22.1 Introduction

Soft tissue disorders are common focal pathological syndromes affecting soft tissue structures like tendons, ligaments, bursa, fascia, and the site of insertions of these structures to bones (enthesis). They are commonly encountered disorders in daily clinical practice particularly in outpatient settings. A systemic disease does not always accompany them; however, they can be associated with spondyloarthritis. They are most likely caused by overuse, repetitive trauma, and occupational history. This chapter will present in a simplified approach different types of bursitis, tendinitis, enthesitis, and fasciitis encountered in clinical practice. The emphasis will be placed on diagnostic workup based on comprehensive history-taking skills and musculoskeletal (MSK) examination findings. Outlines of management principles will be reviewed as most of these disorders respond to conservative therapy (pain management, physiotherapy, and avoidance of aggravating movements) and it rarely needs surgical intervention. There are other soft tissue disorders discussed in “Diabetes and Rheumatology” Chap. 21. Detailed techniques

of MSK examination of several of these disorders are discussed in Chap. 2.

22.1.1 Learning Objectives

By the end of this chapter, you should be able to:

- Discuss the anatomy and classification of common soft tissue disorders (bursa, ligaments, tendons, and fascia) that cause localized pain syndromes.
- Describe the clinical presentation of the most common types of soft tissue disorders.
- Construct a diagnostic approach for different types of soft tissue disorders.
- Outline management principles of these disorders.

22.1.2 Classification of Soft Tissue Disorders

A selective group of soft tissue disorders will be reviewed in this chapter based on the following classification (Fig. 22.1). It is based on the site of involvement of these structures. It is important to consider soft tissue disorders in the differential diagnosis of regional pain syndromes.

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Fig. 22.1 Classification of soft tissue disease in rheumatology

22.1.3 Bursitis

It is important to realize the anatomical definition of a bursa in order to recognize the clinical presentation of bursitis. A bursa is simply the sac structure that is formed of two layers filled with synovial fluid that protects other structure underneath it from injuries caused by pressure. This sac acts as cushions. Bursitis is simply inflammation of this sac.

The most common sites are shoulder (subdeltoid, olecranon), hip (ischial tuberosity, trochanteric),

knee (prepatellar bursa), and foot (retrocalcaneal) [1–9]. Table 22.1 represents a comprehensive a general review of the clinical presentation, investigation, and treatment of bursitis. Table 22.2 represents a review of specific types of bursitis.

22.1.4 Tendinitis

A tendon is a thick fibrous cord that attaches muscle to bone. Inflammation in the tendon is called tendinitis. The most common sites for ten-

Table 22.1 Review of the Bursitis history, physical examination, investigation, and treatment

History	<ul style="list-style-type: none"> • Pain: Assess duration, site, localization, increases with movement, relation to position, interferes with activity, recurrence, other joint pains, stiffness, and functional disability (at home, work, and leisure activities) • Occupation: Repetitive movement disorder that increase pressure in the joint and its surrounding soft tissue structures. For example, overhead lifting, pushing up elbows when arising from bed, carrying heavy objects, prolong sitting on hard surface, and repeated kneeling • History of trauma: Systemic review for evidence of a systemic disease (see Chap. 1) like rheumatoid arthritis (RA), crystal-induced arthritis (gout, pseudogout) and uremia • History suggestive of infection: Fever, (infective endocarditis, cellulitis), skin abrasions in superficial bursae (olecranon and prepatellar bursa) wounds, and diabetic, alcoholic [5–7] and immunosuppressed patients are at increased risk of septic bursitis [8, 9] • Obesity
Physical examination	<ul style="list-style-type: none"> • Swelling: Mainly superficial • Tenderness: With active range of motion (ROM) testing • Reduced active ROM: With less or no pain with passive ROM • Local tenderness: With palpation over the bursa • In septic bursitis: Fever, swelling, redness, tenderness, and hotness [10]
Investigations	<ol style="list-style-type: none"> 1. If history and physical examination suggest septic bursitis <ol style="list-style-type: none"> a. CBC, blood culture, and glucose 2. Bursa fluid aspiration: [11] <ol style="list-style-type: none"> a. Cell count: <ul style="list-style-type: none"> Normal WBC: less than 200/ L. Noninflammatory WBC: 200–2000/ L. Inflammatory WBC: 2000–100, 000/ L. Septic bursitis WBC: may be exceeding 100, 000/ L b. Gram stain and culture in liquid media: [10] It is Positive in two-thirds of patients with septic bursitis [8]. <ul style="list-style-type: none"> The most common organisms: <i>Staphylococcus aureus</i> In about 80% of cases, [8, 9, 12, 13] streptococci beta-hemolytic strain, rare coagulase negative staph, <i>Enterococcus</i>, <i>E. coli</i>, and <i>Brucella</i>, or TB in subacute and chronic endemic areas c. Crystal analysis utilizing compensated polarized microscopy d. Bursa fluid glucose: Serum glucose ratio of <50% [14] 3. Imaging typically not helpful in acute superficial bursitis: <ol style="list-style-type: none"> a. Plain X-ray: When there is history of trauma or foreign body and to exclude crystal-induced arthritis particularly chondrocalcinosis b. CT or MRI: Particularly in septic bursitis to confirm the presence of abscesses or fluid collection

