# Rehabilitation Of Orthopedic Patients

By:

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practice			
1. Use basic rehabilitation principles to improve orthopedic rehabilitation services.	ج- المهارات المهنية الخاصة بالمقرر :		
<ol> <li>Use different types of physical modalities used in the process of orthopedic rehabilitation</li> <li>Learn how to differentiate between various types of orthoses and prostheses.</li> </ol>	III) Professional Skills:		
4. Make region-specific evaluation for patients with different disabilities.			
<b>1.</b> Use sources of medical information and communication technology independently.	د- المهارات العامة :		
2. Communicate effectively with colleagues, staff			
members and helping personnel.	IV) General and Transferable Skills:		
<b>3.</b> Work in interdisciplinary team according to rules			
and principles for assessment and within time-			
planned programs			
<ol> <li>Introduction and basic definitions</li> <li>Physical Modalities: Heating and cryotherapy</li> <li>Physical Modalities: electrotherapy</li> <li>Exercise principles</li> </ol>	4- محتوى المقرر :		
5- Rehabilitation of common shoulder	4- Course content		
<ul> <li>disorders</li> <li>6- Rehabilitation of common elbow disorders</li> <li>7- Rehabilitation of common wrist disorders</li> </ul>	lation		
8- Rehabilitation of common hip disorders			
10- Rehabilitation of common ankle			
disorders			
12- Post operative rehabilitation			
1. Lectures.	5- أساايب التعليم والتعلم		
2. Group discussions.	5- Teaching and		
<b>3.</b> Practical sessions.	Learning Methods:		
If it is a must to accept disable students they	6- أساليب التعليم والتعلم للطلاب ذو بي القدر ان المحدودة		
should have certain characters as they will deal with flames and wax carvers and knives. As	لاوی العدر ات المعدود.		

<ul> <li>examples they should;</li> <li>1- Able to move their hands well.</li> <li>2- Be mentally graded well.</li> <li>3- See properly.</li> <li>For these students regular Teaching and learning methods could be used.</li> </ul>	Teaching and learning methods for students with limited abilities		
7- تقويم الطلاب : 7- Student Assessment:			
<ul> <li>a. Class work:</li> <li>1. Quizzes</li> <li>2. Midterm theoretical</li> <li>b. Final exam:</li> <li>Theoretical and practical</li> </ul>	a- Assessment methods:		
<ul> <li>a. Class work:</li> <li>1. Quizzes:</li> <li>Quiz I (5<sup>th</sup> week)</li> <li>2. Midterm theoretical (7<sup>th</sup> week)</li> <li>b. Final exam</li> <li>Practical exam (13<sup>th</sup> week)</li> <li>written theoretical exam (15<sup>th</sup> week)</li> </ul>	ب- التوقيت b- Assessment schedule: ج- توزيع الدرجات		
Midterm theoretical 10 marksAttendance5 markClinical skills: 40 marksFinal Practical exam20 marksFinal written theoretical exam:120 marks.Total percentage200 marks	C-Weight Of Assessments		
د قائمة الكتب الدر اسية والمراجع : 8- List of References:			
Lecture and practical notes for orthopedic rehabilitation for orthopedic technicians	ا۔ مذکرات a- <b>Course notes:</b>		
<ol> <li>David I, editor. Orthopedic Rehabilitation, Assessment, and Enablement 1<sup>ST</sup> Edition, Springer-Verlag Berlin Heidelberg 2007</li> <li>2-Brotzman SB, Manske RC editors. Clinical Orthopaedic Rehabilitation: An Evidence-Based Approach, 3<sup>rd</sup> Edition, ELSEVIER MOSBY 2011</li> </ol>	ب- کتب ملزمة B)Essential books text books)		



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حقوق النشر والتأليف لوزارة الصحة والسكان ويحذر بيعه

# **Course Description**

This course will focus on orthopedic rehabilitation principles and techniques and approaches to manage common musculoskeletal disorders. This involves identifying, understanding and the clinical manifestations and management plan of disorders affecting various joints. Students will learn about various physical modalities as well as basic principles of orthotics and prothesis. They will also gain practical experience by applying the knowledge gained during the academic year to better understand their audience and create more effective health messages and programming.

#### Core Knowledge

By the end of this course, students should be able to:

- Define the differences between disability, impairment and handicapping
- Recognize various physical modalities and techniques used in orthopedic rehabilitation process.
- different Identify orthotics prostheses of the and parts of body.
- Recognize rehabilitation procedures of common musculoskeletal problems of different body parts. Stry of Health & Popula

By the end of this course, students should be able to:

Differentiate indications and use of different physical modalities.

- Recognize indications and use of different orthotics and prostheses
- Discuss developments of health care services for the diagnosis and management of musculoskeletal diseases to improve medical practice
- Use basic rehabilitation principles to improve orthopedic rehabilitation services.
- Differentiate between different types of physical modalities used in the process of orthopedic rehabilitation
- Learn how to differentiate between various types of orthotics and prostheses.
- Make region-specific evaluation for patients with different disabilities.

