Non-Pharmacological Pain Management of Chronic Kidney Disease
งานเวชศาสตร์ฟื้นฟู

- แพทย์เวชศาสตร์ฟื้นฟู (หมอฟื้นฟู หมอPMR หมอREHAB)
- นักกายภาพบำบัด (PT)
- นักกิจกรรมบำบัด (OT)
- นักกายอุปกรณ์ (PO)
- พยาบาลเวชศาสตร์ฟื้นฟู
- เจ้าพนักงานเวชกรรมฟื้นฟู
- ทีมงานเจ้าหน้าที่
Definition of Pain (IASP)

“An unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage”
Pain is what the patient says it is (Ronald Melzack, 1975)
- Pain is an internal and subjective experience
- No objective imaging study or LAB test can measure pain
Type of Pain

- **Nociceptive pain** – activation of nociceptors that are found in all tissue except CNS
  - Somatic nociceptive pain – skin, muscle, bone
  - Visceral nociceptive pain – visceral organ
- **Neuropathic pain**
  - Pain caused by a lesion or disease of the somatosensory nervous system
- **Psychogenic pain**
Pain in CKD

- Over 58% of CKD patients (Most of these data come from hemodialysis patients) experience pain
- 49% of patients rate their pain as moderate to severe

(Davison SN, Koncicki H, Brennan F. Pain in chronic kidney disease: a scope review. Seminar in dialysis 2014)

- Associated with lower QOL scores as measured by SF-36
- Mean QOL scores were 67.4+/−27.1, 59.0+/−29.2, 75.2+/−23.7 for CKD, dialysis and general population, respectively

Sources of Pain

- Musculoskeletal (62%)
- Gastrointestinal (13%)
- Genitourinary (10%)
- Haematological/Oncological (10%)
- Central and peripheral nervous system (9%)
- Cardiovascular (7%)
- Others (10%)

Musculoskeletal pain

- Disorders of bones, joints, muscles, tendons, ligaments, bursae, or a combination
- Perpetuating factors
  - Mechanical – Structural, Postural, Ergonomics
  - Medical – Infectious diseases, Inflammatory disorders, Immunological/Allergic, Nutritional disorders, Hormonal disorders
  - Psychological factors – Depression, Tension, Anxiety

Chronic MS pain was independently and significantly associated with hyperuricemia as co-morbidity, and with the calcium×phosphate product levels in early- and late stage CKD patients who were not on dialysis.

(Hsu et al. BMC Nephrology 2014)
Specific pain syndromes in CKD

- **Painful Diabetic Peripheral neuropathy (PDN)**
  - Limited literature on the prevalence of PDN in CKD: one study found a prevalence of 50% in dialysis patients with DM. (Innis J: Pain assessment and management for a dialysis patient with diabetic peripheral neuropathy. CANNT J 16:12-17, 2006)
  - Associated with an increase risk of lower limb amputation
  - The PDN rate in DM with CKD stage 4-5 was 10 times greater than the general DM population. (Eggers PW, Gohdes D, Pugh J: Nontraumatic lower extremity amputations in the Medicare end-stage renal disease population. Kidney Int 56:1524-1533, 1999)
  - Chronic persistent PDN may be associated with depression and anxiety
- **Dialysis arthropathy**
  - Shoulder pain of no other known etiology
  - Restricted ROM
  - Inflammatory signs
  - Ultrasonography and MRI
    - Thicker of Supraspinatus tendon
Carpal Tunnel Syndrome (CTS)

- Deposition of amyloid on the surface of the tenosynovium of the flexor tendons
- Uremic tumoral calcinosis
- Placement of arteriovenous fistula
- Incidence – 18.6% among dialysis patients and increases with year on dialysis
  - 37% for HD at least 10 years
  - 75% for HD at least 15 years
  - 85% for HD at least 30 years
- **Autosomal Dominant Polycystic Kidney Disease (ADPKD)**
  - 10-15% of ESRD in the United States
  - Causes of acute pain
    - Pyelonephritis
    - Infected cysts
    - Cyst hemorrhage
    - Mass effect on the surrounding renal parenchyma
    - Distension of renal capsule
    - Nephrolithiasis (higher rates (20%) than the general population)
  - Causes of chronic pain
    - Increased lumbar lordosis
    - Degenerative changes in the spine
    - Disc disease
    - Poor posture
Pain Assessment