(continued)

Table 22.1 (continued)

Treatment	<p>1. Patient education</p> <ol style="list-style-type: none"> Avoid aggravating factors that increase joints pressure Joint protection program using cushion and pads Rest joint position to decrease pressure Weight reduction <p>2. Pain control and decrease inflammation:</p> <ol style="list-style-type: none"> NSAIDs (see Chap. 4): selective cyclooxygenase 2 inhibitor (celecoxib 200 mg twice daily) or nonselective (naproxen 500 mg twice daily for few days in acute bursitis) Local glucocorticoid injection: after ruling out septic bursitis with negative culture there is limited data on efficacy and safety; in general it is more effective than NSAID in speeding recovery, relieving pain, and preventing recurrence of olecranon and subacromial bursitis [7] long-acting glucocorticoid (methylprednisolone 40 mg for large bursa, subacromial or trochanteric, and 10 mg for small bursa, anserine or Ischia) mixed with equal amount of 1% lidocaine injection should not be repeated for 6–8 weeks Apply ice for 20 min 6–4 times per day Heat not more than 20 min <p>Septic bursitis:</p> <p>treatment in immunocompetent or nondiabetic patients: Oral antibiotic (dicloxacillin or second-generation cephalosporin or clindamycin) for 10 days if there is improvement frequent aspiration of the bursa and continue antibiotic for 5 days post sterilization in severe cases and in immunosuppressed patients: IV broad-spectrum antibiotic to cover pseudomonal plus anti-methicillin-resistant <i>S. aureus</i> (MRSA) (vancomycin) for 2–3 weeks, till the culture and sensitivity results are available [15] repeat bursa drain and debridement or open surgical drain in deep bursitis</p>
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Table 22.2

Subacromial bursitis	
Anatomy	Subacromial bursa lies between acromion process and supraspinatus muscle at top of the humerus Bursitis results from inflammation of supraspinatus tendon
Action of supraspinatus muscle	Abduction of the shoulder
Symptoms	<ul style="list-style-type: none"> • severe pain at rest and movement of the affected shoulder • prevent active movement
Signs	<ul style="list-style-type: none"> • tenderness over the bursa just below the acromion • this may extend over deltoid muscle • tender and possibly restricted active ROM, while passive abduction is harmless with possibility of mild tenderness
Treatment	Pain is markedly relieved after injecting local anesthesia, immobilization, rest of the joint, and use of NSAIDs If not improving after 72 h, inject methylprednisolone 40 mg with lidocaine
Comment	<p>It is associated with:</p> <ul style="list-style-type: none"> • rotator cuff tear that presents with supraspinatus muscle weakness • polymyalgia rheumatic when it is usually bilateral
Scapulothoracic bursitis [2–4]	
Anatomy	The bursa is located in medial angle of scapula and adjacent to second and seventh ribs
Symptoms	Pain and popping sensation with scapulothoracic movement It increases with working overhead, pushing up, reaching up, and shoulder shrugging
Signs	Localize tenderness and crepitus with movement

Table 22.2 (continued)

