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6th Edition

Textbook of ORTHOPEDICS

Includes Clinical Examination Methods in Orthopedics



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CHAPTER

10 Soft Tissue Injuries

CHAPTER OUTLINE

- Muscle Injury (Strains)
- Injuries to the Joints
- Injury to the Synovium
- Injury to the Bursa
- Special Types of Muscle Injuries
- Important Soft Tissue Problems

INTRODUCTION

Soft tissue injuries are not quite 'soft' but 'hard' in terms of management and rehabilitation. The term soft tissue implies skin, subcutaneous tissue, fascia, muscles, ligaments, tendons, synovium, capsules, nerves, etc. **(Fig. 10.1)**. Undoubtedly, they are more common than bony injuries. Sportspersons are more prone to suffer from soft tissue injuries than the normal population. Unlike in fractures, the soft tissue injury management is essentially conservative and physiotherapy appears to be the mainstay of treatment.

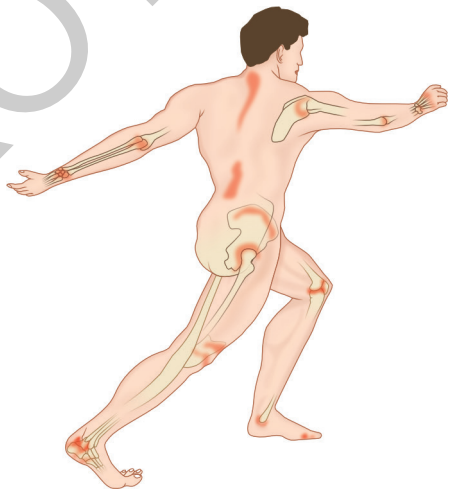

Fig. 10.1: Sites of common soft tissue injuries.

Mechanism of Injury

Direct Trauma

Due to fall, RTA, assault, etc. Contusion, hematomas, lacerations are some of the examples.

Indirect Trauma

Due to avulsion injuries, muscle pull, ligament sprain, etc. More commonly seen in sportspersons.

Approach to a Patient with Soft Tissue Injury

The Patient's Story

Listen to what the patient has to say about the problem. Do not be swayed by his/her story. He may be going overboard. Take their complaints with a 'pinch of salt'. This is the subjective assessment.

Your Observation

This is your assessment of the problem based on 'their' story. Make an objective assessment of the injury with regard to site, nature, intensity of pain, etc., of the injury. Your evaluation may or may not correlate with 'their' story. Evaluate carefully the functional problem, interpret it analytically, and individualize the treatment plan.

Goal Setting

A surgeon needs to set-up goals while treating soft tissue injuries. These could be immediate or long-term.

Execution of Your Plan

Having made a careful evaluation of the injury; you have sized up the problem and formulated your modus operandi. Keeping both the short and long-term goals in mind. Unleash your plan of action now to bottle up this genie.

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Treatment Goals of Soft Tissue Injury

Immediate Goals

This aims to 'nip' the problem in the bud and 'prevent' further damages from taking place. A look at the priorities clarifies this:

- If there is blood loss—arrest it, prevent it, control it.
- If there is swelling—try to minimize it.
- If there is pain—try to alleviate it.
- If there is joint stiffness—try to prevent it.
- In all possibility try to see that there is no further damage whatsoever once you are in charge of the injury!
- In the event of muscle weakness—try to maintain the power.

Thus, immediate goals aim at 'prevention' of further damage and injuries to the soft tissues.

The Distant Goals

Here your efforts are to put the derailed life of the soft tissues back on rails and restore the structures to their pre-injury state. No mean task this and it calls for a sustained and skillful approach. The priorities in this are as under:

- *Movements:* Restore it to as normal as possible.
- *Mobility:* Ensure the affected joints are back to their best.
- *Strength:* The affected muscles need to be given their strength and endurance back.
- *Kinesthetic/proprioception mechanism:* Restore it back to normal.
- *Daily or functional activities:* Restore it back to the original.
- *Confidence:* Boost the patient's morale and that of the affected part.
- *Keep away:* The swelling, edema from raising its ugly head again. Once bitten twice shy, hence no more such injuries.
- *Last but not the least:* Ensure that this problem will not surface again by practicing effective anti-recurrent methods.
- *Inculcate:* A sense of discipline in practicing regular follow-up and valuing the medical advice. Drive home the advantages of 'home care' programs. Instill in them a thought that, "it pays to be your own doctor in the safe confines of their home!"

Classification of Soft Tissue Injury

The four broad classifications for STI are as follows:

1. Strains
2. Sprains
3. Ruptures
4. Contusions

Let us now discuss each one in detail.

MUSCLE INJURY (STRAINS)

Definition

Injury to the muscle and tendons is called *strain* **(Fig. 10.2)**.

Reasons

- Sudden unaccustomed or abrupt action or movements may tear the muscles.
- Direct trauma can also injure the muscles and tendons.
- Overstretching of muscles due to indirect trauma, especially in sportspersons.

