

Transient synovitis of the hip: which investigations are truly useful?

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Summary

QUESTIONS UNDER STUDY/PRINCIPLES: To assess the usefulness of several laboratory and radiological investigations for the limping child with suspected transient synovitis of the hip.

METHODS: The medical records of children admitted at our children's hospital for nontraumatic hip pain between 1999 and 2007 were retrospectively reviewed. During the study period, all children without a definite diagnosis after routine investigations in the emergency department were admitted and a specific work-up including antinuclear antibodies titre, rheumatoid factor, antistreptolysin O titre, Lyme disease serology and hip ultrasonography were obtained. Children were systematically re-evaluated 6 weeks after hospital discharge, with a clinical examination and radiological hip views. Patients were diagnosed with transient synovitis of the hip if an ultrasound-confirmed hip effusion was present at time of admission, complete resolution of symptoms occurred without any specific treatment, and no other pathology of the hip was identified during follow-up.

RESULTS: A total of 417 cases without definite diagnosis were admitted and were submitted to a specific work-up. Transient synovitis of the hip was subsequently diagnosed in 383 patients, septic arthritis in 1 patient, and Lyme arthritis in 1 patient. Thirty-two patients remained without diagnosis. No rheumatological condition was found.

CONCLUSION: Our results suggest that most investigations performed during the initial work-up in patients suspected transient synovitis of the hip are unnecessary and should routinely include only white blood cell count, C-reactive protein, erythrocyte sedimentation rate, and hip radiography and ultrasonography. No further investigations are necessary during follow-up for transient synovitis of the hip in asymptomatic children.

Key words: transient synovitis; hip; children; management; investigations

Introduction

Children presenting with acute nontraumatic hip pathology can display a wide variety of nonspecific symptoms, such as a limp or abnormal gait, pain, refusal to bear weight

or decreased movement of the involved joint. These complaints represent a diagnostic problem for paediatricians and emergency physicians, not only because of the broadness of these complaints but also because the differential diagnosis varies from quite harmless conditions such as transient synovitis of the hip to more severe problems such as Legg-Calvé-Perthes' disease (LCP), slipped capital femoral epiphysis (SCFE) and life-threatening conditions such as septic arthritis of the hip [1]. The most common cause of hip pain and limp in children is transient synovitis of the hip (TSH) [1, 2]. Commonly, the age of presentation is between 4 to 10 years, and the boy to girl ratio is 2:1 [2, 3]. Symptom resolution without any specific treatment in a matter of days is an essential feature of diagnosis [2, 3]. However, the symptoms of TSH are nonspecific and may be present in many other potentially serious hip conditions [4, 5]. Because of the potential risk of missing a serious condition in this situation, acute nontraumatic limping children are promptly referred and often over-investigated [6, 7]. In cases where no definite diagnosis is made during initial management, it is not clear whether further investigations, such as a rheumatological panel, to exclude all other

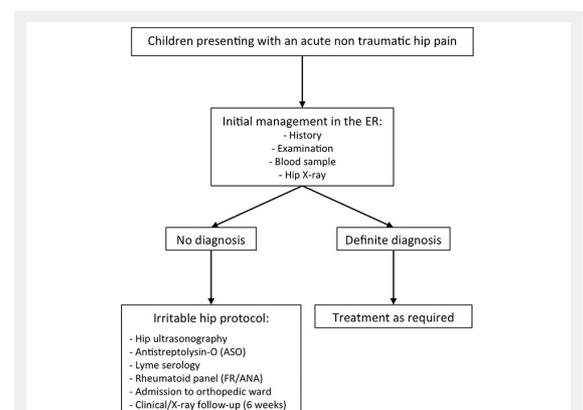


Figure 1. Management protocol of acute non traumatic hip pain applied in our institution between 1999 and 2007. ASO, Antistreptolysin O; CRP: C-reactive protein; ER: emergency room; ESR: erythrocyte sedimentation rate; TSH: Transient synovitis of the hip; WBC: white blood cell

Figure 1

Management protocol of acute non-traumatic hip pain applied in our institution between 1999 and 2007.

