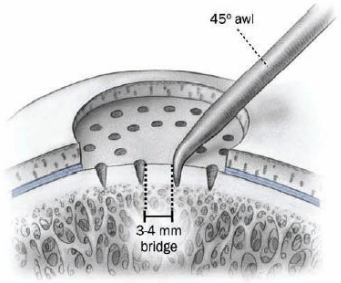
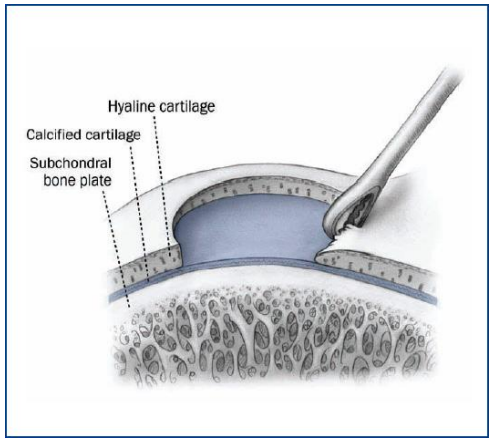
ProCcare
Treat more accurately

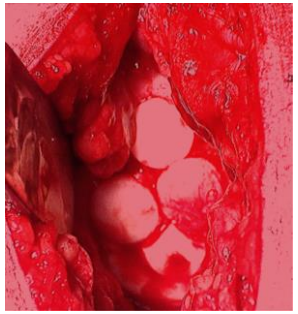
Articular Cartilage Repair Procedures Rehabilitation Guidelines

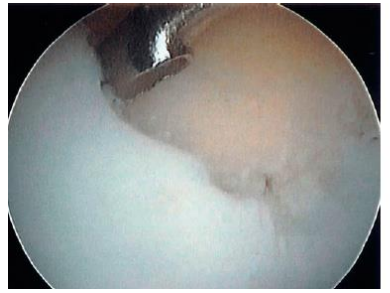
Pat Viroux
Sport Physical Therapist – Independent Consultant

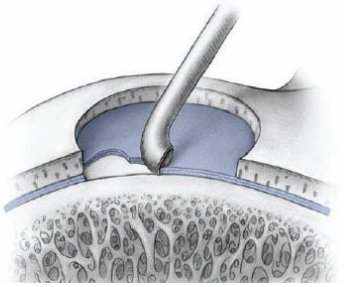
Articular Cartilage Repair Rehabilitation or ACR Rehab