Types

1. *Acute strain:* This is due to sudden violent force or direct trauma.
2. *Chronic strain:* This is due to injury existing since a long period leading to muscle ischemia and fibrosis.

Pathophysiology

Injury to the muscles leads to pain. As a result, the muscle goes into spasm to limit the movements and reduce pain. Nevertheless, paradoxically, this protective muscle spasm causes pain due to stimulation of pain fibers and thus a vicious cycle sets in **(Fig. 10.3)**. The painful stimuli cause muscle spasm through the peripheral nociceptive stimuli **(Fig. 10.4)**.

Severity of Strain

First Degree Strain (Mild Contusion)

This is due to blunt injury and is due to direct trauma of low intensity.

Pathology

Few muscle fibers are torn. Bleeding is minimal and the fascia remains intact.

Clinical Features

- Localized pain and tenderness.
- Pain and spasm prevents muscle stretching.

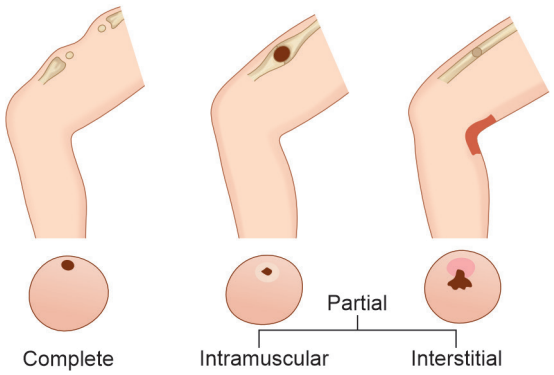

Fig. 10.2: Types of muscle strains.

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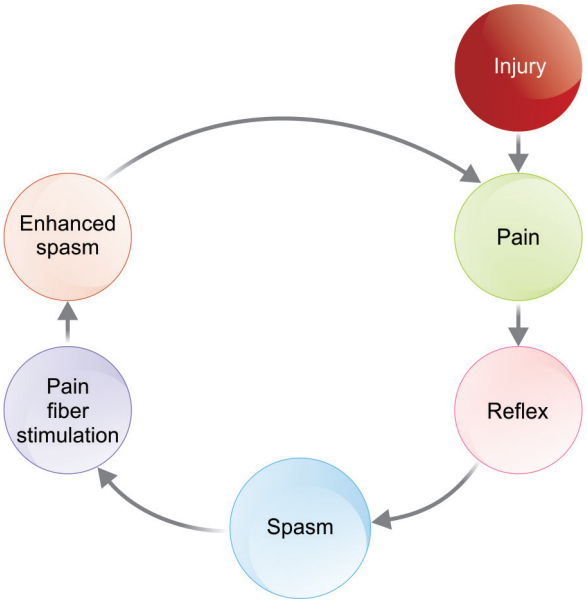

Fig. 10.3: Pain and spasm: The vicious cycle.

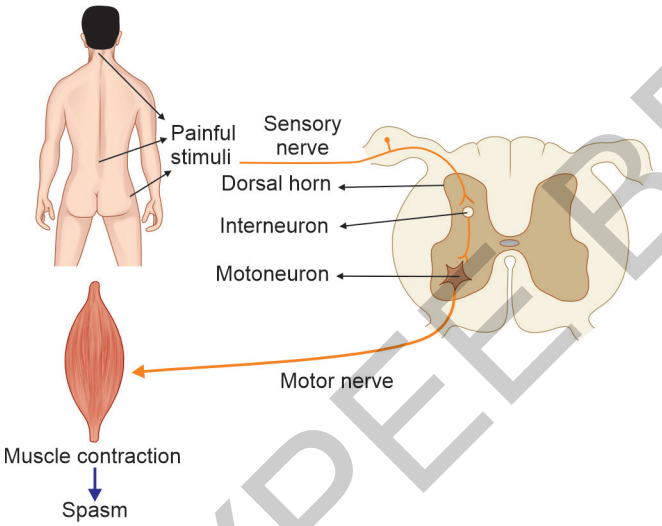

Fig. 10.4: Induction of prolonged muscle contractions (spasm) by peripheral nociceptive stimuli.

- ❖ Function is not impaired largely.
- ❖ Tenderness over the affected muscles.

All the above features are shown in **Figure 10.5**.

Management

- ❖ First aid is by cryotherapy (by application of ice) for a period of 20 minutes.
- ❖ Gentle active muscle stretch may be permitted after 20 to 60 minutes.
- ❖ Compression bandaging with optimum pressure.
- ❖ Low dose and low power ultrasound helps.
- ❖ Gentle massaging of the surrounding area helps.

