JOINT , CONNECTIVE TISSUE AND BONE DISORDERS & MANAGEMENT

CHAPTER 11

1

LEARNING IN THIS CHAPTER

- principles of Management of selected pathologies that affect joints, connective tissue, and bone.
- Characteristics of arthritis, fibromyalgia, myofascial pain syndrome, osteoporosis, and fractures

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ARTHRITIS

- *Arthritis* is inflammation of a joint.
- There are many types of arthritis, both inflammatory and non inflammatory , that affect joints and other connective tissues in the body.
- RA & OA

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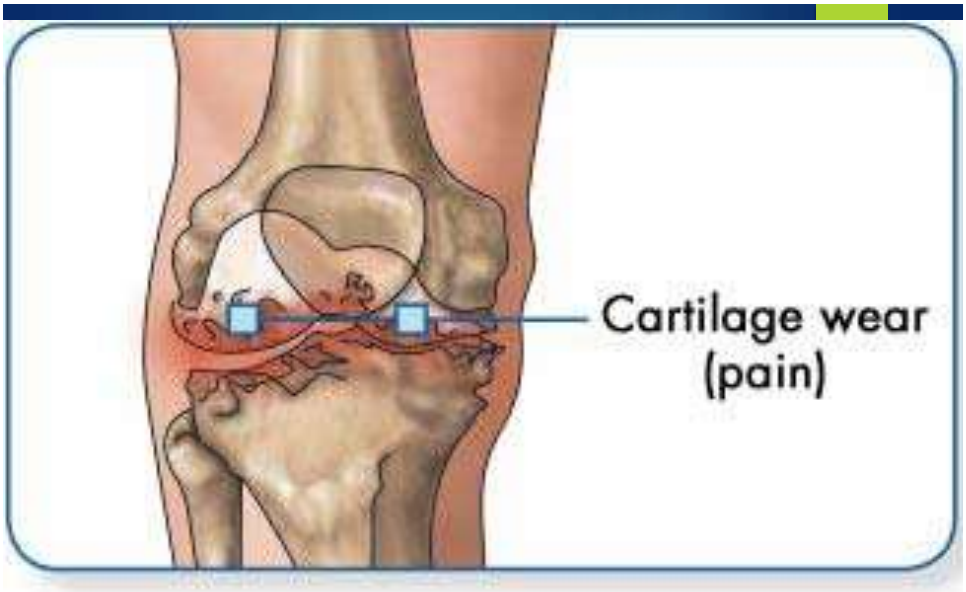

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Arthrosis : limitation of joint without inflammation

Unless the cause of the joint problems is known, such as recent trauma or immobility, medical intervention is necessary to diagnose and medically manage the pathology.

Traumatic arthritis may require aspiration if there is bloody effusion.

The therapist manages the impairments, activity limitations, and participation restrictions that result from the underlying pathology.

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Clinical signs & symptoms

- *Impaired mobility*
  - ✓ Capsular pattern
  - ✓ Firm end feel(in acute guarded)
  - ✓ Decrease and painful Jt play
  - ✓ Joint effusion
- *Arthrosis may be present if the individual is recovering from a fracture or other problem requiring immobilization. There is limited joint play along with other connective tissue and muscular contractures limiting ROM.*

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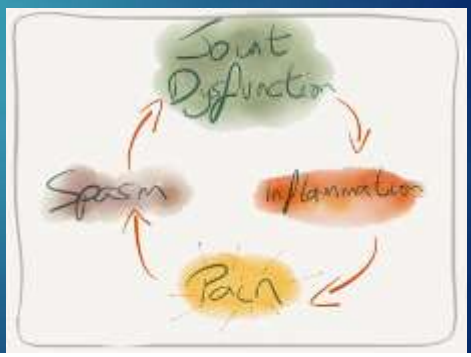
Impaired Ms performance

- With effusion & pain there is weakness and muscle inhibition
- So imbalance & flexibility issue with poor control
- Asymmetry in muscle pull leads to deforming F at Jt
- Good Ms support protect arthritic joint from trauma