Treatment	<ul style="list-style-type: none"> • spontaneous regression in most of the patients [1] • physiotherapy: Postural and scapular strengthening exercise [2] • US heat stretching test might help • if pain persists, glucocorticoid injections under fluoroscopy might be considered • surgery might be indicated in refractory cases [3]
Olecranon bursitis (student's elbow) [9–12]	
Anatomy	The bursa is located just over the extensor aspect of the extreme proximal end of the ulna
Aggravated positions	Leaning on elbow, repetitive forward leaning position, or any position where pressure is exerted on the bursa
Symptoms	Pain in the posterior point of the elbow with normal ROM
Signs	Tenderness, worsening of pain with elbow flexion, and swelling in posterior point of the elbow
Treatment	<p>Consider bursal fluid aspiration if swollen to rule out septic and/or crystal-induced bursitis</p> <p>Treat underlying condition if sepsis or crystal-induced bursitis have been confirmed.</p> <p>Glucocorticoid injection is superior to NSAIDs in preventing recurrent bursitis [4]</p> <p>Referral to orthopedic surgery if recurrent with thick synovium</p>
Ischiogluteal bursitis (Weaver's bottom)	
Anatomy	The bursa is located between gluteus medius muscle and ischial tuberosity
Symptoms	Pain in sitting and lying position. Also, pain in lower buttock after prolonged sitting on hard surfaces
Signs	Tenderness over ischial tuberosity
Treatment	NSAIDs, glucocorticoid injection, foam rubber cushion, and stretching with knee to chest exercise
Greater trochanteric bursitis	
Anatomy	<p>The bursa is located between the tendon of gluteus medius and posterolateral prominence of greater trochanter</p> <p>This bursitis is more common in females rather than males</p>
Symptoms	Night pain, lateral hip pain, 40% radiate to the lateral site of the thigh, worsening if lying on affected side, and patient cannot walk in severe case
Signs	<p>Iliotibial band syndrome (snapping hip) and leg length discrepancy predispose patients to develop trochanteric bursitis</p> <ul style="list-style-type: none"> • tenderness on lateral hip joint pain region over the greater trochanter • hip joint resisted hip abduction may reproduce symptoms • antalgic gait <p>Notes:</p> <p>The differences between greater trochanteric bursitis and gluteus medius tendinopathy are gluteus medius tendinopathy causes pain and tenderness superior to the greater trochanter, positive Trendelenburg test, significant muscle weakness, and positive one—Leg mini-squat test, patient cannot complete a single repetition squat on affected leg to 60°</p> <p>Recommended X-ray: Lateral, anteroposterior, and frog-leg views to rule out other causes affecting hip joint itself</p>
Treatment	<p>Radiating radicular pains from the lower back need to be ruled out as well.</p> <p>Heat and passive stretching exercise with hip adduction can be tried with weight reduction and avoiding stairs</p> <p>Some resistant cases may need to be injected with glucocorticoid and lidocaine</p> <p>Spinal needles should be used in obese patients</p>
Prepatellar bursitis (Housemaid's knee) [1–9]	
Anatomy	The bursa is located between the patella and the skin
Symptoms	<p>Positive history of kneeling down frequently and/or history of trauma</p> <p>Anterior knee pain that increases with flexion</p> <p>Swelling may be observed</p>
Signs	Tenderness over the patella. Swelling, hotness, and redness particularly in septic or crystal-induced bursitis
Treatment	<p>Rule out septic bursitis and/or crystal-induced bursitis with bursal fluid aspiration</p> <p>Rest joint and avoid trauma. Glucocorticoid injection may be considered</p> <p>In refractory cases refer to surgery</p>

(continued)

Table 22.2 (continued)