ANA = antinuclear antibodies; ASO = antistreptolysin O; ER = emergency room; RF = rheumatoid factor;

possible diagnoses are necessary. A few studies have aimed to establish which parameters are most relevant in clinical decision-making for acute nontraumatic hip pathology in order to make the correct diagnosis [8, 9]. In our institution, a strict investigation protocol for children presenting with an acutely irritable hip in the emergency room was applied systematically between 1999 and 2007 (fig. 1). The primary aim of this study was to assess whether the investigation model used at our hospital could exclude all hip pathologies, in the case of an inconclusive initial survey at the emergency department. Secondly, it was intended to assess which investigations were truly necessary in this setting. Finally, we wanted to elaborate a comprehensive and adapted protocol for the management of a child presenting an acutely irritable hip.

Methods

We retrospectively reviewed the medical records of all children under the age of 16 years who were managed according to a specific protocol for acute nontraumatic hip pain used in our institution between January 1999 and April 2007. The protocol included anteroposterior and Lauenstein hip views, hip ultrasonography, white blood cell (WBC) count, measurement of C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR), as well as a panel of rheumatoid tests including antinuclear antibodies (ANA), rheumatoid factor (RF), antistreptolysin O (ASO) titres and Lyme disease serology. All children were admitted to our paediatric orthopaedic ward. Inclusion criteria were: age under 16 years, presentation at the emergency department with an acute, new-onset, nontraumatic limp, hip pain or refusal to bear weight; absence of bone and joint involvement on hip radiography; and blood sample results inconclusive for a definite diagnosis in the emergency department. Exclusion criteria were cases where a definite diagnosis was clearly made during initial management in the emergency room.

Children included in the protocol were prescribed complete avoidance of weight bearing and lower-limb nonadhesive skin traction. Nonsteroidal anti-inflammatory and myorelaxing drugs were used for pain relief and to improve the children's comfort. Once symptom-free, supervised ambulation was resumed and patients were allowed to leave the ward. Children were systematically re-evaluated 6 weeks after hospital discharge with a clinical check-up and radiological (anteroposterior and Lauenstein) views.

The study received institutional review board approval (*Mat-Ped 07-009R*) and was conducted in accordance with Good Clinical Practice guidelines and the Declaration of Helsinki.

Diagnosis definition

Patients were diagnosed with TSH if an ultrasound-confirmed hip effusion was present, complete resolution of symptoms occurred without any specific treatment, and no other pathology of the hip was identified during follow-up. In the event of negative hip ultrasonography for hip effusion, together with spontaneous resolution of symptoms during follow-up and no other identified hip pathology, the diagnosis of irritable hip of unknown origin was given.

Data collection

Data collected included patient age and gender, duration of symptoms prior to admission, results of clinical, radiological and laboratory findings, results of clinical and radiological follow-up 6 weeks after hospital discharge, and the definitive diagnosis. Weight-bearing status was determined from the clinical examination, and delay between limp onset and presentation was recorded in days. Fever was defined as an oral temperature >38.5 °C. The values of ANA, ASO and RF were interpreted according to our laboratory references, i.e., greater than 6 U/ml for RF, 1:80 for ANA, and above 200 U/ml for ASO. At ultrasonography, the presence and amount of articular effusion was reported in mm of space between the femoral neck and the joint capsule.

Statistical analysis

Descriptive statistics were used to present our demographic data. Unpaired Student's test was performed to compare subgroups of patients on laboratory data for values of CRP, WBC count, ESR, and ASO titre. Statistical analysis was performed using SPSS (Version 16.0; SPSS Inc., Chicago, Illinois). Differences were considered significant at $p < 0.05$.

