MINIMALLY INVASIVE
PLATELET RICH PLASMA (PRP):
A SURGEON’S PERSPECTIVE ON NON-SURGICAL OPTIONS

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YOUR BODY. YOUR HEALING.

- The body has a remarkable ability to heal itself.
- However, often the body needs a push to facilitate healing.
- In the past, this “push” has been surgical intervention but as technology progressed, this push can be offered to our patients in minimally invasive procedures.
WHAT IS PRP?

• PRP was initially used over 20 years ago in the Dental community to enhance wound healing in cancer patients with jaw reconstruction.

• Soon afterwards its applications extended across many fields of medicine from cardiovascular surgery to Orthopaedics.
WHAT IS PRP

- Platelet Rich Plasma is composed of plasma with a high concentration of white blood cells (WBC) and platelets containing growth factors.
- The WBCs help fight infections while the platelets help clot the blood and contain the powerful growth factors needed to start the healing process.
- A normal platelet count is 150,000-350,000
- PRP contains 3-6 times that number and sometimes more.
ORTHOPAEDIC USE OF PRP

• Surgeons now have a tool to significantly enhance the healing process and speed up recovery time. When we undergo a surgery or obtain any kind of wound, our bodies must go through a lengthy healing process. Our bodies call up natural healing factors, but sometimes that is not enough.

• Platelet Rich Plasma (PRP) helps “jumpstart” the healing process because it is a concentration of your own autologous (aw-tal’-o-gus) platelets, which have reservoirs filled with powerful “growth factors and healing agents”. To get the PRP we obtain a small amount of your blood (1-2 oz.), then separate and concentrate the platelets. Your surgeon then applies the concentration of platelets to your wound, surgical site, or injury site.

• Clinical data has clearly shown that PRP acts as a bioactive bandage and jumpstarts the healing process. In many different surgical specialties, the data shows that PRP accelerates the healing process, slows or stops post operative oozing, reduces blood loss, accelerates bone regeneration, helps tendons and ligaments repair more quickly, reduces inflammation, and decreases post-op pain.
A NORMAL PLATELET COUNT...
PERIPHERAL BLOOD

- 94% Red Blood Cells
- 0% Platelets
- 6% White Blood Cells
PLATELET CONCENTRATE (PRP)
PLATELET CONCENTRATE

- Platelets: 94%
- Red Blood Cells: 5%
- White Blood Cells: 1%
IS PRP SAFE?

• PRP is derived from a small quantity of your own blood. Using a tabletop device, your blood is processed and prepared at or near your bedside in your doctor’s office or surgery center.

• Since it is your own blood, there is no risk of disease transmission.
Your platelets release healing proteins called growth factors. There are many growth factors with varying responsibilities, however, cumulatively they accelerate tissue and wound healing.

Therefore, after increasing the baseline concentration of these platelets, we are able to deliver a powerful dose of growth factors that can dramatically enhance the healing process.

In summary they:
- Promote the growth of specific types of cells and tissues
- Increase development of new blood vessels
- Accelerate bone regeneration
- Initiate connective tissue
ACTIVATED PLATELETS RELEASE GROWTH FACTOR PROTEINS INTO THE SURROUNDING TISSUE

The Measure of Available Platelets Relates to the Measure of Growth Factors at the Wound Site
TISSUE REGENERATION - MECHANISM OF ACTION

CELL PROLIFERATION REQUIRES THE INTERACTION OF THREE BIOLOGICAL ELEMENTS:

Signal Proteins and Adhesion Molecules control:

1. Recruitment of cells to the scaffold
2. Cell division within the scaffold
HOW PRP IS APPLIED

• The use of PRP varies from procedure to procedure and can be applied in a variety of ways.
• In certain cases, PRP can be injected into an injury site without an incision to help the injury site heal.
• The presence of the high concentration of platelets starts and accelerates the healing process and reduces post operative swelling, bruising, scarring, and pain.
# POSSIBLE APPLICATIONS FOR PLATELET-RICH PLASMA

