PASIG PERFORMING ARTS
SPECIAL INTEREST GROUP

ORTHOPAEDIC SECTION
AMERICAN PHYSICAL THERAPY ASSOCIATION

APTA
American Physical Therapy Association
The Science of Healing. The Art of Caring.

PASIG MONTHLY CITATION BLAST: No. 103 **April 2015**

Dear Performing Arts SIG members:

The 3rd Annual Orthopaedic Section Meeting will be held at the Arizona Grand Resort & Spa in Phoenix, Arizona, May 14-16, 2015. During this 2-day meeting, sessions will explore the multidisciplinary advances in rehabilitation through the episode of care of various lower extremity dysfunctions, treatment of osteoarthritis from presurgical to postsurgical, and the physical therapist's role in advances in regenerative medicine. Experts in the field will gather together for lecture presentations and small group, hands-on lab sessions.

So please, plan to join the Orthopaedic Section in **Phoenix, Arizona, on May 14-16, 2015**, for "*Maximizing Outcomes: Multidisciplinary Advances in the Continuum of Care of Lower Extremity Dysfunctions.*" http://www.orthopt.org/content/home

WE NEED MORE CONTRIBUTORS TO OUR MONTHLY CITATION BLASTS!!!!
Past Monthly citation blasts are available, with citations and EndNote file, listed on the website:
http://www.orthopt.org/content/special_interest_groups/performing_arts/citations_endnotes
TOPICS THAT HAVE BEEN COVERED RECENTLY INCLUDE:
Platelet Rich Plasma Injections
Back Pain in Dancers
Hallux Valgus in Dancers
Posterior ankle impingement
TMD in Musicians
Concussions

Bone Mineral Density in Dancers
Serratus Anterior Strengthening for Dancers
Focal Dystonia
Gymnastics: Update on Injuries and Movement Strategies
Dancers: Jumps, Landings, and Associated Injuries
These blasts are fairly simple to prepare. We love having contributions from our members regarding topics of great interest. If you are interested in contributing by writing a citation blast, contact me, Brooke Winder: BrookeRwinder@gmail.com

Best regards,

Brooke
Brooke Winder, PT, DPT, OCS
Chair, PASIG Research Committee
Director of Physical Therapy, The Cypress Center, Pacific Palisades, CA
Home: brookeRwinder@gmail.com Work: brooke@thecypresscenter.com

PASIG Research Committee members:
Shaw Bronner PT, PhD, OCS, sbronner@liu.edu
Jeff Stenback PT, OCS, jsptocs2@hotmail.com
Sheyi Ojofeitimi PT, DPT, OCS,sojofeit@gmail.com
Susan D. Fain PT, DMA, sfain@ptcentral.org
Laura Reising, MS, PT, DPT, lbreising@gmail.com (EndNote Organizer)

PERFORMING ARTS CONTINUING EDUCATION, CONFERENCES, AND RESOURCES

Musician Health Series, Janice Ying, PT, DPT, OCS
Glendale Adventist Therapy and Wellness Center, Los Angeles area (Eagle Rock), CA
http://www.musicianshealthcorner.com/
Healthy Musician Series - Overuse

Orthopaedic Section Independent Study Course. *20.3 Physical Therapy for the Performing Artist*.
Monographs are available for:
- Figure Skating (J. Flug, J. Schneider, E. Greenberg),
- Artistic Gymnastics (A. Hunter-Giordano, Pongetti-Angeletti, S. Voelker, TJ Manal), and
- Instrumentalist Musicians (J. Dommerholt, B. Collier).

Contact: Orthopaedic Section at: www.orthopt.org

Orthopaedic Section-American Physical Therapy Association,
Performing Arts SIG

http://www.orthopt.org/content/special_interest_groups/performing_arts
Performing Arts Citations and Endnotes
http://www.orthopt.org/content/special_interest_groups/performing_arts/citations_endnotes

ADAM Center
http://www.adamcenter.net/
Publications:
http://www.adamcenter.net/#!vstc0=publications
Conference abstracts:
http://www.adamcenter.net/#!vstc0=conferences

Dance USA
http://www.danceusa.org/
Research resources:
http://www.danceusa.org/researchresources
Professional Dancer Annual Post-Hire Health Screen:
http://www.danceusa.org/dancerhealth