Course Overview

Week	Theoretical	Practice
	(3 hours)	
1 <sup>st</sup> week	Introduction and basic definitions	Introduction
2 <sup>nd</sup> week	Physical Modalities: Heating and cryotherapy	Physical Modalities
3 <sup>rd</sup> week	Physical Modalities: electrotherapy	Physical Modalities
4 <sup>th</sup> week	Exercise principles	Physical Modalities and exercises 1 <sup>st</sup> quiz (theoretical and practical)
5 <sup>th</sup> week	Rehabilitation of common shoulder disorders	Applied Rehabilitation of common shoulder disorders
6 <sup>th</sup> week	Rehabilitation of common elbow disorders	Applied Rehabilitation of common elbow disorders
7 <sup>th</sup> week	Rehabilitation of common wrist disorders	Applied Rehabilitation of common elbow disorders Midterm (theoretical and practical)
8 <sup>th</sup> week	Rehabilitation of common hip disorders	Applied Rehabilitation of common hip disorders

9 <sup>th</sup> week	Rehabilitation of common knee	Applied Rehabilitation of
	disorders	common knee disorders
10 <sup>th</sup> week	Rehabilitation of common ankle disorders	Applied Rehabilitation of common ankle disorders
11 <sup>th</sup> week	Orthoses and prosthesis basic principles	Orthoses and prosthesis 2 <sup>nd</sup> quiz (theoretical and practical)
12 <sup>th</sup> week	Post operative rehabilitation	Revision
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# **Chapter 1** Introduction and basic definitions

#### **Objectives:**

- Define the differences between disability , impairment and handicapping
- Identify basic principles of history and physical examination in orthopedic rehabilitation.

Orthopedic rehabilitation is essential process to improve the treatment outcome of

various orthopedic disorders and disabilities, including fractures, amputations and post-

operative rehabilitation spinal cord injuries.

The field attempts to optimize biomechanics and biology tofocus on improving

functional outcomes and the overall wellbeing of patients.

#### What is Impairment?

Impairment refers to any loss or abnormality of physiological, psychological, or anatomical structure or function, whether permanent or temporary

# What is Disability?

An activity limitation (resulting from an impairment) that creates difficulty in the performance, accomplishment, or completion of an activity in the manner or within the range considered normal for a human being.

#### What is Handicapping?

The way in which the disability influences the individual's ability to fulfill a role that is normal for that individual

#### **Patient assessment:**

#### **Personal history:**

Name, age, sex, occupation, residence, special habits of medical importance

#### **Complaint:**

#### **History of present illness:**

Analysis of pain and what increase and what decrease

#### **Systems review:**

Cardiac, chest, neurological etc,

#### **Functional history:**

It is essential to get an evaluation of the patient's functional status and of obstacles that the patient may meet when he or she returns home. Data should be obtained about:

- Home environment (lives With whom? Are family members accessible at home?, home stairs.

- Previous functional status (Did the patient use a cane, cruchesor walkers

- Work history (patient's job? Job description? Are there mobility obstacles in the work environment?) y of Health & Pop

#### **Physical examination:**

- Inspection of the skin for ulcers.
- Inspection of joints for swelling and deformity.
- Palpation of bones and joints for tenderness.
- Assessment of movement of the joints.

#### Assessment of muscle strength:

- 0. No movement
- 1. Flicker on contraction.
- 2. Movement with elimination of gravity.
- 3. Movement against of gravity.
- 4. Movement against some resistance,
- 5. Movement against full resistance.

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# Chapter 2 Physical Modalities: Heating and cryotherapy

#### **Objectives:**

- Identify the main types of heating modalities.
- Define the most common uses of heating and cryotherapy.
- Identify main contraindications and complications of heating and cryotherapy.

#### What are physical modalities?

Modalities that use physical energy for therapeutic purposes.

### What are types of physical modalities?

- Thermotherapy: Heating and cold.
- Light therapy: ultraviolet radiation, laser.
- Electrotherapy.

# What are types of heating modalities?

- 1. SuperficialHeat: Hot packs, Paraffin bath, Infrared lamps.
- 2. DeepHeat: ultrasound, shortwave diathermy, and microwave diathermy.

#### **Indications of deep heating:**

- 1- Chronic inflammatory conditions: bursitis, epicondlitis, frozen shoulder, plantar fasciitis
- 2- Musculoskeletal pain: sprain, strain, painful nerve lesions, osteoarthritis, rheumatic conditions

3- Contracture (Adhesions): (ultrasound):by deploy mersation of mucopoly saccharides, reducing the viscosity of hyaluronic acid in joints

#### **Contraindication of deep heating modalities:**

- Impaired sensation of the treated part.
- Impaired vascularity.
- Malignancy
- Hemorrhage tendency.
- Pregnancy (Over the abdomen).
- Acute inflammation.
- Over growing ends of bones in children.
- Laminectomy sites.
- Metallic implants.
- Pacemakers.
- Eye.

#### <u>Ultrasound</u>

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Ultrasonic waves are sound waves whose frequency of vibration is beyond the audibility of the human ear.



#### **Complications of ultrasound:**

- 1- Over dosage
- 2- Burn: due to high intenisity, statiationart treatment head during treatment or incomplete contact of the treatment head

3- Cavitation: a bubble of gas is produced in the tissues as a result of isonation.

#### **SHORTWAVE**

Radio waves that produce heating from electromagnetic energy. It the best modality for deep muscles (heating 4-5 cm)

#### Methods of applications:

- 1- Capacitive coupling: the treated part is placed between 2 plates.
- 2- Inductive coupling: the applicator is in the form of a coil.



### **Cryotherapy**

It is the local or general application of cold for therapeutic purpose.

#### Effects of cold:

- Effects on the muscle: Decrease muscle spasm and spasticity.
- Effects on peripheral nerves: Decrease in pain sensation.