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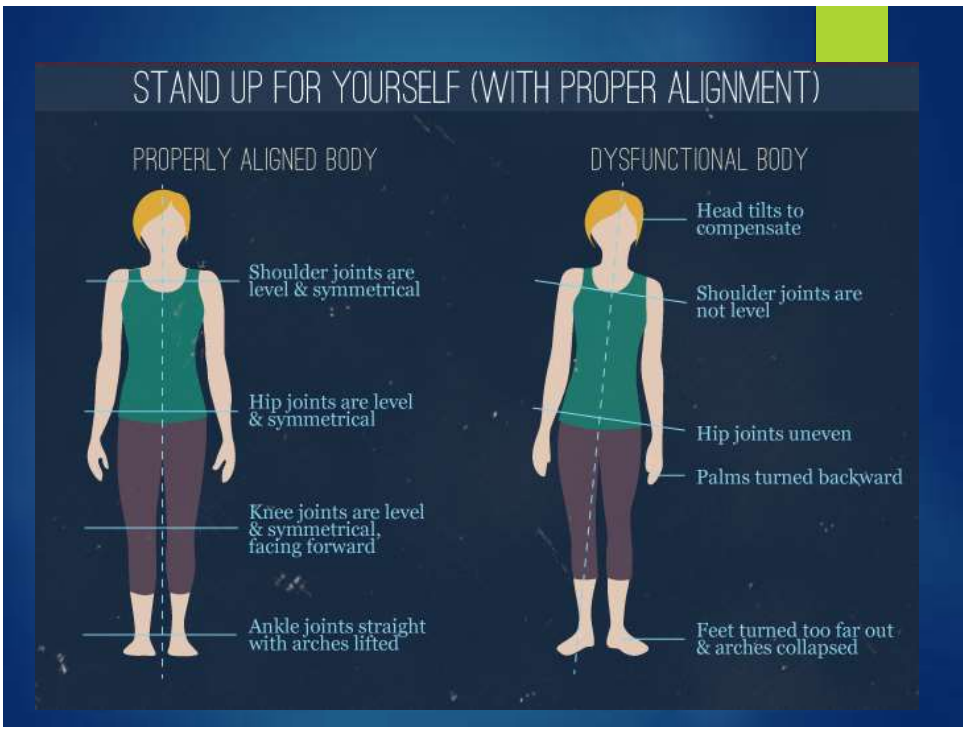

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- Impaired balance d/t decrease sensory input from mechanoreceptors (Wt bearing Jts)
- Activity limitation & participation restriction

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Activity limitation

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Joint protection and energy conservation

- Monitor activities and stop when discomfort or fatigue begins to develop

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Use frequent but short episodes of exercise (three to five sessions per day) rather than one long session

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Alternate activities to avoid fatigue

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- Decrease level of activities or omit provoking activities if joint pain develops and persists for more than 1 hour after activity
- Maintain a functional level of joint ROM and muscular strength and endurance

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- Balance work and rest to avoid muscular and total body fatigue
- Increase rest during flares of the disease
- Avoid deforming positions

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Avoid prolonged static positioning; change positions during the day every 20 to 30 minutes.

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BOX 11.3 Principles of Joint Protection and Energy Conservation[53,73]

- Monitor activities and stop when discomfort or fatigue begins to develop.
- Use frequent but short episodes of exercise (three to five sessions per day) rather than one long session.
- Alternate activities to avoid fatigue.
- Decrease level of activities or omit provoking activities if joint pain develops and persists for more than 1 hour after activity.
- Maintain a functional level of joint ROM and muscular strength and endurance.
- Balance work and rest to avoid muscular and total body fatigue.
- Increase rest during flares of the disease.
- Avoid deforming positions.
- Avoid prolonged static positioning; change positions during the day every 20 to 30 minutes.
- Use stronger and larger muscles and joints during activities whenever possible.
- Use appropriate adaptive equipment.

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OA (DJD)

- A chronic degenerative disorder
- Articular cartilage of synovial joints
- Spurs and lipping
- Synovial and capsular thickening
- Joint effusion
- Impairment lead to participation restriction

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Characteristics of OA

- With degeneration, there may be capsular laxity leading to hypermobility or instability in some ranges of joint motion.
  With pain and decreased willingness to move, contractures eventually develop in portions of the capsule and overlying muscle, so as the disease progresses, motion becomes more limited

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Possible causes

- Although the etiology of OA is not known, mechanical injury to the joint due to a major stress or repeated minor stresses and poor movement of synovial fluid when the joint is immobilized are possible causes

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- OA is also genetically related, especially in the hands and hips and to some degree in the knees.

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Risk factors

BOX 1. COMMON RISK FACTORS FOR OSTEOARTHRITIS OF THE KNEE AND HIP[9,10]

- Age ≥50 years
- Obesity (knee osteoarthritis)
- Being female (especially for knee osteoarthritis)
- Family history
- History of immobilization
- Injury to the joint
- Prolonged occupational or sports stress

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sports with repetitive impact and twisting (e.g., soccer, baseball pitching,

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Occupational activities such as jobs that require kneeling and squatting with heavy lifting.