Results

Between January 1999 and April 2007, 440 patients were admitted at our paediatric orthopaedic ward with a chief complaint of nontraumatic hip pain or a limp. Among these patients, 74 were given a definite diagnosis based on clinical, laboratory and radiological work-up at time of presentation at the emergency room. There were 2 cases of septic arthritis, 46 of Perthes' disease, 2 of juvenile arthritis, 20 of SCFE, 1 Kawasaki's disease, 1 myositis ossificans, 1 fibrous dysplasia of the proximal femur and 1 blood effusion of the hip due to haemophilia. The remaining 366 patients with nondiagnostic initial work-ups were managed under the specific protocol as described in the methods section and fulfilled the inclusion criteria for this study. Among these patients, 51 (14%) had another episode of hip pain requiring readmission to the hospital during the study period. In total, 417 hospitalisation episodes for hip pain without a definite diagnosis at the emergency room were collected. Among this group, the diagnosis of TSH was subsequently confirmed in 383 (91.8%) cases. After admission on the ward, one patient presented clinical and biological parameters (CRP of 51 mg/l and WBC count of $24.0 \times 10^3/\text{mm}^3$) compatible with septic arthritis, and was treated accordingly despite negative hip joint aspiration. One patient had Lyme arthritis diagnosed on positive Lyme's serology, and the remaining 32 patients had a hip pain or limp of unknown origin defined as irritable hips of unknown origin with a negative ultrasound for hip effusion (table 1). Among these 32 cases of irritable hip of unknown origin, full recovery was observed at follow-up. Demographic data of patients who underwent the specific protocol are shown in table 1.

Clinical evaluation

Among the 383 patients with transient synovitis of the hip, 192 (51%) had symptoms for less than 24 hours prior to admission. When symptoms were present for more than 24 hours, mean symptom duration was 2.1 days (range 1–21 days) before medical attention was sought. Among patients (417) who underwent the specific "irritable hip protocol", limping was present in 392 cases (94%), and 69 (16.5%) were absolutely unable to bear weight. In 23 (5%) cases, no information was found concerning the weight-bearing status. Only 5 (1.2%) patients presented an oral temperature greater than 38.5 °C at initial presentation.

One hundred and seventy (40%) patients had an upper respiratory infection within 2 weeks preceding symptom onset.

Laboratory findings

WBC count greater than $>12.0 \times 10^3/\text{mm}^3$ was present in 47 (11.3%) children. Seventy-two patients had a CRP greater than 10 mg/dl with a median value of 15 ± 21.9 mg/dl (5–86). CRP was lower than 10 mg/dl in 345 patients (83%). ESR was greater than 40 mm/h in 8 (2.4%) patients (table 2). ASO titres were tested in 403 patients and were above 200 U/ml in 87 (22%) cases. When abnormal, the median value was 400 U/ml, ranging from 300 to 800 U/ml (table 2). Lyme serology testing was performed in 323 patients and results were normal for all patients but one.

Rheumatological panel

ANA titres were assessed in 402 patients and were negative in 341 cases (86%). Among the positive results, ANA titres were higher than 1:80 in 25 cases (6%). Rheumatoid factor was tested in 388 patients and was positive in 60 (15%)

cases; rheumatoid factor was above 6 U/ml in 60 (15%) patients (table 3). Among children with abnormal results from the rheumatological panel, 38 underwent ophthalmological examination in order to rule out uveitis and all were normal.

Radiological investigations

Indirect signs of effusion were seen in 82 (19.6%) children on the standard pelvic radiographs, while no osseous abnormalities were noted. A hip ultrasound was performed in all patients. Hip effusion was observed in 385 (92.3%) cases with a mean value of 6.7 mm (range 2–19 mm).

Clinical and radiological follow-up

Four hundred and two patients (96.4%) were seen for a clinical and radiological follow-up 6 weeks after hospital discharge and 15 were lost to follow-up. Three hundred and ninety six children were asymptomatic and had a normal hip X-ray. One patient had persistent pain despite a normal radiological aspect of the hip at 6 weeks follow-up. He required further follow-up, and hip X-rays at 12 weeks showed early signs of LCP disease.

Five patients had an asymmetrical aspect of the femoral head on hip X-rays and required additional follow-up despite entire resolution of clinical symptoms. Eventually, all these patients had a complete and spontaneous resolution of radiographic anomalies.

Discussion

The diagnosis of TSH in children with acute nontraumatic hip pain or limp is often challenging. Clinical manifestations of TSH may be suggestive of other, more serious hip

Table 1: Patients' demographic data (417 cases).