Anserine bursitis (Goose's foot)	
Anatomy	The bursa is located medially around 6 cm below the joint line at the attachment of medial collateral ligament to medial tibia It is the site of insertion of three tendons: gracilis, sartorius, and semitendinosus muscles
Symptoms	Risk factors: Positive history of repeated knee flexion in excessive running, stair climbing. More common in obese elderly females and/or with valgus knee alignment Pain at night over the upper tibia around 6 cm below medial joint line It is important to ask the patient to point with one finger the area of pain
Signs	Local tenderness over the exact anatomical location of the bursa. Rule out medial collateral ligament instability (see Chap. 2)
Treatment	Rest. Repeated knee bending should be avoided; also avoid crossing the leg or frequent squatting positions Use pillow under the knee as a relaxation technique. Ice bags may be applied. NSAIDs can be used, and if there is no improvement after 6–8 weeks, local glucocorticoid injection can be considered.
Gastrocnemius semimembranosus bursitis (Baker's cyst)	
Anatomy	The bursa is located between gastrocnemius and semimembranosus muscles on the medial side distal to the crease in the popliteal fossa back of the knee Most common in adult from 35–70 years old, and it increases with age because the communications between the knee and bursa increase [16]
Symptoms	Asymptomatic accidental finding during physical examination or radiological investigation Posterior knee pain and stiffness that increase with activity Swelling or discomfort in prolong that standing and hyperflexion
Signs	Swelling in posterior aspect of the knee, more marked with knee extension Absence of swelling on knee flexion up to 45° (Foucher's sign) Ecchymosis below the medial malleolus (crescent's sign) in rupture baker's cyst
Causes	One third of causes is due to trauma. Two thirds of the causes are due to other diseases (osteoarthritis, rheumatoid arthritis, septic arthritis and meniscal tear)
Complication	Pseudothrombophlebitis, leg ischemia, compartment syndrome, nerve entrapment, and ruptured [17]
Treatment	Investigation by US or MRI Treat underlying disease If asymptomatic no treatment In arthrocentesis and intra-articular corticosteroid injection result in decrease size after 4 weeks by US follow-up [18] Direct cyst injection if it does not communicate with the joint Surgery is indicated in recurrences and lack of response to glucocorticoid injection

dinitis are around shoulder, elbow, and ankle joints. One of the pathophysiological mechanisms for tendinitis is micro-tears, affecting these tendons from repeated stressors like in overuse, or in traumatic situations.

In some situations where there is inflammation of the tendon sheath, the condition is called tenosynovitis. Table 22.3 represents a comprehensive, general review of the clinical presentation, investigation, and treatment of tendinitis.

Table 22.4 represents a review of rotator cuff tendinitis.

Tendinosis is a chronic process associated with an atrophic and degenerative change of the tendon caused by recurrent tendinitis. US or MRI is

required to diagnose it and to differentiate between different causes.

22.1.5 Rotator Cuff Tendinitis and Rotator Cuff Tear

Rotator cuff tendinitis (RCT) is a common type of tendinitis that affects the shoulder. The patient usually presents with lateral shoulder pain and limited active ROM. It is the most common cause of shoulder pain in clinical practice. A brief approach to shoulder pain is presented in Chap. 2. Table 22.4 represents a comparison between RCT and rotator cuff tear (RCTr) in terms of definition, diagnostic, and therapeutic interventions.

Table 22.3 Review of the tendonitis history, examination, diagnosis, treatment, and prevention

History	<ul style="list-style-type: none"> • Localized pain over the tendon with active movement particularly • Limited activity • Occupation: overuse and/or sporting activity, usually in middle age group of patients
Risk factors	<p>Intrinsic</p> <ul style="list-style-type: none"> • Age over 35 years and obesity • Biomechanical abnormalities: Mostly located in lower limbs (pes planus [flat foot], pes cavus, reduced planter dorsiflexion, pelvic inequality and kyphosis) • Previous tendinitis or rupture • Fluoroquinolones use [19] <p>Extrinsic</p> <ul style="list-style-type: none"> • Training error (sudden increase and inadequate rest) • Environmental (hard gym floors, frozen turf) • Poor equipment (inappropriate footwear) • Poor ergonomics excessive movement
Examination	<ul style="list-style-type: none"> • Localized tendon pain • Pain with tendon loading • Pain with passive stretching • Pain with active movement • Normal ROM on passive test • Muscle weakness in chronic tendinitis and tendon tear
Diagnosis	<p>US and MRI:</p> <ul style="list-style-type: none"> • Help to diagnose partial or complete tendon tear • Tendon thickness • To rule out other causes particularly if patient did not improve on treatment
Treatment	<ul style="list-style-type: none"> • Avoid aggravating activity • Apply ice over the tendon for 15 min 4–6 times daily • NSAIDs and local glucocorticoid injection in severe cases • Physiotherapy: Range of motion stretching and strengthening exercises, eccentric exercise, and aerobic fitness • Surgery: probably after 6 months if no improvement or acute tendon rupture

Table 22.4 Review of the tendonitis history, examination, diagnosis, treatment, and prevention [21, 22]