#### **Indications Of cryotherapy:**

- 1- After trauma:to decrease pain and edema.
- 2- Spasticity and muscle spasm.
- 3- After orthopedic operative procedures
- 4- Various musculoskeletal conditions:e.g Rotator cuff tendinitis, sprain, strain etc..

#### Methods of application:

*1*- Immersion techniques: the affected part is immersed for (10) minutes then elevated with compression

2- Ice massage: either as an ice cube wrapped in "paper or cloth" or an ice lollipop on a wooden stick.

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- 3- Vapocoolant spray.
- 4- Cryogel cold packs.

#### **Complications of cryotherapy:**

- 1- Ice burn.
- 2- In older patients, it is possible to cause venous thrombosis.

#### **Contraindications Of cryotherapy:**

- 1- Hyersensivity to cold.
- 2- Impairment of sensation.
- 3- Peripheral vascular disease.
- 4- Cancer.

# Chapter 3 **Physical Modalities: Electrotherapy**

#### **Objectives:**

- Identify the main types of low frequency current.
- Define the most common uses of electrotherapy.
- Identify main contraindications and complications of electrotherapy.

#### What is low frequency current?

Currents with a frequency which varies from 1 HZ to 2000 HZ.

#### What are types of low frequency current?

- Faradic current.
- Sinusoidal current.
- High voltage galvanic currents.

#### **Physiological response to electrical currents:**

1- Motor nerves and muscles Stimulation:

8 Population Producing muscle contraction, the muscle continuous contracting as long as the current is passing and is relaxed only when the current is off.

- 2- Stimulation of sensory nerves :decrease pain sensation.
- 3- Decrease pain and swelling fluid movement in: due to change of cell membrane permeability.
- 4- The nerve supply, must be intact to the muscle being treated by faradic current because the intensity of current need to depolarize.

#### 5- Indications

- 1- Painful conditions: acute and chronic painful musculoskeletal conditions, painful neurological conditions.
- 2- Treatment of weak and atrophied muscles: whose nerve supply in intact (faradic current) and denervated muscle (galvanic current).
- 3- Treatment of persistent edema of the limb.
- 4- Electrodiagnosis: faradic current differentiate between innervated and denervated muscles.
- 5- Treatment of joint effusion: faradic current is used to produce muscle contraction that help in drainage of effusion.

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6- Prevent formation of adhesions.

#### **Contraindications**:

- Impaired vascularity.
- Impaired sensation.
  - Over the carotid sinus
  - Pacemaker
  - Pregnancy
  - Convulsions.
  - Recent fracture
  - Hemorrhage tendency
  - Malignancy.

#### **Transcutaneous Nerve Stimulation (TENS)**

Electrical Stimulation of nerve fibers for relief of pain through lead wires and electrodes attached to the patient's skin. Placement of electrode is usually over peripheral nerve distribution



# Chapter

# **Exercise Principles**

#### **Objectives:**

- Identify the basic types of muscle contraction.

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- Define the most common wrist disorders and recognize basic management plan.
- Identify main benefits and complications of exercises.

Therapeutic exercises are planned physical movement aim to improve mobility, increase muscle strength and increase endurance.

#### What are the types of muscle contraction?

- **1.Isoto**nic: this is muscle contraction with constant external resistance and visible limb movement e.g: lifting a weight.
- 2. Isometric: this is muscle contraction without visible limb movement e.g: pushing a wall.
- **3.** Isokinetic : this is muscle contraction with variable external resistance, constant speed and visible limb movement e.g : Nautilus

#### What are types of therapeutic exercises?

- 1. Mobility Exercises (Range of motion and stretching Exercises).
- 2. Resistance Exercises (Strengthening exercises).
- 3. Cardiopulmonary endurance Exercises (Aerobic & Anaerobic).
- 4. Coordination Exercises.

ROM Exercises: improve flexibility along the patient at the available range of motion

(ROM).

It can perform manually or with device e.g: shoulder wheel.



StretchingExercises: movement occurs beyond the available ROM.

**Strengthening Exercises:** is a type of exercise that use resistance to increase muscle strength, enhance anaerobic endurance, and increase the muscle size.

**Cardiopulmonary endurance Exercises:** low intensity .continuous and rhythmic exercises that use large muscle, that improve cardiopulmonary fitness. They are classified as aerobic and anaerobic endurance exercises.

Aerobic endurance exercises: 3 phases (consist of a warm-up period for 10 minutes, Training period for 20 to 30, Cool-down period for10 minutes)

### What are the factors that determine muscle strength?

- 1- Muscle shape (parallel, pinnate).
- 2- Muscle size.
- 3- Neural factors e.g: synchronization of muscle fibers contraction, and speed of

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recruitment.

4- Torque curve.

#### **Benefits of exercises:**

- 1- Decrease the risk of coronary heart disease.
- 2- Improve control of diabetes mellitus.

- 3- Weight loss and decrease body fat.
- 4- Increase bone mineral density and prevents osteoporosis: with weight bearing exercises.
- 5- Increase muscle strength.
- 6- Decrease anxiety and depression.

# Patients should be evaluated prior to exercise in order to avoid possible complications:

- Age.
- General condition.

History of cardiac or pulmonary diseasetype of exercise

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- Medication use.