- Chronicity
- Severity
- Characters of pain
- Aggravating/Relieving factors
- Location/distribution
- Etiology of pain
- Mechanism of injury
- Barriers to pain assessment
- Psychological factors/QOL/ADL
Measurement of Pain

- Single-dimensional scales
  - Numerical Rating Scales (NRS)
  - Visual Analogue Scales (VAS)
  - Verbal Rating Scales (VRS)
  - Facial Scales
  - Behavioral Pain Assessment Scale
  - Neuropathic Pain Diagnostic Questionnaire

- Multidimensional scales
  - McGill pain questionnaire (MPQ)
Numerical Rating Scales (NRS)

- 0 = no pain, 10 = worst possible pain
- 1-3 = mild pain
- 4-6 = moderate pain
- 7-10 = severe pain
Visual Analogue Scales (VAS)
Verbal Rating Scales (VRS)

- Mild pain
- Moderate pain
- Severe pain
Facial Scales

McGill pain questionnaire (MPQ)
<table>
<thead>
<tr>
<th></th>
<th>None</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Throbbing</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Shooting</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Stabbing</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sharp</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Cramping</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Gnawing</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Hot-burning</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Aching</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Heavy</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Tender</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Splitting</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Tiring-exhausting</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sickening</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Fearful</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Punishing-cruel</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Rate the intensity of your pain on the two scales below. Make a mark on the line to indicate where your pain falls between No pain and Worst possible pain and then circle the appropriate number on the second scale.

No pain | Worst possible pain

Circle the one of the following words that best describes your current pain:

- 0 No pain
- 1 Mild
- 2 Discomforting
- 3 Distressing
- 4 Excruciating
Assessment tools for CKD

- Modified Edmonton symptom assessment system (m-ESAS)
- Palliative Care Outcome Scale-Renal (POS-renal)
- Physical symptom distress scale (PSDS)
- Dialysis symptom index (DSI)
- The Brief Pain Inventory (BPI)
- Short form McGill Pain Questionnaire (SF-MPQ)
- Kidney Dialysis Quality of Life-Short Form/SF-36 (KDQOL-SF)
- CHOICE health experience Questionnaire (CHEQ)+SF-36
Physical examination

- Vital signs
- General appearance
- Gait
- Inspection
- Palpation
- Range of Motion (ROM)
- Special Tests
- Neurological examination
Laboratory investigations, Imaging and Neurological assessment

- Inflammatory markers – ESR, CRP
- X-rays
- CT scan
- MRI
- Bone scan
- Electrodiagnostic study – NCS, EMG
- Ultrasound diagnostic study
Psychological assessment of persons with chronic pain

- Half of patients have a comorbid psychiatric conditions
- 35% of patients with chronic back and neck pain have a comorbid depression or anxiety disorder
- 50-80% of patients with chronic pain had signs of psychopathology
- Substance abuse assessment
Pain Assessment

Medical Evaluation
- Medical history
- Physical exam
- Diagnostic tests

Pain History
- Onset
- Location
- Temporal pattern
- Character
- Relieving factors
- Aggravating factors
- Previous treatments

Pain Severity
- Simple descriptive scale
- NRS
- VAS
- Pain questionnaires

Pain Impact
- Daily activities
- QOF
- Mood
- Social support
- Other symptoms

รูปที่ 1 สรุปขั้นตอนในการประเมินความปวด

NRS = Numerical Rating Scale
VAS = Visual Analogue Scale
QOF = Quality of life
Non-Pharmacological Rehabilitation management

