Platelet Rich Plasma Clinical Applications Truth or Myth?

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No disclaimers
Platelet-Rich Plasma (PRP)
Claims of PRP

- Reduce blood loss
- Improve wound healing
- Reduce infection (due to presence of WBC)
- Improve ligament integration into bone
- Reduce Pain
- Heal tendons
- Treat arthritis
- Grow cartilage
Truth or Myth?
Can Even Grow Hair!

Hair Transplant Surgery Coupled With PRP Therapy - Is This The Next Generation of Hair Restoration?

http://hairloss.iahrs.org/hair-transplant/hair-loss-prp-therapy-hair-transplant/
Vampire Facelift

(Selphyl) uses the patient’s own blood to make the injectable filler.
Truth or Myth?
Which is better?
How is PRP Prepared?

- Single spin systems
- Use for tendon, joint or ligament injections
- WBC = may or may not be present
- Double spin
- Gels
- Matrices
- Membranes
Nonsurgical uses

- All companies have injectable PRP
- Tendinosis- Achilles/quad/patellar tendon/elbow
- Soft tissue pain; bursitis/fasciitis
- OA of the knee
- Ultrasound can facilitate placement
Nonsurgical use

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PRP and Tendinosis

- Alternative to corticosteroids
- Precise introduction of growth factors to the tendinopathic areas
- Chemotactic properties create an inflammatory response and invoke the healing cascade with
Peer Review Articles

- **Aspenberg**: Percutaneous injection into hematoma of rat Achilles tendon tear showed increased tendon callous strength and stiffness (Acta Ortho Scand. Feb 2004)

- **Hammond**: Injection of PRP into Ant tibial muscle vs. controls that had set stretch showed earlier healing and return to normal. (AJSM Vol. 37 2009)
Patellar Tendinosis

- 15 pts w PRP + PT vs. 16 pt w PT alone
- 3 PRP injections 2 wks apart
- No adverse effects
- Earlier return to sport
- Statistically significant improvement in all parameters

Filardo et al. Injury July 2009
Patellar Tendinosis and PRP

- Level 1 -10 pts
- Eccentric PT + dry needling under UTZ
- Eccentric PT + dry needling + UTZ + PRP
Patellar Tendinosis and PRP

- PRP group – sign improve $p=0.01$
- Dry needling - decreased over 12 weeks

Dragoo- Arthroscopy Oct 2011
Achilles Tendinopathy
AJSM deJong, de Vos 8/11

Level 1 Randomized controlled trial

PRP vs. saline + eccentric rehab program

54 pts- all improved (59%)

VAS; and Ultrasound exam- both improved significantly but not different

Conclusion; No difference at 1 year;
Elbow tendinopathy
Mishra: AJSM 2006

- 15 patients
- Original Paper: 93% reduction in pain at 2 years
- VAS; 8 wks 60% decrease vs. controls (16%) p=.001
Lateral Epicondylitis

Peerblooms; AJSM Vol 38 No 2; 2010

- Level 1 Study; Steroid vs. PRP Injection
- 100 pts
- Treatment with PRP reduced pain and increased function (VAS p<.001; DASH p = .005)
- 18/100 required subsequent intervention
  - 5 PRP group; 3 operations; 2 steroid inj.
  - 13 steroid group; 6 operations; 6 PRP inj + 1 steroid
- 2 yrs fu study confirmed ongoing improvement compared to steroids (AJSM Vol 39 2011)
PRP and Lateral Epicondylitis
Hechtman, Uribe; Orthopedics 2011

- 31 pts- 6 mos failed treatment including steroids
- 90% reduction of 25% of VAS and DASH at least 6 mos
- Important point; many were worse at 6 weeks, but then improved.
Rotator Cuff Tendinosis

- Use ultrasound control
- Consider for tendinosis
- Partial cuff tears
Technique
PRP results

- Hansen; not published - observational
- 20 SS tears + MRI + US
- 2 injections
- MRI + US at 6 mos; all had evidence of new tissue formation
- 14/20 excellent results and avoided surgery
- They hurt for 2-7 days
My Opinion

- Not ready for generalized use in RC tendinopathy
- Could be used in repairs of partial tears
- In my hands, not an outpatient procedure—it really hurts to do
## Knee OA and PRP