Males/females	289/128
Age in years (range)	5.6 (1–13)
Diagnosis	
Transient synovitis (%)	383 (91.8)
Septic arthritis (%)	1 (0.2)
Lyme arthritis (%)	1 (0.2)
Irritable hip of unknown origin	32 (7.7)

Table 2: Laboratory results.

	Total*	Transient synovitis of the hip	Irritable hip with unknown origin	p-value
CRP	n = 415	n = 383	n = 32	p = 0.3
< 10 mg/dl (%)	345 (83)	319 (83)	26 (81)	
10–20 mg/dl (%)	47 (11)	45 (11.7)	2 (6)	
> 20 mg/dl (%)	23 (6)	19 (5)	4 (12.5)	
Range	5–86	5–86	5–61	
WBC count	n = 415	n = 383	n = 32	p = 0.73
>12.0 x 10 ⁹ cells/l (%)	47 (11)	44 (11.5)	3 (9.4)	
Range	3.4–22.1	3.4–17	4.3–22.1	
ESR	n = 316	n = 296	n = 20	p = 0.17
<5 mm/h (%)	24 (7.5)	22 (7.5)	2 (10)	
5–40 mm/h (%)	285 (90)	267 (90)	18 (90)	
>40 mm/h (%)	7 (2.5)	7 (2.3)	0	
Range	2–61	2–61	2–24	
ASO titre	n = 401	n = 371	n = 30	p = 0.61
<200 U/ml (%)	316 (78)	293 (79)	23 (67)	
>200 U/ml (%)	85 (22)	78 (21)	7 (23)	
Range	0–800	0–800	0–400	

ASO = antistreptolysin 0; CRP = C-reactive protein; ESR = erythrocyte sedimentation rate; WBC = white blood cell *The two patients diagnosed with septic arthritis and Lyme disease were excluded from data analysis.

disorders, such as septic arthritis, LCP or acute SCFE, and must be ruled out [9]. In order to overcome the possibility of leaving a potentially serious condition undiagnosed after initial work-up at the emergency room, a strict policy of running a systematic clinical, radiological and laboratory work-up has been established in our institution. Moreover, all patients were seen 6 weeks after hospital discharge for clinical and radiological follow-up. Results of the current study show that children presenting with acute, nontraumatic hip pain or limp at the emergency room without a clear diagnosis at time of presentation were subsequently found to have TSH in the great majority of cases (92%) at the end of diagnostic work-up. These results confirm that most children complaining of a limp will turn out to have TSH, which may be adequately managed without any specific therapeutic measures and patients can in most cases be followed up on an outpatient basis [6, 7]. In addition, among the patients included in our study, conditions such as septic arthritis, SCFE or LCP disease were not diagnosed on the basis of the specific investigation work-up. This may be as a result of the fact that these diagnoses were made upon initial presentation at the emergency department, based on routine investigations. Serum inflammatory parameters may be slightly raised in TSH [3]. As a recent viral infection (most commonly an upper respiratory tract infection) has been postulated as a precipitating factor [10], ESR and CRP values may be discretely elevated. However, raised inflammatory markers are paramount predictors of septic arthritis of the hip [8, 9]. Kocher et al. compared data from children with septic arth-

ritis and TSH, and concluded that there were four predictive factors for septic arthritis of the hip: a history of fever (oral temperature higher than 38.5 °C), nonweight-bearing status, ESR >40 mm/h, and a WBC count >12.0 x 10³/mm³ [9, 11]. Caird et al. added CRP level of >20mg/l to these four factors [8]. On the basis of the Caird algorithm, 70% of the investigated children had no predictor, 24% one predictor, 19% two predictors, 1% three predictors, and none had four or five predictors (table 4). The only patient who was considered to have septic arthritis was found to have only two predictive factors according to Kocher and three factors according to Caird, corresponding to a probability of septic arthritis of 40% and 82.6%, respectively [8, 9]. These algorithms should be used with caution, especially in children under 4 years, since it has been shown that children between 6 and 48 months of age are susceptible to *Kingella kingae* osteoarticular infection despite normal laboratory values [12, 13].