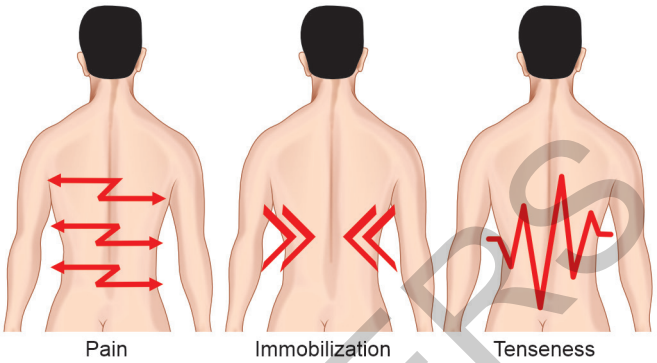

Fig. 10.5: Main symptoms of continuous muscle contractions (muscle spasms) in locomotors system: Pain, immobilization and tenseness-tenderness of muscles.

- ❖ If pain is minimal, the patient can be allowed to do the light work the next day.

Second Degree Strain

Cause: Here the trauma is more serious.

Pathology

- ❖ Greater number of muscle fibers is torn.
- ❖ There is bleeding.
- ❖ The fascia is still intact.
- ❖ Hematoma is still localized.

Clinical Features

- ❖ Pain is more severe.
- ❖ Tenderness is severe.
- ❖ Severe muscle spasm.
- ❖ The patient is unable to move the limb.

Third Degree Strain

Cause

Undoubtedly, these injuries are due to trauma of a greater magnitude.

Pathology

Larger area and greater number of muscle fibers are involved. More than one muscle group may be involved. The fascia is partially torn. Bleeding is widespread and more. There could be both intramuscular and intermuscular bleeding. The patient experiences severe pain and loss of function.

Symptoms

Here all the above symptoms are of greater intensity.

Treatment in Grade II and III Strains

For First 24 Hours

- ❖ Immediate application of ice.
- ❖ Compression bandage.

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- Limb elevation.
- Limb immobilized in splints.
- Isometrics to the muscles, which are immobilized.
- Active exercises to the unaffected joints.
- Pulsed electromagnetic field therapy (PEMF) is known to help.
- No active movements to the affected muscles.

During the Next 24 to 48 Hours

- The pressure bandage is removed and active muscle exercises are begun.
- Stretching within the limits of pain is commenced.
- Thermotherapy: Ultrasound, short wave diathermy and TENS help to relieve pain.
- Slow rhythmic massaging helps relieve the muscle spasm.
- Nonweight bearing on crutches is slowly started.
- Rest of the measures is the same as above.

Between 48 and 72 Hours

Apart from all the measures mentioned so far, the additional measures during this phase include:

- More vigorous active movements are encouraged.
- Deep transverse friction massage is added.
- Partial weight bearing can be permitted.

After 72 Hours

- All the above measures are pursued in a more vigorous manner.
- Pressure bandage is totally removed.
- Progressive resisted exercises using the Fowler technique by taking out 10–12 repetition maximum (RM), is practiced.
- Full weight bearing should be permitted in injuries of the lower limbs.
- After full movement is regained, the patient is allowed to walk and jog.
- Full functional activity should be regained by 4 to 6 weeks.

The various drugs used in the treatment of muscle strain to relieve pain and muscle stiffness is depicted in **Table 10.1**.

TABLE 10.1: Treatment of muscle strain by conservative methods in a nutshell.

Systemic Therapy
Analgesic anti-inflammatory drugs • Antipyretic analgesics • Nonsteroidal anti-inflammatory drugs • Narcotic analgesics
Muscle relaxants • At muscular level • At neuromuscular level • At spinal level • At supraspinal level
Psychotropic drugs • Antidepressants • Neuroleptics • Minor tranquilizers
Others • Calcitonin • Beta-blockers
Local therapy • Local anesthetics • Steroids • Transdermal application of analgesic anti-inflammatory drugs (ointments)

Grade Four Strain

Cause

This is usually caused by severe trauma.

Pathology

- Complete tear of the muscle **(Figs. 10.6A and B)**.
- The fascia is torn.
- Considerable bleeding which is intramuscular and diffuse
- Palpable gap between the muscles felt
- Severe loss of function
- Active movements produced by the agonist are absent
- Active muscle contraction is absent
- Joint function is not lost
- Muscle spasm is very severe **(Fig. 10.7)**

Treatment

- Surgery is advised. This involves opening the ruptured site, evacuating the hematoma and suturing the fascial sheath. Direct muscle repair is avoided.
- Compression bandage is applied and the limb is immobilized for 2 to 3 weeks.
- Active exercises to the unaffected joints.
- Slow rhythmic isometric exercises to the affected muscles.
- Nonweight bearing after 48 hours.
- The use of low frequency current (faradism) to obtain passive contraction is very useful.
- Deep heating modalities like ultrasound, etc., help.
- Rest of the measures is same as for Grade II/III injuries. diffuse.
- Gross swelling is present.

Note

Mild muscle strain is also called by lay public as muscle pull.

