17th June 2023, Burgerstein Ärztekongress

Gut versorgt mit Mikronährstoffen vor und nach der Operation

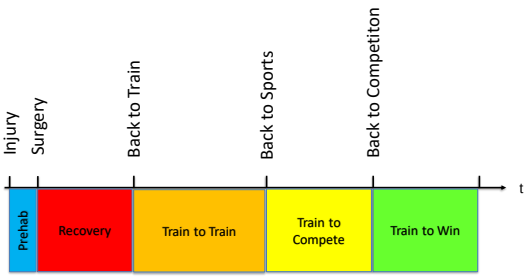
PD Dr. med. Dr. phil. André Leumann

BASEL ORTHOLEU

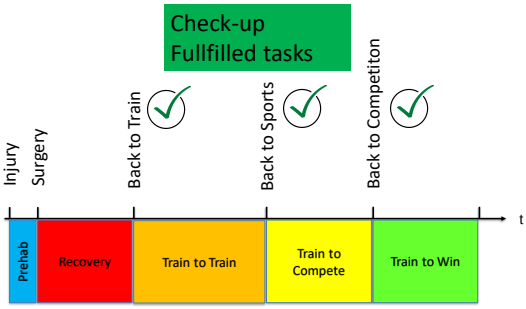
Objectives

- Supplements in Peri-operative Care
- The Joint as an Organ-Concept
- Wound Healing Phases
- Timelines of Healing and Rehabilitation
- Ligaments and Tendons - Collagene
- Bone and Cartilage – osteochondral