Anatomy	Rotator cuff muscles	Origin on scapula	Insertion on humerus
	Supraspinatus	Supraspinous fossa	Insertion on humerus
	Subscapularis	Subscapular fossa	Superior facet of greater tuberosity
	Infraspinatus	Infraspinous fossa	Lesser tuberosity
	Teres minor	Lateral border	Middle facet of greater tuberosity
			Inferior facet of greater tuberosity
Muscle action	Rotator cuff muscles	Muscle action	
	Supraspinatus	Abduction	
	Subscapularis	Internal rotation	
	Infraspinatus	External rotation	
	Teres minor	External rotation	
Definition	Rotator cuff tendinitis	Rotator cuff tear	
	Inflammation in the tendon	Injury in the tendon can be partial or complete tear	
Risk factors	Excessive overhead activity, repetitive stressful movement, obesity, anatomic variants, scapular instability, dyskinesia or hypermobility, old age, Chronic diseases (such as diabetes and hyperlipidemia), and Lifting heavy objects [19]. Acute tear can also occur with a fall or forceful injury.		
Symptoms	<ul style="list-style-type: none"> • Shoulder pain increasing with overhead activity • Shoulder pain could be laterally or posteriorly. It depends on the muscle involved • Limited shoulder movement particularly active ROM. • In the case of rotator cuff tear, muscle weakness is more pronounced, and patients can be asymptomatic. 		
Signs	See (Chap. 2)		
Special tests	See (Chap. 2)		

(continued)

Table 22.4 (continued)

Investigations	Radiology: X-rays for tendon calcifications or bone deformation. US high sensitivity and/or MRI to confirm diagnosis, asses rotator cuff tear and degeneration.
Treatment	Acutely —if there is significant tear refer the patient to orthopedic surgery. In partial tear or tendinitis consider conservative therapy: <ul style="list-style-type: none"> • Avoid aggravating activity. • Apply ice over tendon for 15 mins 4–6 times daily. • NSAIDs. Local glucocorticoid inject with lidocaine may be considered. • Physiotherapy: Range of motion stretching and strengthening exercises. Subacute treatment —If no improvement is achieved within two to three months: <ul style="list-style-type: none"> • Glucocorticoids—subacromial glucocorticoid injection is a common treatment to controlling the symptoms [20].

Table 22.5 History, examination, diagnosis, and treatment of enthesitis

Sites	The common sites for enthesitis are in planter fascia at calcaneus and Achilles tendon in the heel. However, there is a scoring system to measure the extent of enthesitis in different body sites
Causes	Ankylosing spondylitis, reactive arthritis, psoriatic arthritis, inflammatory bowel disease (IBD), celiac disease, Whipple disease, acne-associated arthritis, fracture, trauma, and idiopathic secondary usually to repetitive trauma or mechanical misalignment or over weight History suggestive of SpA (see Chap. 1): Red eyes, pain with eyes movement, oral or genital ulcer, genital discharge, back pain or other joint pain, diarrhea or bloody diarrhea resent gastroenteritis, history of psoriasis, or family history of psoriasis
Symptoms	Pain that increases with activity and possibly swelling
Signs	<ul style="list-style-type: none"> • local tenderness increase with movement • swelling • warmth • decrease active ROM and stiffness • other sites: Iliac crest, greater trochanter, medial and lateral epicondyles in elbow, tibial tuberosities, plantus, costochondral junction, and humeral tuberosities • Most enthesitis in SpA is not detected at clinical examination
Investigations	Special test: HLA B 27 X-ray: Nonspecific finding: like intra-tendon focal edema, calcific deposit spars, soft tissue swelling, and thickening US: Better than clinical examination in the detection of enthesitis of the lower limbs in SpA. There are specific radiographic definitions for enthesitis at different body sites
Treatment	Exercise program Proper shoe wearing using custom made devices Occupation-related measures Local steroid injection in severe and resistant cases In SpA: NSAIDs can be tried first, no clear evidence of efficacy for sulfasalazine [23] and/or methotrexate [24] in enthesitis mainly presentation in SpA. However, several studies showed efficacy of anti-TNF-alpha therapy and IL-17 antagonists in severe enthesitis [25]