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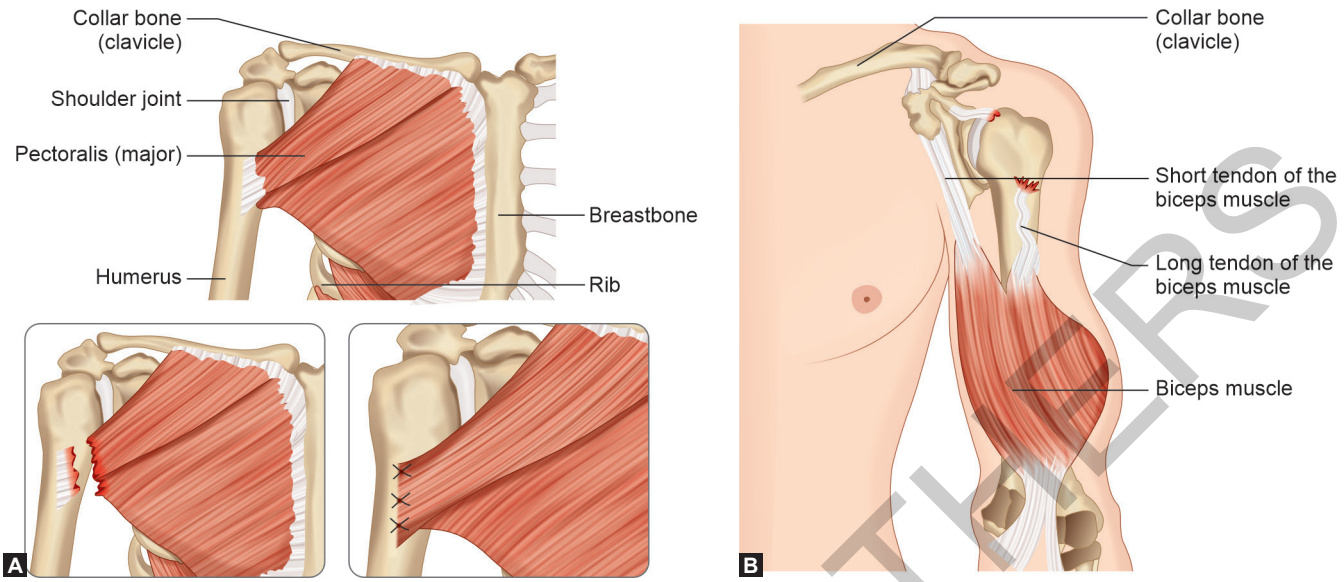

Figs. 10.6A and B: Muscle ruptures that are common: (A) Rupture of pectoralis major muscle; (B) Rupture of biceps tendon.



Fig. 10.7: Grade IV muscle strain (Hamstring strain) (clinical photo).

Clinical Features

- Excruciating pain
- Severe tenderness is present
- A snapping sound may be heard by the patient

INJURIES TO THE JOINTS

During an injury to a joint, three things could happen:

- Injury to the ligaments only.
- Injury to the synovium.
- Both (According to Bass, 1969).

Ligament Injury

A ligament injury is called "Sprain." Depending on the severity, it could be mild (Grade I), moderate (Grade II) or severe (Grade III).

Anatomy

Ligaments are made of fibrous tissues, which are arranged longitudinally. They are tough and elastic. Their vascularity is poor and heals always by scar tissue due to lack of special cells.

Functions

Ligaments serve the following functions:

- *Support:* By reinforcing the capsule, they provide support to the joint.
- *Stability:* By holding the bony ends together, it provides stability.
- *Protection:* The strength of the ligaments offers protection to the joints along with the muscles.

Problems of Healing

- Poor vascularity delays the healing
- Repair is by scar tissue
- Inadequate period of immobilization results in healing with tissue that is more fibrous. This will result in excessive laxity making the joint unstable.
- Intermittent stretching strengthens the ligament while continuous stretch leads to adhesions due to periosteal irritation.

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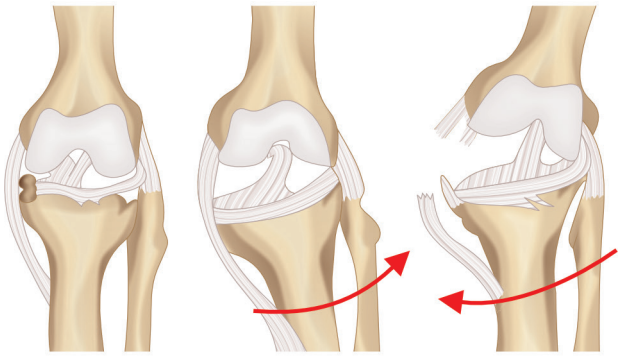

Fig. 10.8: Sprain of medial collateral ligament of the knee.

Types of Sprain (Fig. 10.8)

Grade I (Minor)

- Slight pain and tenderness at the site of injury
- Slight swelling and loss of function
- Stretch test will be positive clinching the diagnosis

Treatment

First day

- Cryotherapy to alleviate pain
- Pressure bandage—to prevent swelling
- Limb elevation—to prevent swelling
- Active movements of the unaffected joints.

Second day onwards

- Add thermotherapy, stop ice therapy.
- Begin isometric exercises to the affected muscles.
- Weight bearing may be permitted.
- Rest of the measures is same as mentioned above.

