Anterior Shoulder Instability: Postoperative rehabilitation and modifications with associated procedures

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ORTHOSURGERY

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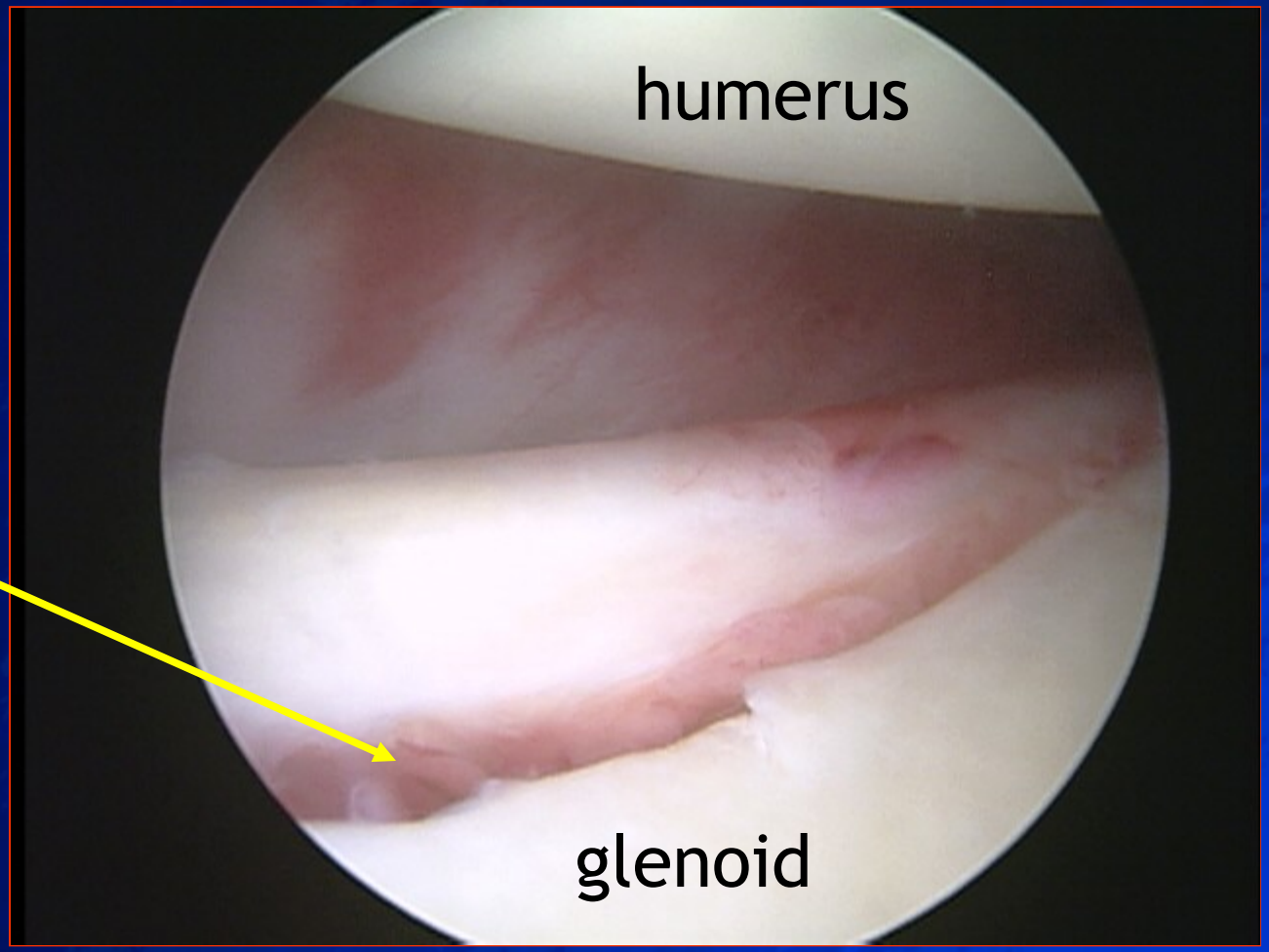
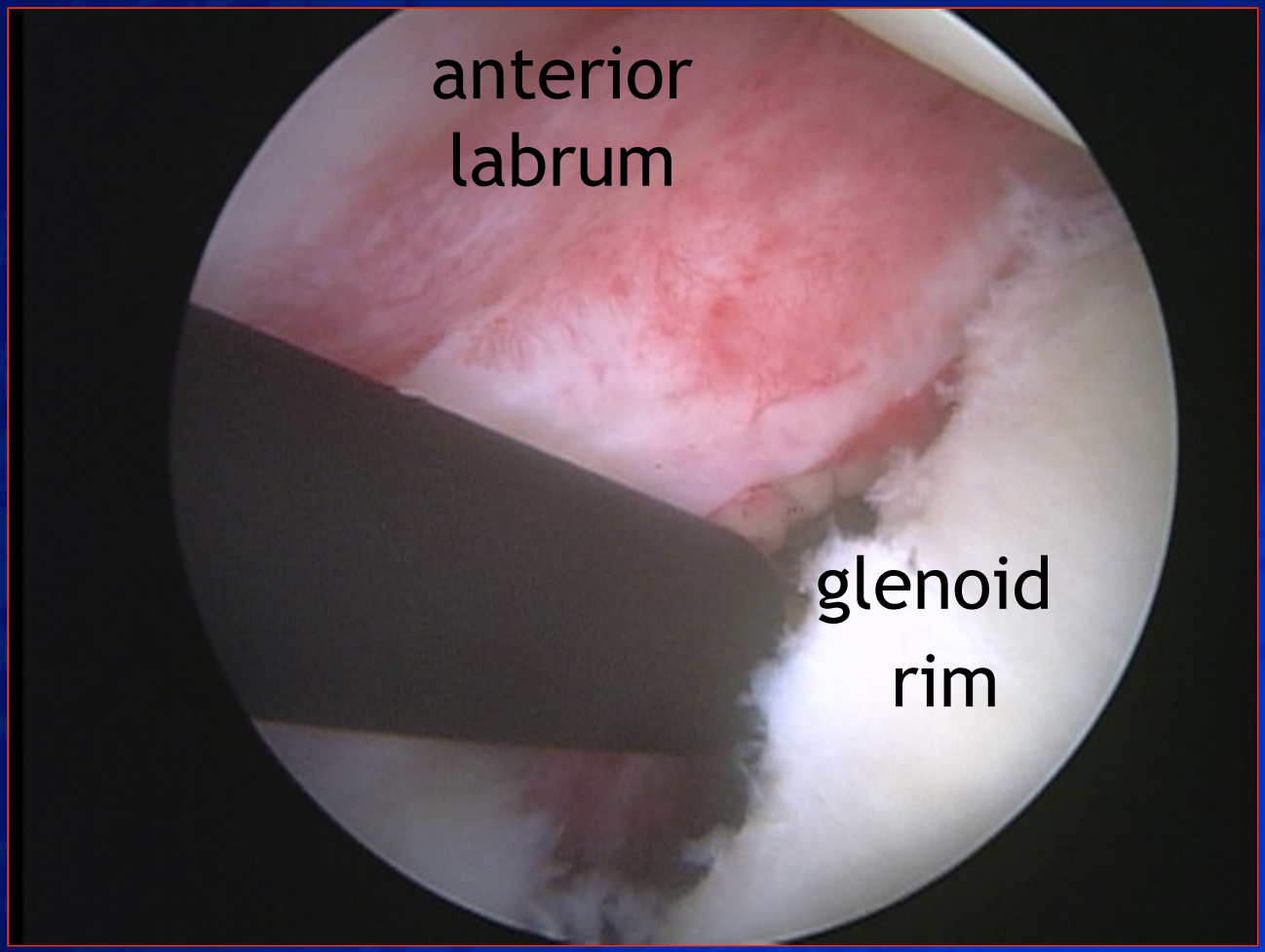
Bankart lesion: The essential lesion