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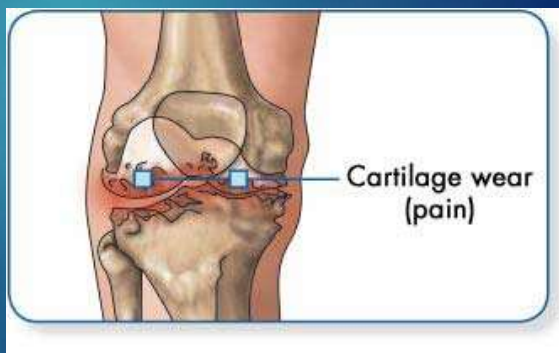
Cartilage splits and thins out, crepitation or loose bodies may occur in the joint. subchondral bone exposed



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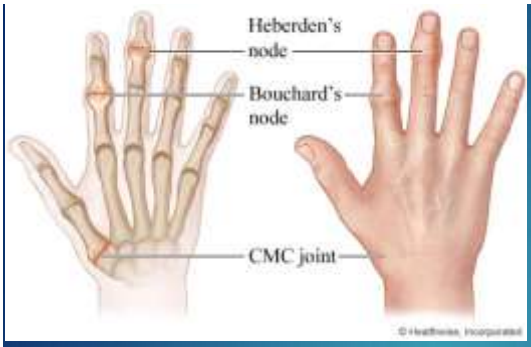

- Affected joints may become enlarged. Heberden's nodes (enlargement of the distal interphalangeal joints of the fingers) and Bouchard's nodes (enlargement of the proximal interphalangeal joints) are common.

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Most Commonly Involved Joints with OA ?

- Most commonly involved are weight-bearing joints (hips and knees), the cervical and lumbar spine, and the distal interphalangeal joints of the fingers and *carpometacarpal joints of the thumbs*

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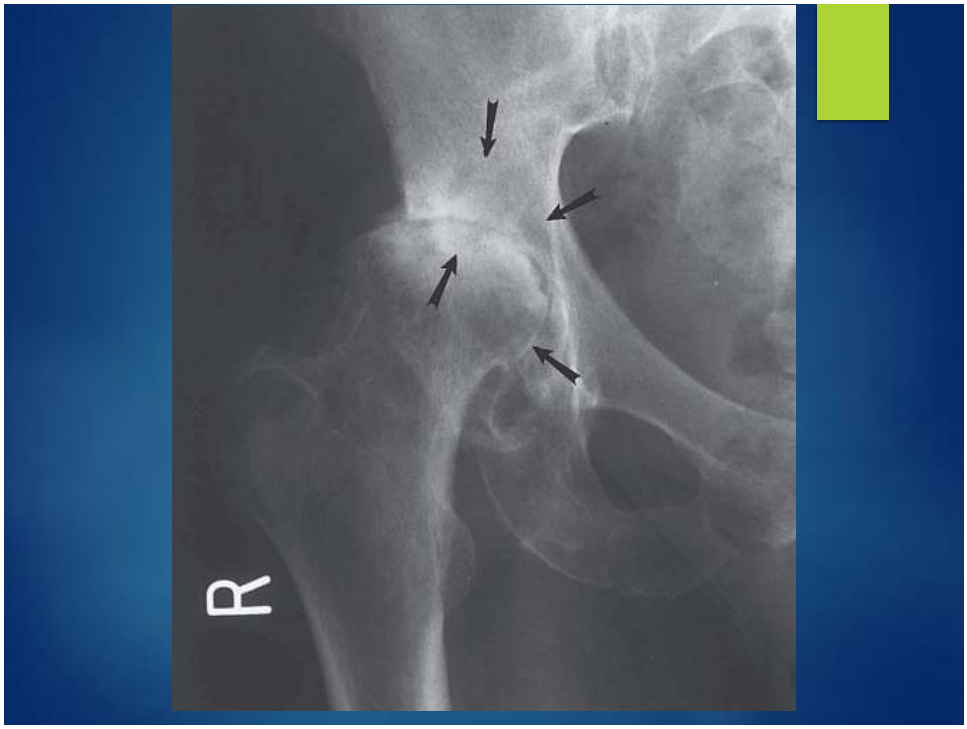

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STRETCHING IN SWOLLEN JOINTS ?? HOW WILL WE PROCEED

- EFFUSION > LIMITED MOTION
- F ON DISTENDED CAPSULE LEADING TO HYPERMOB
- Increase IRRITABILITY and prolong Jt reaction

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Principles of Management

- ***Patient Instruction.***
- **Pain Management: Pain and stiffness during early stages**

Brief periods of stiffness occur in the morning or after periods of inactivity. This is due to gelling of the involved joints after periods of inactivity.

Movement relieves the stasis and feelings of stiffness. Help the patient find a balance between activity and rest and correct biomechanical stresses in order to prevent, retard, or correct the mechanical limitations

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- *Late stages.* During the late stages of the disease, pain is often present at rest. The pain is probably from secondary involvement of subchondral bone, synovium, and the joint capsule. In the spine, if boney growth encroaches on the nerve root, there may be radicular pain Emphasize activity modification and use of assistive devices and/or splints to minimize joint stress. Pain that cannot be managed with activity modification and analgesics is usually an indication for surgical intervention

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Assistive and supportive devices and activity

- Adaptive or assistive devices, such as a raised toilet seat, cane, or walker, may be needed to decrease painful stresses and maintain function.
- Shock-absorbing footwear may decrease the stresses in OA of the knees.
- Aquatic therapy and group-based exercise in water decreases pain and improves physical function in patients with lower extremity OA.