Grade II (Severe)

- More force results in this injury
- The ligament may be partially torn or detached from the attachment
- Swelling is more severe
- Pain and tenderness are also more acute
- Movement is grossly restricted
- Weight bearing is difficult
- Function is severely affected.

Treatment

- Cryotherapy
- Compression bandaging or kneecap and braces **(Fig. 10.9)**
- Elevation
- Rest of the measures same as in Grade I.

Grade III (Complete Rupture)

- Severe violence
- Gross swelling

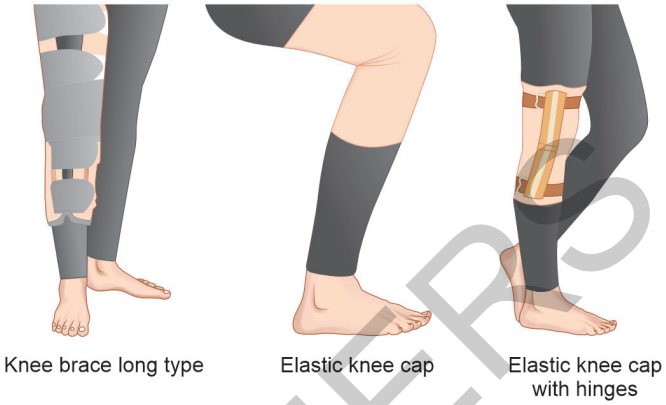

Fig. 10.9: Various elastic knee braces to support the knee joint.

- Pain and tenderness is quite severe
- Joint is unstable
- The patient is unable to bear weight
- Severe loss of function.

Treatment

- *Conservative*
  - Immediate application of ice
  - Compression bandaging
  - Foot end elevation
  - Isometric exercises to the affected limbs
  - Active exercises to affected joints
  - POP cast for 6 to 8 weeks if ligament tear does not cause displacement.
- *Surgical*
  - If the ligament is torn and displaced, it needs surgical repair and immobilization with a POP cast for 6 to 8 weeks.
  - Isometric exercises are started after one week
  - Nonweight-bearing for 3 to 4 weeks

After Removal of the POP Cast

- *Thermotherapy:* Ultrasound, TENS, or SWD helps to relieve pain
- Pressure bandage helps to control the swelling
- Limb elevation to prevent edema
- Transverse friction massage to relieve spasm
- Active exercises to the affected joints are begun slowly and progressed gradually
- Isometrics are done more vigorously
- Passive ROM exercises
- Active, active-resisted, and self-resisted exercises are prescribed
- Weight-bearing is slowly encouraged from partial to full after 6 to 8 weeks
- The patient should be functionally independent by 8 to 12 weeks.

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INJURY TO THE SYNOVIUM

Relevant Anatomy

Synovium is a lining covering the capsule of the joint, tendon sheaths, etc. It has a rich blood and nerve supply. It is present throughout the body.

Functions

Synovium produces synovial fluid, which serves the following functions:

- Facilitates frictionless, smooth joint movements.
- Helps in the nourishment of cartilages.

Causes

Inflammation of synovium is called *synovitis*. It could be due to trauma, arthritis, chondromalacia, rheumatoid arthritis, TB, hemophilia, etc. **(Fig. 10.10).**

Types

- Acute—due to trauma
- Chronic—due to diseases like TB, rheumatoid arthritis, trauma, etc.

Clinical Features

- Swelling of the joint (develops slowly say within 2 to 24 hours)
- The joint is hot and red
- Pain is present over the injured structure
- Feeling of tension or pressure due to swelling
- To accommodate the excess fluid, the joint will assume a flexion attitude (position of ease)
- Muscle atrophy will be quite significant.



Fig. 10.10: Clinical photo showing traumatic synovitis of the knee joint.

In the Event of Synovial Rupture

- The patient feels sudden pain at the back of the knee while getting up from a chair, getting down the stairs, etc.
- The swelling may spread rapidly to the calf muscles. Homan's sign will be positive.

Treatment

Aim: To prevent muscle atrophy and joint contractures by a graduated exercise regimen.

Methods

During first 24 hours

- Ice therapy
- Compression bandage
- Limb elevation
- Isometric contraction of the affected limb muscles
- Active movements of the ankle joint
- Active movements of the unaffected joints
- Splinting of the affected part

After 48 hours

- Aspiration of the joint if swelling persists even after 48 hours. Aspiration of the knee should be done in major OT under full aseptic conditions by giving local anesthesia. The technique of knee aspiration is shown in **Figures 10.11A to E**.
- Sustained isometric contraction of the muscles
- Small range gradual active movements with adequate support should now be begun
- Partial weight bearing may be allowed
- Gradually progressive resistive exercises should be started to achieve full function.

Note

Hemarthrosis vs. synovitis.

In hemarthrosis:

- The swelling is rapid in onset (<2 hours).
- Swelling is more generalized.
- Pain on extreme movements.
- Joint instability may be present in cases of complete rupture.

Chronic Synovitis

This is due to various diseases affecting the synovium usually of more than three weeks' duration.

Tuberculosis of the joints, rheumatoid arthritis, etc., is some of the examples.

