

## The rehabilitation of Multi ligament Knee injuries

Multi-ligamentous knee injuries are rare but serious injuries that can threaten limb viability

# Challenges associated with multi-ligament knee injuries

- Complex injuries varying degrees of ligament strain. (Grade1-3)
- Associated nerve or vascular injuries (CPN)
- Time of Surgical intervention( acute - inflammation vs chronic-joint stiffness)
- Rehabilitation guidelines dependant on repairs-reconstructions and timing of intervention

# Evidence for rehabilitation

- Multiple-Ligament Knee Injuries: A Systematic Review of the Timing of Operative Intervention and Postoperative Rehabilitation

William R. Mook, MD; Mark D. Miller, MD; David R. Diduch, MD; Jay Hertel, PhD, ATC; Yaw Boachie-Adjei, MD; Joseph M. Hart, PhD, ATC; J Bone Joint Surg Am, 2009 Dec 01; 91 (12): 2946 -2957 .

<http://dx.doi.org/10.2106/JBJS.H.01328>

- systematic review was to compare the outcomes of early, delayed, and staged procedures as well as the subsequent rehabilitation protocols.
- Methods: “We surveyed the literature and retrieved twenty-four retrospective studies, involving 396 knees, dealing with the surgical treatment of the most severe multiple-ligament knee injuries (those involving both cruciate ligaments and either or both collateral ligaments).”
- **Acute surgery is highly associated with range-of-motion deficits** “, in the acutely managed patient, **early mobility** is associated with better outcomes in comparison with immobility”
- **Staged procedures** may produce better subjective outcomes and a lower number of range-of-motion deficits but are still likely to require additional treatment for joint stiffness. **More aggressive rehabilitation** may prevent this from occurring in multiple-ligament knee injuries that are treated acutely

# Goals of treating multi ligament knee injuries

- Goals of immediate treatment include the management of pain and any neurovascular deficits that may threaten life and limb
- The goals of definitive management include restoring knee stability, full range of motion, managing long term pain and delivering patients to, at least, their pre-injury level of function or activity
- State of the Art Regarding the Management of Multiligamentous Injuries of the Knee
- Nigel T Mabvuure,<sup>1</sup> Marco Malahias,<sup>2</sup> Behrooz Haddad,<sup>4</sup> Sandip Hindocha,<sup>\*,3</sup> and Wasim S Khan<sup>4</sup>
- Author information ► Article notes ► Copyright and License information ►

# General Rehabilitation Goals

- Protect the post-surgical knee
- Restore normal knee extension and improve scar and patellar mobility
- Eliminate effusion (swelling)
- Restore leg control
- Initiate regaining knee flexion

# Rehabilitation ideas

- Proprioceptive drills
- Ballistic training drills
- Accelerated rehabilitation programs vs traditional rehab programs
- Training ladders;
- Acute phase- treatment of inflammation and early post operative regimes
- Intermediate phase- range of motion, early strengthening, gait and movement training, selective muscle training, balance and joint position.
- Late phase- pre-sports fitness, SAQ drills, high level proprioception drills,

# Suggested Therapeutic

## Acute and Early phase management

- Soft tissue mobilization to anterior knee
- Patellar mobilization
- Electric stimulation as necessary to stimulate quad control
- Quad sets
- Leg lifts in standing with brace on for balance and hip strength – avoid hip extension secondary to hamstring restrictions
- Straight leg raise (SLR) with brace locked
- Ankle dorsiflexion (DF) and plantarflexion (PF) with manual resistance

# Therapeutic guidelines

- Range of Motion (ROM): Parameters allow for full extension (avoid hyperextension)
- with no flexion limits
- Extension: Knee extension on a bolster, (avoid prone hangs secondary to hamstring guarding)
- Flexion: Passive ROM only. Perform in a seated position with posterior support or perform in a prone position



# Cardiovascular Exercise

- Upper body circuit training or upper body ergometer (UBE)

# Rehabilitation Goals

- Full range of motion.
- Pain and inflammation free.
- Good control and no pain with bilateral functional movements, including step ups/downs and squats.

