Platelet-rich Plasma and Stem Cells: Review of Office-based Treatments for Tendinosis and Arthritis

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Disclosures

• None
Objectives:

- Describe current applications of PRP and stem cells in nonoperative orthopedics

- Limitations of stem cells and PRP use

- Review current evidence-based efficacy of PRP and stem cells
Orthobiologics: AAOS

• Using the body’s natural healing properties to replace injured or diseased tissue with new tissue growth
• They are used to improve the healing of broken bones and injured muscles, tendons, and ligaments.
• These products are made from substances that are naturally found in your body
Terminology

• **Regenerative Injection Therapy**
  – Proliferation and Regeneration with tissue healing

• **PRP Therapy (Platelet Rich Plasma)**
  – Autologous activated platelets in a fibrin matrix used as a source of G.F.
    • PDGF/EGF/VEGF/FGF/HGF
  
  – Better tissue organization to allow tissue to heal faster and enhances mechanical properties
Regenerative Medicine

- Healing - 3 stages
  - Inflammation
  - Proliferation
  - Remodeling

[Diagram showing the healing process with stages and associated factors]
Biologics

• FDA defines biologics as:
  – “..products include a wide range of products such as vaccines, blood and blood components, allergenics, somatic cells, gene therapy, tissues, and recombinant therapeutic proteins”

  – “In contrast to most drugs that are chemically synthesized and their structure is known, most biologics are complex mixtures that are not easily identified or characterized. ”

In regards to orthopedics:
Indicated but not approved for any orthopedic surgical site.
“Off label use”
Orthobiologics: Legal
Orthobiologics: Discussed Tonight

PLATELET RICH PLASMA

MESENCHYMAL STEM CELLS

- Osteoblasts
- Adipocytes
- Chondrocytes
Regenerative Therapy:

- Easy Process
- Fairly Inexpensive
- Little Risk

- IS IT THE MAGIC ANSWER??
Who is a Candidate?

- Failed previous treatment
- Documented tendinosis/partial tearing
- Laxity
- OA
- Chronic pain
- Accept alternative techniques
- Educated on procedure and willing to comply
Sports Medicine Office Applications

• Epicondylitis/Epicondylosis
• Trochanteric bursitis
• SI dysfunction/Instability
• Chronic Hamstring Tendinosis
• Dequervain’s syndrome
• Rotator Cuff
• Achilles/Patellar tendinopathy
• OA
• Etc....
“Extra Extra Read all about it” How it started...

❖“Plasma helps Hines Ward be Super”
BY Dr. Josh Dines & Dr. Rock Positano Sunday, February 8th 2009, NY Daily News
Read more: http://www.nydailynews.com/sports/2009/02/07/2009-02-07_plasma_helps_hines_ward_be_super-2.html#ixzz0Uz6ChQ9W

❖“Blood therapy: Athletes and others swear by a European treatment that heals damaged tissue by injecting their own plasma, rich in healing platelets.”
By Robert Strauss For The Philadelphia Inquirer 8/10/09

❖“Cutting-edge, platelet-rich plasma therapy emerging as new option for ailing athletes”
by Jenny Vrentas/The Star-Ledger Saturday July 18, 2009, 10:23 PM

❖“Blood Simple” Charles Curtis ESPN Magazine 12/08
PRP

40 different systems
Experimental (code with T code)

Varying Costs
Procedure cost in US Average $500-1750

Leukocyte Rich-PRP (best tx chronic tendon injury)

Leukocyte Poor-PRP (better used for OA)

Le ADK et al. Curr Rev MSK Med 2018
PRP Preparation Variables

SINGLE SPIN AND DOUBLE SPIN

• Platelet concentration
  – Too high/Too low?
• WBCs/RBCs
• Activation
• Lidocaine
• Number of injections/spacing
• Use of NSAIDs/Supplements/Ice

NO STANDARD PROTOCOLS!
How is PRP Prepared?