Consistently with current literature, our results show that radiographs of the hip are often unremarkable in patients with TSH and may show only indirect signs of effusion [14, 15]. The main reason for radiographic evaluation is to rule out osseous lesions such as LCP disease, acute or chronic SCFE, or bone tumours, and should be obtained early in the diagnostic workup. Nevertheless, it is important to note that these hip disorders do not present with a similar history and clinical findings to TSH. Children with TSH have a complete resolution of symptoms in a week or less, even if residual symptoms may occasionally persist 7 to 10 days after the initial presentation [2, 16]. When compared with patients with TSH, patients with Perthe's disease have a considerably longer duration of hip pain [17]. Analogously, children with chronic SCFE usually present with a history of limping for several weeks and poorly localised pain in the hip, groin, thigh, or knee. Moreover, these latter children are often older than those with TSH.

Ultrasound of the hip may help to confirm or exclude hip effusion in children with suspicion of transient synovitis or septic arthritis [14, 18, 19]. However care must be taken not to misinterpret false-negative studies performed too early in the course of septic arthritis [20]. Moreover, ultrasound is not discriminative in differentiating septic arthritis and TSH and should not be considered a safe diagnostic tool to confirm or exclude hip septic arthritis in children [21, 22]. In fact, ultrasound served mainly to confirm the localisation of symptoms to the hip and to detect the presence of effusion. In the present study, a hip ultrasound was performed in all children presenting with suspicion of TSH. A hip effusion was present in 92% of cases. All negative ultrasound cases were treated as TSH and had

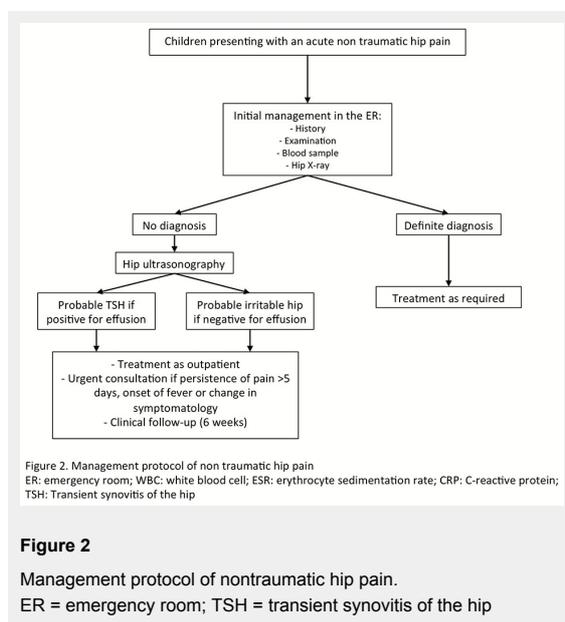


Table 3: Rheumatological panel results.

	Total	Transient synovitis of the hip	Irritable hip with unknown origin
ANA titre	n = 401	n = 371	n = 30
Negative (%)	342 (86)	316	26
>1:80 (%)	59 (14)	55	4
Median (SD)	160 (387)	160 (400)	120 (113)
RF	n = 387	n = 359	n = 28
<6 U/ml (%)	327 (85)	303 (84)	24 (86)
>6 U/ml (%)	60 (15)	56 (16)	4 (14)

ANA = antinuclear antibodies; RF = rheumatoid factor; SD = standard deviation

*The two patients diagnosed with septic arthritis and Lyme disease were excluded from data analysis.

a 6-week follow-up. All had complete resolution of symptoms and no diagnostic entity could explain their initial clinical presentation.