#### **Possible complications of exercises:**

- 1- Increased risk of arrhythmia in patients with underlying heart disease.
- 2- Musculoskeletal injury: may occurs with intensive overload e.g strain, sprain, tear.
- 3- Myocardial infarction and sudden death: especially in patients with multiple cardiac risk factors.
- 4- Exercise induced bronchoconstriction: in patients with pre-existing bronchial asthma.

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# Chapter 5 **Rehabilitation of common shoulder disorders**

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#### **Objectives:**

- Identify the basic anatomical concepts and movements of shoulder joint.
- Define the most common shoulder disorders and recognize basic management plan.

Shoulder joint is a ball and socket joint between the glenoid cavity of scapula and the humerus. It has a relative low stability in order to increase mobility. Stability of shoulder joint depends on glenohumeral capsule and ligaments as well as rotator cuff muscles which are responsible on stability during movement. The rotator cuff muscles include: supraspinaus, infraspinatus, subscapularis and teres minor.

The movements allowed in shoulder joints are:

- 1- Flexion: deltoid, biceps
- 2- Extension: triceps, deltoid
- 3- Abduction: supraspinatus, deltoid
- 4- Adduction: teres major, subscapularis
- 5- External rotation: infraspinatus, teres minor
- Population 6- Internal rotation: teres major and subscapularis

#### **IMPINGEMENT SYNDROME AND ROTATOR CUFF TEAR**

Impingement syndrome occurs due to subacromial space narrowing leading to compression and inflammation of the rotator cuff that may progress to rotator cuff tear. It is the most common cause of shoulder pain. The most commonly affected rotator cuff tendon is the supraspinatus tendon.

#### **Clinical manifestations:**

Pain with movement especially with overhead activities e.g swimming and may be referred along the deltoid.

- Pain may be increased at night with difficulty to sleep on the affected side.
- Crepitus or clicking sensation may be felt with overhead activities.
- Painful arc sign: pain with particular range of motion especially abduction between 60 and 120 degrees of abduction.

#### **Imaging modalities:**

- Plain radiography: cystic changes, shape of the acromion.
- The modalities of choice are musculoskeletal ultrasound and magnetic resonance imaging (MRI).

#### **Treatment:**

- I) Analgesics and anti-inflammatory medications.
- II) Local injection.
- III) Rehabilitation program: 3 phases (Acute, Recovery and Functional phases)
- A) Acute phase: 4 weeks

Rest and avoid painful movements.

Pain free range of motion.

Ultrasound modality.

B) Recovery phase: 6 months

Full pain free range of motion.

Increase strength of rotator cuff and scapular stabilizers.

C) Functional phase:

Increase power and endurance of shoulder muscles.

Activity specific training.

IV) Surgical treatment: failure of conservative treatment.

#### Frozen Shoulder (Adhesive Capsulitis)

It is painful condition of the shoulder associated with marked restriction of range of motion (ROM). It is more common in females aged from 40 to 60 years. It can be idiopathic or secondary to trauma, stroke, cervical spine disease etc,

#### **Clinical manifestations:**

Shoulder pain that increases in intensity at first and then slowly resolves

Decreased active and passive ROM

#### **Imaging modalities:**

Frozen shoulder is a clinical diagnosis and imaging may be done to rule out other diagnoses.

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#### **Treatment:**

I) Analgesics and anti-inflammatory medications.

- II) Local injection.
- III) Rehabilitation program:

Heat and ultrasound

Exercises (ROM and stretching exercise)

**IV)** Manipulation under anesthesia.

V) Surgical capsular release.

#### **Shoulder Instability**

The shoulder is the most commonly dislocated joint. The anterior direction is the most common direction of instability

#### **Clinical manifestations:**

History of trauma

Severe pain

Patient with anterior dislocation hold the arm in abduction and external rotation.

Patient with posterior dislocation hold the arm in adduction and internal rotation.

#### **Imaging modalities:**

Plain radiography AP & lateral views

#### Treatment

- I) Reduction (x ray films after reduction.
- II) The arm should be put in a sling after reduction.
- III) Rehabilitation program:ROM and strengthening exercises

Pendulum-Codman's exercises

IV) Surgical treatment: if recurrent dislocation.

# Chapter 6 Rehabilitation of common elbow disorders

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#### **Objectives:**

- Identify the basic anatomical concepts and movements of elbow joint.
- Define the most common elbow disorders and recognize basic management plan.



Elbow joint is a hinge joint between the olecranon of the ulna and the trochlea of the lower end of the humerus. The movements allowed in elbow joint are:

- 1-Flexion: brachialis, biceps, Brachioradialis.
- 2-Extension: triceps, Anconeus.

#### Lateral Epicondylitis (Tennis elbow)

One of the most common causes of elbow pain and occurs due to inflammation of the common extensor origin especially the tendon of extensor carpi radialis brevis. It occurs most frequently in the dominant hand in persons between 40 and 50 years due to overuse and poor mechanics.

#### **Clinical manifestations:**

Pain on the lateral aspect of the elbow that is induced by movement that causes repetitive arm supination and pronation e.g shaking hands, playing tennis etc,..

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Tenderness on lateral epicondyle.

#### **Imaging modalities:**

Lateral epicondylitis is a clinical diagnosis and no need for imaging modality.

#### Treatment:

- I) Analgesics and anti-inflammatory medications.
- II) Local injection.
- III) Rehabilitation program:

Ice

#### Ultrasound

IV) Brace to distribute stress away from lateral epicondyle.

V) Surgical release (in less than 5% of patients).

