Efficacy of Platelet Rich Plasma and Shock Wave Therapy


Platelet-rich plasma PRP

- Platelet-rich in growth factors
- Plasma rich in growth factors
- Platelet-rich fibrin matrix
- Platelet-rich fibrin
- Fibrin sealant
- Platelet concentrate

- Originally used in clinical practice as and adjunct to surgery (oral) to assist in the healing of various tissues.
- Also use in prosthetic surgery to promote tissue healing, implant integration and control blood loss.
- PRP has also been used at the time of surgery involving shoulder, hip and knee joints
- Used to improve bone healing

Basic science

- PRP may be defined as a volume of plasma fraction of autologous blood having a platelet concentration above baseline, and is therefore a concentrated source of autologous platelets.
- PRP is prepared from a volume of autologous blood using extracorporeal blood processing techniques such as blood savers/separators, centrifuges and filtration methods.
- PRP may contain variable concentrations of red and white cells depending of the preparation technique

Platelets

- Cytoplasmatic fragments of megakaryocytes formed in the bone marrow.
- Smallest of the blood components, irregular shape, diameter 2-3μm.
- Lack nuclei
- Contain organelles
- The types of granules: α,δ,λ
**α granules**
- Membrane
- 200 – 500 nm
- 50-80 granules per platelet
- Contain more than 30 bioactive proteins

While the use of recombinant growth factor for muscle injuries has a strong theoretical and scientific basis, cost and side-effects may contraindicate their use.

Whereas anecdotally being widely used in elite sport, the use of PRP for acute muscle injuries has little scientific support with very few studies.

At present there is little scientific support for the use of PRP for the management of muscle strain injuries.

Hammon et al 2009
100 µl of PRP repeatedly injected into rat tibialis anterior artificially injured.
- Functional improvement
- Elevated myogenesis

Unknown transferability to humans
Provides some support for the use of PRP in promoting muscle injury regeneration.
Wright-Carpenter et al 2004
Autologous Conditionated Serum (ACS):
Compared return to play of 18 professional athletes
treated with 5 ml PRP vs 11 treated with traumeel and
actovegin.
Reduction on RTP (16 vs 22 days).
Concerns: choice of control, lack of blinding, potential bias
of the MRI.

Case reports:
Loo et al 2009
Serial use of PRP on 35 y professional body-builder US
confirmed adductos longus injury
Hammilton et al 2010
Single injection of a grade II semimembranosus muscle
strain injury rapid resolution, both clinical and at MRI.

Sanchez et al 2010
21 muscle injuries of various anatomical localisation on
Spanish football professional players of “La Liga”
Control: matched players aged 25 treated previously with
other treatments 1-3 injections + Physiotherapy
Reduced pain, swelling and RTP.
Lacking methodological details.

Some Unanswered Questions Regarding the Use of
PRP in Muscle Strain Injuries
• Does PRP reduce recovery time from muscle strain injury?
• What are the indications for PRP utilization?
• Which are the active GFs in a PRP solution?
• How do the GFs interact with each other in an acute or chronic injury?
• Is timing of application important?
• What concentrations/volumes of PRP are required?
• How many applications of PRP are optimal?
• Does the platelet concentration really matter?
• Does the system utilized matter?
Hamilton B Best TM Clin J Sport Med 2011

Some Unanswered Questions Regarding the Use of
PRP in Muscle Strain Injuries
• Do you need to activate the PRP before application?
• Should you aim to exclude all white cells?
• Is whole blood just as effective?
• What is the role of exercise and rehabilitation after PRP infiltration?
• What are the short-term and long-term side effects of
PRP?
• Is there a supraphysiological performance enhancing effect of PRP
infiltration in muscle?
Hamilton B Best TM Clin J Sport Med 2011

Tendinopaties
• Difficult to formulate indications in tendon injuries in a clinical setting based on the available scientific.
• There is a lack of well designed studies to support the use of PRP in clinical setting in the clinical management of tendon injuries.
• For each individual athlete and circumstance, a risk/benefit analysis should be performed before embarking on this as yet scientific unproven therapeutica modality.