In our series, ASO titres was higher than normal values in 22% of children (table 2), but we did not encounter any cases of post-streptococcal reactive arthritis (PSRA) or acute rheumatic fever (ARF). The incidence of ARF in the United States and Western Europe has dramatically decreased and PSRA is currently more prevalent [23]. PSRA is a distinct clinical entity and differs from the typical arthritis associated with rheumatic fever [24]. Patients suffering from PSRA usually have ongoing arthritis 6 weeks after symptom onset [25], which may require more than 50 days to resolve [26]. Thus, the clinical course of PSRA is characteristic and radically different from that of TSH. Finally, all clinical findings in PSRA usually subside before the ASO titres reach their peak value. We conclude that streptococcal antibody tests should be performed only in patients who had a documented β -haemolytic group A streptococcal throat infection or when the children have an unusually long history of hip pain, compatible with PSRA. Lyme disease was screened in all patients in our study. Only one patient had positive serology and was successfully treated with antibiotic therapy. Lyme arthritis in children is characterised by brief, often recurrent attacks of oligoarthritis [27, 28]. Of all joints, the knee is the most commonly involved [27, 28]. Lyme arthritis of the hip has been rarely reported [28, 29]. Unlike TSH, isolated hip involvement is very unusual in Lyme arthritis, further helping the distinction between these two entities [29]. Systematic serological screening for Lyme disease is certainly not recommended in children presenting with acute atraumatic hip pain. However, Lyme arthritis should be considered in the differential diagnosis of transient synovitis of the hip in children residing in areas in which Lyme disease exists.

Another goal of the screening protocol used in our institution was to exclude a rheumatological disorder such as juvenile idiopathic arthritis (JIA). In order to achieve this, ANA and RF were assessed. Among patients with positive rheumatological tests, no child was diagnosed with JIA according to the International League of Associations for Rheumatology criteria [30], as none were symptomatic at 6 weeks follow-up. In our study, abnormal values for ANA and RF were found in 8.3% and 14% of patients, respectively. These values are comparable to those observed in a normal population [31]. In fact, none of these parameters are specific to JIA and are present in only 30%–50% of patients with JIA [32, 34]. Retrospectively, measurement of ANA and RF seems questionable in cases of acute hip pain. However, to our knowledge, this has never been assessed and the results presented here support this affirmation. We suggest that these parameters should not be tested routinely in cases of acute hip pain or limp, but should only be performed 6 weeks after onset of articular pain in presence of criteria for JIA.

Finally, all children admitted for suspicion of TSH in our hospital were seen 6 weeks after hospital discharge for clinical and radiological follow-up. All children but one presented with a complete remission of symptoms. The latter presented recurrence of intermittent pain to the groin and was diagnosed with LCP disease, and follow-up was

prolonged accordingly. During follow-up, an asymmetrical aspect of the femoral head was found in five asymptomatic patients. These radiographic findings resolved in subsequent checks. In all remaining patients, complete resolution of symptoms occurred and all standard radiographs were normal. These results suggest that the use of radiographs during follow-up should be considered only in the event of recurrent or persistence of pain or limp and should not be performed routinely.

The design of our study is comparable to previous studies and led to the same conclusion, that most children with acute nontraumatic hip pain or limp may be managed as outpatients and specific investigations should not be done routinely [6, 35].

This study confirms that a vast majority of children with acute hip pain or limp suffer from TSH, a benign and self-limiting condition. Children with suspicion of TSH may therefore be treated on an outpatient basis, provided that severe hip disorders, such as septic arthritis of the hip or acute SCFE, have been ruled out. Therapeutic measures such as skin traction are probably unnecessary and the use of anti-inflammatory and pain managing medication alone may help to alleviate the symptoms. With respect to this particular point, we have currently changed our practice, as hospitalisation and skin traction are no longer used in our department. Specific investigations are probably not fundamental, especially if symptoms have been present for less than a few days. The consequences of such common practice may lead to unnecessary costs as well as patient and parental distress. Thus, initial investigations should, in our opinion, include WBC count, CRP and ESR, and X-rays imaging of the hip (fig. 2). In the absence of a definite diagnosis, we suggest hip ultrasonography should be performed. In the presence of hip effusion without suspicion of septic arthritis, patients could be considered to have a probable transient synovitis of the hip. In the absence of hip effusion, children may be considered to have a so-called irritable hip. However, other diagnoses, such as osteomyelitis, should be kept in mind and excluded in the case of persistence of symptoms. In both situations, children may be treated on an outpatient basis and parents must be told to seek medical care urgently in the event of any change in symptomatology, onset of fever, or persistence of pain. Children should be referred to their paediatrician or paediatric orthopaedist for a check-up 6 weeks after the initial workup only in the case of persistence of symptoms. Also, radiographic views are unnecessary during follow-up for TSH in the asymptomatic child. Finally, screening for rheumatological diseases, acute rheumatic fever, post-streptococcal reactive arthritis, or Lyme disease is not justified at the time of presentation at the emergency room.