### FRACTURE OF THE DISTAL HUMERUS

It can be displaced or not displaced. And may have many complications like malunion, nonunion, contracture or neurovascular injury.

#### **Clinical manifestations:**

- History of trauma.
- Pain, swelling and ecchymosis in elbow region.
- Deformity.

Inability to flex the elbow. -

#### **Imaging modalities:**

Plain X ray AP & Lateral views to elbow region.

#### **Treatment:**

- I) Analgesics and anti-inflammatory medications.
- II) Splinting in non-displaced fracture.
- III) Surgical treatment: open reduction in case of displaced fracture.
- IV) Post-operative rehabilitation: ROM and strengthening exercises

# FRACTUREOFTHE OLECRANON

It can be displaced or not displaced. It occurs due to fall on the elbow with the elbow flexed.

#### **Clinical manifestations:**

- History of trauma.
- Pain, swelling and ecchymosis in elbow region.
- Deformity.
- Numbress and paresthesia in case of ulnar nerve involvement.

Plain X ray AP, Lateral and oblique views to elbow region.

#### **Treatment:**

- J) Analgesics and anti-inflammatory medications.
- II) Splinting and immobilization in non-displaced fracture.
- III) Surgical treatment: open reduction in case of displaced fracture.
- IV) Post-operative rehabilitation: ROM and strengthening exercises

# Chapter 7 Rehabilitation of common Wrist disorders

#### **Objectives:**

- Identify the basic anatomical concepts and movements of wrist joint.
- Define the most common wrist disorders and recognize basic management plan.

Wrist joint is an ellipsoid joint between the lower end of radius and the carpal bones. Carpal bones arearranged into 2 rows:

The proximal row: scaphoid, lunate, triquetrum, pisiform.

The distal row: trapezium, trapezoid, capitate, hamate.

The movements allowed in wrist joint are:

1-Flexion: flexor carpi radialis, flexor carpi ulnaris.palmarislongus

2-Extension: extensor carpi radialislongus, extensor carpi radialisbrevis, extensor carpi ulnaris.

3- Abduction: flexor carpi radialis, extensor carpi radialislongus, extensor carpi radialisbrevis.

4-Adduction: flexor carpi ulnaris, extensor carpi ulnaris.

#### **SCAPHOID FRACTURE**

The most common wrist fracture. It occurs most commonly due to fall on hyperextended wrist. A common complication is avascular necrosis and nonunion of the scaphoid as the majority of blood supply is to the distal 1/3 of the scaphoid.

#### **Clinical manifestations:**

- History of trauma.
- Pain, swelling and tenderness in wrist and thumb region (anatomical snuff box).

- Deformity.
- Numbness and paresthesias in case of ulnar nerve involvement.

#### **Imaging modalities:**

Plain X ray PA and oblique view of the wrist in ulnar deviation. Can be repeated after 2 weeks.

#### **Treatment:**

- I) Analgesics and anti-inflammatory medications.
- II) Splinting with long thumb spica in non-displaced fracture for 6 weeks.

III) Surgical treatment: open reduction in case of displaced fracture or in case of non-healing.

IV) Post-operative rehabilitation: ROM and strengthening exercises

#### **DEQUERVAIN'S TENOSYNOVITIS**

One of the most common causes of wrist pain.it occurs due to inflammation of abductor polices longusand extensor polices brevis tendons due to repetitive use

#### **Clinical manifestations:**

- Pain on radial aspect of the wrist and the thumb that increase with movement.

- Patent may complain from swelling on radial aspect of the wrist. -
- Finkelstein's test: make a fist around the thumb then put the wrist on ulnar deviation.

#### **Imaging modalities:**

It is a clinical diagnosis and usually no imaging modality is required but if needed musculoskeletal ultrasound (MSUS) is the modality of choice.

#### **Treatment:**

- I) Analgesics and anti-inflammatory medications.
- II) Modification of activity
- III) Local steroid injection.
- IV) Physiotherapy: ultrasound, Laser
- II) Splinting with thumb spica may be needed.
- III) Surgical treatment: usually not needed.

#### **Carpal Tunnel Syndrome**

The most common compression neuropathy. There are 9 tendons as well as 1 nerve (median nerve) that pass through carpal tunnel. Carpal tunnel syndrome occurs when there is compression of the median nerve while passing through the tunnel and it may be idiopathic or secondary to other diseases.

#### **Clinical manifestations:**

- Pain on palmar aspect of the hand more at night.
- Patent may complain from tingling and numbness.
- Carpal compression test.

#### **Imaging modalities:**

Ilation It is a clinical diagnosis and usually no imaging modality is required but if needed nerve conduction studies confirm diagnosis and asses severity.

#### **Treatment:**

- I) Analgesics and anti-inflammatory medications.
- II) Modification of activity
- III) Local steroid injection.
- IV) Physiotherapy: ultrasound, Laser
- II) Splinting of the wrist in neutral position may be needed.
- III) Surgical treatment: for severe cases not responding to medical treatment.

# Chapter 8 Rehabilitation of common Hip disorders

#### **Objectives:**

- Identify the basic anatomical concepts and movements of hip joint.
- Define the most common hip disorders and recognize basic management plan



Hip joint is a ball and socket joint between the acetabulum and the head of femur. It has a relative low mobility in order to increase stability (the reverse of shoulder joint).

The movements allowed in hip joint are:

- 1- Flexion: iliopsoas, rectus femoris
- 2- Extension: gluteus maximus, hamstring.