# Suggested Therapeutic Exercises intermediate phase

- Quad strengthening closed chain (progressing to multi-plane) and open chain exercises
- Non-impact balance and proprioceptive drills
- Hip and core strengthening
- Stretching for patient specific muscle imbalance

# Intermediate Phase Progression Criteria

- Pain-free initiation of weight bearing
- Mild to no effusion (swelling)
- Knee flexion 100-125 degrees

# Intermediate Phase

## Rehabilitation Goals

- Single leg control – open and closed chain
- Good control and no pain with single leg functional movements, including step ups/downs and squats

# Progression Criteria

- Dynamic neuromuscular control with multi-plane activities, without instability, pain or swelling
- Ability to land from a sagittal, frontal and transverse plane; leap and jump with good control and balance

# Late Phase Suggested Therapeutic Exercises

- Specific balance and proprioceptive drills
- Sports/work specific balance and proprioceptive drills
- Progress impact control exercises to reactive strengthening and plyometric; initiate a running program as appropriate
- Continue quad strengthening
- Movement control exercise beginning with low velocity, single plane activities and
  - progressing to higher velocity, multi-plane activities from 1 foot to other and then 1 foot to same foot
- Hip and core strengthening
- Stretching for patient specific muscle imbalances

# Suggested Therapeutic Exercises

- Quad strengthening closed chain (progressing to multi-plane) and open chain exercises
- Non-impact balance and proprioceptive drills
- Hip and core strengthening
- Stretching for patient specific muscle imbalances

## Cardiovascular Exercise

- Upper body circuit training or UBE
- Swimming with a pull buoy
- Stairmaster
- Stationary bike without pedal straps or clips



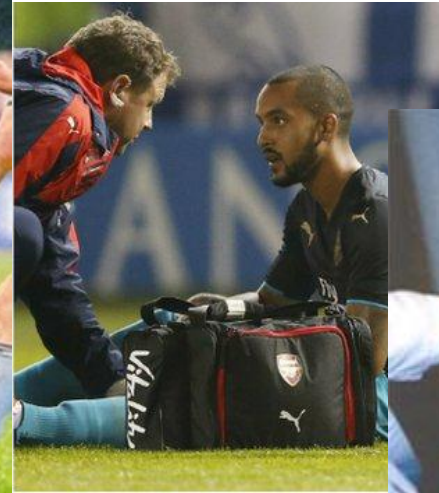
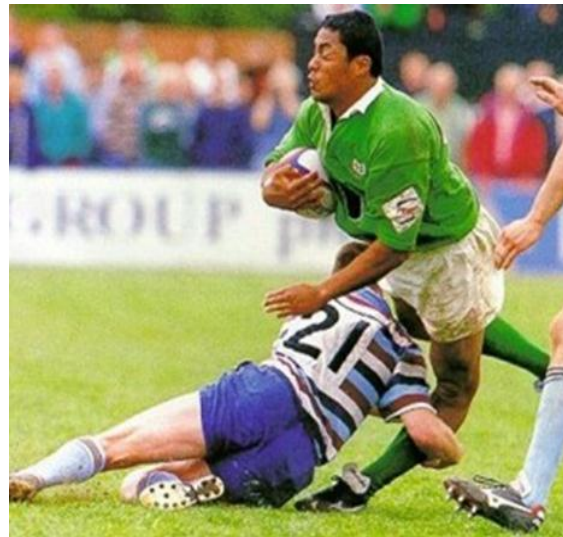
# Cardiovascular Exercise

- Biking, Stairmaster, elliptical machine, walking, upper body circuit
- Replicate sport or work specific energy demands

# Late Phase Rehabilitation Goals

- Good dynamic neuromuscular control and no pain with multi planar impact activities
- Functional sports specific progression

# INITIAL INJURY DIAGNOSIS

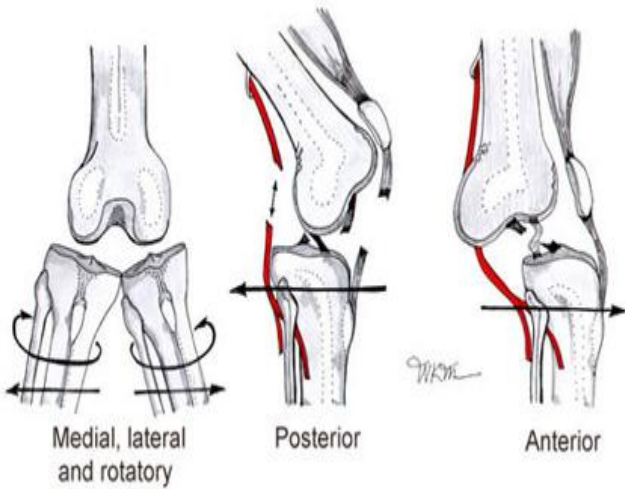




# PROTECTION AND SUPPORT



# INJURY AND POST OPERATIVE CARE





# LIGAMENT SPECIFIC EXERCISES

## Medial Collateral Ligament Sprain Rehabilitation Exercises



Passive knee extension



Heel slide



Clam exercise



Straight leg raise



Side-lying leg lift



Prone hip extension

## Anterior Cruciate Ligament (ACL) Injury Rehabilitation Exercises



Passive knee extension



Heel slide



Prone knee bend



Straight leg raise



Side-lying leg lift



Knee stabilization: A



Knee stabilization: B



Knee stabilization: C



Knee stabilization: D

# General knee exercises

## Knee Exercises Level I

#1 Quad Sets



#2 Hamstring Sets



#3 Straight Leg Raise



#4 Bridging



#5 Knee Extension



#6 Heel Raises



#7 Butt Kicks



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## Back and Core Strength #1