- Myofascial pain and Trigger point injections
- Acupuncture
- Ultrasound-guided local injections and Other spinal procedures
- Extracorporeal Shock Wave Therapy (ESWT)
- Physical agent modalities
- Traction
- Therapeutic exercise
- Orthosis application
- Patient education
Myofascial pain and Trigger point injections

- **Myofascial pain syndrome**
  - Myalgic condition in which muscle and musculotendinous pain are the primary symptoms
  - Trigger point - a tender region in a taut band in skeletal muscle (Simons et al. 1999)
  - Perpetuating factors

- **Trigger point treatment**
  - Dry Needling
  - Trigger point injection
Acupuncture

- **Mechanisms of Action**
  - Endogenous opioid peptide system
  - Effect on the sympathetic nervous system
  - Alterations in pain processing in the spinal cord and brain
  - Increasing local blood flow

- **Conditions that may be amenable to acupuncture identified by the WHO**
  - Musculoskeletal disorders - Low back pain, osteoarthritis, tennis elbow, frozen shoulder, fibromyalgia, sciatica
Ultrasound-guided local injections

- Shoulder pain
  - Rotator cuff syndrome
  - Subdeltoid bursitis
  - Bicipital tendinitis
  - Adhesive capsulitis
- Epicondylitis
- De quervain's tenosynovitis
- Carpal tunnel syndrome
- Trigger finger
- Sacroiliac joint arthritis
- Osteoarthritis of hip
- Piriformis syndrome
- Osteoarthritis of knee
- Anserine bursitis
- Baker’s cyst
- Plantar fasciitis
- Ultrasound-guided myofascial trigger point injection
- Facet joint injection
- Medial branch block
- Caudal epidural steroid injection
Injectable agents

- Corticosteroid
- NSAIDs – Ketorolac
- Hyaluronic Acid
- Lidocaine
- Normal saline
- Platelet Rich Plasma (PRP)
Ultrasound-Guided Nerve Hydrodissection

- **Peripheral nerve entrapment**
  - Anesthetic or solution such as saline to separate the nerve from surrounding tissue
- **Median nerve**
  - Carpal Tunnel Syndrome (CTS)
- **Ulnar nerve**
  - Cubital tunnel syndrome
- **Lateral femoral cutaneous nerve of thigh**
- **Saphenous nerve**

Low-level studies do demonstrate some effectiveness and safety and technique, but further research is necessary.

Median Nerve Hydrodissection with 3rd Generation Platelet Lysate Under High Resolution Ultrasound
Christopher J. Centeno, M.D.
Regenexx Colorado, USA

This needle is 30 gauge about the size of a toothbrush bristle.
Platelet Rich Plasma (PRP)

- Autologous platelet gel, Plasma rich in growth factors (PRGF), Platelet concentration (PC)
- Increased concentration of autologous platelets suspended in a small amount of plasma after centrifugation
- Hemostasis and natural source of growth factors
  - PDGF: stimulation production other GF
  - TGF-β: cells proliferation and migration, collagen synthesis
  - FGF: angiogenesis, cells proliferation and migration
  - VEGF: angiogenesis
  - HGF: cells proliferation and migration, angiogenesis
  - IGF-1: cells proliferation and migration, collagen and ECM synthesis
Animal studies

- Tendons = *small metabolic index*
- GF $\rightarrow$ tenocyte proliferation, *collagen synthesis*, stimulation of angiogenesis, analgesic properties (Anitua 2009; Bosch 2011)
- *Stimulation and acceleration of tissue regeneration* (Virchenko 2006; Bosch 2011; Kaux 2012)
- *Mechanical loads required to obtain optimal tissue quality* (Virchenko 2006; Kaux 2012)
Animal studies

- Each GF = *specific action* during healing process *(Molloy 2003; Anitua 2007)*
- **Improve cicatricial process** and decrease time of cicatrization:
  - *Differentiation of cells from circulation* *(Anitua 2006 & 2007; Kajikawa 2008)*
  - **Improve MMPs-3 expression** → *remodeling ECM* *(de Mos 2008)*
  - **Improve initial stages of healing** *(Anitua 2006 & 2007; Kajikawa 2008; Kaux 2012)*
  - **Improve type 1 collagen fiber synthesis and organisation**, neovascularisation *(Lyras 2009; Kajikawa 2008; Mishra 2009; Kaux 2012)*
  - **Better maturation of the tendinous cal** *(Aspenberg 2004; Virchenko 2006; Kaux 2012)*
Clinical studies