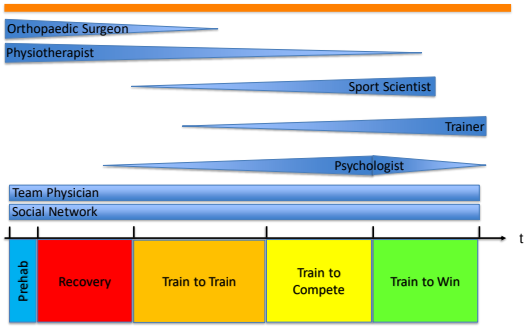
Rehabilitation Phases



Rehabilitation Phases

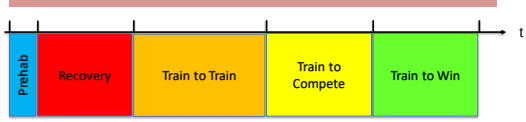


Rehabilitation Phases



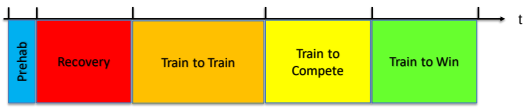
Rehabilitation Phases

To Optimize
=
Teamwork

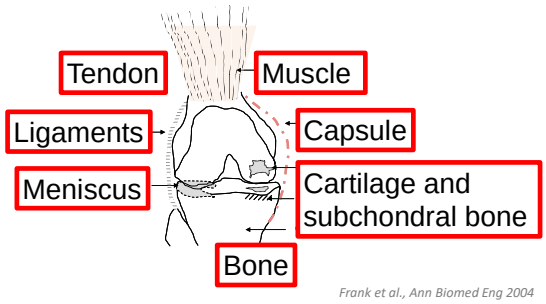


Rehabilitation Phases

To Optimize
=
Fast But Save

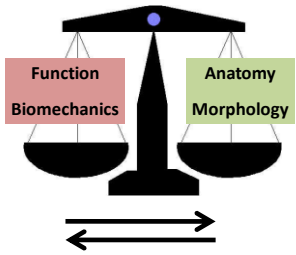


The Joint as an Organ



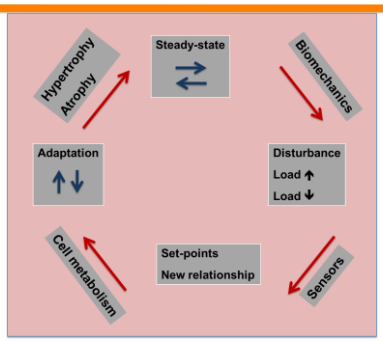
Frank et al., Ann Biomed Eng 2004

Joint Homeostasis

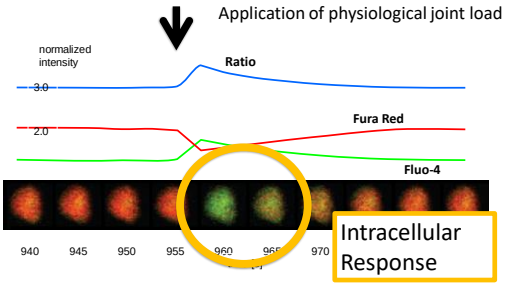


The joint aims for a steady-state in all tissues

Joint Homeostasis

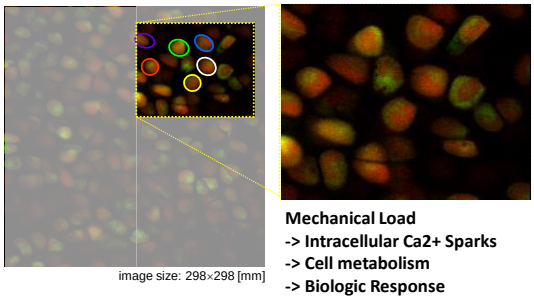


Mechano-biologic Coupling



Han et al., J Orthop Res 2012

Mechano-biologic Coupling



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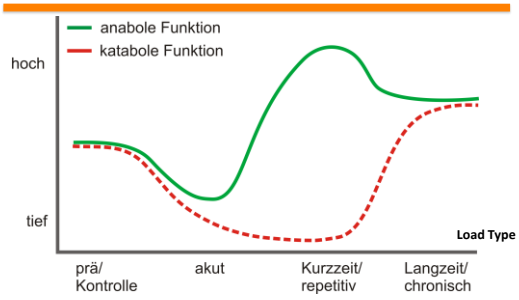
Mechanical Load
-> Intracellular Ca2+ Sparks
-> Cell metabolism
-> Biologic Response

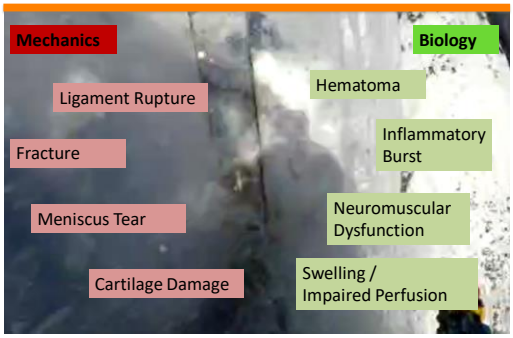
Han et al., J Orthop Res 2012

Cell metabolism – reaction to load



Leumann et al. Schweiz Z Sportmed 2011

Injury = Joint Crash



Prehab

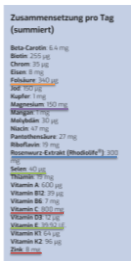
- Controll inflammatory process
  - > Surgery will lead to another inflammatory burst
- Prepare for surgery
- Reduce swelling
- Normalize perfusion

Prehab

- Stabilize the joint
- Physiotherapeutical measures
- Physical measures
  - Compression
  - Ice / Cooling
  - Elevation
- Burgerstein Microcare

Prehab

Basis

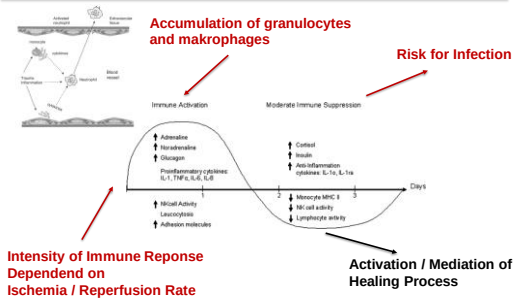


Immunologic Response
Antioxidative
Cell Metabolism
Muscle Relaxation
Mood Stabilizing

+

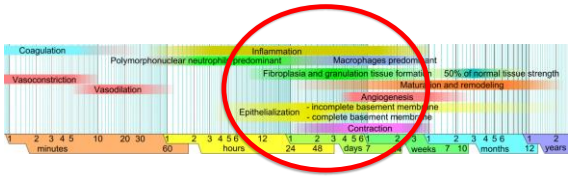
Iron Deficiency
Metabolic Disorders
Vit D Deficiency

Inflammatory Response to Trauma / Surgery



Brochner et al Scand J Trauma 2009, Toft et al Curr Anaest & Crit Care 2008

Wound Healing – Acute Phase



Wound Healing – Acute Phase

- Strengthen immunologic response
  - > prevent infection
- Reduce inflammation / swelling
- Restore perfusion
- Stimulate angiogenesis