- Gravitation Platelet Sequestration (GPS)
  - Tabletop centrifuge system
  - Blood drawn from patient
  - Amount based on system used, injury treated, concentration of platelets
  - +/- Anti-coagulant added
    - Anticoagulant Citrate Dextrose-A (ACD-A)
  - Centrifuge
    - Single spin vs double spin
    - Activation
- Injection
  - Use of Ultrasound

Ultrasound Guidance
Show Me the Data...

- In vitro study activated PRP enhanced cell proliferation & total collagen production by human tendon cells vs. PPP
  

- Randomized double-blinded prospective trial chronic lateral epicondylosis- 230 patients
  

- Double blind randomized prospective trial:
  - Chronic Lat Epicondylosis Corticosteroid injection vs. LR-PRP
    
    51 PRP (76%) vs. 49 steroid injections (47%) over 1 yr
    
    *Gosens et al AJSM 2011;39(6):1200-1208*

- PRP with achilles tendon repair vs. surgery alone shorter recovery time
  
  *Sanchez M., Anitua E. et al. *AJSM 2007*
Do They Work?!?

- De Voss et al PRP inj in achilles didn’t improve result vs placebo JAMA 2010;303(2):144-49
- Dai WL et al Arthroscopy 2017;33(3):659-70
  - Meta-analysis RCT PRP in Tx OA >1000 patients

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<thead>
<tr>
<th></th>
<th>AB</th>
<th>LR-PRP</th>
<th>LP-PRP</th>
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<tbody>
<tr>
<td># of patients</td>
<td>10</td>
<td>77</td>
<td>12</td>
</tr>
<tr>
<td>Avg symptom duration (mos)</td>
<td>12.3</td>
<td>35.8</td>
<td>37.6</td>
</tr>
<tr>
<td>Avg VAS improvement</td>
<td>15.2</td>
<td>21.8</td>
<td>25</td>
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<tr>
<td>Percent of VAS improve &gt;20 points</td>
<td>40%</td>
<td>62%</td>
<td>83%</td>
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Mesenchymal Stem Cells

These cells show great potential as therapeutic agents in regenerative medicine because of their multilineage potential
Mesenchymal Stem Cells

• Treatment
  – Cartilage Lesions
  – Fracture/nonunions
  – Degenerative Arthritis
Mesenchymal Stem Cells

• Derived
  – Bone Marrow
    • Iliac crest
  – Adipose
Mesenchymal Stem Cells: Bone Marrow vs. Adipose

- **Bone Marrow Derived**
  - Harvesting mesenchymal stem cells (MSCs) from bone marrow is also associated with a lower complication rate in comparison with adipose
  - More literature with harvesting from bone marrow

- **Adipose-Derived**
  - The multipotent nature of MSCs allows them to differentiate into various cells in the mesenchymal lineage, including bone, cartilage, adipose, and other soft tissues
Does it work?

Clinical Efficacy of Intra-articular Mesenchymal Stromal Cells for the Treatment of Knee Osteoarthritis

A Double-Blinded Prospective Randomized Controlled Clinical Trial

Jaime R. Garza,* MD, Richard E. Campbell,† BS, Fotios P. Tjoumakaris,† MD, Kevin B. Freedman,† MD, Lawrence S. Miller,‡ MD, Daniel Santa Maria,§ MD, and Bradford S. Tucker,‖ MD

At 6mos & 12mos significantly decreased knee OA symptoms compared to placebo

• Pas et al BJSM 2017 Stem cell knee OA systemic review
  • Favored MSC treatments without adverse outcomes but heavy bias
Future Considerations

• Standardize Dosing
• Specific Injury treated best with PRP/Stem Cell
• Maximizing outcomes with combo treatments
• Post Procedural Protocols
• *FDA approval/ Insurance approval
• Mainstream/Medical acceptance
• Rehab
Thank You

Questions????
References