Clients w/ Orthopedic,
Injury and Rehabilitation
Concerns

Chapter 21
**Terminology**

- **Macrotrauma** – A specific, sudden episode of overload injury to a given tissue, resulting in disrupted tissue integrity (Acute)
- **Microtrauma** – Overuse injury that results from repeated, abnormal stress applied to a tissue by continuous training or training with too little recovery time (Chronic)
- **Edema** – Escape of fluid into the surrounding tissues—inhobiting contractile tissue function and significantly limiting the injured client’s activity level
- **Collagen fibers** – The structural component of new tissue that are strongest when they are lie longitudinally to the primary line of stress.
- **Indication** – An activity that will benefit the injured client
- **Contraindication** – An activity or practice that is inadvisable or prohibited because of the given injury
- **Precaution** – An activity that may be performed under supervision of a qualified personal trainer and according to client limitations and symptom reproduction
- **Annulus fibrosus** – Tough outer layer of intervertebral disk
- **Nucleus pulposus** – Gelatinous inner layer of intervertebral disk
- **Spondylolysis** – a defect or fracture of the arched area of the vertebra that connects the superior and inferior facet joints
- **Spondylolisthesis** – the possible progression of spondylolysis, a forward slippage of one vertebral body on another.
- **Debridement** – involves scraping away at the edge of the tear until a clean, bleeding surface of the tendon is achieved. Allows for greater healing.
- **Decompression** – Involves scraping or shaving away the bone on the anterior and inferior acromion to decrease stress or impingement of rotator cuff tendons
Tissue Healing Following Injury

► **Inflammation Phase**
  - Body’s initial reaction to injury
  - Necessary in order for normal healing to occur
  - Goal: Prepare for new tissue formation (production of new blood vessels & collagen)
    - R.I.C.E. (Rest, Ice, Compression, Elevation)
  - Exercise to injured area not recommended during this phase

► **Repair Phase**
  - Allows for the replacement/regeneration of tissues
  - Goals: Prevent excessive muscle atrophy and joint degeneration, promote collagen synthesis, avoid disruption of the newly formed collagen fibers
  - Balance w/ intro of low-load stresses (promote collagen production & maintain joint motion)
  - Follow the Physician’s Orders w/ exercise
Tissue Healing Following Injury Cont’

- **Remodeling Phase**
  - Weakened tissue produced during repair is strengthened
    - Collagen fibers and scar tissues hypertrophy and align more along lines of stress
  - Goal: Optimize tissue function by continuing exercises performed during repair and by adding more advanced activity-specific exercises and progressive stresses to injured tissues
## Goals During Tissue Healing

<table>
<thead>
<tr>
<th>Phase</th>
<th>Duration</th>
<th>Events</th>
</tr>
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<tbody>
<tr>
<td>Inflammation</td>
<td>Minimum 2 - 3 days</td>
<td>Pain, swelling, and redness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decreased collagen synthesis</td>
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<td></td>
<td></td>
<td>Increased number of inflammatory cells</td>
</tr>
<tr>
<td>Repair</td>
<td>Begins w/in 3 - 5 days and may last up to 2 months</td>
<td>Collagen fiber production</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decreased collagen fiber organization</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decreased number of inflammatory cells</td>
</tr>
<tr>
<td>Remodeling</td>
<td>2 - 4 months (or longer)</td>
<td>Proper collagen fiber alignment</td>
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<tr>
<td></td>
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<td>Increased tissue strength</td>
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</tbody>
</table>
Low Back

- **Lumbar Disc Injury**
  - **Anatomical Limitations**
    - Lumbar region: Annulus fibrosus reinforced anteriorly by strong anterior longitudinal ligament; posterior support limited because the posterior longitudinal ligament narrows
  - **Disc herniations**
    - Part of the nucleus pulposus makes its way through the outer annulus fibrosus, resulting in inflammation that irritates the spinal roots
  - **Movement Guidelines**
    - Generally avoid lumbar flexion in favor of extension
    - Resistance Contraindications may include full sit-ups
    - Resistance Precautions may include squats, all rowing movements, and the deadlift
    - Cardio Precautions may include those that encourage flexion (bike or flexion based aerobics)
    - Flexibility important for those w/ disc injuries; Contraindications are those that involve lumbar flexion (Standing toe touch); Precautions may include gluteal, hip adductor and upper back stretches
Anatomical Limitations
Anatomy Lumbar Spine

- Intervertebral Disk
- Vertebra
- Nerve Root
- Nucleus Pulposus
- Annulus
- Facet Joint
Lumbar Disc Herniation
Low Back Cont’

► Muscle Strains
  - As discussed earlier they are tears to the muscle fibers
  - Movement Guidelines
    - Once determined by physician or physical therapist which muscle has been strained, exercises and movements for that muscle should be avoided during early phases of healing

► Spondylolysis and Spondylolisthesis
  - Commonly occurs following lumbar extension injuries or in persons requiring lumbar extension (divers, gymnasts, etc.)
  - Movement Guidelines
    - Clients should focus on strengthening the muscles surrounding the spine and avoid exercises involving lumbar extension
    - Cardiovascular activities should be modified to adapt to clients' needs / levels tolerance
Spondylolysis and Spondylolisthesis
# Low Back Pain Movement and Exercise Guidelines