Cartilage and articular tissues

• These reports on the use of PRP through intra-articular injections suggest good potential in favouring pain reduction and improved function.
• Methodology of studies is questionable
• The best procedure and proper application modalities still need to be defined.
• It is also not known how applicable the results of PRP being used for treating degenerative articular injuries in non-athletes would be for the active Athletic population.

Suggested techniques and postinjection recommendations

• Ultrasound guidance
• No agreement on whether the needle should be place inside tendons
• Evacuate exudates before injecting.
• Emptying the joint of arthroscopy fluid
• Gel and semisolid forms during open surgery
• Preparation and administration under strict asepsis
• No agreement on the concomitant use of NSAIDs and local anesthetics
• Exercise after 2-5 days
• Ice, rest and limb elevation 48h

Potential adverse effects

• To date there is not compelling evidence of any systemic effect of local PRP injection.
• No scientific reports suggesting potential cause-effect relationship between growth factors present in PRP and carcinogenesis.

Research

• Clear inclusion and exclusion criteria; special attention to confounding factors (use of medication)
• Study population: homogenous, appropriately selected.
• Clear diagnosis of the injury
• Production of PRP
• Delivery of PRP
• Definition of outcome measures and end points: follow up measurements for at least 2 years
• Standardised post-treatment protocol
• Adverse effect documentation
• RCT / Prospective Cohort / Multicentre trials
Antidoping regulations

- Since 2011, PRP is permitted by all routes of administration

Summary and recommendations

- Should we use a treatment with limited evidence supporting its clinical efficacy and with limited evidence supporting its safety?
- Medical ethics
  - Beneficence (doing good)
  - Non-maleficence (do no harm)
  - Patient autonomy (self determination)

Summary and recommendations II

- Non-maleficence is the principal determinant of medical practice
- Beneficence is not proven with PRP
- Current medical ethics generally allows clinicians to make an individual choice to prescribe treatments that have not shown beneficence as long as the treatment is non-maleficent.

Summary and recommendations III

- The final recommendation of the IOC Consensus Group is to proceed with caution in the use of PRP in athletic sporting injuries.
- More work is warranted on the basic science and greater rigor should be implemented in developing robust clinical trials to demonstrate the efficacy or otherwise of PRP.

“A Doctor must be satisfied there is a sufficient evidence base for off-licence prescribing, and patients must be given sufficient information about those delivering the medication to be in a position to give informed consent”

General Medical Council UK 2006
23 appropriate studies were identified.

Focused extracorporeal shockwave therapy (F-ESWT) and radial pulse therapy (RPT) should be considered as different treatment modalities.

There continues to be a lack of large well-designed RCTs in general in F-ESWT and RPT.

Where benefit has been demonstrated further research into the most effective regimes is needed.

There is good evidence for:

- Benefit for high-dose focused ESWT (F-ESWT) and for (RPT) in plantar fasciitis.
  - Lack of benefit for low-dose F-ESWT in plantar fasciitis.
  - F-ESWT in calcific tendinopathy of the rotator cuff, especially in high dose.

There is some evidence for:

- Benefit for high-dose F-ESWT in mid portion and insertional Achilles tendinopathies.
- No benefit in low-dose F-ESWT in this condition.
- Benefit of RPT in calcific tendinopathy.
- Lack of effect of F-ESWT in non-calcific tendinopathy of the rotator cuff and for low-dose F-ESWT in common extensor tendinopathy.

There is no evidence to support or refute the effects of F-ESWT or RPT in other conditions.

There is mixed evidence for the effects of low-dose F-ESWT in common extensor tendinopathy.

It has also been demonstrated over the past few decades that SW is a safe treatment with adverse effects typically being minor, and occurring rarely.

Where benefit is seen in F-ESWT, it appears to be dose dependent, with greater success seen with higher dose regimes.

Both treatments offer an alternative to surgery in the management of recalcitrant conditions.