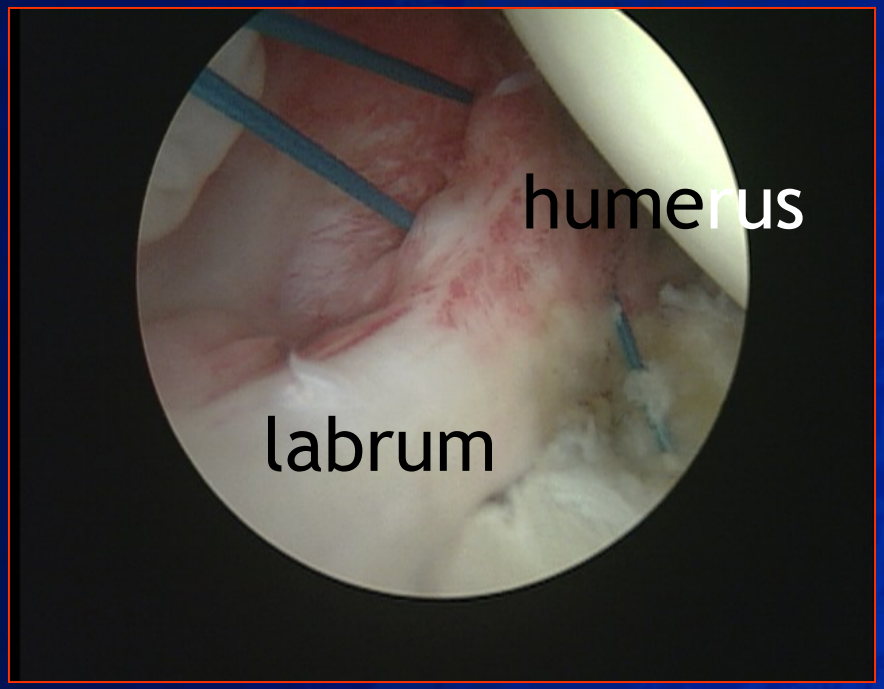
Associated Pathology

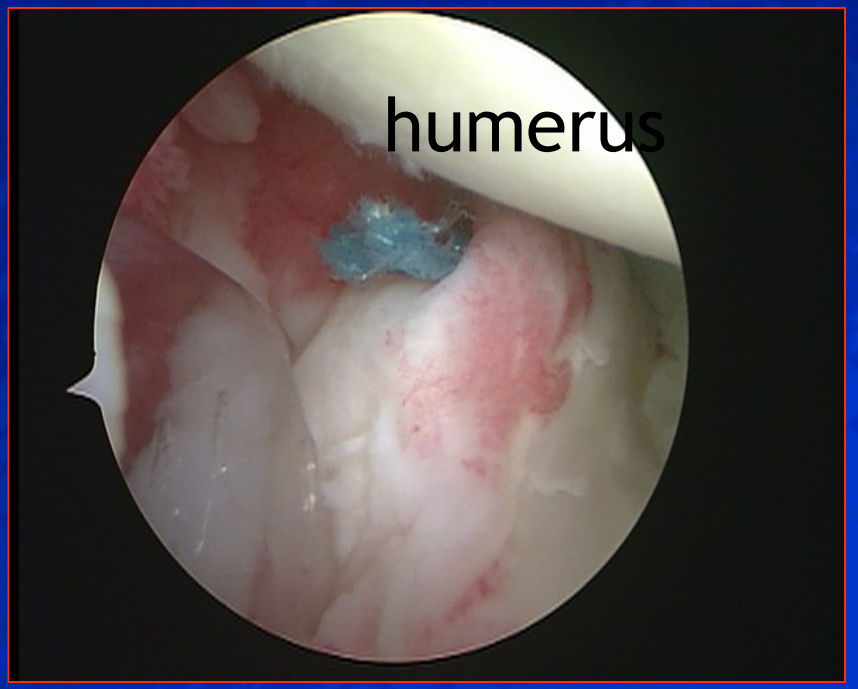
- ✓ Rotator Interval laxity
- ✓ Posterior Capsule stretching
- ✓ Anterior Capsular stretching and/or tear
- ✓ HAGL lesion
- ✓ SLAP lesion
- ✓ Hill-Sachs lesion
- ✓ Cartilage lesion
- ✓ Biceps tendon fraying
- ✓ Rotator cuff tear
- ✓ Loose bodies

