as fracture and SCFE, although SCFE is unlikely in children younger than 9 years of age [9,18]. US is a noninvasive and accessible imaging modality that reliably detects the presence of even small hip effusion; however, it cannot reliably distinguish between the potential causes of the effusion, which can include both TS and septic arthritis [5,8,30]. Although it has been stated that the lack of effusion can be helpful in excluding septic arthritis, Zamzam [8] indicated that the most unsatisfactory outcomes in their study occurred in those who had false-negative US studies as well as those who had their treatment delayed 4 days or more [8].

MRI has been shown to help distinguish TS from septic arthritis, with the former having contralateral joint effusion and the absence of signal intensity abnormalities in the bone marrow [31]. Kwack *et al.* [32] found that decreased perfusion at the femoral epiphysis on fat-suppressed gadolinium-enhanced coronal T-weighted MRI was more likely to be present in septic arthritis than TS. More recently, Kim *et al.* [33] have offered a method of utilizing dynamic contrast-enhanced MRI to

Fig. 1



Approach to hip pain in children. A decision tree aimed at guiding physicians through the process of evaluating a painful or irritable hip. CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; NYD, not yet diagnosed; SCFE, slipped capital femoral epiphysis; WBC, white blood cell.

distinguish between septic arthritis and TS, reporting a negative predictive value of 88.9% and suggesting that this could be very helpful in avoiding unnecessary arthrocentesis in lesions that are not representative of septic hip arthritis. Therefore, the utilization of MRI may be considered in patients with equivocal clinical presentation and US results. However, MRI facilities are not always readily accessible and they frequently require the administration of a general anesthetic [8]. Moreover, given the relatively indolent nature of TS, MRI may not be the most feasible means of establishing a diagnosis.

Scintigraphy has also been used, and although often clinically unremarkable, it may show high periarticular tracer localization; thus, it appears to have limited applicability in the diagnosis of TS [34]. Zamzam [8] cautions, however, that despite the usefulness of bone scintigraphy in identifying multifocal musculoskeletal infections, it is neither sensitive nor specific enough in distinguishing TS from SA in patients with a painful hip.

Hip aspiration

Given the potential deleterious consequences of forgoing treatment, patients with an intermediate or a high probability of septic arthritis (effusion, ≥ 2 of Kocher's

criteria fulfilled), either an US or fluoroscopically guided hip aspiration should be performed [18].

Kung *et al.* [35] used an 18–20-G spinal needle from the hip using standard procedures for fluoroscopic examination. They describe that if fluid is aspirated, it is not necessary to use contrast because by resting the needle tip on the femoral neck and confirming this fluoroscopically it can be assumed that the fluid was derived from the joint. If joint fluid was not obtained, the authors described injecting 10 ml of either iohalamate meglumine contrast or nonbacteriostatic saline, followed by subsequent reaspiration depending on the operator's preference [35]. If saline was used as a lavage, the authors injected a trace amount of Conray 60 (Mallinckrodt Inc., St Louis, Missouri, USA) to confirm intraarticular positioning [35].

The technique for US and aspiration of hip synovial fluid is well described by Nestorova *et al.* [36], who suggest that an anterior longitudinal approach should be applied for puncture and/or injection with the patient in the supine position. They suggest that a needle gauge of 18–21 (0.8 × 80 mm) should be inserted inferiorly 8–10 cm beneath the inguinal ligament toward the anterior or the inferior capsule below the femoral head

and that from there the needle can be guided and traced from 1 cm below the skin surface all the way to the joint [36]. They describe that from there the fluid can be aspirated if present [36]. Nestorova *et al.* [36] also state that when the needle is perpendicular to the US beam, it appears as a sharply defined band with strong posterior reverberations and that the best visualization of the shaft of the needle is reached at 90°, with the needle becoming less evident with increasing obliquity.

Positive culture results, a WBC more than $50 \times 10^9/l$ in the synovial fluid, or a positive gram stain confirm a diagnosis of septic arthritis [27]. However, this is a painful and invasive procedure that is usually performed under general anesthesia and therefore should be reserved for patients with a high pretest probability.