- Chronic tendinopathies
- Initiate an acute inflammatory reaction that quickly moves on to the proliferative phase
- • NOT to be used for acute tendinitis or tenosynovitis


Platelet-rich plasma application in the management of chronic tendinopathies

Jean-François Kaux, Jean-Michel Crielaard

From the University and University Hospital of Liège, Belgium
6 studies

• PRP vs steroids; following 1 year (Peerbooms 2010)
• PRP vs bupivacaine; following 6 months (Mishra 2013)
• PRP vs steroids; following 6 weeks (Omar 2012)
• PRP vs autologous blood; following 6 months
  (Thanassas 2011; Creaney 2011)
• PRP vs steroids vs saline; following 3 months (Krogh 2013)
Platelet-Rich Plasma Versus Focused Shock Waves in the Treatment of Jumper’s Knee in Athletes

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Investigation performed at the Sant’Andrea Hospital, Sapienza University of Rome, Rome, Italy

Background: Tendinopathies represent a serious challenge for orthopaedic surgeons involved in treatment of athletes.

Purpose: To compare the effectiveness and safety of platelet-rich plasma (PRP) injections and focused extracorporeal shock wave therapy (ESWT) in athletes with jumper’s knee.

Study Design: Randomized controlled trial; Level of evidence, 1.

Methods: Forty-six consecutive athletes with jumper’s knee were selected for this study and randomized into 2 treatment groups: 2 autologous PRP injections over 2 weeks under ultrasound guidance (PRP group; n = 23), and 3 sessions of focused extracorporeal shock wave therapy (2,400 impulses at 0.17-0.25 mJ/mm² per session) (ESWT group; n = 23). The outcome measures were Victorian Institute of Sports Assessment–Patella (VISA-P) questionnaire, pain visual analog scale (VAS), and modified Blazina scale. A reviewer who was blinded as to the group allocation of participants performed outcome assessments before treatment and at 2, 6, and 12 months after treatment. Nonparametric tests were used for within-group (Friedman/Wilcoxon test) and between-group (Kruskal-Wallis/Fisher test) testing, and the significance level was set at .05.

Results: The 2 groups were homogeneous in terms of age, sex, level of sports participation, and pretreatment clinical status. Patients in both groups showed statistically significant improvement of symptoms at all follow-up assessments. The VISA-P, VAS, and modified Blazina scale scores showed no significant differences between groups at 2-month follow-up (P = .635, .360, and .339, respectively). The PRP group showed significantly better improvement than the ESWT group in VISA-P, VAS scores at 6- and 12-month follow-up, and modified Blazina scale score at 12-month follow-up (P < .05 for all).

Conclusion: Therapeutic injections of PRP lead to better midterm clinical results compared with focused ESWT in the treatment of jumper’s knee in athletes.

Keywords: jumper’s knee; platelet-rich plasma; extracorporeal shock wave therapy; tendinopathy/therapy
Platelet-Rich Plasma Injection for Chronic Achilles Tendinopathy: A Randomized Controlled Trial

Context  Tendon disorders comprise 30% to 50% of all activity-related injuries; chronic degenerative tendon disorders (tendinopathy) occur frequently and are difficult to treat. Tendon regeneration might be improved by injecting platelet-rich plasma (PRP), an increasingly used treatment for releasing growth factors into the degenerative tendon.

Objective  To examine whether a PRP injection would improve outcome in chronic midportion Achilles tendinopathy.

Design, Setting, and Patients  A stratified, block-randomized, double-blind, placebo-controlled trial at a single center (The Hague Medical Center, Leidschendam, the Netherlands) of 54 randomized patients aged 18 to 70 years with chronic tendinopathy 2 to 7 cm above the Achilles tendon insertion. The trial was conducted between August 28, 2008, and January 29, 2009, with follow-up until July 16, 2009.