Surgical Reconstruction: Bankart Lesion mobilization and suture anchor insertion



Surgical Reconstruction: Suture passing through the anterior capsule and knot tying



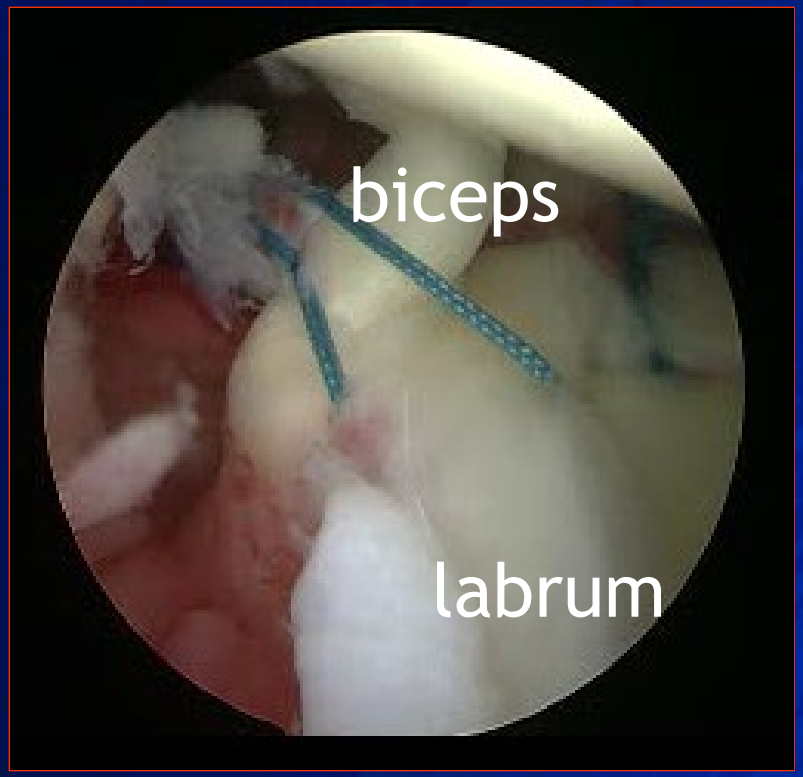


Associated Procedures

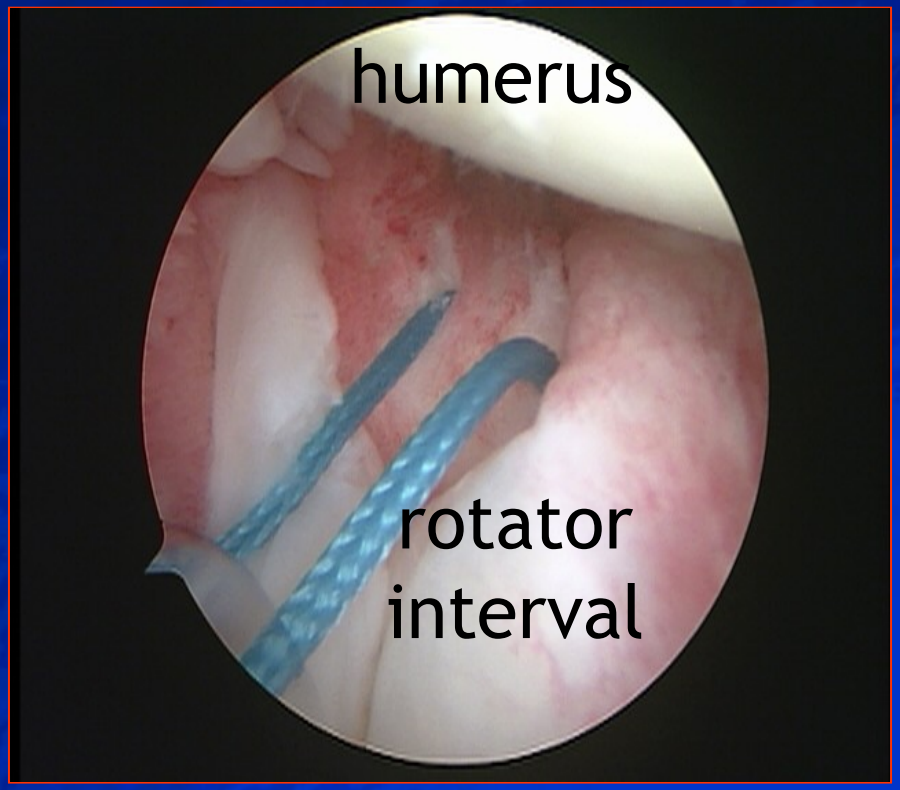
- SLAP lesion repair
- Loose body removal
- Treatment of cartilage lesions
- Synovectomy
- Remplissage (infraspinatus tenodesis)
- Rotator interval closure
- Electrothermal capsule shrinkage
- Biceps tenotomy/tenodesis
- Rotator cuff repair
- Bony procedures: bone block/Latarjet
- Anterior and/or Posterior capsule plication and/or repair