Dancer Wellness Project
http://www.dancerwellnessproject.com/
Becoming an affiliate:
http://www.dancerwellnessproject.com/Information/BecomeAffiliate.aspx

Harkness Center for Dance Injuries, Hospital for Joint Diseases
http://hjd.med.nyu.edu/harkness/
Continuing education:
http://hjd.med.nyu.edu/harkness/education/healthcare-professionals/continuing-education-courses-cme-and-ceu
Resource papers:
http://hjd.med.nyu.edu/harkness/dance-medicine-resources/resource-papers-and-forms
Links:
http://hjd.med.nyu.edu/harkness/dance-medicine-resources/links
Informative list of common dance injuries:
http://hjd.med.nyu.edu/harkness/patients/common-dance-injuries
Research publications:
http://hjd.med.nyu.edu/harkness/research/research-publications

International Association for Dance Medicine and Science (IADMS)
http://www.iadms.org/
Resource papers:
http://www.iadms.org/displaycommon.cfm?an=1&subarticlenbr=186
Links:
http://www.iadms.org/displaycommon.cfm?an=5
Medicine, arts medicine, and arts education organization links:

http://www.iadms.org/displaycommon.cfm?an=1&subarticlenbr=5
Publications:
http://www.iadms.org/displaycommon.cfm?an=3

Performing Arts Medicine Association (PAMA)
http://www.artsmed.org/
http://www.artsmed.org/symposium.html
Interactive bibliography site:
http://www.artsmed.org/bibliography.html
Related links:
http://www.artsmed.org/relatedlinks.html
Member publications:
http://artsmed.org/publications.html

(Educators, researchers, and clinicians, please continue to email your conference and continuing education information to include in future blasts)

Platelet-Rich Plasma Therapy

Platelet rich plasma is autologous blood with a concentration of platelets above baseline status. The growth factors found in platelet rich plasma may be used to stimulate healing, decrease pain, or improve the quality of a tissue repair. PRP injections are more commonly being used in the treatment of orthopedic conditions, primarily tendinopathies. I myself have run into more and more patients asking questions about this and related interventions. I hope the included articles help you to be effective in relating to patients the current research on this intervention.

Brooke Winder, PT, DPT, OCS
Director of Physical Therapy
The Cypress Center, Pacific Palisades, CA

Andia, I., et al. "Platelet-rich plasma in the conservative treatment of painful tendinopathy: a systematic review and meta-analysis of controlled studies." ***Br Med Bull*** **110.1 (2014): 99-115.**

Background: Platelet-rich plasma (PRP) seeks to meet the multifaceted demand of degenerated tendons providing several molecules capable of boosting healing. Areas timely for developing research: PRP is used for managing tendinopathy, but its efficacy is controversial.
Sources of data: Electronic databases were searched for clinical studies assessing PRP efficacy. Methodological quality was evaluated using the methods described in the Cochrane Handbook for systematic reviews.

Areas of agreement: Thirteen prospective controlled studies, comprising 886 patients and diverse tendons were included; 53.8% of studies used identical PRP protocol.
Areas of controversy: Sources of heterogeneity included different comparators, outcome scores, follow-up periods and diverse injection protocols, but not PRP formulation per se.
Growing points: Pooling pain outcomes over time and across different tendons showed that L-PRP injections ameliorated pain in the intermediate- long term compared with control interventions, weighted mean difference (95% CI): 3 months, _0.61 (_0.97, _0.25); 1 year, _1.56 (_2.27, _0.83). However, these findings cannot be applied to the management of individual patients given low power and precision.
Research: Further studies circumventing heterogeneity are needed to reach _rm conclusions. Available evidence can help to overcome hurdles to future clinical research and bring forward PRP therapies.