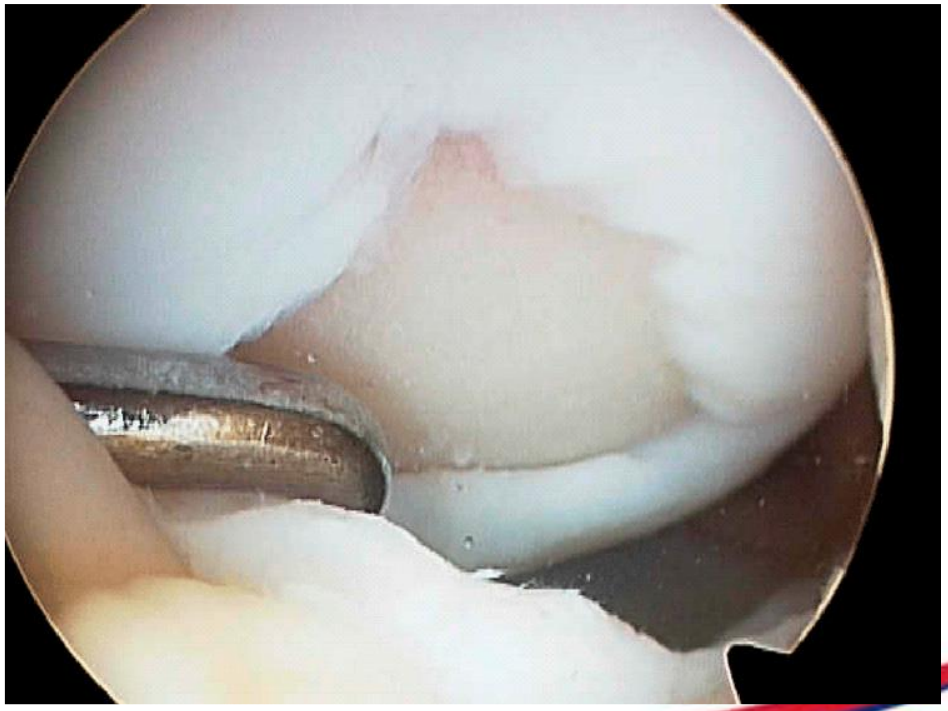




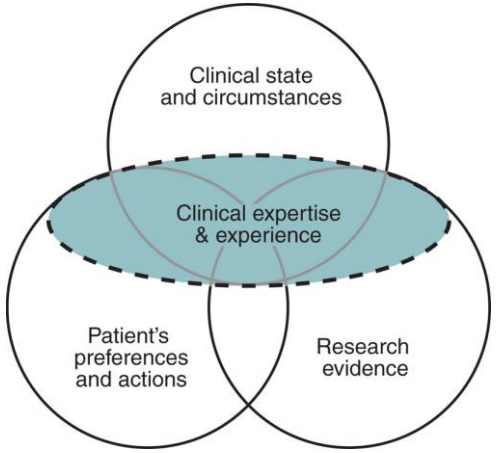


ACR Rehab - Content of Presentation

- Intro
- *Acute Care Management*
- *Rehab Phases & Protocols*
- **Rehab Principles**
- Progression of Rehab Phases
- Where Are We Headed
- Take Home Message.



ACR Rehab - Best Practice

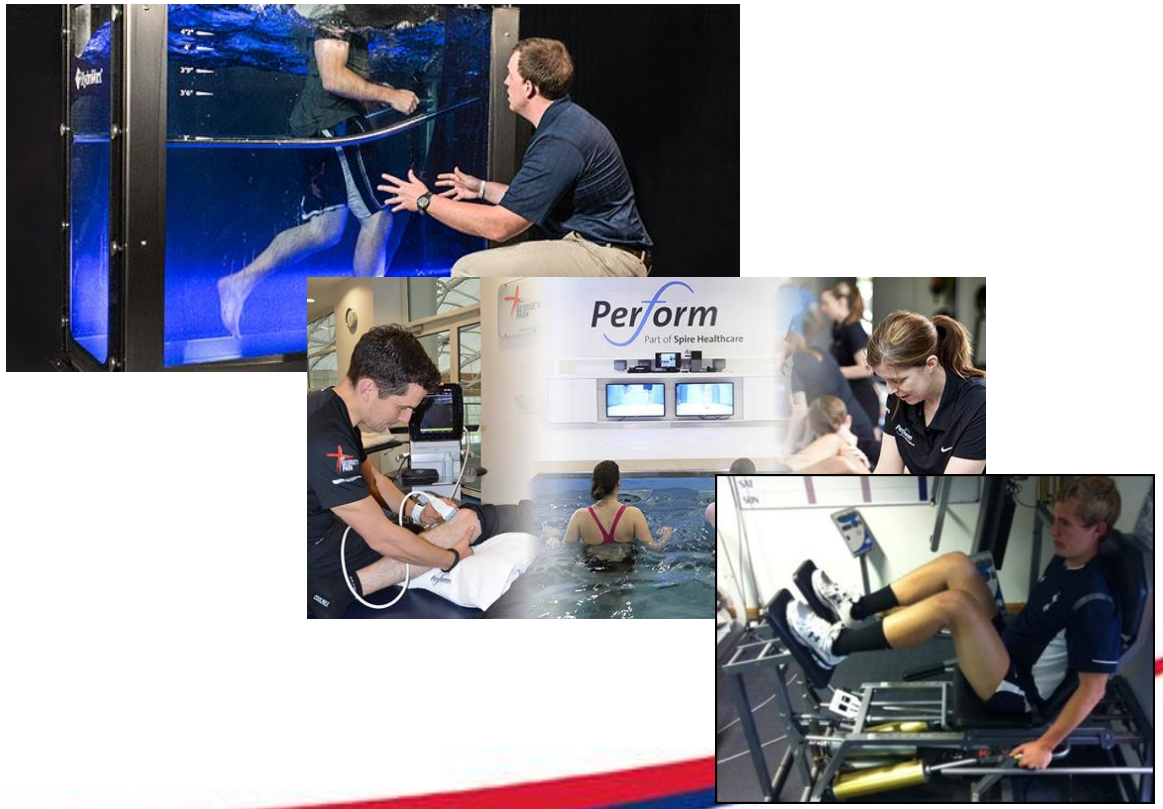


Research Evidence

Current Concepts ACR Rehabilitation

- Michael M. Reinold, PT
  Journal of Orthopedic and Sports Physical Therapy, 2006
- Dieter Van Assche PT, PhDa
  Physiotherapy Theory and Practice, 2010
- Karen Hambly MD
  Cartilage, 2012
- Kai Mithoefer, MD
  Journal of Orthopedic and Sports Physical Therapy, 2012
- Kai Mithoefer, MD
  British Journal of Sports Medicine, 2015