### Kellgren Lawrence Grading System

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 1</td>
<td>Doubtful narrowing of the joint space and poss osteophytic lipping</td>
</tr>
<tr>
<td>Grade 2</td>
<td>Definite osteophytes, definite narrowing of the joint space</td>
</tr>
<tr>
<td>Grade 3</td>
<td>Moderate mult. Osteophytes, def narrowing of joint space, some sclerosis and poss. deformity of bone contour</td>
</tr>
<tr>
<td>Grade 4</td>
<td>Large osteophytes, marked narrowing of the joint space, severe sclerosis and def deformity of bone contour</td>
</tr>
</tbody>
</table>
Osteoarthritis and Knee

PRP vs. HA

- Cerza; Compared PRP and HA (AJSM 2012)
- Level 1 -
  - 60 pts each received 4 injections
  - Fu 6 months
- HA with Grade 3 arthritis had no improvement
- PRP – had sign effect after final injection and continued to 24 weeks and sign better than HA (P<0.001)
- ACP grade of OA was no different
Osteoarthritis and Knee
PRP vs. HA

- Sanchez; Arthroscopy 2012
- Level 1; BMI<32, no malalignment; No Grade 4 changes,
- 176 pts 6 mo followup
- Safe and efficacious in treating mild to moderate OA. Better pain relief compared to HA, but fu short, and no stat significant difference in stiffness and function.
OA and Knee
PRP vs. Saline
AJSM 2013

- PRP vs. Placebo
- Level 1:
- 3 Groups
- A = 1 PRP injection (WBC filtered)- 52 pts
- B = 2 PRP injections 3 wks. apart- 50 pts
- C = Saline- 46 pts

Patel AJSM Feb 2013
OA and Knee

- Groups A and B (PRP) statistically better outcomes in WOMAC, VAS up to 6 mo. P < .001
- Group C (saline) deteriorated over 6 mo.
- No difference in 1 or 2 injections
- No difference in age, sex, weight or BMI in the outcome
- Complications; dizziness and nausea
OA and Knee

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Clinical and MRI after PRP in OA

- Early OA (Kellgren 0-2) 30-70 yrs
- 17 pts single 6 cc injection PRP
- Fu to 1 yr with MRI pre and at 1 yr.
- VAS, WOMAC

Halpern, Rodeo et al; HSS Clin J Sport Med 2012
Clinical and MRI after PRP in OA

- 15 knees underwent MRI
- 73% showed no worsening of OA at 1 year
- May work by increasing HA production, proliferation of Chondrocytes and MSC and reduced inhibition of enzymes that breakdown cartilage in OA

Halpern, Rodeo et al; HSS Clin J Sport Med 2012
Clinical and MRI after PRP in OA

- 15 knees underwent MRI
- 73% showed no worsening of OA at 1 year
- May work by increasing HA production, proliferation of Chondrocytes and MSC and reduced inhibition of enzymes that breakdown cartilage in OA
- Normally OA progresses about 4% a year radiographically

Halpern, Rodeo et al; HSS Clin J Sport Med 2012
Summary-Nonsurgical Uses

- Not all PRP is the same
  - Know your vendor-
  - If its red, there are more WBC’s.
  - Evidence based studies
  - Effective in Elbow- better outcomes than steroid
  - Effective in the Knee for OA
  - Not clear in Achilles and Patellar tendinopathy
  - Injections for muscle strain or small series
Surgical Uses

- RC Repair
- Knee Tendon repair
- Achilles tendon repair
- Ligament reconstruction
If you add a second spin or add an activator

- Gels
- Matrix
- Membrane
Platelet Concentrate Systems

- Ideally can be sutured and placed arthroscopically
- Ease of Use
- Cost factors
- Delayed activation
Patellar Tendon Healing after ACL

- De Almeida AJSM 2012
- Randomized clinical trial
- 28 pts
- Gel placed in Patellar tendon defect
- Reduces postop pain and MRI tendon gap was 4.9 mm +/- 5.3 mm vs. control 9.4 +/- 4.4mm
Gels