## Plastic Surgery
- Face, Brow and Neck Lifts
- Laser Procedures
- Augmentation and Reduction Mammoplasty
- Fat Transfers

## ENT Surgery
- Rhinoplasty
- Thyroidectomy
- Parotidectomy
- Radical Neck

## General Surgery
- Hepatic Lobectomy
- Pancreatic Surgery
- Exploratory Abdominal Procedures

## Ortho/Dental
- Spinal Fusions
- Mandibular Recon.
- Sinus Grafting

## Vascular Surgery
- AAA
- Carotid Endarterectomy

## Cardio-Thoracic Surgery
- CABG
- Valve Replacement

## Chronic Wounds
- Decubitis/Venostasis Ulcers
- Diabetic related Ulcers

## Emergency Medicine
- Wound Care
WHO CAN BENEFIT FROM PRP

• Anyone, from professional athletes to those who enjoy recreational activities or whose wounds are difficult to heal, can benefit from the healing effects of PRP.

• If you have been told you need surgery for your ailment, PRP may be a way to avoid costly surgery.
WHAT TYPES OF CONDITIONS ARE TREATED WITH PRP?

• Based on current research, soft tissue injuries are the most responsive to PRP.
• This includes tendonitis, tendinosis, tendon tears, ligament sprains or tears, loose ligaments, and muscle tears.
• PRP has also been effective at treating cartilage degeneration such as arthritis as well as labrum tears in joints.
WHAT ARE SOME COMMON DIAGNOSES TREATED WITH PRP?

• **SHOULDER**
  – Rotator cuff tendinitis or tear, rotator cuff impingement syndrome or bursitis, bicipital tendinitis, labrum tear, arthritis, instability

• **ELBOW/WRIST/HAND**
  – Tennis elbow*, golfer’s elbow, DeQuervaine’s Tenosynovitis, trigger finger, arthritis, other wrist or finger tendonitis

• **HIP**
  – Iliotibial band tendinitis (ITB Syndrome), psoas tendinitis and bursitis, greater trochanteric bursitis, labrum tears, arthritis, sacroiliac joint dysfunction

• **KNEE**
  – Patellar tendinitis, partially torn or strained major ligaments of knee (ACL/LCL/MCL), meniscus tears, chondromalacia, arthritis, instability

• **ANKLE**
  – Achilles tendinitis, peroneal tendinitis, ankle sprain, instability, other foot or ankle tendinitis

• **SPINE**
  – Whiplash injury, ligament sprain, instability, rib problems, arthritis
CHRONIC ELBOW TENDINOSIS

Aim: IRB approved prospective pilot study to evaluate the efficacy of using PRP as a potential treatment for chronic severe epicondylar tendinosis.

Methods: 140 patients were evaluated for this study

20 patients (15%) met strict inclusion criteria

55 ml of whole blood was processed to produce 5 ml of PRP with a mean increase of 5.4x above baseline

2-3 ml of either PRP or bupivacaine with epinephrine (control) were injected using a 22-g needle into the common extensor or flexor tendon

Results: Outcome Data

<table>
<thead>
<tr>
<th>Time</th>
<th>Visual Pain Scores</th>
<th>Analog Pain Scores</th>
<th>Mean Mayo Elbow Scores</th>
<th>Mayo Elbow Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PRP 80.3</td>
<td>Control 86</td>
<td>p value 0.259</td>
<td>PRP 50.3</td>
</tr>
<tr>
<td></td>
<td>43.4</td>
<td>71.0</td>
<td>0.028</td>
<td>71.3</td>
</tr>
<tr>
<td></td>
<td>32.0</td>
<td>72</td>
<td>0.001</td>
<td>76.3</td>
</tr>
<tr>
<td></td>
<td>15.1</td>
<td>-</td>
<td>0.001</td>
<td>86.3</td>
</tr>
<tr>
<td></td>
<td>5.7</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

At 6 months, the PRP-treated patient’s

1. Visual analog pain scores improved 81% (p=0.0001) over baseline
2. Mean mayo elbow scores improved 72% (p=0.0001) over baseline

Key Points: PRP treated patients demonstrated significant improvement with a single injection that was sustained over time.