Clinical Expertise

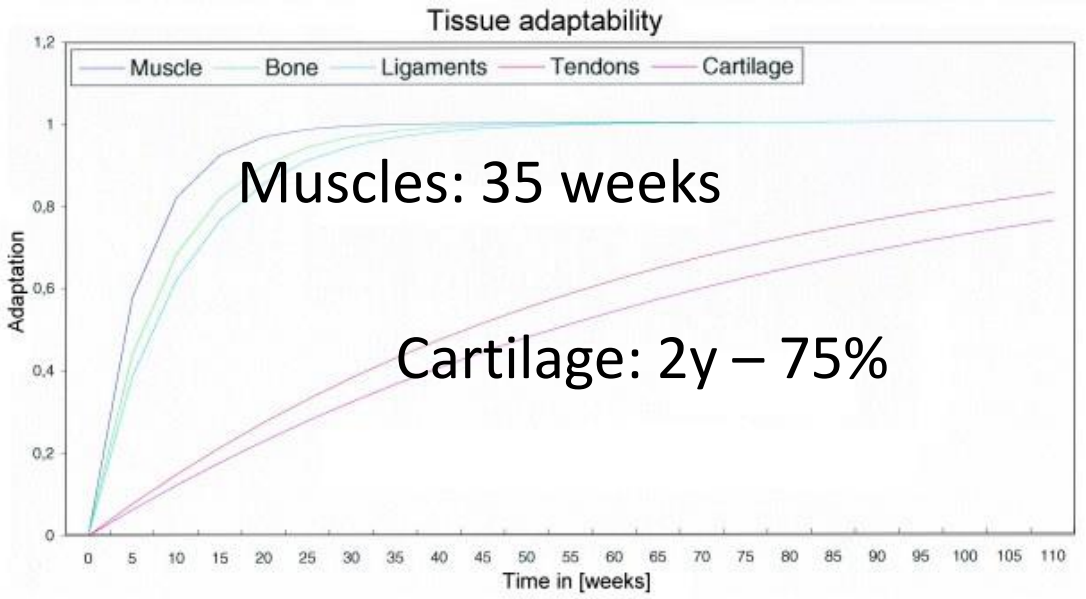


ACR Rehab - Protocols

- Many variations
- Surgical procedure
- Individual needs
- Long and Demanding

The overall goal of postoperative rehabilitation is to maximize patient recovery and outcomes, while facilitating cartilage healing and maturation and preventing risk of further chondrocyte death or injury. Kai Mithoefer, MD – JOSPT, 2012

Limited number of clinical studies.