Intervention  Eccentric exercises (usual care) with either a PRP injection (PRP group) or saline injection (placebo group). Randomization was stratified by activity level.

Main Outcome Measures  The validated Victorian Institute of Sports Assessment-Achilles (VISA-A) questionnaire, which evaluated pain score and activity level, was completed at baseline and 6, 12, and 24 weeks. The VISA-A score ranged from 0 to 100, with higher scores corresponding with less pain and increased activity. Treatment group effects were evaluated using general linear models on the basis of intention-to-treat.

Results  After randomization into the PRP group (n=27) or placebo group (n=27), there was complete follow-up of all patients. The mean VISA-A score improved significantly after 24 weeks in the PRP group by 21.7 points (95% confidence interval [CI], 13.0-30.5) and in the placebo group by 20.5 points (95% CI, 11.6-29.4). The increase was not significantly different between both groups (adjusted between-group difference from baseline to 24 weeks, −0.9; 95% CI, −12.4 to 10.6). This CI did not include the predefined relevant difference of 12 points in favor of PRP treatment.

Conclusion  Among patients with chronic Achilles tendinopathy who were treated with eccentric exercises, a PRP injection compared with a saline injection did not result in greater improvement in pain and activity.

Trial Registration  clinicaltrials.gov Identifier: NCT00761423

JAMA. 2010;303(2):144-149

www.jama.com
No effects of PRP on ultrasonographic tendon structure and neovascularisation in chronic midportion Achilles tendinopathy.

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Abstract

OBJECTIVE: To assess whether a platelet-rich plasma (PRP) injection leads to an enhanced tendon structure and neovascularisation, measured with ultrasonographic techniques, in chronic midportion Achilles tendinopathy.

DESIGN: Double-blind, randomised, placebo-controlled clinical trial.


PATIENTS: 54 patients with chronic midportion Achilles tendinopathy were included.

INTERVENTIONS: Patients were randomised to eccentric exercise therapy with either a PRP injection (PRP group) or a saline injection (placebo group).

MAIN OUTCOME MEASUREMENTS: Tendon structure was evaluated by ultrasonographic tissue characterisation, a novel technique which quantifies tendon structure into four echo-types: echo-types I+II represent organised tendon bundles, whereas echo-types III+IV represent a disorganised tendon structure. Colour Doppler ultrasonography was used to measure the degree of neovascularisation. Follow-up was at 6, 12 and 24 weeks.

RESULTS: A significant improvement in echo-types I+II was found after 24 weeks within both the PRP group (n=27) and the placebo group (n=27), but there was no significant between-group difference (95% CI -1.6 to 7.8, p=0.169). After 6 weeks, the neovascularisation score increased within the PRP group (p=0.001) and the placebo group (p=0.002), but there was no significant between-group difference in change in neovascularisation score at any point in time.

CONCLUSION: Injecting PRP for the treatment of chronic midportion Achilles tendinopathy does not contribute to an increased tendon structure or alter the degree of neovascularisation, compared with placebo.

FUNDING: Biomet Biologics LLC, Warsaw, Indiana.
One-Year Follow-up of Platelet-Rich Plasma Treatment in Chronic Achilles Tendinopathy: A Double-Blind Randomized Placebo-Controlled Trial

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Abstract

Background: Achilles tendinopathy is a common disease among both athletes and in the general population in which the use of platelet-rich plasma has recently been increasing. Good evidence for the use of this autologous product in tendinopathy is limited, and data on longer-term results are lacking.

Purpose: To study the effects of a platelet-rich plasma injection in patients with chronic midportion Achilles tendinopathy at 1-year follow-up.

Study Design: Randomized controlled trial; Level of evidence, 1.