22.1.6 Enthesitis

It is inflammation at the site of insertion of ligaments, tendons, fascia, and articular capsules into the bone. It might be associated with pain at free nerve ending. It is the hallmark of spondyloarthritis (SpA) particularly when paravertebral ligaments are involved causing spondylitis. Extensive search for a systemic spondyloarthritic disease (see Chap. 1) should be

sought in patients presenting with common enthesitis like Achilles tendinitis and plantar fasciitis [21, 22]. However, most of these enthesitis disorders have no systemic correlation, and they are induced by regional pathophysiological mechanisms. Table 22.5 represents a review about enthesitis. Tables 22.6, 22.7 and 22.8 summarize common enthesitis encountered in clinical practice: Achilles tendinitis, epicondylitis, and plantar fasciitis (Table 22.6).

Table 22.6 Achilles Tendonitis [21, 22]

Anatomy	It is the largest tendon in the body formed by the union of tendons of soleus and gastrocnemius muscles to form Achilles tendon. It inserts posteriorly at the calcaneus
Muscles action	Plantar flexion
Epidemiology	<ul style="list-style-type: none"> • patients are usually 30–40 years of age • males are equally affected like females • rupture Achilles tendon is five times more common in males
Risk factors	Excessive supination, increase intensity of training program and increasing time in training (basketball and football players), repetitive stress, obesity, male gender, previous history, mechanical factors: Pes planus and pes cavus deformities, over pronation of foot, and drugs—Fluoroquinolone or local glucocorticoid use
Symptoms	<ul style="list-style-type: none"> • pain with activity relieved after rest • pain 2–6 cm above insertion of the tendon, swelling, and possibly redness • in rupture Achilles tendon patient feels struck violently in the back of ankle or hears loud popping sound with severe pain • absence of pain does not rule out Achilles tendon rupture
Signs	<ul style="list-style-type: none"> • gait and excessive foot supination. This is common with genu varus deformity in the knee • examine the patient in prone position with feet hanging off at the end of the bed • inspect for bruising, swelling, and foot misalignment • palpation: Hotness, thick tendon or defect, edema, hematoma, tenderness 2–6 cm above calcaneus and compare it with the other side • palpate the tendon in while in dorsiflexion of the ankle, plantar flexion, and Neutral position • assess retrocalcaneal bursitis as one of the differential diagnosis for heel pain • crepitus in chronic tendinitis • assess for peripheral vascular disease (pulse, capillary refill, hair loss, and edema) <p>Notes:</p> <p>The retrocalcaneal bursitis causes pain, fullness, or swelling proximal and anterior to the insertion of Achilles tendon in to the calcaneus</p> <p>The posterior tibial tendinitis causes pain in medial side of the ankle</p>
Special tests	<ul style="list-style-type: none"> • calf squeeze or (Thompson test): Sensitivity of 96% and specificity of 93% [21] (see Chap. 2) • Matles test: Sensitivity of 88% and specificity of 85%: [21] <p>The patient lies prone with knees flexed to 90°. Observe whether the affected foot is dorsiflexed or neutral (both are abnormal) compared with the uninjured side, where the foot should appear plantar-flexed</p>
Investigations	Radiology: US and/or MRI to confirm diagnosis, monitor treatment response, and/or to assess why the patient is not responding if another diagnosis is missing
Treatment	<p>Avoid aggravating activity, support Achilles tendon with bandage, apply ice, NSAIDs can be used, avoid glucocorticoid as it is associated with high risk of tendon rupture [22]. Consider corrections of mechanical defects by providing custom-made orthotics that provide arch support</p> <p>Consider rehabilitation and occupational therapy programs with eccentric exercise for around 12 weeks. Air heel brace cast can be used in severe cases</p> <p>Superficial heat and cold compressors</p> <p>Deep heat by (US and iontophoresis)</p> <p>Surgery can be considered in refractory cases after 3–6 months if no improvement all measures</p> <p>Acute tendon rupture: Apply ice, analgesic, rest the ankle, and consider immobilization trial in few degrees of plantarflexion. Consider surgical referral for partial rupture: there is still no clear rule for surgical intervention</p>

22.1.7 Achilles Tendinitis

See Table 22.6.