#1 Tabletop



#2 Bridging



#3 Pilates Crunch



#4 The Dart



#5 Front Bridge



#6 The 100

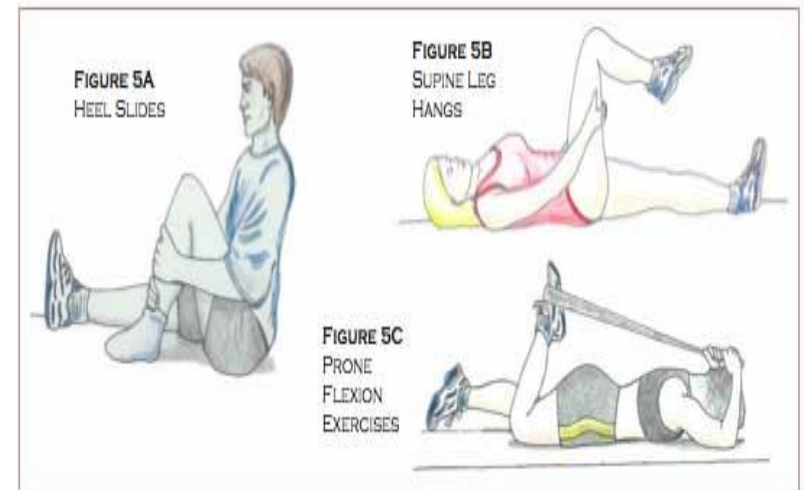


#7 Airplaning



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# EARLY PHASE REHAB





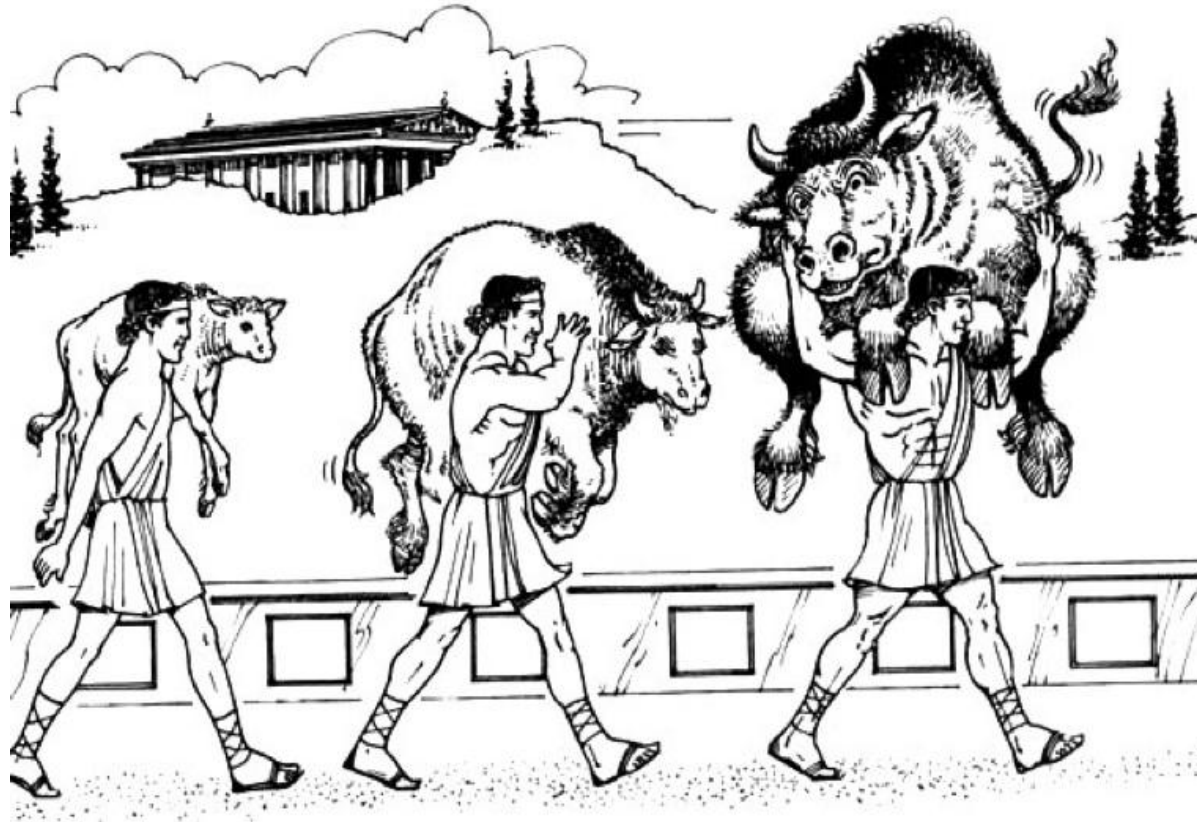
# MOBILISATION AND STRETCHING



# LOW LOAD EXERCISES-specific muscle control



# PROGRESSIVE STRENGTH TRAINING



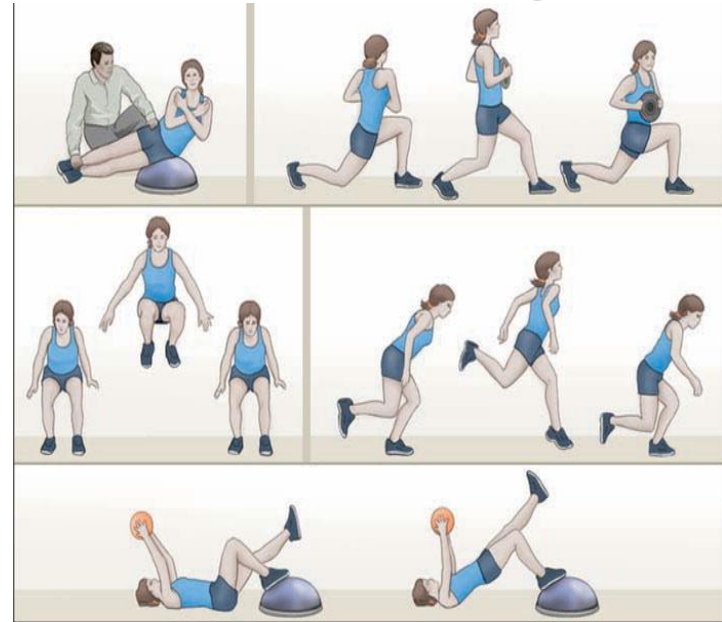