- 3- Abduction: gluteus medius, gluteus minimus
- 4- Adduction: adductor longus, brevis and magnus
- 5- External rotation: the 6 lateral rotators
- 6- Internal rotation: the anterior fibres of gluteus medius, gluteus minimus

#### Osteoarthritis of the hip

Osteoarthritis is the most common joint disease that usually involve lower limb joints.

#### **Clinical manifestations:**

- Patients usually over 50 years. -
- Pain in the groin that may radiate to the thigh and increase with weight bearing. -
- Decreased ROM of the joint.
- Patients may complain of limping.

#### **Imaging modalities:**

Plain X ray AP& Lateral views of the pelvis.

#### **Treatment:**

I) Analgesics and anti-inflammatory medications.

II) Modification of activity.

III) Local hyaluronic acid injection.

IV) Physiotherapy: ultrasound, Laser, TENS, ROM and strengthening to decrease pain and increase & Populati

ROM.

V) Use a cane in the opposite hand.

VI) Surgical treatment: for severe cases may require replacement of the joint (hip arthroplasty).

### **AVASCULAR NECROSIS OF THE FEMORAL HEAD**

It is death of the femoral head due to interruption of the blood supply. It may be idiopathic or secondary to preexisting disease or steroid use.

#### **Clinical manifestations:**

- Pain in the groin that may radiate to the thigh and increase with weight bearing.
- Pain with ROM.

Loss of internal and external rotation of the hip. -

### **Imaging modalities:**

- Plain x ray: late.
- Magnetic resonance imaging (MRI): Early \_

## **Treatment:**

- I) Analgesics and anti-inflammatory medications.
- II) Modification of activity and decrease weight bearing.
- III) Use a cane in the opposite hand.
- IV) Surgical treatment: Early cases: osteotomy

Advanced cases may require replacement of the joint (hip arthroplasty).

# FEMORAL NECK FRACTURES

### **Clinical manifestations:**

- Pain in the groin that may radiate to the thigh -
- Inability of weight bearing.
- Limb in external rotation.
- Loss of hip ROM. -
- Shortened limb in the affected side.

# **Imaging modalities:**

Plain X ray AP& Lateral views of the pelvis.

# **Treatment:**

opulation I) Analgesics and anti-inflammatory medications

II) Surgical treatment: Pin fixation

Advanced stages may require replacement of the femoral head (hemiarthroplasty).

# **Hamstring Strains**

Hamstring muscles include semitendinosus, semimembranosus and biceps femoris. They extend both hip and knee joint and injury occurs while maximally stretched during active contraction.

#### **Clinical manifestations:**

- Acute posterior thigh pain with movement.
- Pain increases with straight leg raising.
- The patent may feel audible pop.
- Swelling and ecchymosis.

#### **Imaging modalities:**

Usually a clinical diagnosis, MSUS or MRI may be needed to confirm diagnosis

#### **Treatment:**

- I) Analgesics and anti-inflammatory medications.
- II) Rest, ice and compression. جمهورية مسر العربية

III) Physiotherapy (after 1week): stretching and strengthening exercises and exercises on stationarybike.

**IV**) Surgical treatment: in case of complete hamstring rupture



# Chapter 9 Rehabilitation of common Knee disorders

#### **Objectives:**

- Identify the basic anatomical concepts and movements of knee joint.
- Define the most common knee disorders and recognize basic management plan.

Knee joint is a modified hinge joint between the lower end of femur and upper end of tibia and the posterior surface of patella. The knee has 2 unique intra-capsular structures (the cruciate ligaments and the menisci). The movements allowed in knee joint are:

lation

- 1-Flexion: hamstring (semitendinosus, semimembranosus, bicepsfemoris).
- 2-Extension: quadriceps femoris.
- 3- Medial rotation (with knee in flexion):popliteus, semitendinosus, sartorius
- 4-Lateral rotation: (with knee in flexion): biceps femoris.

#### <u>Knee osteoa</u>rthritis

#### Clinical manifestations:

- Patients usually over 50 years.
- Knee pain that increase with weight bearing and decrease with rest.
- Decreased ROM of the joint.
- Crepitus.
- **Imaging modalities:**

Plain X ray AP& Lateral views of the knee while weight bearing



#### **Treatment:**

I) Analgesics and anti-inflammatory medications.

II) Modification of activity and weight reduction.

III) Local hyaluronic acid injection.

**IV)** Physiotherapy: ultrasound, Laser, TENS, ROM exercises and strengthening to decrease pain and increase ROM.

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V) Use a cane in the opposite hand.

VI) Surgical treatment: for severe cases may require replacement of the joint (knee arthroplasty).

#### Anterior cruciate ligament (ACL) injury

Anterior cruciate ligament is the main stabilizer of the knee and ACL is the most commonly injured ligament in the athletes. ealth & Pop

#### **Clinical manifestations:**

- History of trauma
- Usually occurs with hyperextension and change in direction.
- Severe pain and inability to walk.
- Knee swelling and effusion.
- The patent may feel audible pop.
- Anterior drawer test to assess stability.

#### **Imaging modalities:**

Magnetic resonance imaging (MRI) is the modality of choice

Plain radiography may be obtained to exclude fracture.

#### **Treatment:**

- I) Analgesics and anti-inflammatory medications.
- II) Rest, ice. Compression.
- III) Knee aspiration may be needed to decrease intra articular pressure.
- IV) Physiotherapy: to increase ROM and quadriceps strength.