Associated Procedures

SLAP repair



Rotator Interval Closure



Goals of Postoperative Rehabilitation

- restore full shoulder and upper limb function
- achieve full active (AROM) and passive (PROM) range of motion (ROM)
- initiate or improve scapula positioning and stability
- strengthen rotator cuff and humeral head depressors
- improve postural awareness
- restore shoulder proprioception

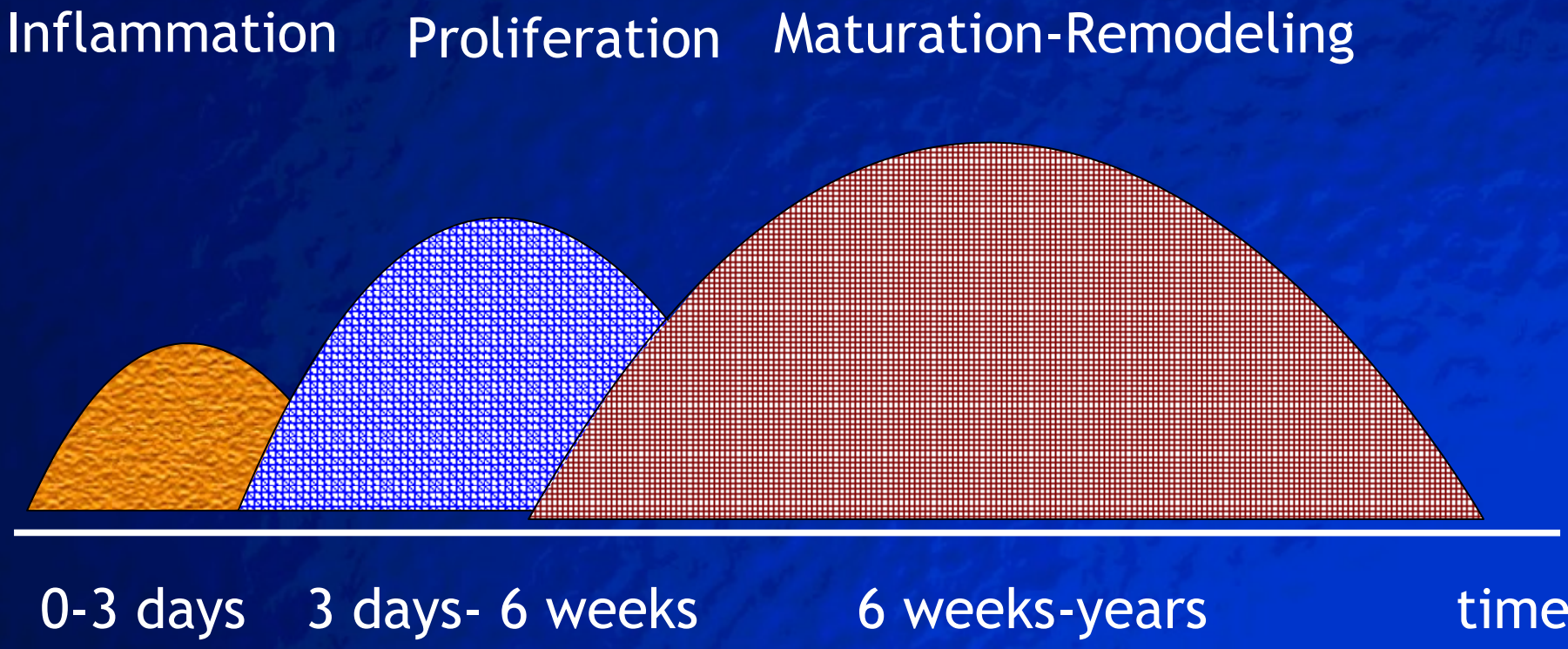
Questions that need to be answered!

- When to begin passive motion?
- When to progress to active exercise?
- When is safe to apply stress to soft tissues?
- How much stress should be applied to the scar and to soft tissues promote remodeling?
- In what direction should stress be applied?

Before rehabilitation starts

- Understanding of the anatomy and biomechanics of the shoulder
- Knowledge of the stages of soft tissue healing
- Evaluation of the direction of restriction, pain and reactivity
- Communication between the physical therapist and the surgeon

Biological Restraints:
The 3 phases of soft tissue healing



Biomechanical Restraints of Postoperative Motion - 1

The primary restraints to anterior translation with the arm at the side are the superior and the middle glenohumeral ligaments (GHL).

Biomechanical Restraints of Postoperative Motion - 2

- At 45_o of abduction the middle GHL limits anterior translation.
- At 90_o the inferior GHL becomes the major restrain to anterior translation.
- From 90_o to full elevation the GHL complex is gradually and increasingly stressed.
- Addition of external rotation places even more stress on the anterior capsule.

Biomechanical Restraints of Postoperative Motion - 3

Between 0_o and 90_o of abduction in the plane of the scapula very little stress is applied on the anterior shoulder capsule and ligaments.

Anterior Shoulder Reconstruction

- How often?
- How intensive?
- How aggressive?

- 3-5 times a week will suffice.
- Limitations in ROM set by the surgeon and dictated by the quality and efficacy of the repair as well as from the additional procedures performed.