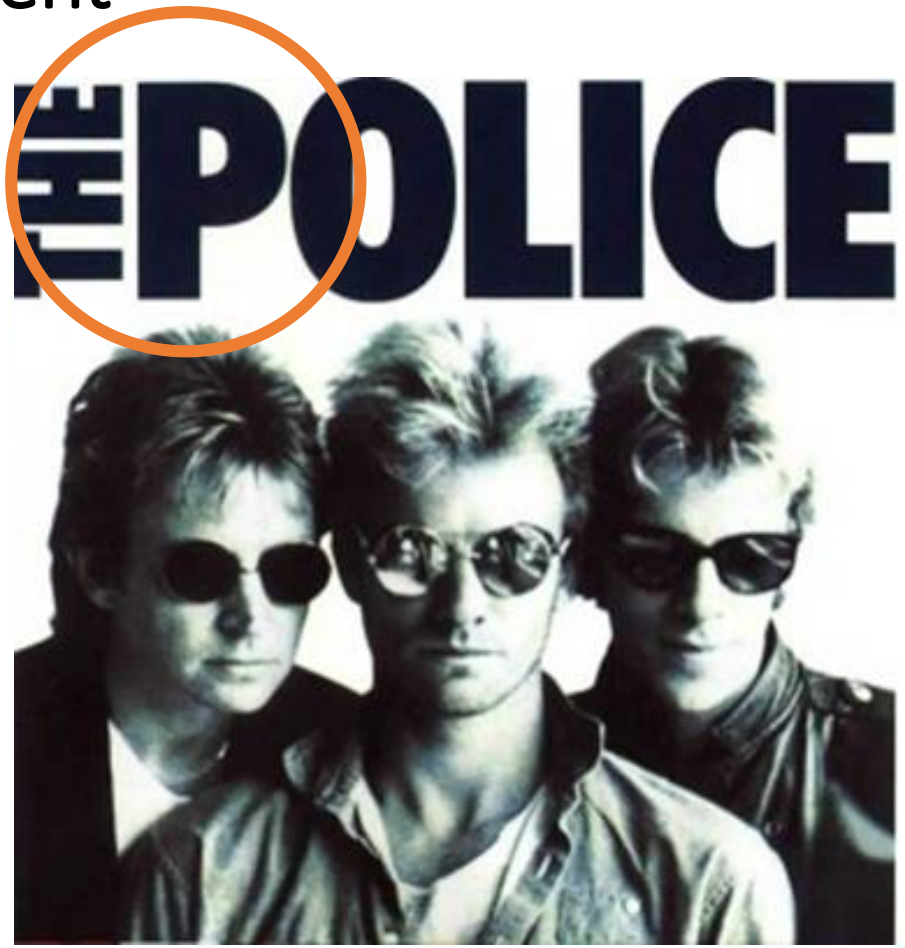
ACR Rehab - Acute Care Management

- Acronym: RICE – PRICE

- **PRICE needs updating, should we call the POLICE?**
  C M Bleakley et al – BJSM 2012

- P = Protection

- OL = Optimal Loading



ACR Rehab – Phases

Biologic and Rehabilitation Phases After ACR		
	Biologic Phase	**Rehabilitation Phase**
Phase 1	Graft integration and stimulation	Protection and joint activation
Phase 2	Matrix production and organization	Progressive loading and functional joint restoration
Phase 3	Repair cartilage maturation and adaptation	Activity restoration

Kai Mithoefer, MD - JOSPT, 2012

ACR Rehab - Protocols

General Patient Population:

- Van Asche et al
- Rehab Guidelines UW Health

Competetive & Elite Athletes:

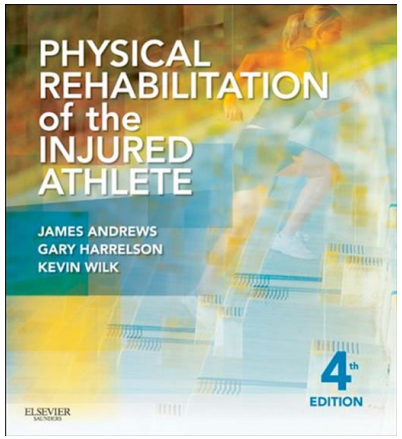
- Kai Mithoefer and Michael M. Reinold
- Rehabilitation of the Injured Athlete

Reference list: info@proccare.com

Implementing one standardized rehabilitation protocol following autologous chondrocyte implantation or microfracture in the knee results in comparable physical therapy management

Dieter Van Assche, PT, PhD,[1] Danny Van Caspel, PT,[2] Filip Staes, PT, PhD,[1] Daniel B Saris, MD, PhD,[2] Johan Bellemans, MD, PhD,[1] Johan Vanlauwe, MD,[1] and Frank P Luyten, MD, PhD[1]

[1]*Division of Rheumatology and Department of Orthopedics, University Hospitals Leuven, Leuven, Belgium*
[2]*Department of Physiotherapy, Central Military Hospital, Utrecht, Netherlands*



ACR Rehab - Principles

- Individualization
- Create a Healing Environment
- Biomechanics of The Knee
- Reduction of Pain and Effusion
- Restore Soft Tissue Balance
- Restoring Muscle Function
- Enhance Proprioception an Neuromuscular Control
- Controlling the Application of Loads

?

Kai Mithoefer, MD - JOSPT, 2012
Michael M. Reinold – JOSPT 2006

ACR Rehab - Principles

- **Individualization**
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Kai Mithoefer, MD - JOSPT, 2012
Michael M. Reinold – JOSPT 2006

Patient Related	Implication
Athlete's age	Slower cartilage repair with increased age
Body mass index	More gradual rehabilitation progression with body mass index greater than 30 kg/m^2
Type of sport	Higher demand on repair tissue in impact sports
Competitive level	Competitive athletes have better outcomes
Psychological	Less fear of re-injury and higher self-efficacy are associated with better outcomes

Kai Mithoefer, MD - JOSPT, 2012

Lesion / Defect	Implication
Defect size	Smaller defects frequently improve faster with rehabilitation
Repair technique	More rapid rehabilitation progression with restorative techniques
Defect location	Immediate weight bearing for patellofemoral defect (knee brace locked in full extension)
Duration of symptoms	Longer recovery if symptoms persist longer than 12 months (deconditioning)
Cartilage quality	Slower rehabilitation progression with generalized joint chondropenia