V) Surgical treatment: arthroscopic reconstruction followed by post-operative rehabilitation program.

#### Meniscal injuries

Menisci are shock absorbers of the knee. Meniscal injuries arecommonly associated with ACL injury. Medial meniscus injury occurs with tibial rotation in partially flexed knee. While lateral meniscus injury occurs with rotation in squatting or full flexion.

#### Clinical manifestations:

- History of trauma
- Severe pain and inability to walk.
- Knee swelling and effusion.
- The patent may feel audible pop.
- McMurray test is positive.

#### **Imaging modalities:**

Magnetic resonance imaging (MRI) is the modality of choice

#### **Treatment:**

- I) Analgesics and anti-inflammatory medications.
- II) Rest, ice. Compression.
- III) Knee aspiration may be needed to decrease intra articular pressure.
- `IV) Physiotherapy: to increase ROM and quadriceps strength.

V) Surgical treatment: arthroscopic repair: non-weight bearing for 4–6 weeks. arthroscopic removal: weight bearing as tolerated

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# Chapter10Rehabilitation of common Ankle and foot disorders

#### **Objectives:**

- Identify the basic anatomical concepts and movements of ankle joint.
- Define the most common ankle disorders and recognize basic management plan.

Ankle joint is a hinge joint between the lower end of tibia and the talus. The lateral malleolus lies distal to the medial malleolus mobility in order to increase stability

The movements allowed in ankle joint are:

1-Flexion (plantar flexion): gastrocnemius, soleus, plantaris, tibialis posterior.

2-Extension (dorsiflexion): tibialis anterior, extensor halluces longus, extensor digitorum.

#### Ankle Sprain

It is the most common sport injury. The most commonly injured ligament is the anterior talofibular ligament on the lateral aspect of the ankle joint due to inversion of dorsiflexed foot.

#### **Clinical manifestations:**

- History of trauma (fall on the ankle).
- Pain and may be inability to walk.
- Ankle swelling and possibly ecchymosis.
- The patent may feel audible pop.
- Anterior drawer test to assess stability.

#### **Imaging modalities:**

The patient that doesn't have bony tenderness and can bear weight for 4 consecutive steps: no imaging needed (Ottawa rule)

- If not: Plain radiography may be obtained to exclude fracture.
- Magnetic resonance imaging (MRI) or MSUSmay be needed to confirm the diagnosis.

#### **Treatment:**

- I) Analgesics and anti-inflammatory medications.
- II) Rest, ice, Compression: in acute stage.
- III) Physiotherapy: ROM and strengthening exercises

Tapping and braces.

Ultrasound or short wave.

**IV)** Surgical treatment: reserved to severe cases or failure of conservative treatment for 6 months.

#### <u>Achilles tendon Injury</u>

Achilles tendon is the strongest tendon the body. It is under stress especially with running and jumping so it is liable to inflammation (tendonitis) or even rupture.



#### **Clinical manifestations of Achilles tendon rupture:**

- History of trauma (fall on the ankle) or sudden movement.
- Pain and inability to plantarflex the foot.
- Ankle swelling and possibly ecchymosis.
- The patent may feel audible pop.
- Thompson's test: squeezing of calf muscles doesn't produce plantar flexion.

#### **Imaging modalities:**

- Magnetic resonance imaging (MRI) or MSUS may be needed to confirm the diagnosis.

#### **Treatment:**

I) Analgesics and anti-inflammatory medications.

**II**) Rest, ice, Compression: in acute stage.

III) Bracing in a plantar flexion position for 12 weeks with gradual increase in dorsiflexion.

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**IV**) Surgical treatment: reserved for active individuals.

Post-operative cast for 2 weeks.

Brace for additional 4 weeks.

#### PLANTAR FASCITIS

It is inflammation of the calcaneal insertion of the plantar fascia.

#### **Clinical manifestation:**

- Pain especially when standing after awakening from sleep or prolonged sitting and partially relieved with walking.
- Tenderness on medial calcaneal tuberosity.

#### **Imaging modalities:**

- Plain radiography on heel lateral view to show calcaneal spur.

#### **Treatment:**

- I) Analgesics and anti-inflammatory medications.
- II) Local steroid injection.

III) Physiotherapy: stretching exercises to plantar fascia and tendoachilis

Ultrasound

Shock wave therapy

IV) Heel cushion pad.



V) Surgical treatment: release of the plantar fascia. Rarely needed, if there is failure of conservative treatment for at least 6 months.

# **OSTEOCHONDRAL FRACTURE OF THE TALUS**

May be displaced or non-displaced.

### **Clinical manifestation:**

- Pain with walking.
- Deceased ROM of the ankle.

#### **Imaging modalities:**

- Mild ankle effusion may be found. **dalities:** Plain radiogram
- MRI.

#### **Treatment:**

- I) Analgesics and anti-inflammatory medications.
- II) Non-weight bearing.
- III) Physiotherapy.
- IV) Surgical treatment: reduction and internal fixation in case of displaced fracture.

# Chapter 11 PROTHETICS AND ORTHOTICS

#### **Objectives:**

- -Recognize the main causes and levels of amputation.
- Identify the main components of upper and lower limb prosthesis.
- Identify main indications and components of lower limb orthotics.
- Enumerate walking aid devices.

#### **Causes of limb loss:**

- Congenital.
- Trauma: more in the young males.
- Medical disease Complications i.e., diabetes, peripheral vascular disease- Infections.
- Malignancy.

