Orthobiologics

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I have no disclosures:
- I wish I was on payroll for anything that I am presenting today but as of this lecture no one has offered...

Anyone? Anyone?

What do orthobiologics consist of?
- Various Autologous and Allogenic samples
  - Blood
  - Bone Marrow Aspirate
  - Adipose aspirate
  - Amniotic derived cells
- Usually processed, concentrated or cultured
- Made available for application on various tissues or injected into various joints.
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Primary focus
- Platelet Rich Plasma
- Bone Marrow Aspirate Concentration (BMAC)
- Adipose Aspirate Concentrate
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Adipose Aspirate Concentrate

How do they work?
- Hematopoietic Stem Cells
- Mesenchymal Stem Cells
- Various Growth Factors and inflammatory mediators
  - PDGF, platelet derived growth factor
  - TGF-β, transforming growth factor
  - VEGF, vascular endothelial growth factor
  - FGF, fibroblast growth factor
  - IGF, insulin-like growth factor
  - Chemokines and cytokines

How do they work?
- PDGF, TGF-β, FGF, IGF
  - Upregulates cellular growth and regeneration and downregulates cellular breakdown
  - Upregulates Hyaluronic Acid production
  - VEGF
  - Upregulates healthy blood supply to damaged tissue sites
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How do they work?

- Interleukin 1 receptor IL-1 antagonist
- Blocks cellular inflammatory mediators
- TNF-alpha receptor blocker
- Also blocks cellular inflammatory signaling

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How do they work?

- HSC, MSC
- Undifferentiated cells that can help upregulate growth and differentiate into various applicable components of the healing process.
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What can they be used for in Orthopedics

- Joint injections for acute and chronic joint problems
  - OCD lesions, Meniscus tears
  - Osteoarthritis
- Another option for chronic tendinopathies and acute tendon injuries
  - Tendon partial tears, chronic tendinopathies
  - As adjunct to rest and rehab

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Joint Injections

- Knee, hip, shoulder, etc.

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Tendinopathies

- Anywhere
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Joint Injection Research
  - Reviewed 6 studies: 795 patients, 817 knees
  - Is PRP effective at improving OA knee pain
  - Comparing PRP vs. Corticosteroid vs. Hyaluronic Acid
  - Yes. It was very effective and it scored equivalent or higher in all categories measured.
  - Compared to the other injections it was significantly better at 3, 6, and 12 month post injections

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Joint Injection Research
- Nayana Joshi Jubert: Platelet-Rich Plasma Injections for Advanced Knee Osteoarthritis, A Prospective, Randomized, Double Blinded Clinical Trial
  - 75 patients with symptomatic knee OA
  - PRP vs Corticosteroid injection
  - Statistically similar but magnitude of improvements were superior in PRP group
  - Effective treatment for Severe OA of the knee

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Joint Injection Research
- Emily A. Sundman: The Anti-inflammatory and Matrix Restorative Mechanisms of Platelet Rich Plasma in Osteoarthritis
  - PRP vs. HA effects on the expression of anabolic and catabolic genes in OA
  - PRP vs. HA effects on nociceptive and inflammatory mediators in OA
  - Both PRP and HA decrease catabolism
  - PRP significantly increased cartilage synthesis compared to HA
  - Both suppressed inflammation
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Joint Injection Research
Jorge Chahla: Concentrated Bone Marrow Aspirate for the Treatment of Chondral Injuries and Osteoarthritis of the Knee, A systematic Review of Outcomes
• Review of current literature regarding OA of the knee / Chondral defects and treatments with BMAC
• 11 studies, 5 prospective, 3 retrospective, 2 case series, 3 case reports
• Still a lack of high quality studies
• But all showed varying degrees of benefit with BMAC
• Safe procedure with good results

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Joint Injection Research
Steven Sampson: Intra-articular bone marrow concentrate injection protocol: short-term efficacy in osteoarthritis
• Case Series with 125 participants
• Varying joints: Knee, Hip, Shoulder, Ankle and C-spine
• BMAC followed by PRP at 8 weeks
• Significant decrease in VAS (visual analog scale) pain scale 71.5% reduction in pain
• Patient satisfaction 92.7% would consider doing it again and 94% would recommend it to others.
• Effective alternative treatment for mild to severe OA in various joints.

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Not all preparations are created equal
Harvest, Emcyte, Arthrex, Dr. PRP, Stryker, Magellan etc...
• Unfortunately there is a substantial amount of variability with regards to cellular concentrations of current commercially available concentration systems
• Contributes to varying results and creates problems for comparing research studies.
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Not all preparations are created equal

• Concentration of platelets 1.5-3.0 million platelets per microliter produce best healing response.
• In reality most preparations effective in ranges from .7 – 1.5 million platelets per microliter.

Identification of an optimal concentration of platelet gel for promoting angiogenesis in human endothelial cells.
Giusti I, Bagheri A, D’Ascenzo S, Millimaggi D, Pavan A, Dell’Orso L, Dolo V.

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Why not?

• FDA- as long as you aren’t altering the aspirate it is not considered a drug and therefore not regulated by FDA
• Grey areas galore. Amniotic preparations???
• Europe is culturing MSC and HSC for re-introduction into the body
• Ethics- Its your own blood, bone marrow, or adipose tissue
  • Not much unethical about that, even if you are Jehovah Witness (level Eric evidence)

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• Clinics all over the US and the World are offering these procedures
  • Exciting new scientific evidence and Level 1 studies proving effectiveness currently in the works
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Downside
• Considered experimental treatment
• Not covered by insurance companies
  • Expensive
    • PRP alone $500-$2500
    • Bone Marrow Concentrate $2500-$5000

So why would we still consider it a viable option?
Hyaluronic acid and corticosteroid injections ineffective in some cases
• Steroids do not promote healing, just reduce inflammation and pain
• Patient may not be surgical candidate for various reasons
• Orthobiologics can be an alternative for healing and pain relief

Currently Cox has approved the Sports Medicine team to begin using PRP in joints as well as tendinopathies
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Discussion:

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References:


Identification of an optimal concentration of platelet gel for promoting angiogenesis in human endothelial cells.

Giusti I1, Rughetti A, D'Ascenzo S, Millimaggi D, Pavan A, Dell'Orso L, Dolo V.

Meheux, Carlos; Efficacy of intra-articular Platelet-Rich Plasma Injections in Knee Osteoarthritis: A Systematic Review

Nayana Joshi Jubert: Platelet-Rich Plasma Injections for Advanced Knee Osteoarthritis, A Prospective, Randomized, Double-Blind Clinical Trial

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