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Resistance exercise.

- Strong muscles protect the joint
- use of multiple-angle isometrics in pain-free positions, applying resistance only through arcs of motion that are not painful, and use of a pool to decrease weight-bearing stresses and improve functional performance

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Stretching and joint mobilization.

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Balance activities: Joint position sense may be impaired.

Tai Chi

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Aerobic conditioning.

- low impact on the joints, such as walking, biking, or swimming.
- Avoid activities that cause repetitive intensive loading of the joints, such as jogging and jumping.

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BOX 11.4 MANAGEMENT GUIDELINES— Osteoarthritis

Structural/Functional Impairments, Activity Limitations, and Participation Restrictions:

Pain with mechanical stress or excessive activity
Pain at rest in the advanced stages
Stiffness after inactivity
Limitation of motion
Muscle weakness
Decreased proprioception and balance
Functional limitations in ADLs and IADLs

Plan of Care	Intervention
1. Educate the patient.	1. Teach about deforming forces and prevention. Teach home exercise program to reinforce interventions and minimize symptoms.
2. Decrease effects of stiffness.	2. Active ROM Joint-play mobilization techniques
3. Decrease pain from mechanical stress and prevent deforming forces.	3. Splinting and/or assistive equipment to minimize stress or to correct faulty biomechanics, strengthen supporting muscles. Alternate activity with periods of rest.
4. Increase ROM.	4. Stretch muscle, joint, or soft tissue restrictions with specific techniques.
5. Improve neuromuscular control, strength, and muscle endurance.	5. Low-intensity resistance exercises and muscle repetitions.
6. Improve balance.	6. Balance training activities.
7. Improve physical conditioning.	7. Nonimpact or low-impact aerobic exercise.

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- Recently published clinical practice guidelines highlight the importance of therapeutic exercise and physical activity to increase strength, manage pain, and improve aerobic capacity and functional status in patients with OA.

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- Two systematic reviews of studies designed to examine evidence of the effects of exercise in the management of hip and knee OA describe support for aerobic exercise and strengthening exercises to reduce pain and disability.
- exercise should be individualized and patient-centered with consideration for age, comorbidity, and general mobility

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Rheumatoid Arthritis

- Rheumatoid arthritis (RA) is an autoimmune, chronic, inflammatory, systemic disease primarily of unknown etiology affecting the synovial lining of joints as well as other connective tissue.
- It is characterized by a fluctuating course, with periods of active disease and remission. The onset and progression vary from mild joint symptoms with aching and stiffness to abrupt swelling, stiffness, and progressive deformity

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- Rheumatoid arthritis (RA) is a chronic autoimmune disease targeting multiple joints. The synovium is the primary site of the inflammatory process, which if untreated leads to irreversible damage to the adjacent cartilage and bone. It is now well established that autoantibodies that are characteristic of RA, including rheumatoid factor (RF) and anti-citrulluninated protein antibodies (ACPA), are present before clinical disease onset.

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Characteristics of RA

- Characterized by symmetric, errosive synovitis with periods of exacerbation (flare) and remission. Joints are characteristically involved with early inflammatory changes in the synovial membrane, peripheral portions of the articular cartilage, and subchondral marrow spaces. In response, granulation tissue (pannus) forms, covers, and erodes the articular cartilage, bone, and ligaments in the joint capsule.

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- Adhesions may form, restricting joint mobility. With progression of the disease, cancellous bone becomes exposed. Fibrosis, ossific ankylosis, or subluxation may eventually cause deformity and disability
  - Inflammatory changes also occur in tendon sheaths (tenosynovitis); if subjected to recurring friction, the tendons may fray or rupture.

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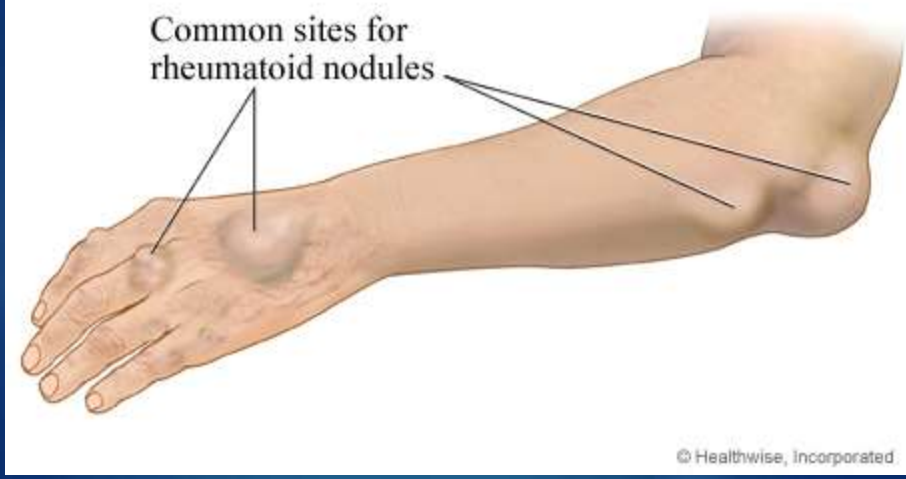