- **Second spin:**
  - Add bovine thrombin to allow a workable/injectable form through large gauge catheters
  - Remember growth factors are all activated in face of thrombin within 1 hour
  - Most have WBC’s and some RBC’s
Platelet Rich Fibrin Matrix

- **Second spin;**
- Uses 0.01% CaCl to neutralize the anticoagulant from first spin
- Uses PRP (growth factors) + PPP (fibrin) to allow growth factors to adhere and forms a lattice
Platelet Rich Fibrin Matrix
no thrombin

- Produces a scaffold as well as a reservoir of growth factors
- Nonactivated platelets - released over 7 days
Matrix

- Scaffold; makes it easier to suture and pass through cannulas
- Meniscal repairs, Labral repairs

“Barbie Boobs”
Membrane

- Concentrates platelets up to 52X
- Much more robust
- Excellent for incorporating into soft tissue repairs (Quad, ACL, RC)
Sanchez- Achilles Tendon

- AJSM 2007
- 12 athletes; 40 cc blood; used CaCl, No thrombin; Used glass container to develop fibrin matrix
- 6 PRGF; 6 no PRGF
- Running 11 vs 18 wks (p= .024)
  Training 14 vs 21 wks (p= .004)
Achilles Tendon- caveat- these wounds look great
Ligament Reconstruction

- Fanelli;
- Reduced tunnel widening in ACL patients at 6 weeks compared to controls
- Controls 52% incidence of tunnel widening vs. 6.7% in PRFM
- Less soft tissue swelling / inflammation in extraarticular work.
Meniscal Repair

- Integrate into the repair much like a fibrin clot
- Use a passing suture to pull the matrix into the repair site or inject directly
Rotator Cuff Tears
Rotator Cuff Repair
RC Repair

- Castricini - AJSM Dec 2010
  - Level 1 study n = 80
  - Used PRFM
  - No difference in Constant score
  - Error in statistics on MRI - they said no difference in footprint coverage and quality of the tendon - but in fact there was a statistically significant improvement in footprint and quality!
Rodeo ASES 2010

- Level 1 –PRFM vs Control
- 1 yr followup
- No difference by ultrasound at 1 year
- Platelet count not related to healing
Barber  Arthroscopy 8/11

- Level 3
- 40 pts; PRFM and control
- 31 months
- MRI – persistent FT defects in 60% of controls vs 30% of PRFM  p=.03
  - If tear < 3 cm controls- 50% healed
  - PRFM – 86% healed;  P<.05
- No difference in standard outcome measures except Rowe score
Materials and Methods

- Cohort study –
- Retrospective consecutive series-2005-2007
- Rotator cuff tears in patients failing conservative treatment
- Matched control group during the same period
- Standard demographics as well as technique, tear size, medication use, sleep patterns, workers compensation status, range of motion and strength were documented
Current technique

PRF Membrane
## Return to Work

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<th>WC-PRFM</th>
<th></th>
<th>WC- Non PRFM</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Full duty</td>
<td>15</td>
<td>71%</td>
<td>21</td>
<td>60%</td>
</tr>
<tr>
<td>Modified</td>
<td>5</td>
<td>24%</td>
<td>12</td>
<td>34%</td>
</tr>
<tr>
<td>Retired</td>
<td>1</td>
<td>5%</td>
<td>2</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td></td>
<td>35</td>
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</table>
Conclusions

- The use of platelet rich fibrin matrix reduces pain ($p<0.01$) and improves sleep ($p = 0.013$) in pts undergoing rotator cuff repair.

- A high percentage of PRFM WC patients return to full duty (71%) vs. 60% controls.

- The use of PRFM may improve healing in patients with large-massive rotator cuff repairs.
Current Uses

- Indications
  - OA and Knee
  - Epicondylitis
  - Rotator cuff tendinosis; Achilles tendinosis, Plantar fasciitis
  - Surgical adjunct
New Directions

- Indications
  - OA and Knee
  - Epicondylitis
  - Rotator cuff tendinosis; Achilles tendinosis, Plantar fasciitis
  - Using with MSC in tendon repair and ligament repair

Research and Quality

Award-Winning Research May Make ACL Healing Without Reconstruction Possible

Biologystem combines extracellular matrix, proteins, and autologous blood

AAOS NOW Feb 2013
Thank You