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psychogenic headache should be
exclusion only after the aforemen
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ension headache must receive th
istorical, general physical, and ne
nation as the child with suspecte
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40/PAIN—JOINTS

Robert A. Doughty, M.D., Ph.D., and Carlos D. Rose, M.D.

Arthritis is defined as "swelling of a joint or
itation of motion of a joint with heat, pain or
nderness." Pain or tenderness alone (arthralgia)
not sufficient for the diagnosis of arthritis,
cause many conditions may be associated with
mbpain without true arthritis.

IFFERENTIAL DIAGNOSIS

Infectious causes of arthritis include bacteria,
ngi, and viruses. Major or recurrent trauma may
se arthritis. In some conditions such as internal
rangement of a joint or osteochondritis, trauma
ay be the sole cause of the condition. In other
agnoses (e.g., hemophilia, Ehlers-Danlos syn-
ome, benign hypermobility syndrome), arthritis
ay result from mild trauma that would not cause
nificant problems in a normal person.

Rheumatic diseases have arthritis as a principal
esenting feature. Differentiation among these
eases often is subtle and requires knowledge of
e clinical and laboratory features of each condi-
on.

The immune response to a number of viral and
cterial infections may lead to an immune com-
ex-mediated (postinfectious) arthritis. Chronic
thritis associated with their disease may develop
patients with hemoglobinopathies (e.g., sickle
ll disease, β-thalassemia). Finally, arthritis
casionally may be a prominent presenting fea-
re of malignancy in childhood diseases such as
ukemia or neuroblastoma.

The most common causes of swollen joints are
auma and postinfectious reactive arthritides
able 40.1). Septic arthritis is not rare, however,
d must always be excluded, because it may lead
destruction of a joint. Acute serious disorders
shown in Table 40.2.

Table 40.3 presents a differential diagnosis of
nditions that are initially seen with a swollen,
ainful joint, categorized by etiology. This broad
fferential diagnosis requires an organized
pproach.

EVALUATION AND DECISION

Figure 40.1 presents an algorithm for evaluation of children with swollen, painful joints. Three major points to consider in approaching such children are (1) presence of fever, (2) history of trauma, and (3) duration of symptoms.

If there is a history of significant trauma, it is likely that a hemarthrosis or traumatic effusion is the cause of the swollen, painful joint. It must be kept in mind, however, that the trauma may be incidental to a preexisting problem. Especially in a febrile child, one must be wary of accepting a traumatic etiology for arthritis without first excluding infectious arthritis by appropriate studies.

History is important in narrowing the differential diagnosis of a child with arthritis. Involvement of multiple joints makes infection, internal derangement, or osteochondritis dissecans less likely and increases the likelihood that acute

Table 40.1 Swollen Joint—Common Causes

Septic arthritis
Staphylococcus aureus
Hemophilus influenzae
Neisseria gonorrhoeae
Trauma
Hemarthrosis (severe trauma)
Postinfectious reactive arthritis
Lyme disease
Benign hypermobility syndrome

Table 40.2 Severe Causes of Arthritis in Children

Septic arthritis
Leukemia
Neuroblastoma
Bone tumor
Systemic lupus erythematosus
Acute rheumatic fever
Kawasaki syndrome
Intraarticular fracture

Table 40.3 Swollen Joint—Differential Diagnosis by Etiology*

Infection
Acute bacterial including Lyme arthritis
Chronic fungal
Mycobacterial
Viral
Trauma/mechanical
Simple
Internal derangement
Osteochondritis
Hemophilia
Benign hypermobility and Ehlers-Danlos syndromes
Rheumatic diseases and inflammatory conditions
Juvenile rheumatoid arthritis
Systemic lupus erythematosus
Scleroderma
Dermatomyositis
Sjögren's syndrome
Ankylosing spondylitis
Psoriatic arthritis
Inflammatory bowel disease-associated arthritis
Reiter's syndrome
Behçet disease
Polyarteritis nodosa and other necrotizing vasculitides
Henoch-Schönlein purpura (anaphylactoid purpura)
Stevens-Johnson and erythema multiforme
Erythema nodosum-associated arthritis
Kawasaki syndrome
Foreign body arthritis
Hypertrophic osteoarthropathy
Pigmented villonodular synovitis
Postinfectious reactive arthritis
Viral
Rubella, hepatitis B, EBV, CMV, parvovirus
Herpesvirus-6, mumps, enterovirus, adenovirus
Varicella-zoster virus
Bacterial
Streptococcus (including acute rheumatic fever)
Lyme borrelia, gonococcus, chlamydia, shigella, *Campylobacter*, meningococcus, *streptobacillus moniliformis*