Methods: Fifty-four patients, aged 18 to 70 years, with chronic tendinopathy 2 to 7 cm proximal to the Achilles tendon insertion were randomized to receive either a blinded injection containing platelet-rich plasma or saline (placebo group) in addition to an eccentric training program. The main outcome was the validated Victorian Institute of Sports Assessment–Achilles score. Patient satisfaction was recorded and ultrasound examination performed at baseline and follow-up.

Results: The mean Victorian Institute of Sports Assessment–Achilles score improved in both the platelet-rich plasma group and the placebo group after 1 year. There was no significant difference in increase between both groups (adjusted between-group difference, 5.5; 95% confidence interval, −4.9 to 15.8, P = .292). In both groups, 59% of the patients were satisfied with the received treatment. Ultrasonographic tendon structure improved significantly in both groups but was not significantly different between groups (adjusted between-group difference, 1.2%; 95% confidence interval, −4.1 to 6.6, P = .847).

Conclusion: This randomized controlled trial showed no clinical and ultrasonographic superiority of platelet-rich plasma injection over a placebo injection in chronic Achilles tendinopathy at 1 year combined with an eccentric training program.
Outcomes After Ultrasound-Guided Platelet-Rich Plasma Injections for Chronic Tendinopathy: A Multicenter, Retrospective Review

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**Objective:** To determine whether ultrasound-guided platelet-rich plasma (PRP) injections are an effective treatment for chronic tendinopathies.

**Design:** A retrospective, cross-sectional survey.

**Setting:** Four academic sports medicine centers from across the United States.

**Patients:** A total of 180 men and women between the ages of 18 and 75 years who received ultrasound-guided PRP injections for tendinopathy refractory to conventional treatments.

**Interventions:** Survey on satisfaction and functional outcome.

**Main Outcome Measurements:** Perceived improvement in symptoms at least 6 months after treatment, perceived change in visual analog scale score, assessment of functional pain, and overall satisfaction.

**Results:** On average, patients were 48 years old, had symptoms for a median of 18 months before treatment, and answered the survey on average 15 months after treatment. Overall, 82% of patients indicated moderate to complete improvement in symptoms. The most common injection sites were the lateral epicondyle, Achilles, and patellar tendons. Other sites treated included the rotator cuff, hamstring, gluteus medius, and medial epicondyle, among others. Furthermore, 60% of patients received only 1 injection, 30% received 2 injections, and 10% received 3 or more injections. Patients' perceived decrease in visual analog scale score was 75%, from 7.0 ± 1.8 to 1.8 ± 2.0 (-5.2, SD 2.7, 95% confidence interval -5.65 to -4.86, P < .0001). In addition, at follow-up, 95% of patients reported having no pain at rest that disrupted their activities of daily living and 68% reported no pain during activities. A total of 85% of patients were satisfied with the procedure.

**Conclusions:** In this retrospective study, in which we evaluated administration of PRP for chronic tendinopathy, we found that the majority of patients reported a moderate (>50%) improvement in pain symptoms.
Platelet-rich plasma injections for chronic plantar fasciopathy: a systematic review

F. Franceschi†, R. Papalia†, E. Franceschetti†, M. Paciotti†, N. Maffulli†,§,* and V. Denaro†

Abstract

**Introduction:** There is an increasing interest in platelet-rich plasma (PRP) injection as a treatment for chronic plantar fasciopathy (PF). We wished to evaluate the evidence for the use of PRP in PF/fasciitis.

**Sources of data:** We performed a systematic review on the effects of PRP in PF. In June 2014, we searched Medline, Cochrane, CINAHL and Embase database using various combinations of the commercial names of each PRP preparation and ‘plantar’ (with its associated terms). We only included prospectively designed studies in humans.

**Areas of agreement:** Eight articles met the inclusion criteria, three of them were randomized. All studies yielded a significantly greater improvement in symptoms between baseline and last follow-up assessment. None of the papers recorded major complications.

**Areas of controversy:** Only three randomized studies were identified; none of them had a true controlled group treated with placebo and one of the three studies had a very short (6 week) follow-up. A non-randomized study evaluating PRP versus corticosteroids (CCS) injections, and a randomized controlled trial comparing PRP and dextrose prolotherapy reported no statistical significant differences at 6 months. Most studies did not have a control group and imaging evaluation.