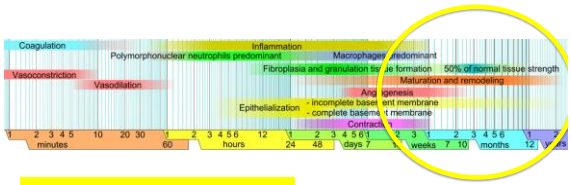
Wound Healing – Acute Phase

Prophylaxis for infection
Antioxidative
Controll inflammation
Reduction of Swelling

+

Extended inflammatory response
Boswellia
Expected muscle atrophy
Kreatinin + Leucin
Mood instability
Rhodiolife

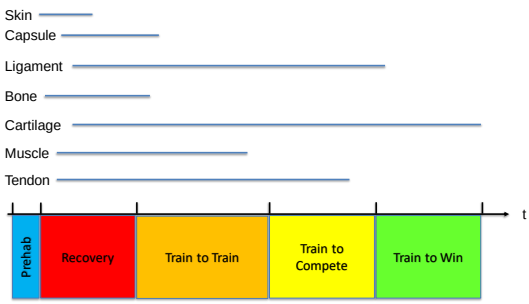
Wound Healing
Long-term / Tissue Regeneration



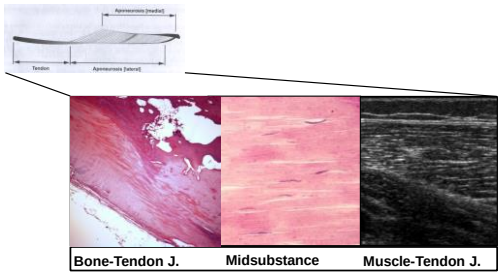
Mechanical Stimulation
+
Biological Substances

Cell Activation
Mechanical Competence

Mechanical Competence

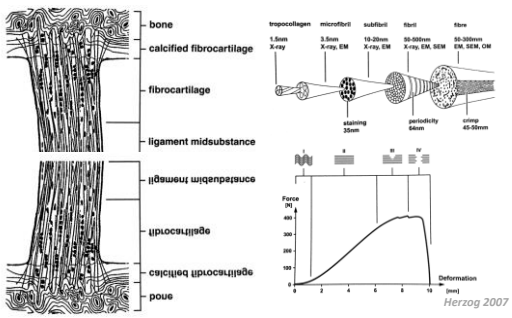


Ligaments and Tendons: Collagene



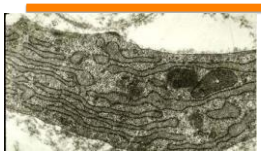
Herzog 2007

Ligaments and Tendons: Collagene

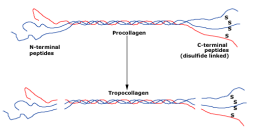


Herzog 2007

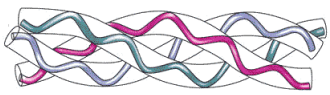
Collagene Synthesis



Endoplasmatic Reticulum (ER)

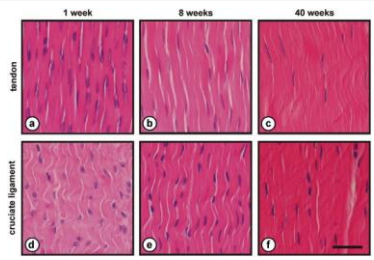


Bio Synthesis (e.g. Vit C dependent)