*EPV = Epstein-Barr virus; CMV = cytomegalovirus.

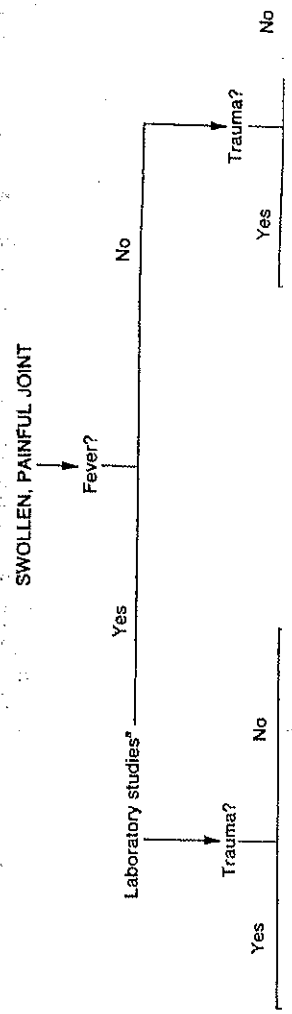
rheumatic fever and chronic inflammatory arthritides are present. Morning stiffness is strongly suggestive of rheumatoid disorders, whereas afternoon pain more commonly occurs in traumatic arthritis, internal derangement, myositis (without true arthritis), and functional conditions. A history of "joint locking" strongly suggests mechanical cartilage or ligament injury. The severity of the pain can suggest a diagnosis. Severe pain is characteristic of septic arthritis. Significant but less severe pain is seen in acute traumatic arthritis, internal derangement, and sickle cell disease. The pain of rheumatic diseases, such as juven rheumatoid arthritis (JRA) or systemic lupus er thematosus (SLE), is generally more subacute an insidious.

There are certain key points of physical exam ination. A thorough joint examination must b performed on all patients with suspected arthrit All joints (including cervical and lumbosacr spine, temporomandibular, and sternoclavicul joints) should be tested for swelling, warmt tenderness, and range of motion (ROM). Rel tion of joint size to surrounding muscle ma should be considered. Warmth of a joint esta lishes inflammation, even in the absence fever, and may help direct the differential di nosis. Extraarticular findings of acute fever a rash suggest postinfectious reactive arthrit (Tables 40.4 and 40.5). The patient should specifically examined for alopecia (SLE); pso asis (psoriatic arthritis); uveitis (JRA, sarcoid sis, Reiter's syndrome); nasal or oral ulcerati (SLE, Behçet's disease, Wegener's granul matosis); lymphadenopathy (tumor, infecti rheumatoid disease); pneumonitis (SLE, s temic JRA); heart murmur (acute rheuma fever, subacute bacterial endocarditis w embolic septic arthritis); abdominal sig (inflammatory bowel disease [IBD]); geni ulceration (Reiter's and Behçet syndrome peripheral cyanosis or ulceration (SLE, scle derma); nailbed pitting (psoriatic arthrit bruises (hemophilia); other rashes (SLE, JR dermatomyositis, gonococcal arthritis); and jo hypermobility (Ehlers-Danlos and benign hyp mobility syndromes) (Table 40.6).

Laboratory studies should be performed o after initial narrowing of the differential diagno Most commonly, a complete blood count (CB erythrocyte sedimentation rate (ESR), and ra ographs of the affected joint(s) with contralate control(s) have the highest yield in defining differential diagnosis further.