Kai Mithoefer, MD - JOSPT, 2012

Additional	Implications
Concomitant injuries	Ligament, capsule,…
Meniscus status	Slower rehabilitation progression after meniscectomy (especially lateral meniscus)
Concomitant procedures	Modified protocols for anterior cruciate ligament reconstruction, meniscal repair, osteotomy, etc
Alignement and Core Stability	Additional loading in certain compartments

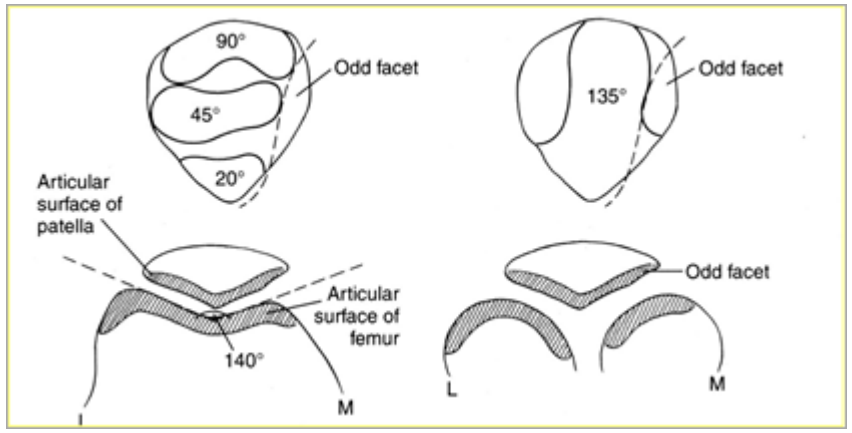
ACR – Rehabilitation Principles

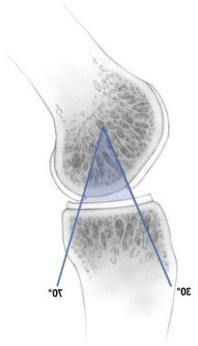
Create a Healing Environment

- Weight Bearing Restrictions
- ROM Limitations
- CPM, Manual PROM, ….

Rodrigo et al – 6-8h per dag – 8 weken

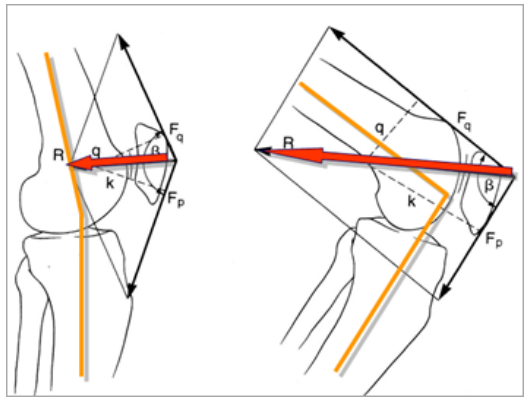
ACR – Rehabilitation Principles

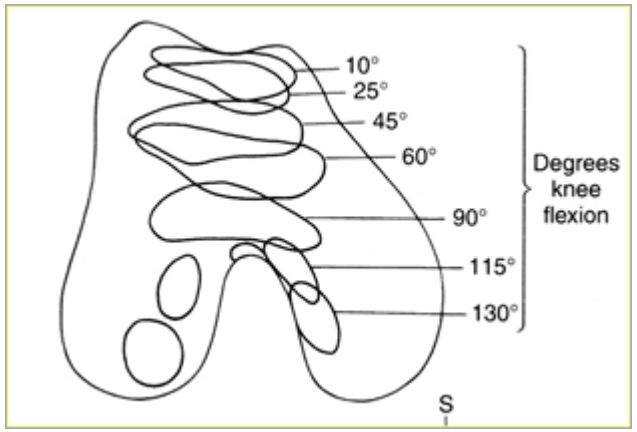


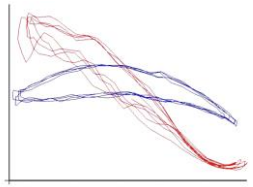


Biomechanics of the Knee

- Selection of exercises to prevent deleterious forces
- Joint arthrokinematics
- Avoid compressive or shearing forces in relation to localisation of the lesion…but they are needed to a certain extend.
- Leg Press or Vertical Squat