22.1.8 Epicondylitis [26, 27]

See Table 22.7

22.1.9 Fasciitis

A fascia is a layer of fibrous *connective tissue* (*collagen*) below the skin that covers underlying tissues (muscles, blood vessels, and nerves). Fasciitis is the inflammation of the fascia that causes fibrosis and loss of elasticity. The most common types of fasciitis are

Table 22.7 Lateral and medial epicondylitis

Types	Lateral epicondylitis (tennis elbow): 15 times more common than medial epicondylitis Females are equally affected like males	Medial epicondyle (golfer elbow): Less common
Definition	It is inflammation at bony origin for wrist extensors muscles (extensor carpi radialis brevis “inserted in posterior base of third metacarpal” and extensor digitorum communis), due to overuse. The elbow of the dominant arm is affected more	It is inflammation at bony origin for wrist flexors muscles (pronator teres and flexor carpi radialis)
Muscles action	Extensor and abductor of the hand at wrist joint	Flexors of fingers and thumb. Also, flexors and pronators of the wrist
Risk factors	Age: Player 30 years or older, smoking, obese, Tennis ball player , Occupation: Computer user and repeat movement for 2 h daily [27, 28]	
Physical exam	<ul style="list-style-type: none"> • localize tenderness in lateral epicondyle • pain on resisted wrist extension while elbow in flexion • pain in resisted supination and hand shaking • pain in resisted middle finger extension • Normal ROM of the elbow except in severe cases • few degrees of extension might be affected • examine radial nerve • in compression neuropathy the pain diffuses distally to epicondyle and is associated with muscle weakness 	<ul style="list-style-type: none"> • Localized tenderness in medial epicondyle • Pain on resisted wrist flexion while elbow in extension • pain with resisted forearm pronation • examine ulnar nerve
Investigation	It is a clinical diagnosis and investigations are usually not required X-rays if indicated to look for osteophytes and calcification in epicondyle	
Treatment	<p>Phase 1: Symptom less than 6 weeks</p> <ul style="list-style-type: none"> • rest the joint and use splint • physiotherapy (eccentric exercise) • NSAID: There is limited evidence, oral NSAIDs helps to reduce pain and improve the function in 6 weeks [27], and there is limited benefit of topical NSAIDs in acute epicondylitis [29] <p>Phase 2: If symptoms do not improve for 6–12 weeks</p> <ul style="list-style-type: none"> • repeat 3 views X-ray to identify other possible causes • continue eccentric exercise • local injection of corticosteroid. If no improvement, repeat in 2–4 weeks for total of 2 Doses. Use of local corticosteroid injection in lateral epicondylitis improves many patient Symptoms in 6 weeks but does not prevent recurrences and long-term outcome worseness [30, 31] <p>Phase 3: If symptoms do not improve after 12 weeks</p> <ul style="list-style-type: none"> • do US and/or MRI <p>Alternate treatment option might be considered as platelet-rich plasma injections, autologous blood injections, prolotherapy, extracorporeal shock wave therapy, and percutaneous needle tenotomy [32]</p> <ul style="list-style-type: none"> • surgery if more than 6 months with failed conservative therapy including corticosteroid injection • 1. debridement +_ arthroscopic drain • 2. open debridement • 3. Pericutanous tenotomy 	

planter fasciitis, palmar fasciitis, and eosinophilic fasciitis (these types can be secondary to autoimmune rheumatological diseases and malignancies).

22.1.11 Palmar Fasciitis

See Table 22.9.

22.1.10 Plantar Fasciitis

See Table 22.8.

22.1.12 Eosinophilic Fasciitis

See Table 22.10.

Table 22.8 Planter fasciitis anatomy, history, physical exam, investigation and treatment