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Movement contraindications</th>
<th>Exercise contraindications</th>
<th>Exercise indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disc injury</td>
<td>-Lumbar flexion</td>
<td>-Sit-up</td>
<td>-Passive lumbar extension stretches</td>
</tr>
<tr>
<td></td>
<td>-Lumbar rotation</td>
<td>-Knee to chest stretch</td>
<td>-Isometric ab and extensor strengthening, progressing to lumbar stabilization program</td>
</tr>
<tr>
<td>Muscle strain</td>
<td>-Passive lumbar flexion (during inflammatory phase)</td>
<td>-Knee to chest stretch</td>
<td>-None during inflammatory phase, progressing to gentle flexion stretching, followed by extension strengthening</td>
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<tr>
<td>and Spondylolisthesis</td>
<td>-Active lumbar extension (during inflammatory phase)</td>
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<tr>
<td>Spondyloysis</td>
<td>-Lumbar extension</td>
<td>-Squat</td>
<td>-Knee to chest stretch</td>
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<tr>
<td></td>
<td></td>
<td>-Shoulder press</td>
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<tr>
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<td>-Push press</td>
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Shoulder

► **Impingement Syndrome**
  - “Pinching” of the supraspinatus, long head of the biceps tendon, or subacromial bursa under the acromial arch
  - **Causes:**
    - Hooked Acromion, muscle imbalances, poor posture, poor scapular control, improper exercise technique/excessive ROM, and overuse of shoulder (typically overhead)
  - **Movement Guidelines**
    - Implement Rotator Cuff & Scapular exercises (rhomboids, middle & lower trapezius) to promote muscle balance/control
    - Overhead presses exercises and all bench presses used cautiously
      - Decline might be most appropriate for reintroduction
    - Avoid exercises that raise the elbow too high
    - Lat pulldown behind the head is contraindicated
    - Cardio exercises that place the arm overhead should be used with caution
Acromioplasty - Shoulder Impingement Syndrome Surgery

A large skin incision is made over the shoulder to reach the area of injury. The anterior portion of the acromion is removed.
Shoulder Cont’

► Anterior Instability
  ▪ Where the head of the humerus moves too far forward, resulting in possible injury or dislocation.
  ▪ Shoulder dislocation is likely to reoccur after initial dislocation (especially in the young)
  ▪ Movement Guidelines
    ► Rotator Cuff & Scapular Strengthening
    ► Contraindications in table 21.3 must be followed closely
    ► Shoulder exercises should stay within the “safe zone”
    ► Cardio and Flexibility exercises should be limited to those that remain within the “safe zone”
Shoulder Cont’

► Rotator Cuff Debridement and Subacromial Decompression
  - Movement Guidelines
    - FOLLOW THE PHYSICAL THERAPIST’S GUIDELINES
    - Continue rotator cuff & scapular strengthening exercises
    - Contraindications after these procedures are low rep high intensity exercises and exercises outside the “safe zone”
    - After rehab and recovery is complete, most activities are indicated but caution must be used

► Rotator Cuff Repair
  - Most often carried out when there is a tear through the full thickness of the muscle
  - Movement Guidelines
    - Amount of time immobilized determined by physician
    - Rehab includes rotator cuff & scapular strengthening
    - Contraindications: Listed on table 21.3 pg. 545
Knee

► Anterior Knee Pain

- Common description by clients that includes many possible diagnoses caused by poor mechanics, overuse or muscle imbalances
- Individual approach must be taken with each diagnoses
- Rehab would focus on reducing inflammation and optimizing tissue function
- Movement Guidelines
  - Exercises requiring greater than 90 Degrees of knee flexion must be used with caution
  - 90 degrees contraindicated in high impact aerobics; generally recommend cycling or water based aerobic activities
Anatomy of the Knee

- Femur (thigh bone)
- Patella (knee cap)
- Patellar tendon
- Tibia (shin bone)
- Fibula
- Lateral collateral ligaments
- Lateral meniscus
- Medial collateral ligaments
- Medial meniscus
- Anterior cruciate ligament (ACL)
- Posterior cruciate ligament (PCL)
- Articular cartilage
Knee Cont’

► Anterior Cruciate Ligament (ACL) Reconstruction

▪ Graft taken to reconstruct the ACL (patellar, semitendinosus, or gracilis)

▪ Movement Guidelines

► After discharged from rehab should have full ROM and good quad strength/function

► Post rehab exercises should combine Open and Closed chain exercises

► Leg extension should be used with caution (last 30 degrees = most stress on ACL) for first 6 months to 1 year

► Contraindications: Full ROM extension and Closed Chain exercises w/ more than 90 degree knee flexion

► Take into account where graft was taken from
Knee Cont’

► Total Knee Arthroplasty
  ▪ Total knee replacement where prosthetics are inserted to cover worn areas of the femur and tibia

► Movement Guidelines
  ▪ Table 21.5 pg. 550
Hip

► Total Hip Arthroplasty
  - Total hip replacement where prosthetics are inserted to cover worn areas of the femur
  - Movement Guidelines
    - indicated on table 21.5 pg. 550
Arthritis

► Osteoarthritis
  - The progressive destruction of a joint’s articular cartilage.
  - Often manifests itself as spurs or osteophytes that interfere w/ normal joint function and cause pain and limited ROM
  - Leads to bone on bone contact that causes inflammation
  - Movement Guidelines
    - Low-resistance, high repetition, minimize loading of articular surfaces (water based, bikes, etc)
    - Typically open chain exercises better because of less compressive forces
    - Guidelines table 21.7 pg. 552

► Rheumatoid Arthritis
  - A systemic inflammatory disease affecting not only joint surface, but also connective tissue (joint capsules and ligaments)
  - Movement Guidelines
    - Neck specific exercises contraindicated
    - Guidelines table 21.8 pg. 553