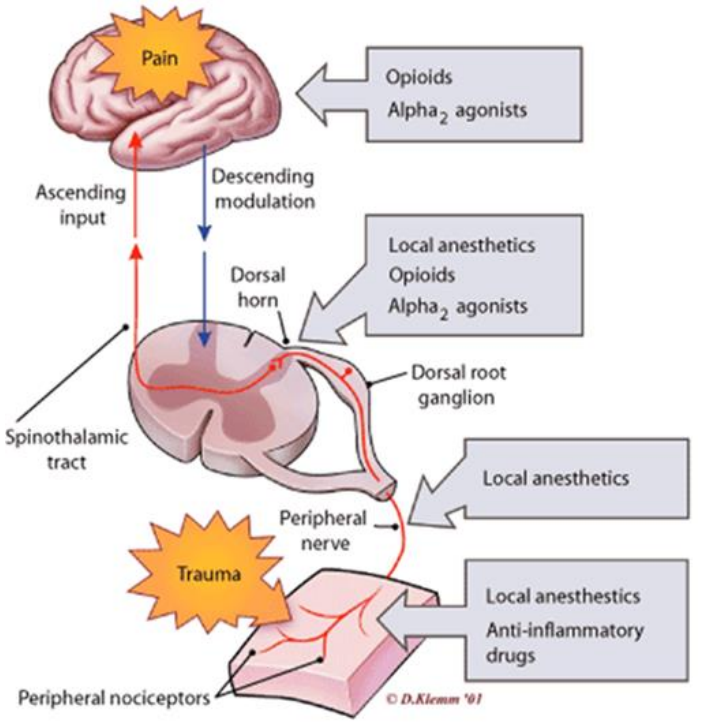


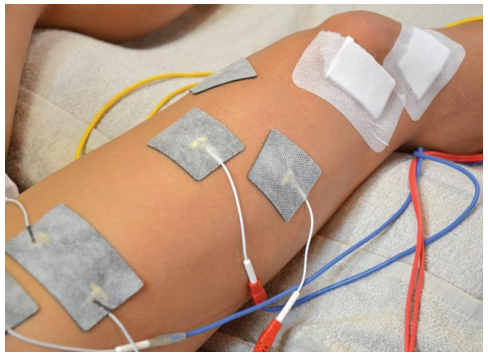
The Influence of Abnormal Hip Mechanics on Knee Injury:
A Biomechanical Perspective. Christopher M. Powers, JOSPT 2010.

ACR Rehab - Principles

Reduction of Pain and Effusion

- Minimize relfex inhibition (P-S-P Cycle -AMI)
- Decrease intra-articulare temperature and pressure
- *Analgesic medication*
- Transcutaneous Electrical Nerve Stimulation
- Manual Techniques





ACR Rehab- Principles

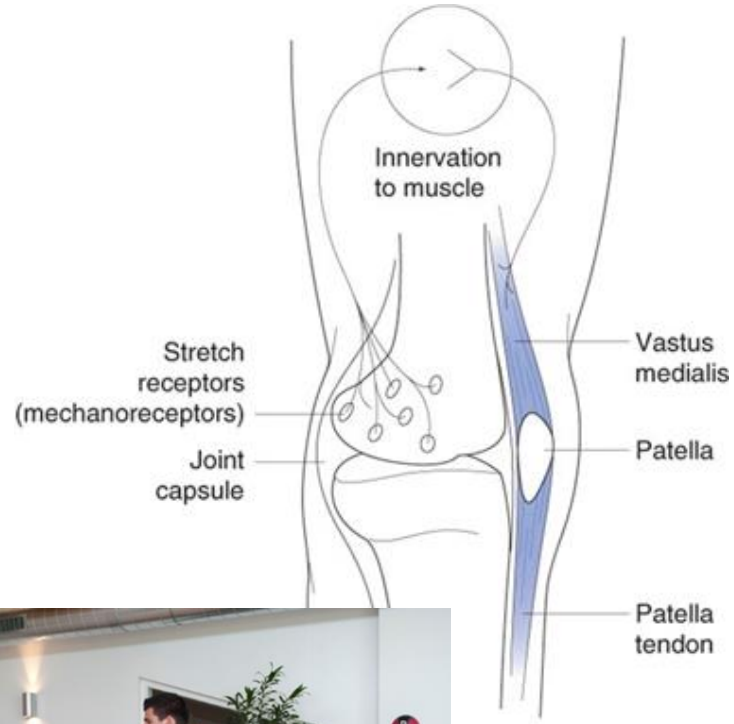
Restore Soft Tissue Balance

- Prevention of arthrofibrosis
- PROM: full extension (drop-lock brace) and optimal flexion
- Hamstring & Gastrognemius Stretching
- Patellar Mobilizations
- Scar Management