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TABLE 11.1 Comparison of Osteoarthritis and Rheumatoid Arthritis[5,18,44,84,91,92]

Characteristics	Osteoarthritis	Rheumatoid Arthritis
Age of onset	Usually after age of 40	Usually begins between age 15 and 50
Progression	Usually develops slowly over many years in response to mechanical stress	May develop suddenly, within weeks or months
Manifestations	Cartilage degradation, altered joint architecture, osteophyte formation	Inflammatory synovitis and irreversible structural damage to cartilage and bone
Joint involvement	Affects a few joints (usually asymmetrical); typically: —DIP, PIP, 1st CMC of hands —Cervical and lumbar spine —Hips, knees, 1st MTP of feet	Usually affects many joints, usually bilateral; typically: —MCP and PIP of hands, wrists, elbows, shoulders —Cervical spine —MTP, talonavicular and ankle
Joint signs and symptoms	Morning stiffness (usually <30 min), increased joint pain with weight-bearing and strenuous activity; crepitus and loss of ROM	Redness, warmth, swelling, and prolonged morning stiffness; increased joint pain with activity
Systemic signs and symptoms	None	General feeling of sickness and fatigue, weight loss and fever; may develop rheumatoid nodules, may have ocular, respiratory, hematological, and cardiac symptoms

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BOX 11.1 Criteria for Diagnosis of Rheumatoid Arthritis[6]

1. Morning stiffness in and around the joints, lasting at least 1 hour before maximal improvement
2. At least three of the following joints simultaneously have soft tissue swelling or fluid observed by a physician: right or left proximal interphalangeal (PIP); metacarpophalangeal (MCP); wrist, elbow, knee, ankle, and metatarsophalangeal (MTP) joints).
3. Swelling in the wrist, MCP, or PIP joints
4. Symmetrical joint involvement (bilateral involvement of PIP, MCP, or MTP joints may occur without absolute symmetry)
5. Rheumatoid nodules
6. Positive serum rheumatoid factor
7. Radiographic changes including erosions or or boney decalcification localized in or adjacent to the involved joints

NOTE: RA is defined by the presence of at least four of these seven criteria. Numbers 1–4 must have been present for at least 6 weeks.

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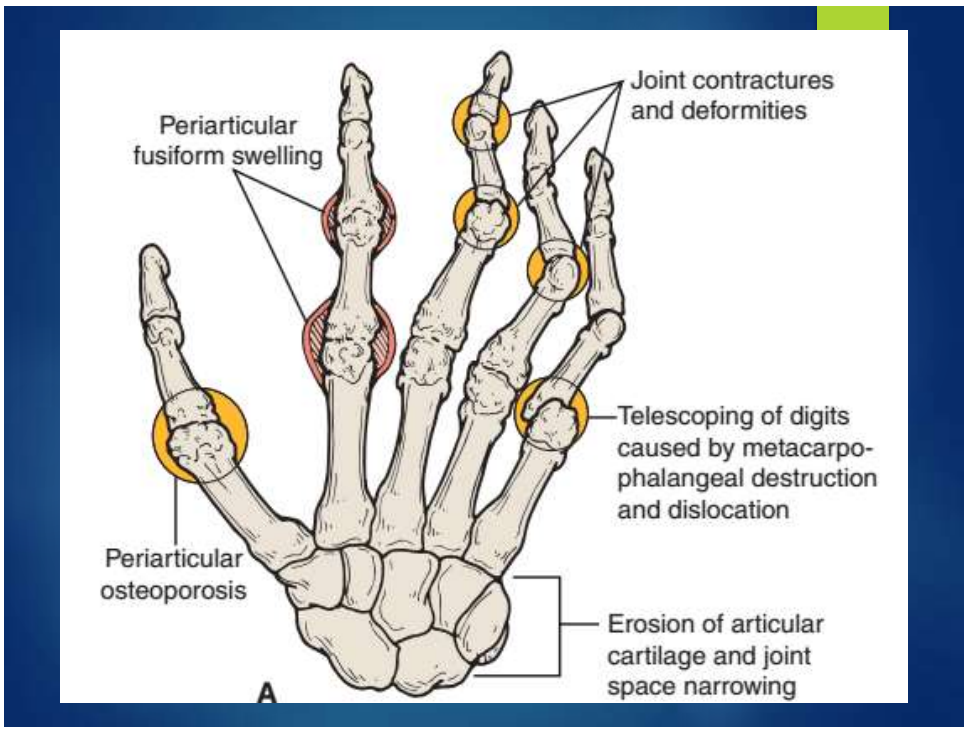

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FIGURE 11.3 Rheumatoid arthritis of the foot. First metatarsophalangeal joint shows severe erosion of the joint surface with subluxation of the metatarsal (arrow). (From McKinnis,[42] p 58, with permission.)