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Figs. 10.11A to E: Technique of knee aspiration: (A) Gross swelling of the knee (clinical photo); (B) Mark the point of aspiration; (C) Part prepared and draped, local anesthesia given; (D) Thick blood being drained out; (E) Frank thick blood devoid of fat globules.

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Problems of Chronic Synovitis

- Firm swelling
- Muscle atrophy may be gross
- Joint stiffness may be considerable
- Lax ligaments create instability
- Mild pain unlike acute synovitis

Treatment

- Resistive exercises to the affected limbs
- Isometric exercises to the affected parts
- Passive ROM exercises to over come joint stiffness
- Proper gait training
- Ultrasound, transcutaneous electrical nerve stimulation (TENS), short-wave diathermy (SWD), and other heat modalities to overcome pain and spasm.

INJURY TO THE BURSA

Bursae are thin membranous sac lined with synovial membrane situated at the ends or certain important locations of the bones where tendons, etc., pass over them **(Fig. 10.12)**.

Functions

- To prevent friction between two structures like tendons and bones that is liable to be rubbed against each other.
- To prevent wear and tear of muscles and tendons
- To protect the structures from pressure and injury.

Types

1. *True bursa:* They are normally present in the body at certain important situations like beneath the acromion, elbow, knee, heel, etc.
2. *False bursa:* They are also called as adventitious bursa. They develop due to external trauma, pressure, etc.

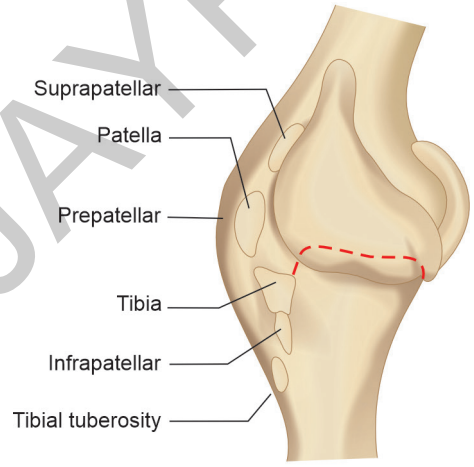

Fig. 10.12: Knee joint has many bursae around it.

Causes

The causes of bursitis are as follows:

- *Trauma* may be due to a single blow or repetitive trauma.
- *Infection* acute or chronic (e.g., TB)
- *Metabolic disorders,* e.g., gout, etc.
- *Abnormal external pressures,* etc. (e.g., hip ischial tuberosity, etc.).
- *Inflammatory disorders,* e.g., rheumatoid arthritis, etc.
- *Unaccustomed activity,* exercise or ill-fitting shoes, etc.
- *Due to excessive pressure,* friction, etc. (e.g., olecranon bursitis, student's elbow, etc.).

Common Sites

Upper limbs

- Subacromion
- Olecranon

Lower limbs

- Prepatellar
- Tendo Achilles
- Medial side of the great toe
- Lateral side of the little toe

Clinical Features

- Pain, more so if it ruptures
- Swelling is tender and hot
- Movements of the joint may be painful
- Tenderness may be present
- Limp due to glutei bursitis, etc.

Treatment

In Bursitis Due to Friction

- Rest to the part.
- Thermotherapy: Ultrasound, SWD, TENS, etc.
- Cryotherapy in initial stages (first 24 to 48 hours)
- Restricted weight bearing
- Isometric exercises to the affected part
- Muscle strengthening exercises
- Joint mobilization if there is restriction
- Injection of hydrocortisone in intractable cases
- Excision of the bursa, if chronic and troublesome

Infective bursitis

- Appropriate antibiotics
- Rest of the measures is same as above.

Chronic cases

- Appropriate supports like felt pad, footwear modifications, etc.
- Avoiding repeated frictional movements, e.g., shoulder abduction in subdeltoid bursa
- Relaxed passive movements to avoid friction

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- Active limited ROM exercises with strong isometrics
- Progressive resistive exercises
- Deep heating like US, SWD, TENS, etc.
- Deep friction massage
- Active exercises to the unaffected joints
- Isometrics with limb in elevation helps considerably.

Tenosynovitis

This is due to inflammation of the synovial lining of the tendon sheath. The fibrous sheath is, however, not affected.

Types

1. *Irritative*: Due to abnormal or excessive friction. There is pain and crepitus on palpation. The movements are not affected and there are no adhesions. There is watery effusion due to sheath inflammation.
2. *Infective*: May be due to acute pyogenic infection or chronic infection like TB, etc.

Treatment

Irritative

- Rest to the part by appropriate splints
- Avoid movements at the joints
- Bandaging or POP cast
- Thermotherapy, US, SWD, or TENS
- Deep friction massage
- Difficult cases, hydrocortisone injection
- Intractable cases, surgical excision
- Shoe modifications, etc.

Infective

- Appropriate antibiotics
- Immobilization for 2 to 3 months
- Rest of the measures is the same as mentioned above.