Tropocollagene Triple Helix

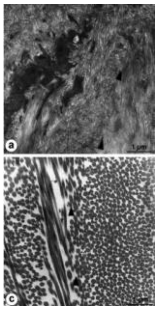
Ligament Maturation



Zellen (%)	33.4	23.2	5.9
ECM (%)	64.5	75.8	93.3
Blutgefässe (%)	2.1	1.0	0.8

Meller 2009

Ligament Maturation



1 week

8 weeks

Amorph Tissue
Scar
Unorganized Cloud of Collagene

Organized Structure
Ligament
Mechanical Competence

Meller 2009

Wound Healing
Long-term – Ligament and Tendon

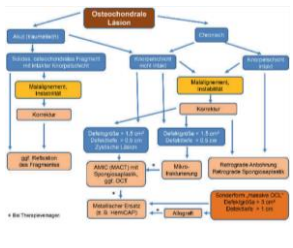
Beta-Carotin: 6.4 mg
Biotin: 255 µg
Chrom: 35 µg
Eisen: 8 mg
Folsäure: 340 µg
Jod: 150 µg
Kollagenpeptide (Verisol®): 4000 mg
Kupfer: 1 mg
Mangan: 1 mg
Molybdän: 30 µg
Niacin: 47 mg
Pantothensäure: 27 mg
Riboflavin: 19 mg
Selen: 90 µg
Thiamin: 19 mg
Vitamin A: 600 µg
Vitamin B12: 39 µg
Vitamin B6: 7 mg
Vitamin C: 400 mg
Vitamin D3: 42 µg
Vitamin E: 239.92 I.E.
Vitamin K1: 64 µg
Vitamin K2: 96 µg
Zink: 18 mg

Collagene Formation
Collagene Synthesis

+

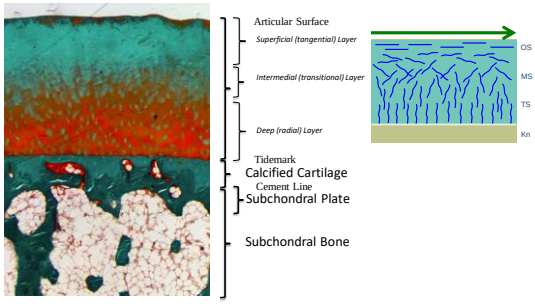
Prolonged inflammatory response
Curcuma and Boswellia
Osteochondral Problem
Chondroitin/ Glucosamin
Muscle Atrophy
Kreatinin/Leucin

Osteochondral Lesions of the Ankle

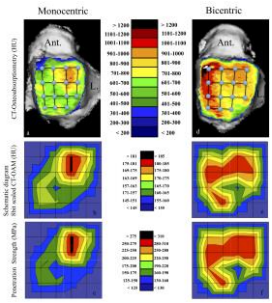


Aurich et al. DGOU 2017

Osteochondral Unit



Subchondral Bone Plate



CT-Osteoabsorptiometry

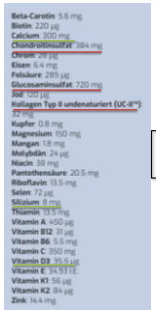
Areas of high mineral density correlate with:

a) OCL localization

b) Cartilage thickness distribution

Buettner, Leumann et al. 2013
Leumann et al. 2015

Wound Healing
Long-term - osteochondral



Cartilage Formation
Bone Formation

+

Prolonged inflammatory response
Curcuma and Boswellia
Collagene Problem
Collagene
Muscle Atrophy
Kreatinin/Leucin
High Homocystein
B-complexe
Menopause/Andropause
Testofen

Lessons learned I

- Optimization means Individualization
- Body reactions to injury and surgery do follow specific timelines
- By adding the important supplements according to the timeline I can support the healing process
- But: Nutritional Supplements do not produce mechanical competence

Lessons learned II

- Prehab
  - Preparation for surgery
  - Prepare body for
    - Antioxidative burst
    - ✓ Vitamine E and Selen
    - Risk for infection
    - ✓ Vitamine C and Zink
    - Stress
    - ✓ Rhodiolife

Lessons learned III

- Acute Post-operative Care
  - Modulate inflammatory reaction
  - ✓ Curcuma and Boswellia
  - Prevent infection
  - ✓ Vitamine C and Zink
  - Reduce antioxidative burst
  - ✓ Vitamine E, Selen and Liponic acid

Lessons learned IV

- Long-Term Tissue regeneration
  - Collagene Production / Ligament and Tendon
    - ✓ Collagene
    - ✓ Vitamine C
  - Cartilage Maturation
    - ✓ Chondroitin
    - ✓ Glucosamin
  - Bone strengthening
    - ✓ Calcium
    - ✓ Vitamine D
    - ✓ Silicium
- Multiple Add-ons based on individual needs

Lessons learned V

- Pro's, Con's and Limitations

+++	-	Limitations
Optimize Micro Nutrition	Evidence	Macro Nutrition
Good Tolerance	Parameters	Does Not Replace Rehab
No Anti Doping Restriction	Unclear Duration of Supplementation	Influence on Outcome
Little Side Effects	Costs	Compliance «Smarties»
Easy and speedy Logistics	Follow-up Prescriptions	

Thank you!

PD Dr. med. Dr. phil.
André Leumann

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