Treatment

TS is a self-limiting condition that resolves spontaneously and is managed conservatively through observation and by encouraging rest. The utilization of NSAIDs in addition to this advice has been proposed as well: Kermond *et al.* [37] assessed the efficacy of ibuprofen in reducing the average number of days with symptoms through a randomized placebo-controlled triple-blind study published in 2002 and reported a decrease in symptoms from 4.5 days in the placebo group to 2 days in those administered ibuprofen. Although other NSAIDs have not yet been evaluated, it would seem reasonable to assume that they would have comparable efficacy in shortening the duration of symptoms as well.

Arthroscopic debridement of synovium and evaluation and treatment of other identifiable problems such as cartilage defects have been proposed as a potential treatment for cases refractory to conservative management; this was successful in a 13-year-old patient with 4 weeks of persistent symptoms [38]. However, it is likely that the rare nature of such occurrences is indicative of another pathology that may have presented similar to TS.

Wingstrand *et al.* [23] determined that intracapsular pressure in TS patients depends on the position of the hip joint and is greatest when the joint is extended; thus, they recommended the hip to be immobilized at 45° of flexion to reduce intracapsular pressure. Furthermore, Kesteris *et al.* [24] reported that aspiration of synovial fluid in children with TS has an immediate palliative effect. However, Skinner *et al.* [39] pointed out that there is no evidence for a prolonged benefit after aspiration, and Wingstrand *et al.* [23] noted that effusion recurred the following day in 11 of 13 patients.

Prognosis

The natural history of TS is benign, resolving without specific treatment over an estimated period of 3–10 days [6]. In one investigation, in which patients were

diagnosed with TS and followed with serial clinical exams as well as US, resolution of symptoms as well as effusion occurred in the majority of patients after 1 week [39].

It is important to also note that an increased likelihood of developing a recurrence of the condition has been reported in patients with a previously documented diagnosis [7]. Uziel *et al.* [40] documented the recurrence of TS in 39 patients and observed that the percentages of recurrences within the first year, second year, and thereafter were 69, 13, and 18%, respectively.

The incidence of LCPD following an episode of TS has been estimated to be 3% [7], whereas the incidence of LCPD in the general population has been estimated to be 0.9/100 000 [41]. An increased incidence of LCPD in patients diagnosed with TS has also been suggested by Mukamel *et al.* [42], who agglomerated data from 10 studies for a total of 455 patients, of whom 18 patients subsequently developed LCPD. However, Kallio *et al.* [43] were not able to support a correlation in their prospective study of 119 patients. An early sign of LCPD is widening of both the medial and the superior joint space with a disparity greater than 2 mm compared with the contralateral side; however, this may be present in up to 20% of TS cases [7]. Uziel *et al.* [40] found that most children were asymptomatic on long-term follow-up; however, in a few cases, TS was the initial presentation of a chronic inflammatory condition.

Thus, parents should be informed to expect complete resolution of symptoms but should be instructed to watch for recurrent symptoms as they may be an indicator of recurrence or another, less benign diagnosis that initially presented as TS.

Summary

TS is the most common cause of acute pediatric hip pain, and yet, much is unknown about the condition. There are indications that an infectious, likely viral, etiology is the culprit; however, this remains controversial. Attempts to find a specific pathological cause have been unsuccessful, and therefore, the possibility that TS may represent merely a constellation of symptoms for multiple etiologies rather than a single entity cannot be excluded.

Although strides have been made to formulate a clinical diagnostic algorithm as discussed earlier in our review, the focus remains that of differentiating TS from septic arthritis, and clinical guidelines on how to manage TS patients do not currently exist. Considering the limited amount of literature currently at disposal to researchers, it may be more feasible to devise a stepwise scheme to exclude the most pertinent causes of pediatric hip pain, as we have done in this review, in lieu of formulating practice guidelines. However, the diagnostic process described in our figure requires access to equipment and late-night facilities that may not be available to all

clinicians; therefore, the decision-making process remains largely on the basis of clinical assessment.

It is important to emphasize that a correct diagnosis of TS remains of utmost importance, not because of the consequences of its omission, but rather because of significant morbidity that may result by its misdiagnosis. By being able to better differentiate TS from other conditions such as septic arthritis, clinicians will be able to provide faster, more effective treatment and avoid potential deleterious sequelae of their delayed intervention.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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