Tenovaginitis

Unlike in tenosynovitis, here the fibrous sheath and not the synovial sheath of the tendon are affected. Though patient may complain of pain, crepitus is conspicuous by its absence, e.g., de Quervain's disease **(Fig. 10.13)**.

Though the exact cause is unknown (Adams 1981), Cyrius (1978) says it may be due to repeated strains. Infection is not known to cause this problem.

Treatment

This is similar to tenosynovitis.

SPECIAL TYPES OF MUSCLE INJURIES

- **Bruise or contusion:** It is nothing but the Grade I muscle strain. This has already been discussed and is called a superficial hematoma.

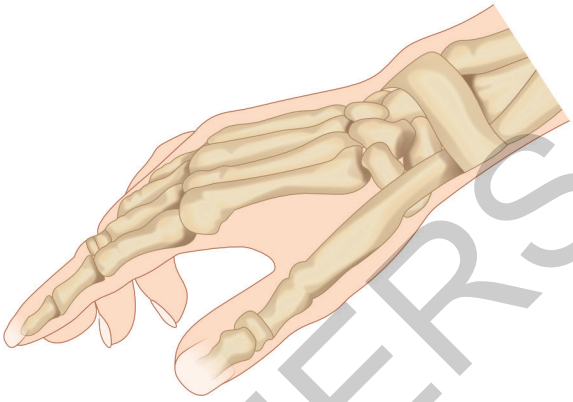

Fig. 10.13: de Quervain's disease, an example of tenovaginitis.

- **Hematomas:** These are deep in nature and two types are described:

Intramuscular Hematoma

- Here blood is contained within the muscle and is bound by an intact muscle sheath.
- Following an injury, bleeding occurs and stops within two hours.
- There is localized swelling.
- If there is further trauma, more bleeding may occur.

Intermuscular Hematoma

- Here the sheath of the muscle is torn resulting in extravasations of blood between the muscle and fascial planes.
- The hematoma is more diffuse.
- Bleeding will be more as the tension does not build-up to stop it.
- Due to gravity, it tracks down and may cause discoloration beneath the skin.
- For the first 48 hours, it is difficult to differentiate between the above hematomas **(Fig. 10.14)**.

Quick facts

Features of intermuscular hematomas

- Moderate pain
- Swelling reduces drastically by 48 to 72 hours
- Muscle contraction is regained first
- Due to tracking swelling may be seen at a distance away from the site of injury.

Treatment

Aim is to prevent further bleeding.

Methods

- Rest to the part
- Immobilize the affected part with splint

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Fig. 10.14: Hematoma of the thigh (clinical photo).

- Cryotherapy to relieve pain and spasm
- Pressure bandage to control the swelling
- Limb elevation to prevent edema

Note

In hematomas, there is no loss of function. If there is loss of function then it may be a Grade II/III muscle strain.

IMPORTANT SOFT TISSUE PROBLEMS

Given below is a list of important soft tissue problems in orthopedics. Please refer the appropriate sections for details.

Upper Limb

Shoulder

- Rotator cuff injuries
- Supraspinatus tendonitis
- Infraspinatus tendonitis
- Subscapularis tendonitis
- Adhesive capsulitis
- Tendonitis of the long head of biceps

Elbow

- Tennis elbow
- Golfer's elbow
- Student's or Miner's elbow

Wrist

- Ganglion
- de Quervain's disease
- Dupuytren's contracture
- Trigger finger
- Carpal tunnel syndrome
- Mallet finger

Lower Limbs

Hip and Pelvis

- Piriformis syndrome
- Iliotibial tract syndrome
- Glutei bursitis
- Trochanteric bursitis

Knee and Leg

- Bursa around the knee
- Collateral ligament injury
- Cruciate ligament injury
- Meniscal injury
- Quadriceps strain
- Hamstrings strain
- Calf muscle strain
- Patellar tendonitis
- Plica syndrome

Ankle and Foot

- Ankle sprain
- Plantar fasciitis
- Calcaneal spurs
- Morton's neuroma
- Tendo-Achilles injuries
- Tarsal tunnel syndrome

Tendons and Nerves

- Injuries of flexor and extensor tendons of the hand.
- Injuries to the nerves. Please refer to chapter on Peripheral Nerve Injuries.

OVERVIEW

Soft tissue injuries involve muscles, ligaments, tendons, synovium, bursae, fascia, and joint capsules and are **more frequent than fractures** in clinical practice. Although termed "soft," these injuries are often difficult to manage due to pain, stiffness, instability, and risk of recurrence.

The chapter discusses injuries caused by **direct trauma** (contusions, hematomas) and **indirect trauma** (strains, sprains, avulsion injuries). Muscle strains are graded from **Grade I to Grade IV**, with attention to the pain–spasm vicious cycle and phased rehabilitation. Joint-related soft tissue injuries such as **ligament sprains, synovitis, bursitis, tenosynovitis, and tenovaginitis** are described with their anatomy, healing characteristics, and treatment protocols. The importance of **goal-based treatment, physiotherapy, and patient compliance** is emphasized.