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Figures (large format)

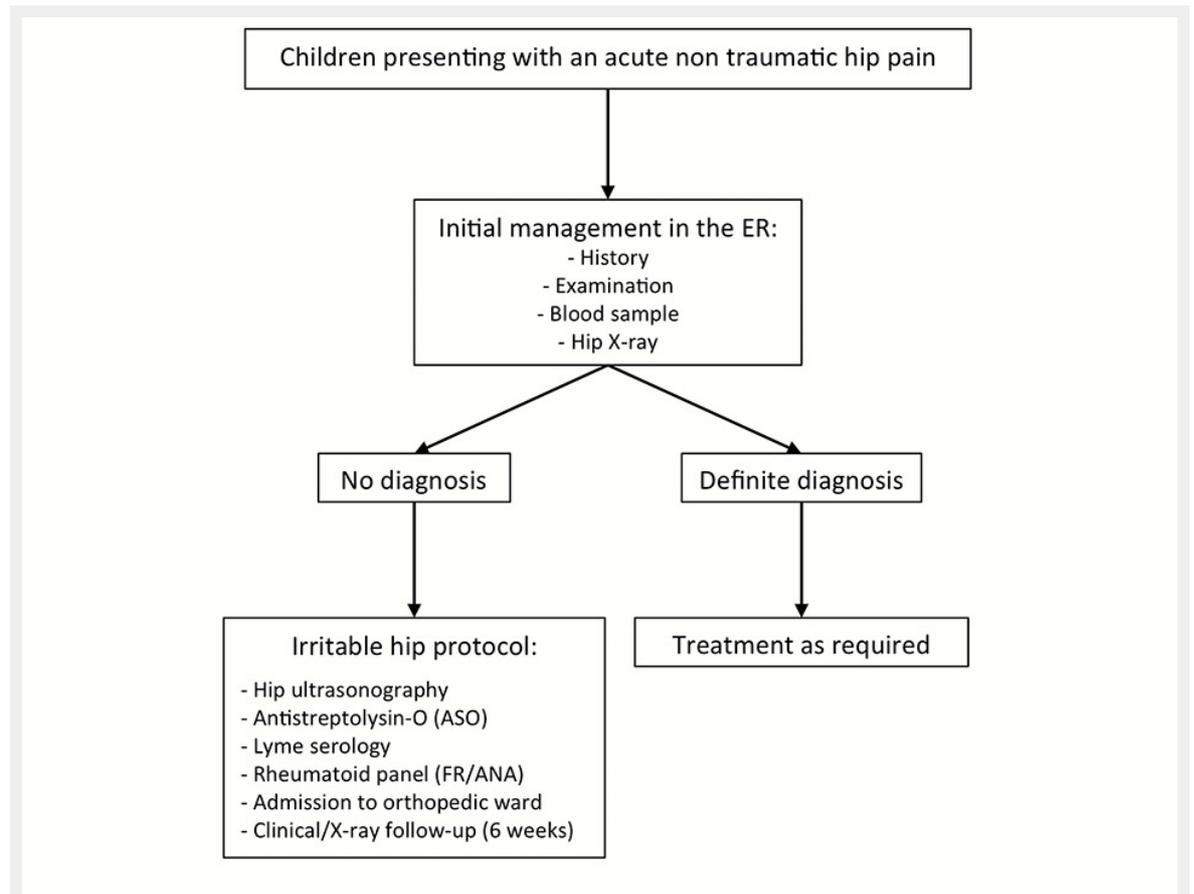


Figure 1. Management protocol of acute non traumatic hip pain applied in our institution between 1999 and 2007.