**Growing points and areas for research:** Evidence for the use of PRP in PF shows promising results, and this therapy appears safe. However, the number of studies available is limited and randomized placebo-controlled studies are required. Characterizing the details of the intervention and standardizing the outcome scores would help to better document the responses and optimize the treatment.
Extracorporeal Shock Wave Therapy (ESWT)

- Physical agent modality
- High-intensity pulsed mechanical waves with relatively low repetition frequency
- Focused shock waves
  - Electrohydraulic, electromagnetic, or piezoelectric generators
- Destroying sensory unmyelinated nerve fibers and eliciting neovascularization
- Chronic plantar fasciitis, Epicondylitis, Rotator cuff calcified tendinopathy
Physical agent modalities

- Physical agents used to produce desired therapeutic effect
- Cold, heat, sound, electromagnetic waves, electricity, and mechanical forces
- Adjunctive rather than curative treatments
Cryotherapy

- Changing local sensation, muscle relaxation and vasoconstriction, which are possibly followed by vasodilation

- Indications
  - Acute soft tissue inflammation
  - Acute phase of inflammation in conditions such as tenosynovitis, bursitis, acute exacerbation of osteoarthritis, and rheumatoid arthritis
  - Postsurgical pain and edema, such as after anterior cruciate ligament repair or reconstruction
  - Chronic myofascial pain syndrome
- **Contraindications and precautions**
  - Impaired circulation
  - Peripheral vascular disease
  - Hypersensitivity to cold
  - Skin anesthesia
  - Local infection
Types of Devices and Techniques

- Ice pack, ice massage, cold whirlpool
- Superficial layer, subcutaneous and superficially located muscles
- Recommended treatment duration
  - 20 minutes
- Local tissue: 0-10 degree celsius
- Cold whirlpool: 10-15 degree celsius
- Whole body cryotherapy: 18-27 degree celsius
- Other type – cold spray
Superficial Heat

- Less than 1 cm deep
  - Skin and subcutaneous tissue
  - Reflexively increase blood flow to subcutaneous fat and muscles
- Relaxing skeletal muscle
- Increased blood flow
- Increased tendon extensibility
- Decreased joint stiffness
- Decreased chronic inflammation
Indications for heat therapy

- Subacute and chronic inflammatory conditions
- Subacute or chronic pain
- Subacute muscle strain
- Subacute contusion
- Subacute ligament sprain
- Muscle spasm
- Decreased range of motion of joint
- Myofascial trigger points
Contraindications

- Acute musculoskeletal conditions
- Impaired circulation
- Peripheral vascular disease
- Skin anesthesia
- Open wounds
- Infection
- Types of Devices and Techniques
  - Heating pad, hydrocollator packs, paraffin bath, hot whirlpool, and infrared
- Home use – Hot towel, hot water bath, and electrical heating pad
**Hydrocollator Pack**

- A thermostat maintains the high temperature of 76 degree celsius
- Treatment duration: 15-20 minutes
**Paraffin Bath**

- Simple and efficient method to apply superficial heat, especially to the small joints of the body such as the interphalangeal joints
- Combination of paraffin and mineral oil
- Temperature setting: 52 degree celsius
- Dipping and Immersion method
Deep Heat

- Ultrasound, shortwave, and microwave diathermy
- Deep tissue such as ligament, tendon, muscle, and joint capsule, avoiding excessive heat in skin and subcutaneous fat
Ultrasound diathermy

- Therapeutic ultrasound emits high-frequency acoustic energy to produce thermal and mechanical effects in tissue.
- Reach as deep as 3 to 5 cm without heating superficial tissues.
- Enhance the proliferation, collagen production, and noncollagen protein synthesis.
Contraindications and Precautions of Ultrasound Diathermy

