Platelet Rich Plasma: Hoax or Hope

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Professional Background

- Double Boarded in both Anesthesiology and Pain Medicine
- Residency and Fellowship at the University of Pennsylvania
- Assistant Professor at Penn 2014-2016
- Relievus Pain Management Group
  - 20 offices in the greater Philadelphia region
Disclosure

- Nothing to disclose

Learning Objectives

- Platelet rich plasma or PRP
  - Describe what it is and how it is acquired
  - Explain beliefs surrounding its use
  - Cite data to support or refute its use
  - Describe what the future holds
Regenerative Medicine

- Currently popular due to patient preference
- Less reliance on pharmaceuticals
- “More natural”
- Allowing the body to heal itself
- Whole Foods vs your local/national grocery chain

Some Terms and Definitions

- Regenerative medicine
  - To use an intervention or substance to heal, treat, regenerate injured or damaged tissue
- RIT = regenerative injection therapy
- Not a new concept
**Ancient Greek Mythology**

- **Prometheus**
  - Banished to Carpathian mountains after stealing fire from Zeus
  - Tortured for 30,000 years by the eagle, Ethos, who would eat at his liver every night
  - Prometheus liver would regenerate every night to allow his torture to continue daily
Famous Athletes

Popular in the Press

- http://6abc.com/health/treatment-promises-to-grow-thicker-hair-using-your-own-blood/1023980/
Popular in the Press

- https://www.youtube.com/watch?v=QrlG43gEl6s

So What is PRP

- PRP = platelet rich plasma or blood plasma that has been enriched with platelets
- Believed to contain cytokines and growth factors that aid in healing
  - Platelet derived growth factor
  - Transforming growth factor beta
  - Fibroblast growth factor
  - Insulin-like growth factor 1 and 2
  - VEGF
  - Epidermal growth factor
  - IL-8
  - Keratinocyte growth factor
  - Connective tissue growth factor
- A lot of GROWTH FACTORS = GROW, REGENERATE, HEAL
Beliefs Surrounding PRP Use

- Growth factors present in PRP aid in:
  - Wound healing
  - Tissue repair
  - Angiogenesis
- Most of these claims still are under investigation
Cytokines for Tissue Healing

- Mitogenic growth factors
  - Platelet derived growth factor, fibroblast growth factor
  - Mostly in platelets
- Angiogenic factors
  - VEGF
- Matrix building proteins
  - Fibrinogen, fibronectin
  - Mostly in plasma

Wound Repair
How is PRP Acquired

[Image of blood collection process]

First Spin
- Collection of anticoagulant
- Gently mix before centrifugation

Second Spin
- Transfer of upper layer with Buffy coat to separate sterile tubes
- Centrifuge to sediment PRP

Promoting platelet riches by homogenization
- Incubate at 37°C
- Decant upper layer

Ready to use 5mL of homogenized PRP
Acquiring PRP

- Typical platelet count 200,000 per μL
- Therapeutic PRP concentrates platelet count and growth factor concentration roughly 5-fold
- Strict aseptic technique needs to be maintained
  - Platelets are most common blood product to grow bacteria

Acquiring PRP (cont’d)

- Separating whole blood into 3 layers
  - Platelet poor plasma (PPP)
  - Platelet rich plasma
  - RBCs
- 2 spins are typically used
- 1st spin AKA “Hard Spin” separates PPP from PRP and RBCs
- 2nd spin AKA “Soft Spin” separates red fraction from PRP
- Prior to use a platelet activator is introduced to the PRP
  - Topical bovine thrombin and 10% calcium chloride
Some Early Uses of PRP

- Enhancing bone grafts in oral surgery
- Treatment for hair loss
- Tendon or joint repair
- Skin rejuvenation

Why the Need for PRP

- Limitations of surgery for spinal pathologies
- Limited life span of surgical/orthopedic procedures
- Trends towards “granola” treatment
- Interest in the body healing itself
That’s Great But Does it Work

- New concept that still for the most part has yet to be proven in the literature
- High profile athletes acting as guinea pigs
- High incidence of post procedure pain in orthopedic and spine literature
- Expensive
- Time consuming

