PROLOTHERAPY AND PLATELET RICH PLASMA
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Summary Outline
- Prolotherapy
  - Basic principles
- Platelet Rich Plasma (PRP)
  - WHAT IS IT?
  - HOW IS IT DONE?
  - HOW DOES IT WORK?
  - WHEN TO USE PRP?
  - RECENT STUDIES

How was Prolotherapy Developed?
- Prolotherapy in its most current form has been used for over 50 years.
- Earl Gedney, DO began to develop a technique for healing injured ligament by stimulating growth of new ligament tissue in 1937.
- George Hackett, MD expanded upon Gedney’s methods and coined the phrase “prolotherapy” in 1958.
- Gustav Hemwall, MD also started teaching this pioneering treatment in the late 50’s and early 60’s.
- Late 1980’s, academic wound healing and tissue repair research scientifically explained how prolotherapy promotes therapeutic healing.

Basic Concept of Prolotherapy and PRP
- Ligaments and tendons can become weak or injured and may not heal back to their original strength or endurance.
- Because their blood supply is limited, ligaments and tendons will not tighten to their original length on their own. Healing is slow and often incomplete.
- To further complicate this, these structures also have many nerve endings which cause the person to feel pain at the areas which are damaged or loose.

Basic Concept of Prolotherapy and PRP
- The basic mechanism of Prolotherapy and PRP is simple.
- A substance is injected into the affected ligaments or tendons, which leads to local inflammation.
- The localized inflammation triggers a wound healing cascade; resulting in the deposition of new collagen, which is the substance of ligaments and tendons.
- The steps are initiated and controlled by bioactive proteins found in platelets, plasma, and white blood cells.
- New collagen shrinks as it matures.
- The shrinking collagen tightens the ligament or tendon that was injected and makes it...
• **PROLOTHERAPY/PRP - THEORETICAL BASIS**
  - Ligamentous, tendonous, or joint injury
  - Failure to heal
  - Instability
  - Pain and disability

• **RATIONALE FOR TREATMENT**
  - Concentrated dextrose/lidocaine or concentrated autologous platelets injected into tendons, ligaments, and joints
  - Inflammation
  - Deposition of strengthening collagen + exercises
  - Decreased pain and disability

**PLATELET RICH PLASMA  (PRP)**

**WHAT IS IT?**
The “modern” version of dextrose prolotherapy: Injections of autologous centrifuged blood with platelets concentrated is used as the “formula” instead of dextrose and injected into ligaments, tendons and joints “prolo style”.
  - PRP stimulates musculoskeletal healing in same manner as Dextrose Prolotherapy, but also provides growth factors to the tissue directly (like planting seeds with fertilizer!)

**History**
  - Been used since the 1980’s in surgical and dental applications; equipment large and costly until recently.
  - Introduced into Musculoskeletal Medicine in 2006. Mishra and Pavelko (Stanford) published first human study to show PRP for epicondylitis.
  - 93% improvement at 25 months follow up.

**BROUGHT TO NATIONAL ATTENTION AFTER SUPERBOWL 2009**

Hines Ward and Troy Polamalu both credited PRP, given just weeks before, in allowing them to return to play and bring the Pittsburgh Steelers to victory.

**MORE MEDIA ATTENTION IN 2010**

Tiger Woods, professional Golfer, admits to receiving PRP injections to his knee and Achilles tendon.

  -ABC News April 7,2010.

Kenyon Martin, professional NBA player for the Denver Nuggets, has PRP injections to his patellar tendon.

MORE MEDIA ATTENTION IN 2011
Kobe Bryant, professional NBA player for the LA Lakers, has PRP injections to his knee in Germany.