ACR Rehab - Principles

Restoring Muscle Function

- AMI
- Electrical stimulation
- Biofeedback
- Exercise Management



ACR Rehab - Principles

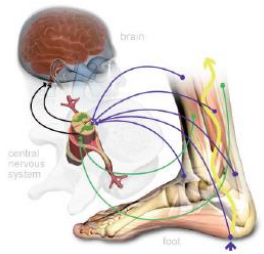
Enhance Proprioception and Neuromuscular Control

- Proprioceptive Exercises
- Neuromuscular Control Drills

CLINICIAN'S CORNER:

Overcoming the Myth of Proprioceptive Training

Daehan Kim[1], Guido Van Ryssegem[2], and Junggi Hong[3]



The Power of Exercise in Rehabilitation:

Proprioceptive & Neuromuscular Exercises

University of Kent

Karen Hambly

K.Hambly@kent.ac.uk

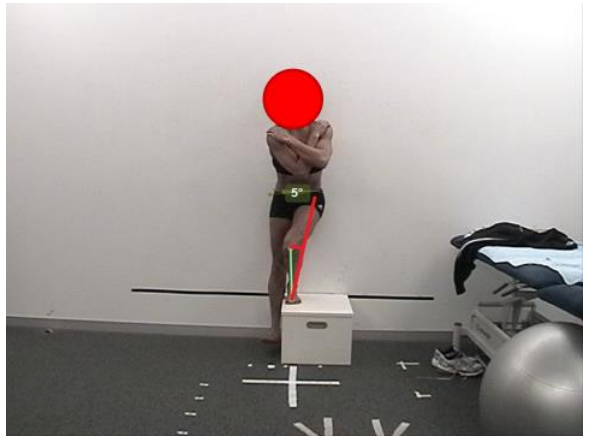
University of Kent

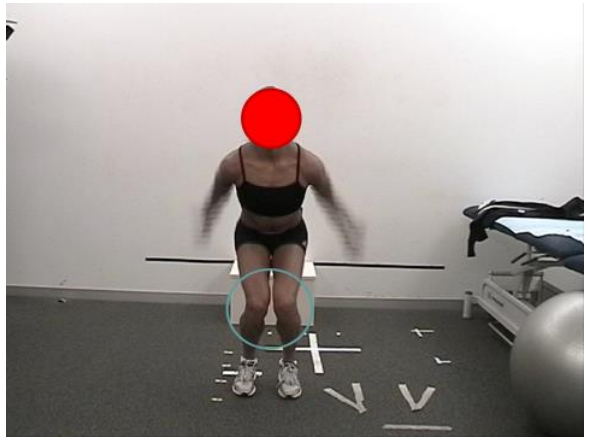
School of Sport and Exercise Sciences, University of Kent

ACR Rehab - Principles

Controlling the Application of Loads

- Gradually Increasing
- Cyclic Compressive Stress
- Monitoring of Pain and Effusion...BUT…
- Alignement – Kinetic Chain Principles (Functional Diagnosis)





The Effects of Isolated Hip Abductor and External Rotator Muscle Strengthening on Pain, Health Status, and Hip Strength in Females With Patellofemoral Pain: A Randomized Controlled Trial. Christopher M. Powers JOSPT 2012

Differences in Hip Kinematics, Muscle Strength, and Muscle Activation Between Subjects With and Without Patellofemoral Pain. Richard B. Souza JOSPT 2009

ACR Rehab - Principles

Team Communication

- ACR Patient Knowledge

- Rehabilitation of an athlete following articular cartilage repair involves a **multidisciplinary team** approach that requires **active and frequent communication**.

- 1-day surgery – rehab up to 2 years and very complex

- Implications on daily life (crutches)…sports competition.

- **Close communication between surgical and rehabilitation teams is essential for successful recovery and return to sport.**

Kai Mithoefer, MD - JOSPT, 2012

ACR Rehab – Progression of Phases

Based upon

- Individual Variables
- Individual Progression
- Surgical Technique
- Clinical Symptoms
- Healing Timelines

The development and implementation of these treatment guidelines reflect a criteria-based ap proach based on scientific research of articular cartilage repair healing constraints, knee complex biomechanics, neuromuscular physiology, and general sport-specific tasks.

Thus, progression through rehabilitation should be based on criteria rather than fixed time lines.