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- Extra-articular pathological changes sometimes occur; they include rheumatoid nodules, atrophy and fibrosis of muscles with associated muscular weakness, fatigue, and mild cardiac changes.
  - Progressive deterioration and decline in the functional level of the individual attributed to the muscular changes and progressive muscle weakness is often seen, leading to major economic loss and significant impact on families.

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- The degree of involvement varies. Some individuals experience mild symptoms that require minor lifestyle changes and mild anti-inflammatory medications. Others experience significant pathological changes in the joints that require major adaptations in lifestyle. Loss of joint function is irreversible, and often surgery is needed to decrease pain and improve function.

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- Early recognition is essential during the initial stages, with referral to a rheumatologist for diagnosis and medical management to control the inflammation and minimize joint damage

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Signs and Symptoms: Periods of Active Disease

- With synovial inflammation, there is effusion and swelling of the joints, which cause aching and limited motion.
- Joint stiffness is prominent in the morning. Usually there is pain on motion, and a slight increase in skin temperature can be detected over the joints. Pain and stiffness worsen after strenuous activity.
  - Onset is usually in the smaller joints of the hands and feet, most commonly in the proximal interphalangeal joints. Usually symptoms are bilateral.

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- With progression, the joints become deformed and may ankylose or subluxate.
  - Pain is often felt in adjoining muscles, and eventually muscle atrophy and weakness occur. Asymmetry in muscle strength and alterations in the line of pull of muscles and tendons add to the deforming forces.
  - The person often experiences nonspecific symptoms such as low-grade fever, loss of appetite and weight, malaise, and fatigue.

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BOX 11.3 Principles of Joint Protection and Energy Conservation[53,73]

- Monitor activities and stop when discomfort or fatigue begins to develop.
- Use frequent but short episodes of exercise (three to five sessions per day) rather than one long session.
- Alternate activities to avoid fatigue.
- Decrease level of activities or omit provoking activities if joint pain develops and persists for more than 1 hour after activity.
- Maintain a functional level of joint ROM and muscular strength and endurance.
- Balance work and rest to avoid muscular and total body fatigue.
- Increase rest during flares of the disease.
- Avoid deforming positions.
- Avoid prolonged static positioning; change positions during the day every 20 to 30 minutes.
- Use stronger and larger muscles and joints during activities whenever possible.
- Use appropriate adaptive equipment.

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BOX 11.2 MANAGEMENT GUIDELINES— Rheumatoid Arthritis/Active Disease Period

Structural/Functional Impairments, Activity Limitations, and Participation Restrictions:

Tenderness and warmth over the involved joints with joint swelling
Muscle guarding and pain on motion
Joint stiffness and limited motion
Muscle weakness and atrophy
Potential deformity and ankylosis from the degenerative process and asymmetric muscle pull
Fatigue, malaise, sleep disorders
Restricted ADLs and IADLs

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Plan of Care	Interventions
1. Educate the patient.	1. Inform the patient on importance of rest, joint protection, energy conservation, and performance of ROM. Teach home exercise program and activity modifications that conserve energy and minimize stress to vulnerable joints.

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2. Relieve pain and muscle guarding and promote relaxation.	2. Modalities Gentle massage Immobilize in splint Relaxation techniques Medications as prescribed by physician
3. Minimize joint stiffness and maintain available motion.	3. Passive or active-assistive ROM within limits of pain, gradual progression as tolerated. Gentle joint techniques using grade I or II oscillations.

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Functional training. Modify any activities of daily living

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4. Minimize muscle atrophy.	4. Gentle isometrics in pain-free positions, progression to ROM when tolerated.
5. Prevent deformity and protect the joint structures.	5. Use of supportive and assistive equipment for all pathologically active joints. Good bed positioning while resting. Avoidance of activities that stress the joints.

PRECAUTIONS: Respect fatigue and increased pain; do not overstress osteoporotic bone or lax ligaments.

CONTRAINDICATIONS: Do not stretch swollen joints or apply heavy resistance exercise that cause joint stress.

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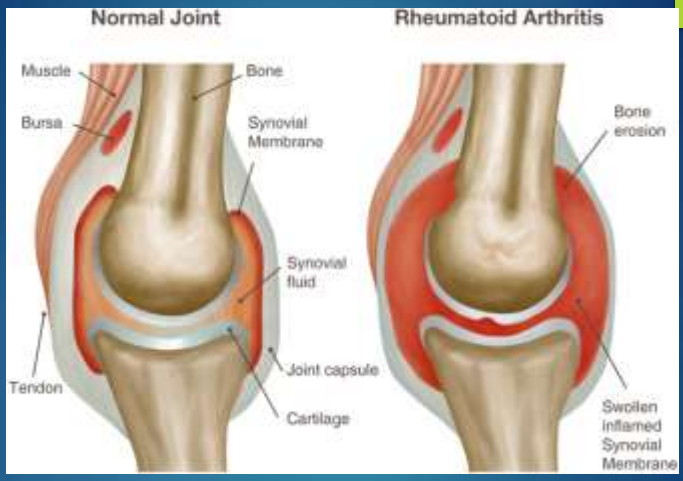

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Exercise.