The 4 Phases of Postoperative Rehabilitation after Shoulder Reconstruction for Anterior Instability

Phase I (0-6 weeks): Immediate postoperative phase

Phase II (6-12 weeks): Intermediate phase

Phase III (12-16 weeks): Advanced strengthening phase

Phase IV: (>16 weeks): Return to sports

Phase I: Immediate postoperative phase

Goals:

- maintenance and protection of the repair site
- minimization of immobilization side effects
- reduction of pain and inflammation control
- reduction of inflammation
- maintaining general fitness
- retardation of muscular atrophy by preventing muscular inhibition
- become independent with activities of daily living

Anterior Shoulder Reconstruction

Week 1: pain and inflammation control

- sling/immobilizer day and night for 3-4 weeks
- sleep with the immobilizer and a pillow under the elbow for shoulder support
- NSAID's and analgesics administration
- patient education on the procedure
- immediate elbow/wrist/finger passive and active exercises
- physical modalities for pain relief (cryotherapy, electrical stimulation)

Phase I – Physical Modalities for Pain and Inflammation Reduction

- heat
- low-Voltage surge stimulation
- spray and stretch to the active trigger points (e.g. upper trapezious and rhomboid muscles)
- TENS
- therapeutic Massage

Pendulum Exercises

Best be avoided

Anterior Shoulder Reconstruction: 2nd week

- suture removal and wound healing check
- Continuous passive motion (CPM)
- submaximal pain-free external and internal rotation isometrics
- mobility of proximal and distal joints
- manual scapular mobilization and stabilization exercises
- Neuromuscular Electrical Stimulation (NMES) to improve scapular proprioception

Anterior Shoulder Reconstruction: 2nd week

- Passive (PROM) range of motion (ROM) exercises for Forward Flexion (FF) and Abduction (ABD)
- Goals: FF=90^0 and Abduction 60^0
- No Active ROM (AROM) for the first 4 weeks
- No external rotation (ER) beyond 20^o for 4 weeks
- Start internal rotation (IR)
- Isometrics in neutral position
- Ball squeezes, wrist exercises

Isometric Shoulder Abduction

1. Stand along a wall with operated shoulder facing it.

1. Put a pillow between arm and wall.

1. Push against the pillow, trying to raise the arm.

1. Hold the "push" for 10 seconds.

1. Repeat exercise for 1-2 sets of 10-15 repetitions

Isometric Shoulder Internal Rotation

1. Stand with the arm at the side and the elbow bent.
2. Put a pillow between arm and wall.
3. Push against the pillow, pivoting at the elbow.
4. Hold the "push" for 10 seconds.
5. Repeat exercise for 1-2 sets of 10-15 repetitions.

Isometric Shoulder External Rotation

1. Stand along a wall with operated shoulder facing it.
2. Put a pillow between arm and wall.
3. Push against the wall, pivoting at the elbow.
4. Hold the "push" for 10 seconds.
5. Repeat exercise for 1-2 sets of 10-15 repetitions.

Continuous Passive Motion

- protection of repair
- prevention of adhesions
- prevention of detrimental effects of immobilization
- pain reduction
- inflammation reduction
- healing promotion

Continuous Passive Motion (CPM)

- abduction in the scapula plane
- horizontal abduction and adduction
- flexion and extension
- internal and external rotation

Anterior Shoulder Reconstruction: weeks 3-4

- Sling removed during the day, used at night for 1-2 weeks
- PROM and PAROM exercises for FF and ABD
- Goals: FF=120^0 and Abduction=90^0
- In scapular plane ER=30^0, IR=$45\text{-}60^0$

Anterior Shoulder Reconstruction: weeks 3-4

- no shoulder extension or combined abduction/ER
- maximum pain-free isometrics
- supine to sit exercises
- begin aquatic therapy if incisions completely healed
- begin submaximal dynamic stabilization
- manual resistance to scapular stabilizers

Mobilization of the scapulothoracic joint

Mobilization of the scapulothoracic joint

Aquatic Therapeutic Exercise

Aquatic Exercises in Shallow and Deep Water

- Early activity with non-weight bearing status
- Reduction of joint compressive forces
- Warmth of water

  Relaxation of muscles

  Gate theory mechanisms
- Psychological factors

Phase II: Intermediate phase

Goals:

- regain full ROM
- reestablish dynamic stability (muscular balance)
- increase muscular strength
- improve proprioception and neuromuscular control
- improve or normalize glenohumeral and scapulothoracic joint kinematics
- maintain general fitness

Anterior Shoulder Reconstruction: weeks 5-8

- active and active-assisted ROM exercises continued
- gradually increase ROM to full FF
- in patients with signs of stiffness, more aggressive rehabilitation is indicated to avoid permanent stiffness
- at 45^0 abduction: ER=60^0 and full IR

Anterior Shoulder Reconstruction: weeks 5-8

- initiate posterior capsular stretching
- initiate exercise tubing ER/IR (with arm at side) to tolerance
- continue dynamic stabilization, PNF
- daily home stretches instructed and encouraged


THIS
IS THE
NEW
SELF!

Posterior Capsule Mobilization

Flexibility Training

- Wall Walks
- Wand or Cane Exercises
  - Flexion/Extension
  - Abduction/Adduction
  - IR/ER
  - Horizontal flexion/extension
- Pulley and Theraband Stretches
  - Flexion/Extension
  - IR/ABD

Types of stretching exercises

- Static
- Dynamic or Ballistic
- Proprioceptive neuromuscular facilitation (PNF)
- All three types of stretching are effective in increasing ROM

Static stretching

- The muscle group is slowly stretched to the point of tension or mild discomfort
- This position is held for 10-30 seconds
  - Proper techniques and breathing during stretch is important!
- Should be repeated 3-4 times
- Usually the preferred method of stretching
  - Risk of injury and/or soreness is the lowest
  - Requires little assistance

Standing External Rotation

Standing Internal Rotation

Dynamic or Ballistic stretching:

- A relatively fast, active “bouncing”, controlled movement
  - Often used prior to explosive-type sports movements
- The momentum of the moving body part can stretch the joint beyond its normal ROM
- If not done correctly, it can be counterproductive for increasing muscle stretch
  - If muscle group is stretched too forcefully, it evokes the stretch reflex (a contraction and resistance to the stretch)
  - This can cause strain to the tendons, muscle fibers and connective tissue

PNF Stretching

- Widely accepted as an effective method for increasing range of motion
- Uses both passive movement & active muscle action
- Occasionally a partner is necessary