#### Levels of Amputation:

- 1- Toes amputation.
- 2- Lisfranc's (tarsometatarsal) and Chopart's (tarsotarsal amputations
- 3- Syme's ankle disarticulation:
- 4- Below knee amputation (BKA):
- 5- Knee disarticulation
- 6-Above knee amputation (AKA)
- 7-Hip disarticulation.

#### **Postoperative Stump Care:**

- **Prevention of contracture**: not to place a pillow between legs, not to overly a soft mattress, Amputees should lie prone for 15 minutes 3 times dailyto prevent hip flexion contracture.

- **Postoperative plaster dressing**: protects the stump, prevents edema, and decreases pain.
- Physiotherapy:ROM and strengtheningexercises. -
- Desensitization program: gentle tapping and massage. -

#### What are Prosthetics?

A prosthesis (artificial limb) is a device that replaces as much as possible a missing body part.



#### The main component for lower limb prosthesis are:



1- Sockets:

Population It contacts with the stump and connects it with the prothesis, usually made of

plastic.

2- Socks.



3- Suspensionsystems:

Used to secure the prosthesis to the stump.

4- Shank: tubes or shells that attach the socket to the terminal device

5- Ankle- foot assemblies (terminal device):

Prosthetic feet may be made of metal, plastic, wood or graphite.

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Shank

terminal device

For above knee prostheses a thigh piece and a prosthetic knee joint are added.

#### The main component for upper limb prosthesis are:

Socket, suspension system, cable control system, terminal device.

#### What are Orthotics?

Orthotican external device that improve the function or support a body segment/joint.

(The natural limb exist but has functional impairment, no amputation).



#### **Indications:**

Used to various orthopedic and neuromuscular disorders to improve walking efficacy,

decrease pain and stabilize the gait, for example:

- Spinal cord injury.
- Stroke.
- Paraplegia.
- Foot drop.

- The main component for lower limb orthotics are: 1- Shoes: protect the feet and t body to be a fut
- 2- Stirrups: they connects the shoes to the uprights.
- 3- Uprights: metal plates that extends between joints.
- 4- Ankle joints: it is axis lies between the malleoli.
- **5- Knee joints:** it is axis is centered at the medial femoral condyle.
- 6- Hip joints: can allow free motion or limit motion.
- 7- Calf bands: for support.

- 8- Thigh bands: for support.
- 9- Pelvic bands: to control adduction and rotation of the lower limbs.

### Walking Aids

Ambulatory devices include canes, crutches, and walkers. They help to stabilize the gait

and improve ambulation.



# Chapter 12 POST-OPERATIVE REHABILITATION

#### **Objectives:**

- Recognize the main complications of prolonged immobilization.
- Identify the indications and basic rehabilitation program of main arthroplasty operations.

#### **Complications of prolonged immobilization**:

- 1- Deep venous thrombosis (DVT).
- 2- Pressure ulcers.
- 3- Muscle weakness and atrophy.
- 4- Osteoporosis.
- 5- Postural hypotension.
- 6- Constipation.
- 7- Depression

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#### Total Hip Replacement (THR)



THR means replacement of both femoral head and acetabular surface while hemiarthroplasty means replacement of the femoral head only. It can be fixed as cemented or cementless . Cemented is strongest immediately after insertion of the artificial joint.

#### **Indications:**

- Avascular necrosis.
- Advanced OA of the hip.
- Congenital hip dislocation.

#### **Definitions of weight bearing:**

- Non weight bearing: no weight bearing is allowed.
- Toe touch weight bearing: 10% of body weight is allowed.
- Partial weight bearing: up to 50% of body weight is allowed.
- Weight bearing as tolerated: as much as the patient can tolerate (50-90%)
- Full weight bearing: 100% of the body weight.

#### **Post-operative Rehabilitation:**

 Patient education: no hip flexion more than 90 degree, no adduction of the leg that pass midline and no internal rotation of the leg.

- With cemented THR: weight bearing as tolerated immediately postoperative.
- With cementless THR: toe touch weight bearing for 6 weeks then progress to weight bearing as tolerated.
- **On day 1 postoperative:** bed mobility and transfertraining.Bedside exercises, ankle pump, quadriceps set
- On day 2 postoperative: gait training with assistive device
- **Day3-5 postoperative:** gentle ROM ad strengthening exercises
- After 5 days: more intense mobility and strengthening exercises
  - At 6 weeks postoperative: most patients can walk without a cane.
    - Rehabilitation program should continue from 3 to 6 months

# Total Knee Replacement (TKR)



It is replacement of the opposing articular surfaces of the knee and it usually has cemented fixation. Artificial joint has many types: constrained (the femoral and tibial components connected), semi-constrained and non-constrained (the 2 components separated). The most commonly used is the non-constrained type and its stability depends on knee ligaments.

#### **Post-operative Rehabilitation:**

- **Patient education:** joint protection techniques.
- With cemented TKR: weight bearing as tolerated immediately postoperative.
- With cementless TKR: toe touch or partial weight bearing for 6 weeks then progress to weight bearing as tolerated.
- Day 1 -2 postoperative: continuous passive motion (CPM). Isometric exercises to the hamstring and quadriceps.
- Day3-5 postoperative: gentle ROM ad strengthening exercises
- After 5 days: more intense mobility and strengthening exercises
- Rehabilitation program should continue for at least 3 months

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