DEFINITION
“Platelet Rich Plasma” is autologous blood with concentrations of platelets above baseline levels*, which contains at least seven growth factors**


Normal Blood
Platelet Rich Plasma

Main Growth Factors in PRP
• Platelet-derived growth factor: Stimulates cell replication, angiogenesis, mitogen for fibroblasts
• Vascular endothelial growth factor: Angiogenesis
• Fibroblast growth factor: Stimulates proliferation of myoblasts, angiogenesis
• Epidermal growth factor: Key regulator in balance between fibrosis and myocyte regeneration
• Hepatocyte growth factor Angiogenesis, mitogen for endothelial cells, antifibrotic
• Insulin-like growth factor-1 Stimulates myoblasts and fibroblasts, mediates growth and repair of skeletal muscle
• Transforming growth factor Beta-1 Proliferation of mesenchymal and epithelial cells

Done in the office setting

Bio-Science
• Cellular regeneration, remodeling, and proliferation requires a combination of:
  o Scaffold (structure or matrix)
  o Undifferentiated Cells
  o Signal Proteins (platelets, plasma and white blood cells)
• Increasing the concentration of the bioactive proteins acts as a catalyst for accelerating the wound healing process and forms the foundation of tissue rebuilding.
How PRP works

• Evidence that cells “talk” to each other.
• First injured tissue signals to the PRP and they become activated.
• Then PRP growth factors signal and recruit repair stem cells to the wound area, then help induce them to heal into needed tissue.

WHEN TO USE PRP?

“Man, I hate needles!”
- Patients that fail standard prolo or improvement levels off
- Good for discrete ligament or tendon tears
- Good for muscle tears or tendon sheath vs. prolo which focuses on the enthesis;
- For extreme “needle phobes”
- For those patients who just want the latest technology available!

RECENT EXPLOSION OF STUDIES

Two year follow up of the Gosens study. March 21, 2011

• CONCLUSION: “TREATMENT OF PATIENTS WITH CHRONIC LATERAL EPICONDYLITIS WITH PRP REDUCES PAIN AND INCREASES FUNCTION SIGNIFICANTLY, EXCEEDING THE EFFECT OF CORTICOSTEROID INJECTION EVEN AFTER A FOLLOW-UP OF 2 YEARS”

Recalcitrant Epicondylitis

• Involved 31 patients with epicondylitis unresponsive to nonsurgical treatment (including steroid injection) for greater than six months.
• One PRP treatment with peppering technique.
• Success was defined as “25% decrease in worst pain at follow up with no intervention after one year. “

RESULTS

• 2 patients elected for surgery 1 month post injection so eliminated from the trial;
• Of the remaining 29 elbows, 28 had improvement with only one patient reporting no improvement after 6 months.
• Overall success rate of 90%

OSTEARTHRITIS

Took synovium from patients with OA and cultured in normal medium v. PRP rich medium

• Conclusion: “Intra-articular administration of Platelet Rich Growth Factors might be beneficial in restoring Hylauronic Acid concentration and switching angiogenesis to a more balanced status …”
• Anuita, et al.  Platelet-released growth factors enhance the secretion of hyaluronic acid and induce hepatocyte growth factor production by synovial fibroblasts from arthritic patients.  Rheumatology.  2007.  46(12): 1769-1772

Clinical trial – knee OA

14 patients with primary and secondary knee OA who met the criteria received three PRP injections in the affected knee at approx 4 week intervals.

Results
• No adverse events reported.
• Significant and almost linear improvements in knee injury and osteoarthritis outcome scores with majority of patients expressing a favorable outcome at 12 months after treatment.

Refractory Jumpers Knee

• 15 patients who had failed previous nonsurgical or surgical treatments.
• Multiple PRP injections on three occasions two weeks apart into the site of the patellar tendinopathy.  Combined with physical therapy.

Results
• A statistically significant improvement in all scores observed at the end of the series with further improvement notes at six months after physical therapy added.

Knee: Patellar tendinopathy (2009)
Kon et al.  70% with marked improvement; 80% satisfied

Plantar fasciitis
Barrett and Erredge – 7 / 9 patients with complete pain relief at 1 year follow up

Muscle injury
Sanchez et al. (2 studies) Full recovery in all patients in half the expected time

CONCLUSION
• Prolotherapy and PRP are here!
• Think about these less invasive procedures in your athletes with chronic tendon, ligament, and joint problems.
Thank You!

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Demonstration
- PRP commonly used to treat chronic low back pain.
- Majority of low back pain is musculoskeletal in nature.
- Pain often from ligamentous instability and poor compensation from the muscles.
- Injections aimed at postural and structural ligaments such as iliolumbar, sacroiliac, lumbosacral and supraspinous ligaments decrease pain and instability in this region.

Additional references