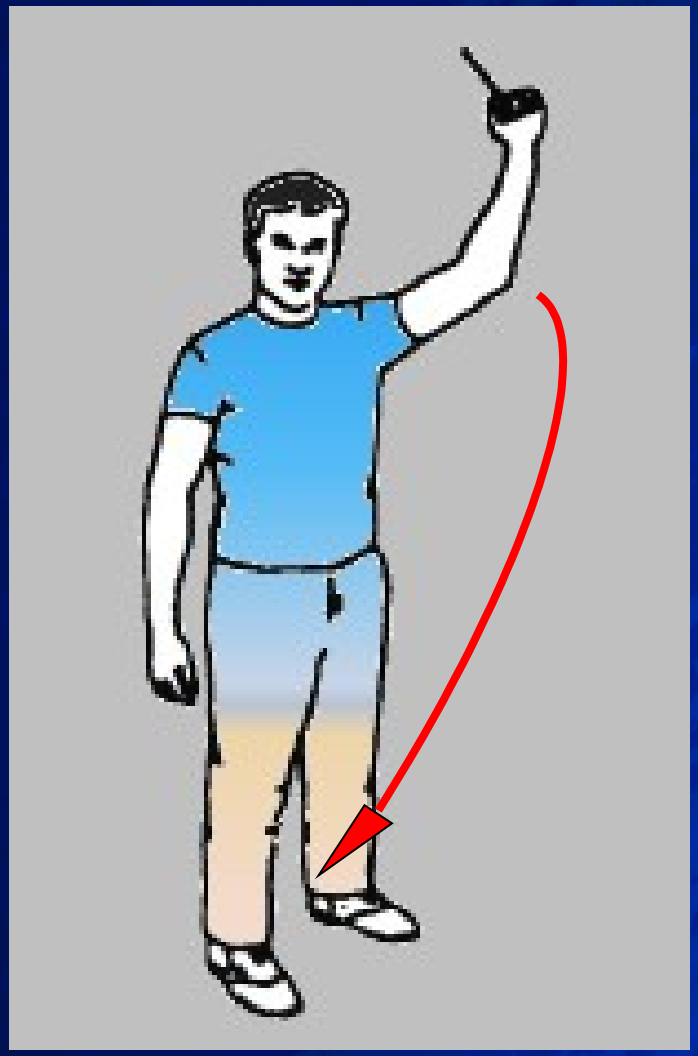
Steps for PNF stretching

- Stretch the target muscle group by moving the joint to the end of its ROM
- Isometrically contract this muscle group against an immovable resistance (such as a partner or wall) for 4-6 seconds
- Relax the contracted muscle group as you or your partner statically stretch the muscle to a new ROM
- Can add the contraction of the agonist to facilitate further stretching

PNF Diagonal Patterns

- D2 Extension – 10 to 4 o'clock; thumb down
- D1 Flexion – 8 to 2 o'clock; thumb-up
- D1 Extension – 2 to 8 o'clock; thumb down
- D2 Flexion – 4 to 10 o'clock; thumb up

Diagonal Pattern D2 Extension



Diagonal Pattern D2 Flexion

Anterior Shoulder Reconstruction: weeks 8-12

- ROM: at 90^0 abduction, ER=90^0 and IR=75^0
- joint mobilization, stretching, etc.
- continue self-capsular stretching
- PNF diagonal patterns (rhythmic stabilization techniques)
- progressive isotonic strengthening

Strengthening of Scapular Stabilizers

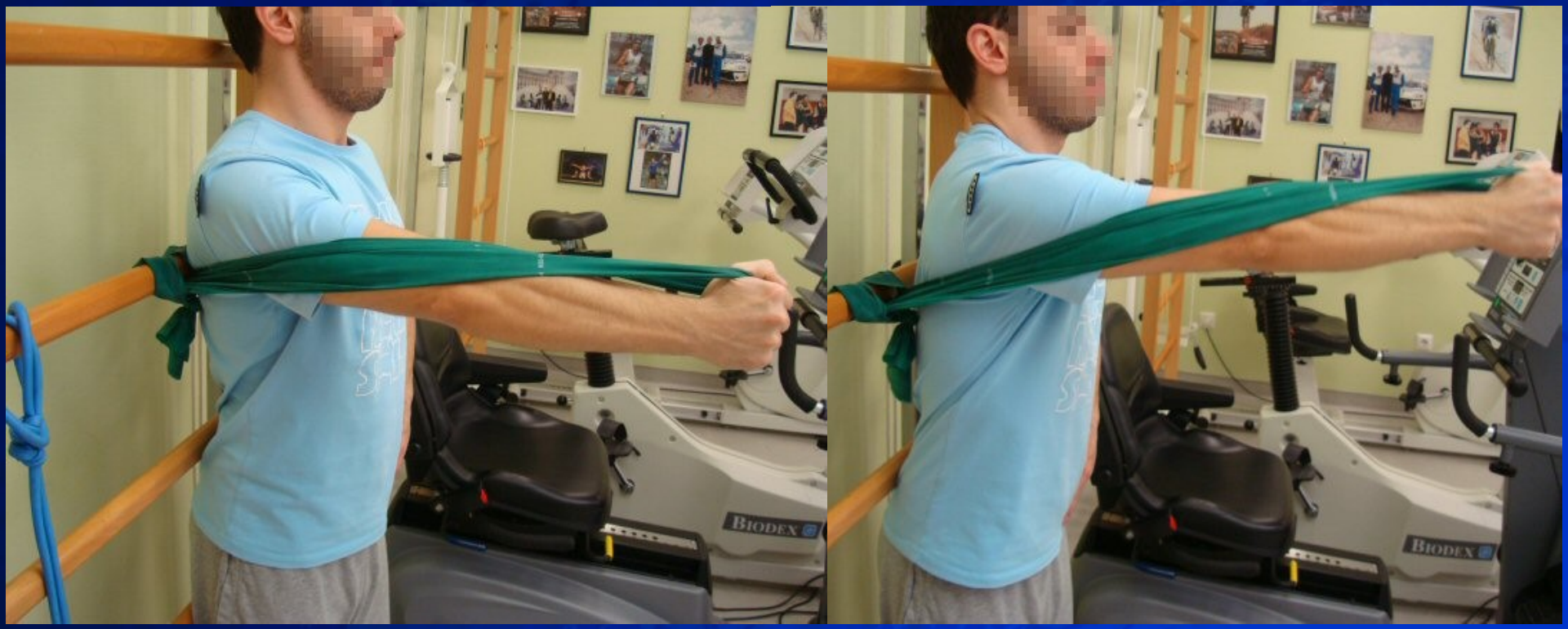
Closed Kinetic Chain:

- protraction
- retraction

Open Kinetic Chain:

- when motion is nearly full
- rhythmic stabilization

Scapula protraction and retraction



Functional Strengthening: Plyometric Exercises

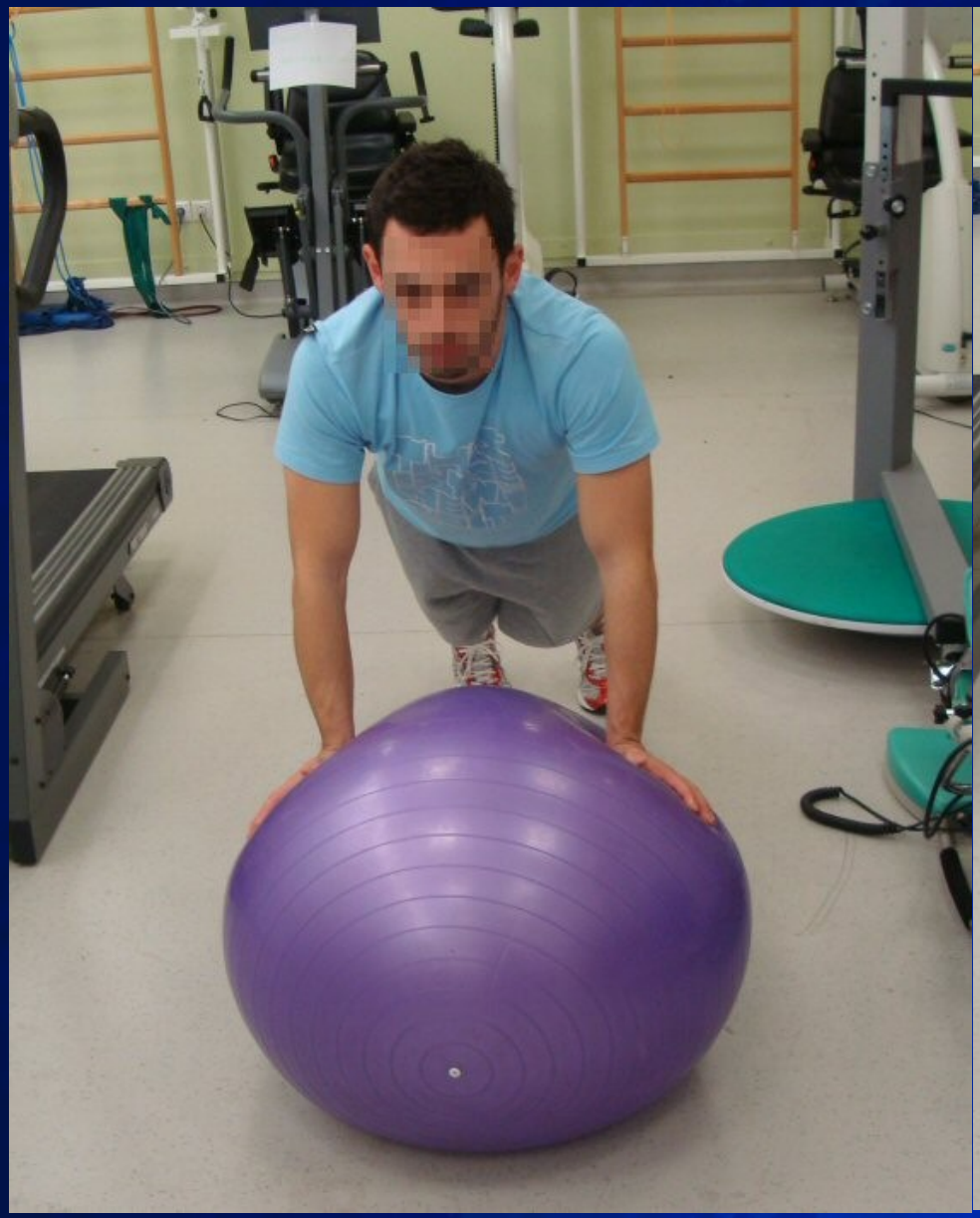
- a muscle is loaded and then contracted in rapid sequence
- used to increase the speed or force of muscular contractions

Three phases:

1) *eccentric phase*: rapid prestretch is applied to the musculotendinous unit
2) *amortization phase*: the time between the eccentric and concentric phases
3) *Concentric contraction*

Functional Strengthening: Plyometric Exercises

- Slide Board
- Swiss ball with BAPS board
- Push-ups on small balls (both hands)
- Push-ups on large ball
- Box jumps
- Stairmaster
- Treadmill
- Medicine ball exercises

