

# Therapy with PRP

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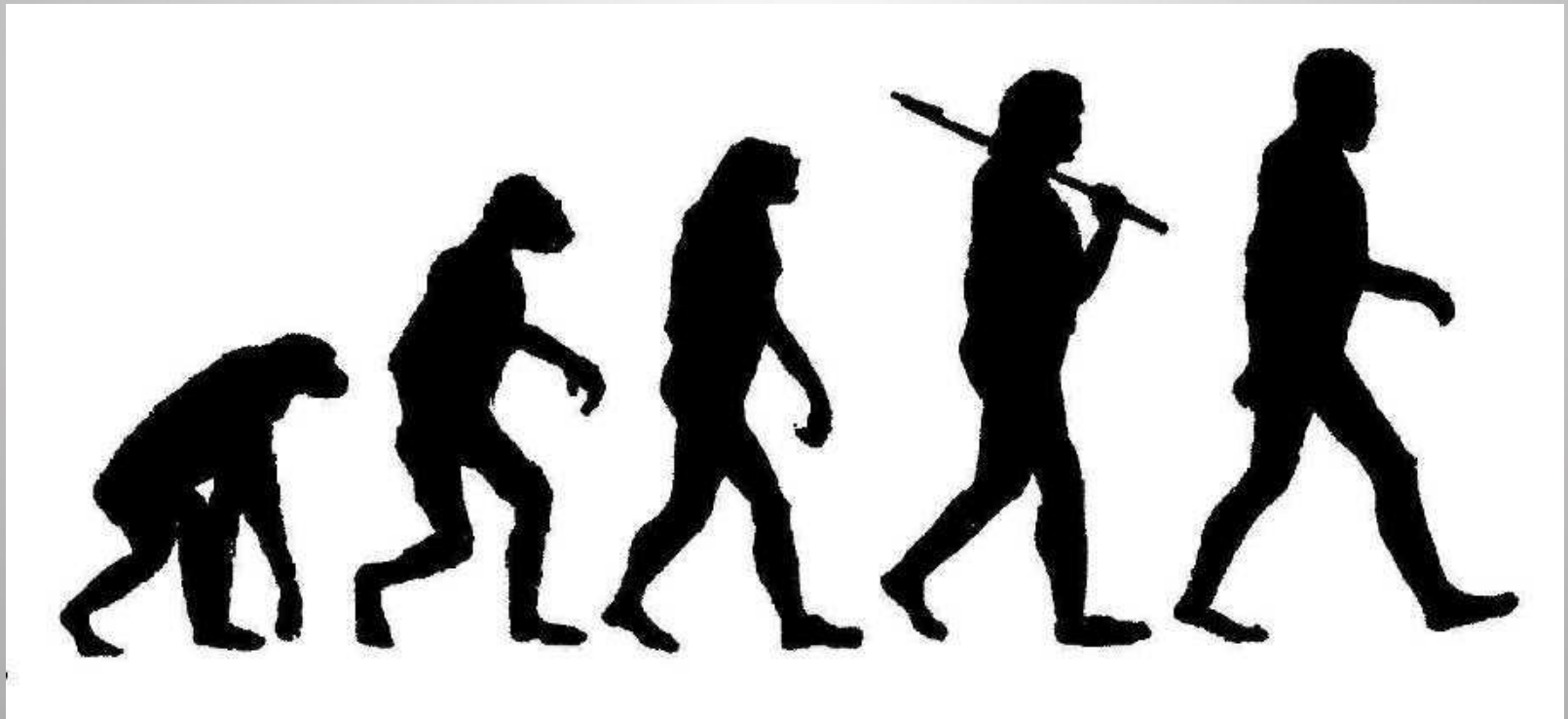
Team Doctor ÖSV (Ski Jumping and Nordic Combined)

**Flachau S.I.T.E.M.S.H 2014**



# Therapy with PRP

Where are we ?