- General heat precautions
- Acute injury/inflammation
- Near nerve, brain, eyes, reproductive organs
- On pregnant uterus
- Near spine or laminectomy sites
- Malignancy
- Near pacemaker
- On epiphysis
- Implants containing plastic materials
Electrotherapy

- Segmental inhibition of pain signals to the brain and the dorsal horn of the spinal cord (Melzack and Wall’s gate control theory)
- Activation of descending inhibitory pathways and stimulation of the release of endogenous opioids and other neurotransmitters such as serotonin, gammaaminobutyric acid, noradrenaline, and acetylcholine
Transcutaneous Electrical Nerve Stimulation (TENS)

- Nociceptive pain – acute, subacute or chronic pain
- Neuropathic pain
**Interferential Current**

- Musculoskeletal conditions
- Neurologic conditions
- Incontinence
Precautions and Complications

- Near implanted or temporary stimulators (pacemakers, intrathecal pumps, spinal cord stimulators, etc.)
- Near sympathetic ganglia or the carotid sinus
- Near the gravid uterus
- DVT
- Insensate skin or a patient with cognitive impairment
- Complications - Burn
LASER Therapy

- Low power LASER
- High power LASER
- Painless treatment laser energy
- Increase circulation, drawing oxygen and nutrients to the damaged area
- Reduces inflammation
- Biostimulate tissue repair and growth
Spinal Traction

- Stretch the ligament, muscle, and facet joint
- Reduces the disc pressure and facilitates the disc to return to its origin position
- Excellent effect on disc protrusion and disc-related pain
- Increased joint separation lessens the compression pressure of articular cartilage, encourages synovial fluid exchange, nourishes the cartilage
- Increases proprioceptive discharge from the facet joint and muscles
- Relieve the possible local nerve compression
**Indications**

- Impingement on a nerve root
- Disc herniation
- Narrowing within the intervertebral foramen
- Osteophyte formation
- Degenerative joint diseases
- Spondylolisthesis
- Joint hypomobility
- Diskogenic pain
- Muscle spasm or guarding
- Spinal ligament or connective tissues contractures
Contraindications

- Acute sprains or strains
- Acute inflammation
- Fractures
- Any condition in which movement exacerbates the existing problem
- Tumors
- Bone diseases
- Pregnancy
- Vertebral joint instability
- Osteoporosis
Therapeutic exercise

- The use of activities requiring physical exertion in the prevention, treatment, and rehabilitation of illness and disabling condition
- Strengthening exercise
- Flexibility exercise
- Endurance exercise (Cardiovascular exercise)
- Proprioceptive retraining
- Functional training
Orthosis application

- A singular device used to aid or align a weakened body part
- Protection
  - Correct alignment and prevent progressive deformity
  - Stabilize unstable bony components and promote healing of soft tissues and bones
- Correction
- Assistance with function
Musculoskeletal conditions

- Tendonitis, Tenosynovitis, and Enthesopathy
- Sprains and strains
- Fractures
- Arthritis
- Pes Planus (Flat Foot)
- Pes Cavus (High-Arched Foot)
- Forefoot Pain (Metatarsalgia)
- Heel pain
- Leg Length Discrepancy
- Ligament injury
- Low back pain - degenerative disc disease, herniated disc, spondylolisthesis, and mechanical low back pain, and for postsurgical supports for lumbar laminectomies, fusions, or discectomies
- Scoliosis
- Infection
- Tumor
Patient education

- Anatomy
- Pathology
- Risk factors
- Emotional factors
- Biomechanics: posture, sitting, body mechanics
- Pain: sources and management
- Treatment procedures
- Exercise
- Recreational activities
- Sex
- Practical session: rest positions, body mechanics, relaxation exercises
- Questions and answers
Ergonomics

- An applied science concerned with designing and arranging things people use so that the people and things interact most efficiently and safely—called also human engineering, human factors engineering
การยกของ

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การขยับของทิศทาง

การสะพายเป้
หัวของซ้ายไว...ไกลบวตกด ปฎำบ้า
ใส่รองเท้าทำใหม่...ใกล้ปลายหลัง
Thank You
Special Thanks