ACR Rehab – Phases

Biologic and Rehabilitation Phases After ACR		
	Biologic Phase	**Rehabilitation Phase**
Phase 1	Graft integration and stimulation	Protection and joint activation
Phase 2	Matrix production and organization	Progressive loading and functional joint restoration
Phase 3	Repair cartilage maturation and adaptation	Activity restoration

Kai Mithoefer, MD - JOSPT, 2012

Phase 1. Weight-Bearing Guidelines

• Femoral defects	Restorative techniques (OATS/allograft): touch-down loading for 2 wk, then progress to full weight bearing by 4 to 6 wk
	Reparative techniques (microfracture/ACI): touch-down loading for 2 wk, then progress by 25% body weight per 2wk + full weight bearing by 8 weeks VERSUS no loading for 2-4 weeks
• Patellar/trochlear defects	Immediate weight bearing with brace locked in 0° to 10° of knee flexion

Kai Mithoefer, MD - JOSPT, 2012

Progression Criteria or Milestones to Go from Phase 1 to Phase 2

- Full passive ROM equal to the non-operated knee
- Minimal or absent pain (VAS less than 3/10)
- Minimal or no effusion (grade 0 or 1+)
- Recovery of muscular activation
- Recovery of normal gait cycle (equal stride length and stance time between limbs, no limp)

Kai Mithoefer, MD - JOSPT, 2012

Progression Criteria or Milestones to Go from Phase 2 to Phase 3

- Full and painless ROM
- No or minimal pain (VAS less than 3/10) – No or minimal effusion (grade 0 or 1+)
- Maximum peak torque difference of less than 20% between limbs on isokinetic test
- Hop performance difference of less than 10% between limbs
- Self-report outcomes greater than 90%
- Ability to run on a treadmill at 8 km/h for more than 10 min

Kai Mithoefer, MD - JOSPT, 2012

On-Field Phases

Stage	Test	Rehabilitative Exercises
1	• Aerobic fitness test	• Gaining confidence with the environment and the ground
		• Walking in a straight line without shoes
		• Slow running in a straight line on rehabilitation field
		• Exercises of mobilization and coordination
		• Sand exercises (walking, balancing without jumping)

On-Field Phases

Stage	Test	Rehabilitative Exercises
2	• Aerobic fitness test	• Circular running
		• Increasing speed of running
		• Light jumps and landings on the sand
		• Advanced proprioceptive exercises
		• Aerobic conditioning

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On-Field Phases

Stage	Test	Rehabilitative Exercises
3	• Countermovement jump	• Running at different speeds with slow changes of direction
	• Squat jump	• Slow decelerations
		• Skips (different patterns)
		• Jumps and landings on the field
		• Aerobic conditioning

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On-Field Phases

Stage	Test	Rehabilitative Exercises
4		• Running with fast changes of direction
		• Decelerations
		• Technical and sport-specific exercises
		• Jumps and landings with rotations
		• Aerobic conditioning
		• Anaerobic-threshold running for 15 min

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On-Field Phases

Stage	Test	Rehabilitative Exercises
5	• Aerobic fitness test	• Sprinting and fast changes of direction
	• Countermovement jump	• High-intensity exercises in playing situations
	• Squat jump	• Aerobic conditioning
		• Anaerobic-threshold running for 20 min

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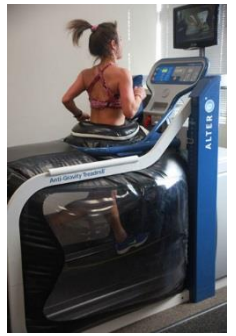
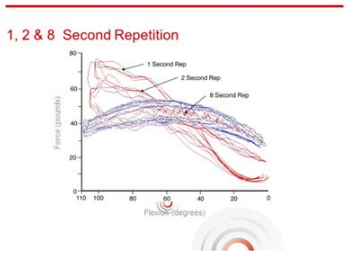
ACR RehaB – Where are we headed

- Rehab Centers – Specialization
- Better Communication
- Integration of New Technologies and Ideas
- New Resistance Technologies
- Rehab Methodologies
- …





"There are two parts to every movement – the FORCE you produce , and the SPEED at which you produce it"
POWER

ACR Rehab – Take Home Message

- **ACR & Rehab: Can be succesful**
- **ACR Rehab process is vital**
- **Based on several ‘Key’ principles;**

  ‘Optimal and progressive loading’
- **Knowledge and Expertise**
- **Communication**
- **…Patience**

Met dank

Literature References: infa@proccare.com