There were no reported complications (specifically, no infections, neurovascular changes, or worsening of patient’s epicondylar pain).

Treatment of patients with chronic elbow tendinosis with buffered PRP significantly reduced pain.

PRP should be considered before surgical intervention.

CASE STUDY: NON-SURGICAL REPAIR OF HIGH GRADE ACHILLES TENDON WITH PRP

- 38 y/o male high-grade tear of left Achilles tendon with remainder of tendon demonstrating severe tendinopathy

Description of Procedure (5/17/07)
- Anesthesia: left leg popliteal block
- Achilles tendon prepped & draped
- 10cc of PRP prepared from 60cc of whole blood
- 3cc PRP placed distal & proximal fragment of tendon near edges with 22g needle under US guidance
- With complete plantar flexion the tendon’s torn edges were abutted & 4cc of PRP injected
- 1cc of thrombin/calcium chloride was introduced from other side of tear to form a clot matrix

Michael Scarpone, DO
CASE STUDY: NON-SURGICAL REPAIR ACHILLES

• Physical therapy started 3 weeks after injection

• Follow-up (6/21/07): Patient stated that he is doing well, does not have pain and does not need crutches

• Follow-up (7/2/07): MRI shows interval healing of the high-grade tear with some tendon thickening

• Follow-up (7/16/07): Patient reports that he does not have much pain at all, no swelling/clicking/locking and ankle does not give out. Normal ROM
CASE STUDY: NON-SURGICAL REPAIR OF PATELLAR TENDONITIS WITH PRP

- 26 y/o male professional basketball player with 4 yr history of chronic left patellar tendonitis. No significant relief from past conservative treatments

- MSK ultrasound revealed significant thickening of tendon proximally and anechogenicity consistent with mucoid degeneration

- Opposite patellar tendon appeared normal
CASE STUDY: NON-SURGICAL REPAIR OF PATELLAR TENDONITIS

Description of Procedure (5/17/07)
• Anesthesia: Saphenous nerve block
• Left knee sterilely prepped & draped
• 3cc of PRP was prepared from 20cc of whole blood
• 4cc 2% xylocaine with 1:100,000 dilution of epinephrine injected into tendon
• 3cc of PRP injected into thickened area of tendinosis
• 1cc thrombin/calcium chloride injected to create a matrix

2 weeks later a second identical procedure was performed

2 weeks after 2nd injection the tendon was no longer tender to palpation. Nor was there pain with resisted extension of the knee

Physical Therapy: started after the 2nd injection. After 4 weeks of therapy including a functional return to basketball, the patient was able to play the entire professional season pain free

Henry Stien, MD
CASE STUDY: NON-SURGICAL REPAIR OF PATELLAR TENDONITIS

Ultrasound preformed 16 weeks after 2nd injection. The tendon was significantly less thickened and the area of anechogenicity was no longer visible:

Before PRP Injection

16 Weeks After PRP Injection

Henry Stien, MD
# USE OF PRP FOR JOINTS


Study: 20 patient prospective ACL pilot study with 6 month follow-up – CT data showed that the transformation from autolocous quadrupled hamstring tendon graft to ACL was faster in the PRP group than the controls.


Study: 71 patient (81 knees) retrospective cohort TKA study – The use of PRP lead to shortened hospital stay, improved ROM, improved hemoglobin profile, and a more stable hemodynamic profile.


Study: 98 patient retrospective cohort TKA study – The use of PRP lead to earlier functional ROM, shorter LOS, decreased IV and oral narcotic requirements, and lower hemoglobin drop in TKA patients.
EFFICACY OF PRP IN TOTAL KNEE ARTHROPLASTY

Aim: Retrospective cohort study assessing using of PRP in TKA to improve hemostasis, reduce blood loss, accelerate tissue repair, and decrease pain.