# Therapy with PRP

## ■ **Methods :**

✓ **PRP** (Platelet-rich Plasma)  
Buffy-Coat / Plasma-based PRP

✓ **ACP** (Autolog conditioned Plasma) –  
Plasma based PRP

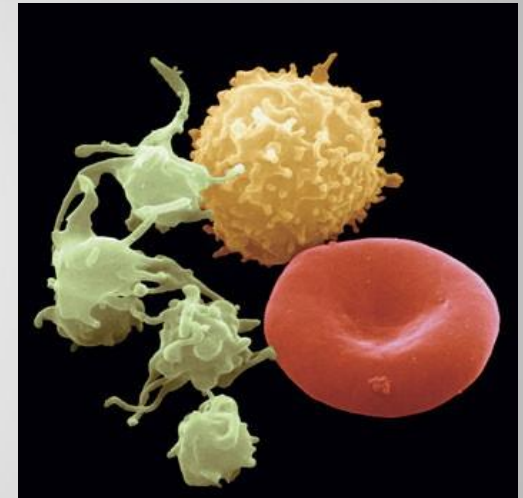
✓ Higher Concentration of Thrombocytes and Growth  
Factors per Plasma Unit



# Therapy with PRP

## ■ Growth Factors in $\alpha$ -Granula :

- ✓ Transforming growth factor  $\beta$  (TGF- $\beta$ )
- ✓ Platelet-derived growth factor (PDGF)
- ✓ Insulin-like growth Factor (IGF I,II)
- ✓ Fibroblast growth factor (FGF)
- ✓ Epidermal growth factor (EGF)
- ✓ Vascular endothelial growth factor (VEGF)
- ✓ Endothelial cell growth factor (ECGF)



-- Influence on Chemotaxis, Vascularisation,  
Cell Differentiation and Proliferation,  
Matrix Formation through E.g. Collagen  
Production

# Therapy with PRP

## ■ Wound Healing:

- ✓ **PHASE 1** (Hemostases/Inflammation) :
  - 2 bis 5 days
  - Thrombocytes Activation
  - Degranulation and Release of Growth Factors – Inflammation
  - 70-95% of GF released in first 10 min – Day 9
  
- ✓ **PHASE 2** (Proliferation) :
  - 2nd Day - 3. Weeks
  - Vascularisation, Collagen production, low GF-Release
  
- ✓ **PHASE 3** (Remodeling) :
  - up to 1 year
  - Scar Building

# Therapy with PRP

## ■ Basics ACP/PRP 1 :

- ✓ different Process of production – Different Concentration
- ✓ Concentration of Platelets and Growth Factors dependent on:
  - Volume of Blood
  - Platelet Production
  - Plasma Volume
- ✓ Increase of Growth Factors not proportional to the increase of Platelets (HGF und IGF-I out of Plasma)
- ✓ Ideal Concentration?
- ✓ Which Concentration ideal for which Tissue?

# Therapy with PRP

- **Products – ACP/PRP :**



Symphony III DePuy



GPS III Biomet



Magellan Medtronic

Buffy coat based



Plasma based



Cascade MTF



ACP Arthrex

# Therapy with PRP

## ■ Basics 2 : Plasma based vs Buffy coat based

**TABLE 1. Plasma-based PRP systems**

| Device Name | Centrifuge time (min) | Initial blood volume (mL) | Final PRP volume (mL) | Platelet concentration | WBC concentration |
|-------------|-----------------------|---------------------------|-----------------------|------------------------|-------------------|
| Arthrex/ACP | 5                     | 16                        | 4-7                   | 2-3 ×                  | Minimal to none   |
| Cascade/MTF | 6 (plasma)            | 9                         | 4.5 (plasma)          | 1.3-1.7 ×              | Minimal to none   |
| Fibrinet    | 21 (clot)             |                           | 2 (clot)              | (plasma)               | none              |
| BTI/PRGF    | 8                     | 9                         | 2-3                   | 2-3 ×                  | Minimal to none   |

PRP indicates platelet-rich plasma; WBC, white blood cell.

**TABLE 2. Buffy coat-based PRP systems**

| Device name           | Centrifuge time (min) | Initial blood volume (mL) | Final PRP volume (mL) | Platelet concentration | WBC concentration       |
|-----------------------|-----------------------|---------------------------|-----------------------|------------------------|-------------------------|
| Biomet GPS II/III     | 12-15                 | 30 or 60                  | 3 or 6                | 2-8 ×                  | Increased over baseline |
| Harvest SmartPRP 2/   | 12-15                 | 20 or 60                  | 3 or 7-10             | 3-7 ×                  | Increased over baseline |
| DePuy Symphony II     |                       |                           |                       |                        |                         |
| Arteriocyte/Medtronic | 14-20                 | 30 or 60                  | 3-10                  | 3-7 ×                  | Increased over baseline |
| Magellan              |                       |                           |                       |                        |                         |
| Emcyte Genesis CS/    | 12                    | 30 or 60                  | 3 or 10               | 7-10 ×                 | Increased over baseline |
| Exactech Accelerate   |                       |                           |                       |                        |                         |

PRP indicates platelet-rich plasma; WBC, white blood cell.