Planter fasciitis	
Anatomy	It is a thick white tissue with longitudinal fibers attach to medial process of calcaneal tuberosity divide to five slips continuing forward to form fibrous of flexor sheathes on plantar aspect one for each toe
History	Age 40–60 years old Pain in planter region that worse when initiate walking during the first few steps in morning Aggravating factors: prolong standing or jumping, flat foot, high arch foot, heel spurs, running, excessive training during aerobic exercise and obesity [33, 34] Symptoms suggestive of SpA (see Chap. 1) [35]
Physical examination	<ul style="list-style-type: none"> • local tenderness • limited ankle dorsiflexion <p>The examiner should dorsiflex the patient toes with one hand, then pull the plantar Fascia tight, and then palpate with thumb or index finger of other hand, the fascia From heel particularly the medial aspect where the plantar fascia originates to the Forefoot: Tenderness can be elicited</p>
Investigations	<ul style="list-style-type: none"> • HLA-B27 and CRP if SpA is suspected • X-rays: Lateral and axial films to detect thickness, fat pad abnormality, heel spur <p>And to rule out other causes</p> <ul style="list-style-type: none"> • MRI in resistant cases [36] • US: 80% sensitivity and 88, 5% specificity to detect fascia thickening and edema [37]
Treatment	<ul style="list-style-type: none"> • 80% resolve spontaneously by 12 months • decrease physical activity and consider stretching exercise • arch support with custom made orthotics and avoid flat shoes • ice massage • NSAIDs can be tried for 2–3 weeks • inject with local glucocorticoid and lidocaine in resistant cases <p>Mechanical defects should be corrected otherwise symptoms may recur</p> <ul style="list-style-type: none"> • botulinum toxin injection might be considered • for resistant cases refer to surgery for cast and possible splint extracorporeal shock wave therapy • if still no response fasciotomy can be considered as 5–10% of cases ultimately required it

Table 22.9 Palmar fasciitis: definition, risk factors, symptoms, physical exam, investigation and treatment

Palmar fasciitis (palmar fibromatosis)	
Definition	Inflammation of the palmar fascia which causes fibrosis
Risk factors	Malignancy most common as ovarian cancer but can also be associated with breast, lung, pancreas, stomach, colon, and metastasis [38]
Symptoms	<ul style="list-style-type: none"> • Pain in palm with swelling: inability to close hands resulting in limitation of activity and function • joints pain • vasomotor symptoms • symptoms suggestive malignancy
Physical examination	<ul style="list-style-type: none"> • tenderness and swelling of bilateral palms with tight fascia and fibrosis (woody hands) • symmetrical polyarthritis and flexion deformity of the fingers • Nailfold capillary is normal
Investigations	<ul style="list-style-type: none"> • tissue biopsy shows extensive fibrosis with fibroblast and mononuclear cell infiltration • screening for malignancy
Treatment	<ul style="list-style-type: none"> • treat underlying malignancy if patient has metastasis and has poor prognosis • NSAIDs • corticosteroid • ganglion blockade

Table 22.10 Eosinophilic fasciitis definition, risk factors, symptoms, physical exam, investigation and treatment

Eosinophilic Fasciitis (Shulman's syndrome or diffuse fasciitis with eosinophilic)	
Definition	Inflammation of the fascia with eosinophils infiltration causes fibrosis in early stages
Risk factors	Hematological malignancy leukemia, myelodysplasia, and aplastic anemia [39]
Symptoms	<p>Stage 1:</p> <ul style="list-style-type: none"> • pitting edema bilaterally most involving both arms and legs with sparing fingers and toes • proximal area more than distal in the extremities • no Raynaud's phenomenon <p>Stage 2:</p> <ul style="list-style-type: none"> • sever induration of the skin and subcutaneous tissue with peau d's orange appearance • Groove sign is an induration due to retraction of the subcutaneous tissue along the superficial veins • mild myositis with normal CK level <p>Stage3:</p> <ul style="list-style-type: none"> • Neuropathy like carpal tunnel syndrome • flexion deformity of the digits • muscle atrophy • no sclerodactyly and normal nailfold capillary
Investigations	<ul style="list-style-type: none"> • CBC and peripheral blood film look for hematological malignancy • peripheral eosinophilia in 80% of the cases and the degree of eosinophilia does not correlate with disease activity • elevated ESR and CRP • aldolase can be elevated with normal CK • presence of polyclonal hypergammagloblinemia • tissue biopsy shows inflammation and fibrosis in all skin layers except the epidermis and eosinophils infiltration can be seen in early stages • MRI findings fascial thickening with enhancement
Treatment	<ul style="list-style-type: none"> • treat underlying causes • some patients may experience spontaneous improvement as the disease can be self-limited • complete remission can be seen after 2 years or more • high dose of prednisolone 20–60 mg/ day • in resistant cases use hydroxychloroquine and methotrexate
Poor prognostic factors	<ul style="list-style-type: none"> • young age at onset of the disease • trunk involvement

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