Spine Data
Discogenic Pain

Study | Year/Journal | Level of Evidence, Site of Treatment +/- Guidance, preparation | # Pts and F/U | Study Results
--- | --- | --- | --- | ---
Auflero et al. | 2015 J Spinal Cells Res, Rev Rep | Case Series 3 PRP injections – Facet Jt., Surrounding Ligaments | 5 pts 6-12 M F/U | 40-100% Improvement with up to 3 injections.
Authors admit data could be biased

Navani, et. al. | Unpublished 2016 | PRP (14) & BMC (4) Discogenic LMP with 50% Maintained disc height, failed conservative therapy, concordant discography, degen discs, annular tear, contained disc protrusions | 18 pts | Improved VAS > 50% until 6M 94% (n = 17) patients;
Sig improvement SF-36 100% 6M;
77% reported pain flare lasted 2-4 weeks;
decrease in pain meds 89%
No AEs

Orozco et al. | 2011 Transplantation | P & S Study Chronic back pain with lumbar disc degeneration with intact annulus treated with ASC-BMD-MSCs in NP area | 10 pts 1 year | Confirmed F & S
Rapid improvement of pain and disability 75% efficiency (max 85% in 3M)
Disc height not recovered.
### Spine Data

<table>
<thead>
<tr>
<th>Study</th>
<th>Year/Journal</th>
<th>Level of Evidence</th>
<th>Site of</th>
<th># Pt and</th>
<th>Study Results</th>
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<tbody>
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<td>Yoshi</td>
<td>Spine</td>
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<td>Intensity with cell grafts high</td>
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<td>Symptom alleviation in both patients</td>
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<td>8/20 improved 1 grade MRI</td>
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<td>&gt; 2,000 CFU did better</td>
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<td>Mesoblast</td>
<td>Conference Report 2015</td>
<td>RCT-02-ARC Phase II</td>
<td>Allagene MSC + HA</td>
<td>100 2 year</td>
<td>11 Year 69% HD, 62% LD &gt; 50%</td>
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<td>decr pain vs 35% 83% HA and Sal</td>
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<td>@24 month-48% LD- MPC</td>
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<td>achieved minimal or no pain</td>
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<td>(-2.0 mm) compared to 13%</td>
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<td>saline treated patients</td>
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### Orthopedic Data

- More robust than spine but still lacking positive outcomes
- Has been used for the longest period of time
  - Typically in setting of treating athletic tendinopathies and soft tissue trauma
Orthopedic Data (cont’d)

- **Cochrane Review**
- 19 trials with 1088 participants
- 8 types of injuries
  - Rotator cuff tears (6); shoulder impingement syndrome (1); tennis elbow (3); ACL reconstruction (4); the donor site of the tendon used for knee ligament reconstruction (2); patellar tendinopathy (1); Achilles tendinopathy (1); and acute rupture of the Achilles tendon (surgical repair) (1)
- Low quality evidence mostly due to preparation of PRP
- There is currently insufficient evidence to support the use of PRP for treating musculoskeletal soft tissue injuries
Arthroscopic Rotator Cuff Repair

Knee Osteoarthritis
Wound Healing

- Show some benefit in healing foot ulcers in diabetics compared to standard care
- No long term benefit with venous ulcers or other “chronic wounds”
In a Nutshell

- At this time the therapy seems more Hoax but of course more studies need to be performed
- Is it more reasonable to use PRP than the glucocorticoids that are typically used for spinal interventions?
  - Debatable
    - Obvious need for more data, cost prohibitive at this time, time consuming

What the Future Holds

- Intradiscal therapy to help repair torn discs, annular fissures
- Expanding the use of PRP to
  - Facet injections
  - Caudal/cervical/lumbar epidurals
  - Pars defects
  - Ligaments that support the spine
  - Sacroiliac joint
Platelet Rich Plasma

- Right now still lacking solid knowledge on benefits of injection for spinal procedures
  - Orthopedic literature is oldest and most robust
- Studies still ongoing to assess effectiveness
- Mostly done on patients who can afford therapy
  - Pay out of pocket
  - 1000s of dollars per injection
Questions?