If infection is suspected, arthrocentesis is n essary for definitive diagnosis. Arthrocentesis a may distinguish traumatic from inflammat arthritis (Table 40.7).

Other laboratory studies may be helpful. Pr ence of autoantibodies (e.g., antinuclear antibo rheumatoid factor, or positive Coombs's test) hypocomplementemia suggests SLE. Eleva serum complement is seen in various infectio postinfectious, and chronic inflammatory co



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bowel disease [IBD]); genita
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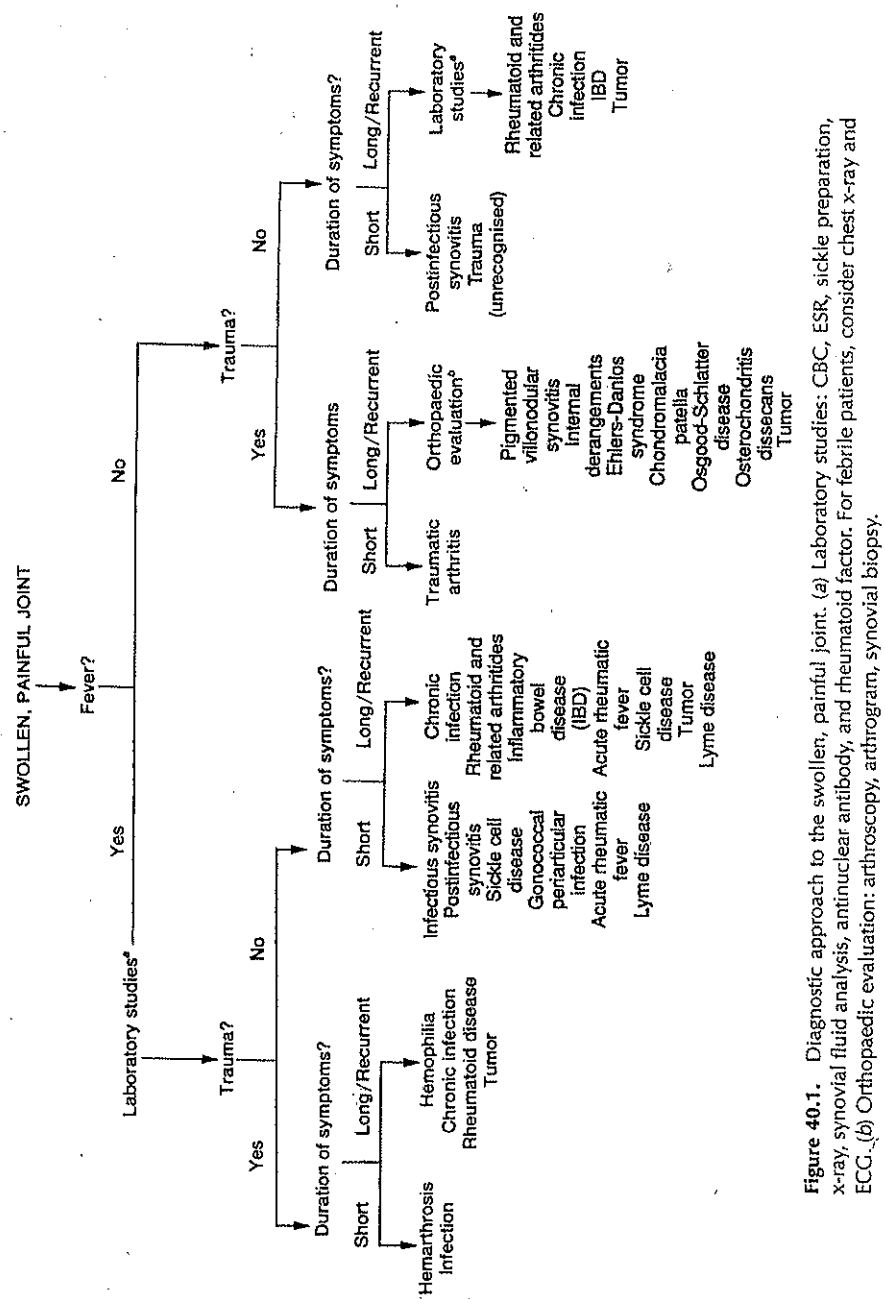

Figure 40.1. Diagnostic approach to the swollen, painful joint. (*a*) Laboratory studies: CBC, ESR, sickle preparation, x-ray, synovial fluid analysis, antinuclear antibody, and rheumatoid factor. For febrile patients, consider chest x-ray and ECG. (*b*) Orthopaedic evaluation: arthroscopy, arthrogram, synovial biopsy.