- **The type and intensity of exercise vary depending on the symptoms. Encourage the patient to do active exercises through as much ROM as possible (not stretching). If active exercises are not tolerated owing to pain and swelling, passive ROM is used. Once symptoms of pain and signs of swelling are controlled with medication, progress exercises as if subacute**

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Therapeutic exercises cannot positively alter the pathological process of RA, but if administered carefully, they can help prevent, retard, or correct the mechanical limitations and deforming forces that occur and therefore, help maintain function.

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The joint capsule, ligaments, and tendons

may be structurally weakened by the rheumatic process (also as a result of using steroids), so the dosage of stretching and joint mobilization techniques used to counter any contractures or adhesions must be carefully graded

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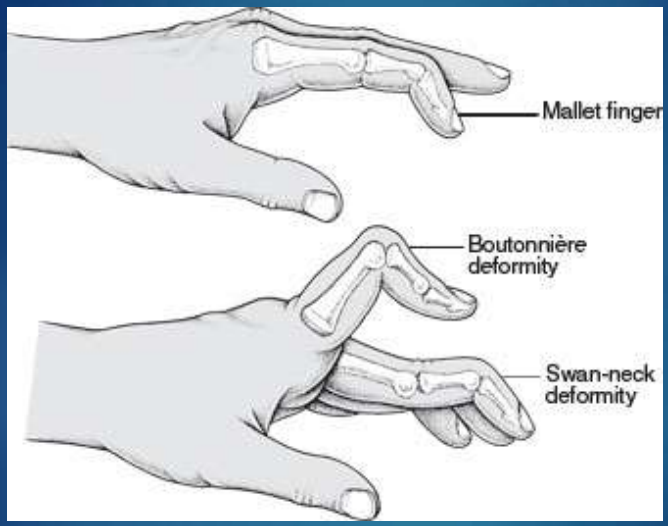

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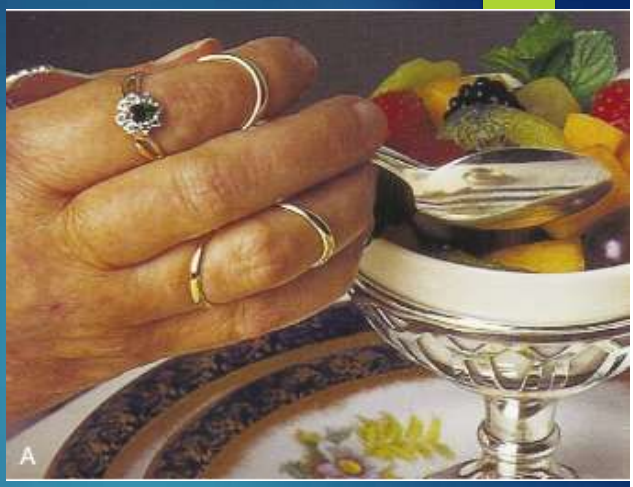

- Ring orthoses to correct swan-neck and boutonnière deformities

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Orthosis to correct ulnar deviation of the fingers

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- Resting orthosis to decrease pain in acutely inflamed joints

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- Broad-handle utensils to facilitate meal consumption and opening of faucets

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Knee brace to unload the medial knee compartment

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Principles of Management: Subacute and Chronic Stages of RA

- As the intensity of pain, joint swelling, morning stiffness, and systemic effects diminish, the disease is considered subacute.
  Often medications can decrease the acute symptoms, so the patient can function as if in the subacute stage. The chronic stage occurs between exacerbations. This may be very short in duration, or it may last many years.

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- *Joint protection and activity modification*
- *Flexibility and strength*
- *Cardiopulmonary endurance*
  Nonimpact or low-impact conditioning exercises—such as aquatic exercise, cycling, aerobic dancing, and walking/running—performed within the tolerance of the individual with RA, improve aerobic capacity and physical activity and decrease depression and anxiety. Group activities, such as water aerobics, also provide social support in conjunction with the activity.

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Myofascial pain syndrome

- Myofascial pain syndrome (MPS) is defined as a painful disorder characterized by the presence of myofascial trigger points, distinct sensitive spots in a palpable taut band of skeletal muscle fibers that produce local and referred pain.