# Therapy with PRP

- **Basics 3 : Can we have too much of something Good?**

*Am J Sports Med 2012 - Mazzocca et al – in vitro Study on human Tissue PRPLP significant higher Cell Proliferation.*

*Am J Sports Med 2007 - Sanchez et al, Anitua et al*  
Positive Effect of PRP with a 2-3 times increases Platelet Concentration

*Orthopedic Research Society 2002 – Haynesworth SE*  
>6 times increased Platelet Concentration leads to  
Apoptosis, Receptor Down-Regulation

# Therapy with PRP

- **Angel System:**
- ✓ Individual Formation of PRP
- ✓ Platelet-rich Fibrin-Gel (with activAT)

PRP mixed with Autologous Thrombin (AT)  
Release of Growth Factors over a couple of days at a certain location

Time for Production approximately 30 min.



# Therapy with PRP

- **ACP Production :**



# Therapy with PRP

## ■ How to use :

- ✓ 2- 3 Injections every 4-7 days
- ✓ Interaction between Steroides and  $\alpha$ -Granula
- ✓ Lidocaine deactivates  $\alpha$ -Granula because of a decreased pH value
- ✓ Benefit in chronic Cases  
(Restart Inflammation-Phase)
- ✓ No Change of Rehabilitation Program
- ✓ No need for Heparin

# Therapy with PRP

## ■ Indications :

- ✓ Disease Patterns of Tendons
  - Epicondylitis, Achillodynia
  - Runners / Jumpers Knee
  - Fasciitis plantaris
- ✓ - Osteoarthritis (Grad I-III)
- ✓ Muscle- and Ligament Leasions -  
Ultrasonic-Guided Injections
- ✓ peri- postoperatively
  - Achilles Tendon Repair
  - HTO, Mikrofracturing
  - Meniscal Suture, RC Repair etc.



# Therapy with ACP

## ■ Indications:

### ACL Repair :

- Fehske, Eichhorn et al : Arthroskopie 2013 -  
Intraoperative biological Augmentation on Ligaments

Treatment of Partial Ruptures of the ACL with  
ACP n=207 + Control Group without ACP (32% good results)  
Grad 1 - 5 - intra- and postop injection of ACP into the ACL

### intermediate Results :

Gruppe 1,2 : 98% (subsynovial Ruptures,)  
Gruppe 3 : 85% (torn Synovia + partial torn ACL)  
Gruppe 4 : 70% (partial 2 Bundle Leasion)  
Gruupe 5 : <30% (some fibers left)

# Therapy with PRP

## ■ Indications :

### ACL Repair (Future?!):

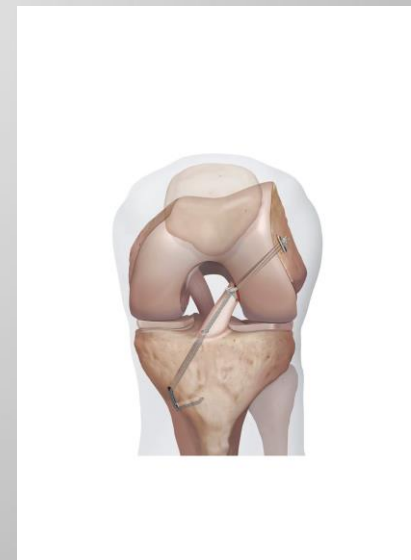
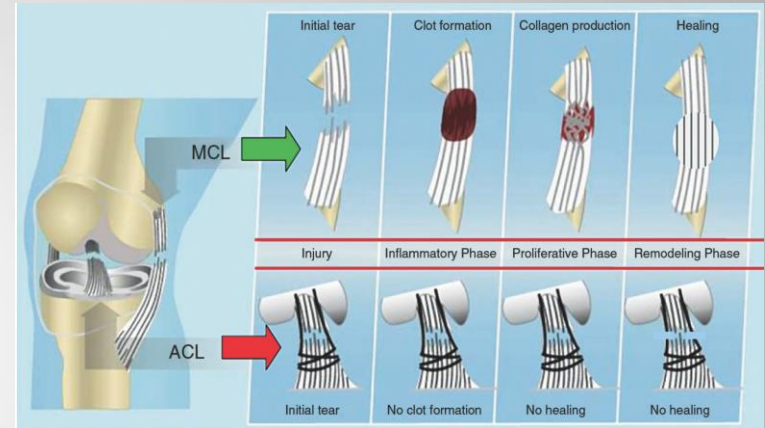
#### - ACL Repair :