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Quick Recall

General Principles

- Soft tissue injuries are **more common than fractures**
- Management is **mainly conservative**
- Physiotherapy is the **mainstay of treatment**
- Early control of pain, swelling, and stiffness prevents chronic disability

Classification

- Strains
- Sprains
- Ruptures
- Contusions

Muscle Strains

- **Grade I:** Minimal fiber tear, function preserved
- **Grade II:** Partial tear, hematoma, severe pain
- **Grade III:** Extensive tear, marked functional loss
- **Grade IV:** Complete rupture → **surgical treatment**

*Pain–spasm–pain forms a **vicious cycle***

Ligament Injuries (Sprains)

- **Grade I:** Stretch injury
- **Grade II:** Partial tear
- **Grade III:** Complete rupture
- Ligaments heal by **scar tissue**, not regeneration

Synovial Injuries

- **Synovitis:** Swelling in **2–24 hours**
- **Hemarthrosis:** Swelling within **2 hours**
- Chronic synovitis → atrophy, stiffness, instability

Hematomas

- **Intramuscular:** Localized, painful, slower recovery
- **Intermuscular:** Diffuse, faster functional recovery

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John Ebnezar is an internationally acclaimed orthopedic and spine surgeon, pioneering researcher, academician, author, and the founder of the subspecialty of Geriatric Orthopedics in India. A distinguished clinician with a unique integration of modern orthopedics and evidence-based holistic medicine, he is widely regarded as one of the foremost proponents of Wholistic Orthopedics globally.

He is the recipient of some of India's highest medical and civilian honors, including the prestigious Padma Shri, becoming the first and only orthopedic surgeon from Karnataka, India and among the very few orthopedic surgeons in India to receive this national distinction. He is also a recipient of the coveted Dr BC Roy National Award, India's highest medical honor, and uniquely became the only doctor in the country to receive both the Padma Shri and Dr BC Roy National Award in the same calendar year (2016).

He has made extraordinary contributions to orthopedic education and medical literature. He has authored more than 200 books in Orthopedics, a world record achievement by an individual orthopedic surgeon, covering the entire spectrum from undergraduate and postgraduate education to subspecialty reference works for orthopedic surgeons, physiotherapists, nurses, lawyers, and the general public. His renowned *A to Z Orthopedics Series* and public health orthopedic books have earned global recognition, with several international editions published in the United States, United Kingdom, Italy, and Spain.

A visionary researcher, he became the first orthopedic surgeon in the world to obtain a PhD in Yoga, establishing scientific evidence for the role of yoga in orthopedic rehabilitation and musculoskeletal disorders. His pioneering research in osteoarthritis, spinal disorders, fracture healing, and spinal cord injuries has been published extensively in peer-reviewed indexed journals, and his work has contributed to internationally accepted orthopedic guidelines, including recommendations by the American Academy of Orthopedic Surgeons (AAOS).

He has received over 400 international, national, and state awards, including multiple Lifetime Achievement Awards, Karnataka Rajyotsava Award, Kempegowda Award, and several prestigious research honors. He also holds multiple Guinness World Records in academics, community service, and health awareness initiatives.

An inspiring teacher and speaker, he has delivered more than 400 scientific presentations and is notably the first orthopedic surgeon in India to become an international TED Speaker. He has served in several leadership roles, including Vice President of the Indian Orthopedic Association, Founder President of the Geriatric Orthopedic Society of India, and President of the Neuro Spinal Surgeons Association (Karnataka Chapter).

Through decades of clinical excellence, academic innovation, social commitment, and relentless dedication to patient care, Professor–Emeritus Dr John Ebnezar continues to inspire generations of medical professionals and remains a towering figure in contemporary orthopedics.



Rakesh John is a highly accomplished orthopedic surgeon with extensive academic and clinical expertise in contemporary orthopedics. He is currently serving as a Consultant Orthopedic Surgeon at Macclesfield District General Hospital, United Kingdom, and has been closely associated with academic orthopedics, contributing significantly to teaching, research, and postgraduate training.

An academically distinguished surgeon, he has graduated with top honors from Postgraduate Institute of Medical Education and Research and subsequently pursued advanced orthopedic training internationally. He holds the prestigious distinction of being a Double FRCS and has undergone specialized fellowships in Knee Surgery, Shoulder Surgery, and Trauma from reputed institutions in the United Kingdom, Canada, Hong Kong, and other internationally recognized centers.

He has authored and co-authored more than 70 scientific articles published in peer-reviewed indexed journals, reflecting his strong commitment to evidence-based orthopedics and academic excellence. His areas of interest include orthopedic education, trauma care, joint reconstruction, and subspecialty surgical training.

He has been actively involved in undergraduate and postgraduate teaching with a special emphasis on maintaining clarity, clinical relevance, conceptual understanding, and examination-oriented presentation in orthopedic education. His contribution to this edition has played a vital role in the thorough revision and updating of the text, ensuring that it remains aligned with the current academic standards and the evolving needs of medical students and trainees.

His continued dedication to academic orthopedics and high standards of medical education is clearly reflected throughout this edition.

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