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- Thus, MPS is characterized by both a motor abnormality (a taut or hard band within the muscle) and a sensory abnormality (tenderness and referred pain).
- In addition to pain, the disorder is accompanied by referred autonomic phenomena as well as by anxiety and depression

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Myofascial Pain Syndrome

- Chronic regional pain syndrome
- myofascial trigger points (MTrPs) with specific referred pattern of pain.
- The *trigger point* is defined as a hyperirritable area in a tight band of muscle

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- The patient generally complains about dull or achy pain, sometimes poorly localized, particularly during repetitive activities or activities requiring sustained postures.
- Symptoms are exacerbated with digital pressure over tender areas of muscle with reproduction of the patient's usual pain.
- Symptoms are relieved with rest or cessation of repetitive activities.
- The presence of sleep disturbances, depressed mood, and fatigue may help distinguish patients with MPS from those with fibromyalgia.
- The pathophysiologic process of MPS is not clearly understood,

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Treatment

- US
- Laser
- Physical therapy techniques that focus on correction of muscle shortening by targeted stretching, strengthening of affected muscles, and correction of aggravating postural and biomechanical factors are generally considered to be the most effective treatment of MPS
- Spray & Stretch
- Dry needling
- Hypnosis
- MTrPs Injections.

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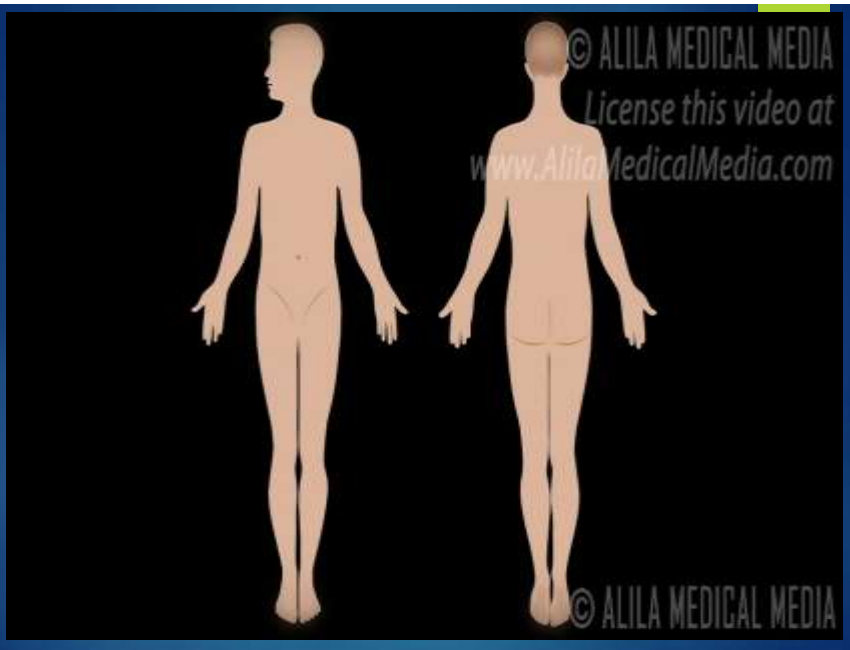

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TABLE 11.2 Similarities and Differences Between Fibromyalgia and Myofascial Pain Syndrome

Similarities	
Pain in muscles Decreased ROM Postural stresses	
Differences	
Fibromyalgia	***Myofascial Pain Syndrome***
Tender points at specific cites	Trigger points in muscle
No referred patterns of pain	Referred patterns of pain
No tight band of muscle	Tight band of muscle
Fatigue and waking unrefreshed	No related fatigue complaints

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Fibromyalgia

Fibromyalgia, as defined by the American College of Rheumatology

a chronic condition characterized by widespread pain that covers half the body (right or left half, upper or lower half) plus the axial skeleton, and has lasted for more than 3 months.

- ✓ 11 of 18 tender points at specific sites throughout the body
- ✓ Sleep issue , morning stiffness, post activity fatigue

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Characteristics of FM

- The first symptoms of FM can occur at any age but usually appear during early to middle adulthood.
- For many of those diagnosed, the symptoms develop after physical trauma such as a motor vehicle accident or a viral infection.
- Pain is usually described as muscular in origin and is predominantly reported in the scapula, head, neck, chest, and low back
- Fluctuation in symptoms

Environmental / Physical & Emotional Stress can aggravate symptoms

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Management

- Aerobic Ex

**aerobic exercise was beneficial in reducing FM symptoms and improving exercise capacity, and resistance exercises might be beneficial in reducing symptoms

- Modification in activities
- Avoidance of stress
- Cognitive behavior therapy

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Cognitive-behavioral therapy

- Cognitive-behavioral therapy is the psychological approach that focuses on changing dysfunctional beliefs by which individuals process, store, and act on information.

- Nature of Pain has been evaluated and there is no cure for pain
- Physical activity and conditioning will increase functional capabilities and eventually reduce suffering
- No harm with this physical Conditioning
- Re-injury or worsening of symptoms are unlikely

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