Table 40.4 Revised Jones Criteria*

Major	Minor
Carditis	Fever
Migratory polyarthritis	Arthralgia
Chorea	Previous rheumatic fever or rheumatic heart disease
Erythema marginatum	Elevated ESR or positive CRP
Subcutaneous nodules	Prolonged PR interval

*Requires two major or one major and two minor and evidence of antecedent streptococcal infection (positive culture, ASO titer, history of recent scarlet fever) for diagnosis of rheumatic fever. From Stolleman GH: Jones criteria (revised) for guidance in the diagnosis of rheumatic fever. *Circulation* 32: 664, 1965. ESR = erythrocyte sedimentation rate; CRP = C-reactive protein.

Table 40.5 Findings Suggestive of Postinfectious Reactive Arthropathy*

Recent symptoms of infection
- Recent pneumonia (mycoplasma)
- Recent diarrhea *(shigella, campylobacter)*
- Urogenital tract (chlamydia, gonococcus)
- Mononucleosis-like (EBV, CMV)
- Fifth disease (Parvovirus)

Acute onset of polyarticular arthritis
Migratory arthritis
Presence of systemic involvement (fever, malaise, high ESR)
Maculopapular, purpuric, multiforme, or urticarial rash with palmar compromise and symmetrical distribution
Ocular, renal, gastrointestinal, cardiac, or serosal involvement

*EBV = Epstein-Barr virus; CMV = cytomegalovirus.

Table 40.6 Hypermobility Syndrome—Diagnostic Maneuvers

Passive hyperextension of fingers to position them parallel to the forearm
Passive apposition of the thumb to the volar aspect of the forearm
Elbow hyperextension >10°
Knee hyperextension >10°
Truncal flexion to full palmar contact with the floor

Table 40.7 Characteristics of Common Pediatric Synovial Effusions*

Condition	Color	Clarity	Leukocyte Count (per mm³)	PMN (%)	Glucose (serum-synovial fluid) (mg/dl)	Mucin Clot or String Test
Normal	Clear or straw-color	Transparent	≤200	10–20	0–10	Good
Traumatic arthritis	Straw-color or bloody	Opaque	≤2000	10–30	0–10	Good
Aseptic inflammatory arthritis (JRA, acute; rheumatic fever; postinfectious arthritis)	Cloudy, yellowish	Translucent	10–50,000	50–80	0–20	Fair to poor
Septic arthritis	Cloudy, yellow, gray or greenish	Opaque	>50,000	90	20–50	Poor

*Abbreviations: PMN = polymorphonuclear leukocytes; JRA = juvenile rheumatoid arthritis.

tions. Positive antinuclear antibodies are often seen in SLE.

In many cases, careful observation and benign neglect are the most important diagnostic and therapeutic modalities. The primary exception to this is a case in which bacterial infection is highly suspect. In such cases, arthrocentesis must be performed promptly, and, if results suggest infection, appropriate antibiotic therapy should be initiated pending culture results.

Suggested Readings

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41/

Howard M. Snyder
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Acute scrotal swelling in a chil
dered a potential surgical emerg
Some causes of acute scrotal sv
benign and require no more th
other causes may lead to the rapid
delay in diagnosis and treatmen
41.1 lists the principal causes c
swelling.

EVALUATION AND DECISION

The evaluation of acute scrotal
cussed here through consideration
entities causing painful versus
swelling. This approach is outline

Causes of Painful Scrotal Swel

Torsion of testicular append
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