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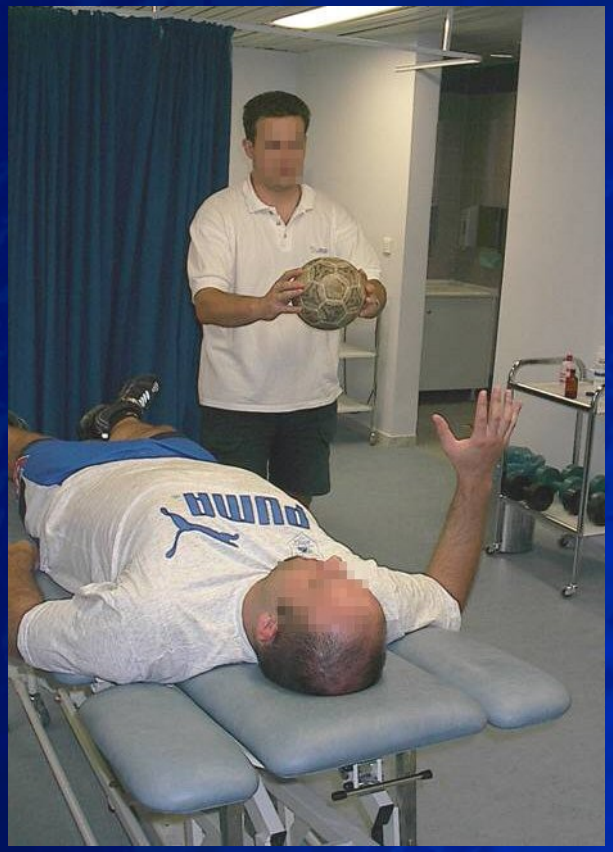
Restoration of Dynamic Stability

Restoration of Reactive Neuromuscular Control

Restoration of Reactive Neuromuscular Control

Restoration of Reactive Neuromuscular Control

Activities with light-weighted ball



Phase III: Advanced rehabilitation and strengthening 12-16 weeks

Goals:

- increase muscular strength, power and endurance
- maintain active and passive range of motion
- control functional stress/strain
- control flexibility

Phase III: Advanced rehabilitation and strengthening 12-16 weeks

Prerequisites for entering Phase III:

- full range of motion
- no pain or tenderness
- stability restoration
- proprioception restoration
- mild strength deficit (70-80% of contralateral side)

Anterior Shoulder Reconstruction: weeks 12-16

- Passive and active Stretching
  - in overhead athletes, progress ER past 90^0
  - in non-overhead athletes, maintain 90^0 ER (!!)
- Strengthening exercises
  - isotonic strengthening
  - isokinetic strengthening
  - begin sports specific exercises
  - plyometric exercises
  - isotonic machine weight training
  - swimming
- PNF manual technique
  - Neuromuscular control drills

Isokinetic Exercise

- 210 to 300°/sec in active athletic patients

- 120 to 210°/sec for less active and general orthopedic patients

Isokinetic Test Data

- Bilateral comparisons

- Unilateral strength ratios
(external/internal rotation ratio: 66% -75%)

Phase IV (>16 weeks): Return to sports

Goals:

- return to the previous activity level without restrictions
- control functional stress/strain
- further increase strength and endurance
- continue strengthening and flexibility drills

Phase IV (>16 weeks): Return to sports

Prerequisites for entering Phase IV:

1) Full non-painful ROM

2) Restoration of stability

3) Restoration of strength

4) Successful functional progression

- Capsular stretching to preserve full mobility at all planes
- Continue strengthening program
- Proprioception
- Sports-specific training

Return to Play Criteria

- athlete is fully reconditioned
- pain-free, full ROM
- no instability or apprehension
- restoration of shoulder strength and stability
- 90% isokinetic strength in all planes (ER >60% of IR)
- normal shoulder proprioception
- regained strength, neuromuscular control, cardiovascular fitness and sports specific functional skills

Modification of Postoperative Rehabilitation following Associated or Secondary Procedures

1. Electrothermally Assisted Capsular Shift
2. Open reconstruction
3. SLAP repair
4. Biceps tenodesis
5. Bone block & Latajet procedures
6. Posterior capsule reefing/repair
7. Anterior instability in pts with MDI
8. Rotator cuff repair

T. Electrothermally Assisted Capsular Shift

the early rehabilitation program is more conservative

Early Phase

Weeks 0-2

- immobilization for 10-14 days
- active abduction at 14 days to 90^0
- ER to 45^o in neutral
- 0-90^o FF
- extension <20^0

Weeks 3-4

Begin strengthening for scapula
– low weight/high repetitions

Intermediate and Late Phase

Weeks 4-8

- full ROM
- ER < 45^0
- diagonal patterns
- no overhead exercises

Week 12

- plyometrics
- functional drills

2. Open reconstruction

- No ER beyond neutral for 4 weeks post op
- ER to 30 degrees until the 6th week
  to protect the subscapularis
- Emphasis on subscapularis strengthening

3. SLAP repair:

4. Biceps tenodesis:

- avoid elbow flexion under resistance
  for 4 weeks
- avoid abduction/ER coupled motion
  for 6 weeks

5. Bone block & Latajet procedures

- no need to avoid ER
- bone to bone healing is accomplished within 8 weeks
- active and active-assisted ROM can begin after 1-2 weeks
- aggressive stretching and strengthening after 6 weeks

6. Posterior capsule reefing/repair

- avoid combined flexion, internal rotation and horizontal adduction for the first 6 postoperative weeks
- slower progression of IR exercises

7. Anterior instability in pts with MDI

restriction of ER to 30^0 and avoidance of combined ER and ABD for 6 weeks

8. Rotator cuff repair

the postop program for cuff repair is followed

Conclusions - 1

1. Rehabilitation following shoulder stabilization procedures is a demanding and complex process.

2. The rehabilitation program should be tailored accordingly and adapted to every specific patient and not vice versa.

Conclusions - 2

3. Addressing both the glenohumeral as well as the scapulothoracic joints is mandatory.

4. The patient/athlete is able to return to his previous activity level only when muscular strength and balance as well as proprioception are reestablished.

5. Using arthroscopic techniques accelerated rehabilitation protocols may be employed with success.

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