# Intermediate REHABILITATION



Lunge

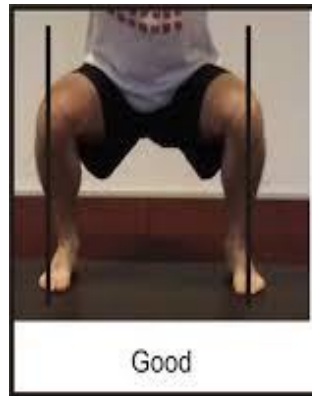


One-legged squat





# INTERMEDIATE PHASE ALIGNMENT AND BALANCE CONTROL

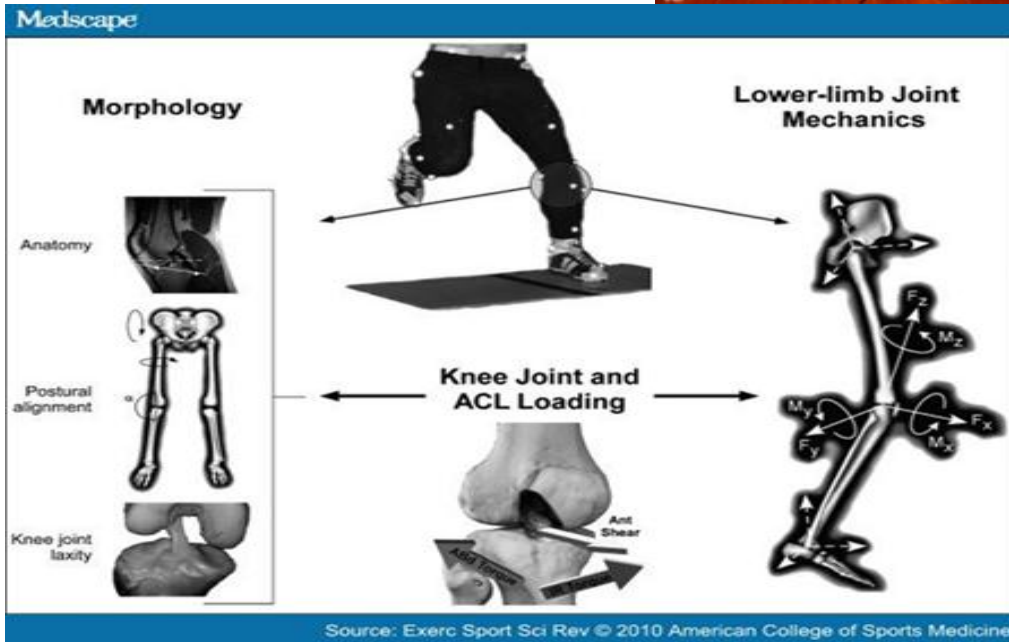


Good



Bad

# INTERMEDIATE PHASE ALIGNMENT AND BALANCE CONTROL-THERAPIST GUIDANCE AND MANUAL RESISTANCE



# INTERMEDIATE PHASE ALIGNMENT AND BALANCE CONTROL-THERAPIST