Collagen-platelet scaffolding for ACL healing (Animal Studies)

M.Murray - Harvard: J Bone Joint Surg Am

#### - ACL Repair with internal Brace + PRP

Refixation of ACL + Internal Brace  
Stem Cells through Microfracturing  
+ PRP Scaffold?!



# Therapy with PRP

## ■ Evidence : PRP und Hyaluronic Acid



- ✓ 2008 Anitua E et al – non randomised, n = 60, 3 Injektion every 7d  
WOMAC Score - after 5 weeks  
Subjektiv less Pain in 33% PRP and 10 % HA Group
- ✓ 2010 Kon et al – n = 150, 3 Injektions every 14 d, FU 6 Mo, Grad I-III OA  
signifikant better in IKDC compared to HA
- ✓ 2012 Cerza et al – Level 1 Study, n=120, FU 6 Mo  
4 Injektionen every 7 d,  
WOMAC Score in Osteoarthritis III  
74,85 HA Gruppe vs 41,2 ACP Gruppe

# Therapy with PRP

## ■ Evidence : PRP and Return to Sport



- ✓ 2014 A Hamid: *Am J Sports Med.*– Level 2 Studie, n=28  
**Hamstring Läsion II** : Rehab vs Rehab + ACP  
Return to Sport 42,5 +/- 20,6 vs 26,7+/-7 d
- ✓ 2014 Laveret al: *Knee Surg Sports Traum arthrosc* –n =16 Elite Athletes,  
**AITFL Läsion** - Rehab vs Rehab + ultraschall gestützt PRP  
RTP 40,8 vs 59,6 d, less pain PRP Group

# Therapy with PRP

## ■ Evidence : Conclusions :

- ✓ Creating a Higher Concentration of Platelets and Growth Factors (+/- Erythrocytes und Leukocytes) in the Tissue
- ✓ Restart of Inflammation Phase in chronic Tendinopathies – Healing Response
- ✓ First good results in clinical Trials
- ✓ Different Protocols
  - Different Concentration of Platelets
  - Scaffolds (Gel, Fibrin, Matrix)
  
- ✓ Further Studies need to be done !

# Therapy with PRP

- **What to do?**



M, 38 a, former Soccer Player,  
Achillodynia for more then 15 years,  
multiple Steroid Injections;  
Physiotherapy, Viscoheel, Shock Wave  
No Sport due to Pain, Increasing Weight,  
Wants no Surgery.



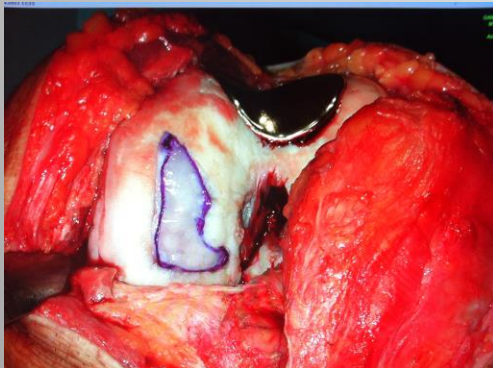
F, 61a, Mother of Traumatologist and Friend  
since 2 a Fasciitis plantaris, Pain medication  
multiple Steroid Injections,  
Physiotherapy, Insoles, Shock Wave

# Therapy with PRP

- **What to do?**



M, 22a, Olympic Medalist in Ski Jumping,  
Partial Rupture of the MCL at the beginning of the  
Season -  
Return to Sport ?!



M, 36a, Police Officer  
Wave Implantation + MACT med. Femoral Condyle  
Physiotherapy, Brace, Pain Killers, Hyaluronic Acid ,  
Still Pain, unable to work in his job.

Thanks for your Attention !!