ASO, Antistreptolysin O; CRP: C-reactive protein; ER: emergency room; ESR: erythrocyte sedimentation rate; TSH: Transient synovitis of the hip; WBC: white blood cell

Figure 1

Management protocol of acute non-traumatic hip pain applied in our institution between 1999 and 2007.
ANA = antinuclear antibodies; ASO = antistreptolysin O; ER = emergency room; RF = rheumatoid factor;

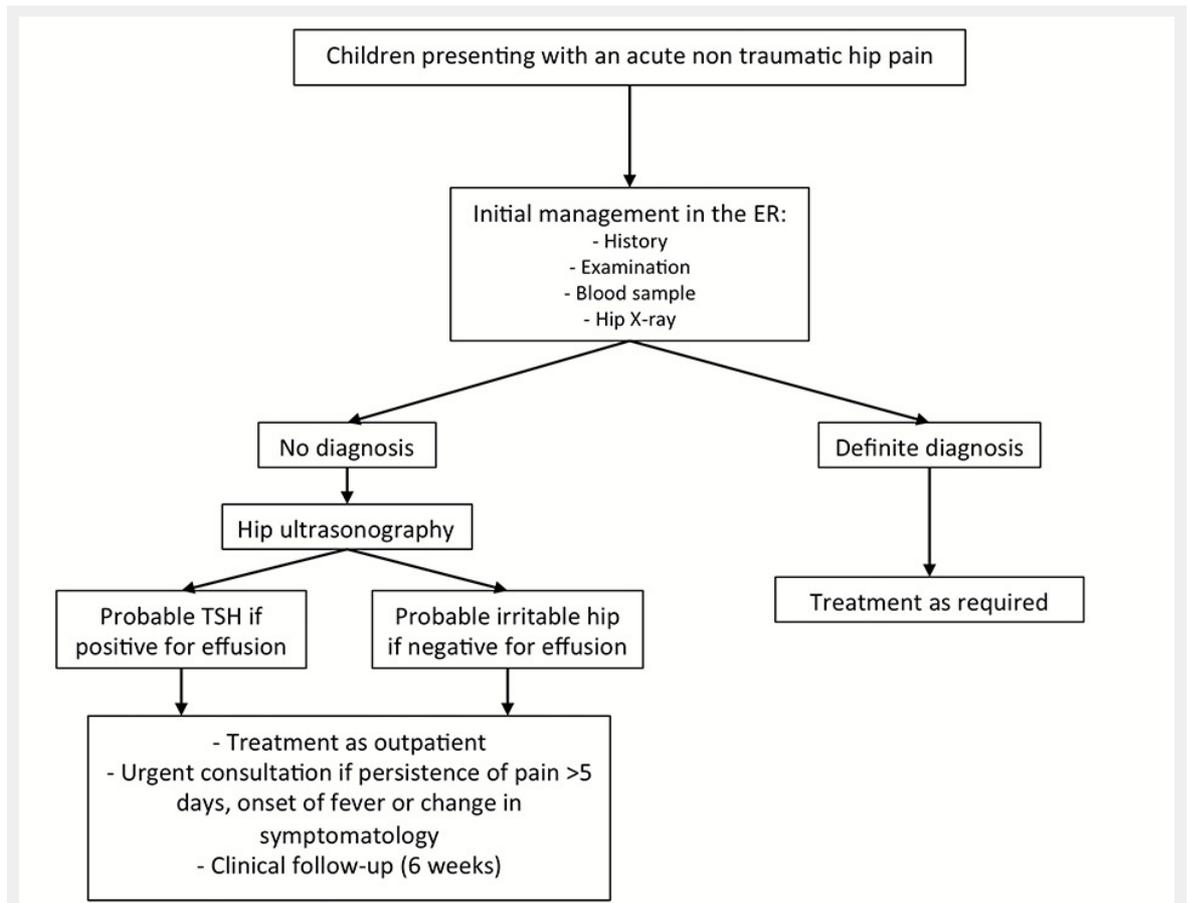


Figure 2. Management protocol of non traumatic hip pain

ER: emergency room; WBC: white blood cell; ESR: erythrocyte sedimentation rate; CRP: C-reactive protein; TSH: Transient synovitis of the hip

Figure 2

Management protocol of nontraumatic hip pain.

ER = emergency room; TSH = transient synovitis of the hip