Methods: 98 consecutive patients undergoing unilateral TKA
- PRP Group: 61 consecutive patients
- Control Group: 37 consecutive patient cohort prior to PRP
- All patients required TKA due to end-stage osteoarthritis

PRP was applied to posterior recess, gutters and exposed surfaces of the femur and tibia

A medial parapatellar approach to knee was used and patellar averted

Wound was closed in layers w/o drains

Outcomes analyzed included postop Hgb changes, intravenous and oral narcotic requirements, ROM, and LOS

PRP IN TOTAL KNEE ARTHROPLASTY

Results: Outcome Data

<table>
<thead>
<tr>
<th></th>
<th>PRP Group</th>
<th>Control</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-op Hgb – Day 3, g/dl</td>
<td>2.68</td>
<td>3.16</td>
<td>0.026</td>
</tr>
<tr>
<td>Intravenous Narcotics, mg/day</td>
<td>17.0</td>
<td>36.3</td>
<td>0.024</td>
</tr>
<tr>
<td>Oral Narcotics, tabs/day</td>
<td>1.84</td>
<td>2.75</td>
<td>0.063</td>
</tr>
<tr>
<td>Range of Motion, degrees</td>
<td>78.2</td>
<td>71.9</td>
<td>0.052</td>
</tr>
<tr>
<td>Length of Stay, days</td>
<td>4.40</td>
<td>5.29</td>
<td>0.002</td>
</tr>
</tbody>
</table>

Final ROM was measured on the day of discharge, allowing controls a longer recovery time and an additional day of physical therapy

Key Points: PRP exhibits a **broad spectrum of beneficial effects**
1) earlier functional ROM
2) shorter LOS
3) decreased IV and oral narcotics
4) lower drop in postop Hgb

## USE OF PRP FOR FOOT & ANKLE SURGERY

<table>
<thead>
<tr>
<th>Study</th>
<th>Authors</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bibbo, C, et al; “Union Rates Using Autologous Platelet Concentrate Alone and With Bone Graft in High Risk Foot and Ankle Patients”, <em>Journal of Surgical and Orthopaedic Advances</em>, 14:17-22, 2005</td>
<td>Study: 62 patient (123 procedure) prospective foot and ankle study with follow-up every two weeks until union was achieved radiographically – A 94% fusion rate was achieved at a mean of 41 days. The enhanced fusion rates were attributed to using PRP.</td>
<td></td>
</tr>
</tbody>
</table>
## FUSION IN AGILITY TOTAL ANKLE REPLACEMENT

### Results: Syndesmosis Fusion Rates

<table>
<thead>
<tr>
<th></th>
<th>Historic Control (n=114)</th>
<th>PRP Group (n=66)</th>
<th>p Values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2 month</strong></td>
<td>70 (61.4%)</td>
<td>50 (76%)</td>
<td>p &gt; 0.001</td>
</tr>
<tr>
<td><strong>3 month</strong></td>
<td>84 (73.6%)</td>
<td>62 (93.9%)</td>
<td>p &gt; 0.001</td>
</tr>
<tr>
<td><strong>6 month</strong></td>
<td>97 (85.1%)</td>
<td>64 (96.9%)</td>
<td>p &gt; 0.001</td>
</tr>
<tr>
<td><strong>Nonunions</strong></td>
<td>17 (15%)</td>
<td>2 (3%)</td>
<td>p &gt; 0.001</td>
</tr>
<tr>
<td><strong>Delayed (3-6) and nonunions</strong></td>
<td>26%</td>
<td>6%</td>
<td>p &gt; 0.001</td>
</tr>
</tbody>
</table>

TIMING OF BENEFITS

- Most patients notice some element of improvement by 2-6 weeks after PRP.
- Symptom improvement is slow and subtle as days and weeks pass, with usual report of original pain being replaced with more of a soreness.
- “Good days” become more and “bad days” become less as time passes, with pain intensity dropping along the way.
- Increased endurance and strength are typically reported.
- Clinical trials are reporting ongoing improvement up to 6-9 months after PRP in some cases.
THANK YOU!

CHARLESTON SPORTS MEDICINE – Move Forward

• Offer