GUIDANCE





# RESISTANCE AND STRENGTH TRAINING- isokinetic, open and closed chain





# LATE PHASE SPEED AND CO-ORDINATION



# LATE PHASE SAQ DRILLS

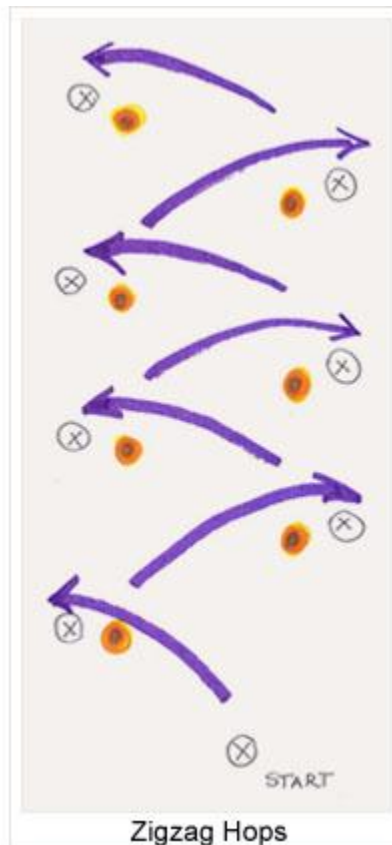
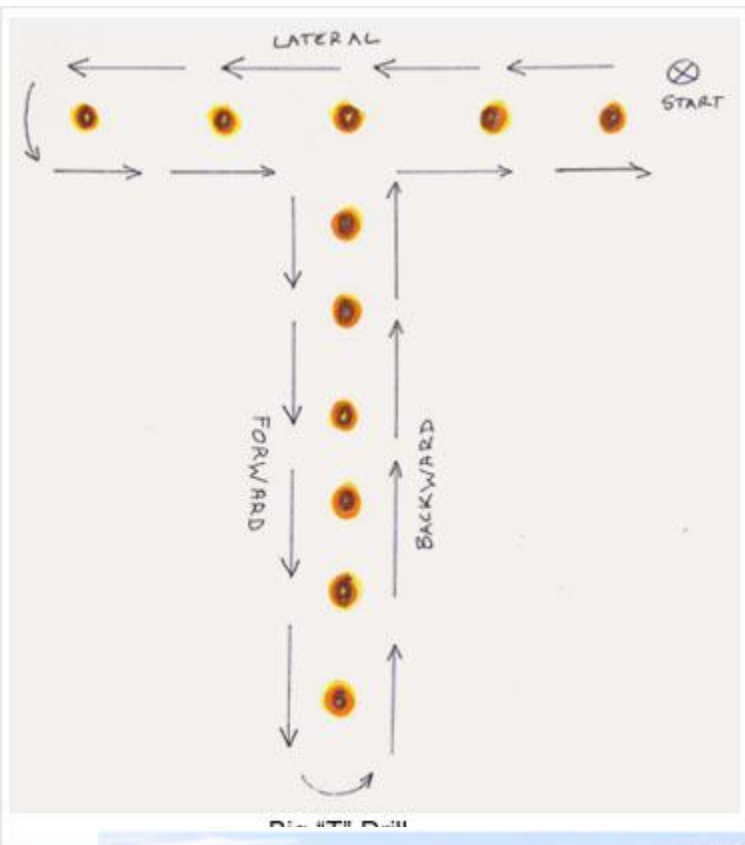


Figure 5. - T Drills



Figure 2. - Slide Board



Figure 6. - Figure Eights



# RETURN TO (SPORTING) ADL ACTIVITIES





# Activity specific training- modest outcomes