Charousset, Christophe, et al. "Are multiple platelet-rich plasma injections useful for treatment of chronic patellar tendinopathy in athletes? A prospective study." ***The American journal of sports medicine*** **(2014): 0363546513519964.**
Background: Chronic patellar tendinopathy (PT) is one of the most common overuse knee disorders. Platelet-rich plasma (PRP) appears to be a reliable nonoperative therapy for chronic PT.
Purpose: To evaluate clinical and radiological outcomes of 3 consecutive ultrasound (US)–guided PRP injections for the treatment of chronic PT in athletes.
Study Design: Case series; Level of evidence, 4.
Methods: A total of 28 athletes (17 professional, 11 semiprofessional) with chronic PT refractory to nonoperative management were prospectively included for US-guided pure PRP injections into the site of the tendinopathy. The same treating physician at a single institution performed 3 consecutive injections 1 week apart, with the same PRP preparation used. All patients underwent clinical evaluation, including the Victorian Institute of Sport Assessment–Patella (VISA-P) score, visual analog scales (VAS) for pain, and Lysholm knee scale before surgery and after return to practice sports. Tendon healing was assessed with MRI at 1 and 3 months after the procedure.
Results: The VISA-P, VAS, and Lysholm scores all significantly improved at the 2-year follow-up. The average preprocedure VISA-P, VAS, and Lysholm scores improved from 39 to 94 ($P < .001$), 7 to 0.8 ($P < .0001$), and 60 to 96 ($P < .001$), respectively, at the 2-year follow-up. Twenty-one of the 28 athletes returned to their presymptom sporting level at 3 months (range, 2-6 months) after the procedure. Follow-up MRI assessment showed improved structural integrity of the tendon at 3 months after the procedure and complete return to normal structural integrity of the tendon in 16 patients (57%). Seven patients did not recover their presymptom

sporting level (among them, 6 were considered treatment failures): 3 patients returned to sport at a lesser level, 1 patient changed his sport activity (for other reasons), and 3 needed surgical intervention.
Conclusion: In this study, application of 3 consecutive US-guided PRP injections significantly improved symptoms and function in athletes with chronic PT and allowed fast recovery to their presymptom sporting level. The PRP treatment permitted a return to a normal architecture of the tendon as assessed by MRI

Dallaudière, Benjamin, et al. "Intratendinous injection of platelet-rich plasma under US guidance to treat tendinopathy: a long-term pilot study." *Journal of Vascular and Interventional Radiology* 25.5 (2014): 717-723.
Purpose To assess the potential therapeutic effect of intratendinous injection of platelet-rich plasma (PRP) under ultrasound (US) guidance to treat tendon tears and tendinosis in a pilot study with long-term follow-up.
Materials and Methods The study included 408 consecutive patients referred for treatment by PRP injection of tendinopathy in the upper (medial and lateral epicondylar tendons) and the lower (patellar, Achilles, hamstring and adductor longus, and peroneal tendons) limb who received a single intratendinous injection of PRP under US guidance. Clinical and US data were retrospectively collected for each anatomic compartment for upper and lower limbs before treatment (baseline) and 6 weeks after treatment. Late clinical data without US were collected until 32 months after the procedure (mean, 20.2 months). The McNemar test and regression model were used to compare clinical and US data.
Results QuickDASH score, Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) score, and residual US size of lesions were significantly lower after intratendinous injection of PRP under US guidance at 6 weeks and during long-term follow-up compared with baseline ($P < .001$ in upper and lower limb) independent of age, gender, and type of tendinopathy ($P > .29$). No clinical complication was reported during follow-up.
Conclusions Intratendinous injection of PRP under US guidance appears to allow rapid tendon healing and is well tolerated.

Di Matteo, B., et al. "Platelet-rich plasma: evidence for the treatment of patellar and Achilles tendinopathy—a systematic review." *Musculoskeletal surgery*(2014): 1-9.
Platelet-rich plasma (PRP) has been introduced in the clinical practice to treat a growing number of different musculoskeletal pathologies. It is currently applied in the treatment of Achilles and patellar tendinopathies, which are common sport-related injuries very challenging to manage. Aim of the present paper was to review systematically the available clinical evidence concerning the application of PRP in the treatment of patellar and Achilles tendinopathy. A systematic review of the literature was performed according to the following inclusion criteria for relevant

articles: (1) clinical reports of any level of evidence, (2) written in the English language, (3) with no time limitation and (4) on the use of PRP to treat conservatively Achilles and patellar tendinopathy. Twenty-two studies were included and analyzed. Two studies on patellar tendinopathy were randomized controlled trials (RCTs), whereas just one RCT was published on Achilles tendon. All the papers concerning patellar tendon reported positive outcome for PRP, which proved to be superior to other traditional approaches such as shock-wave therapy and dry needling. In the case of Achilles tendon, despite the encouraging findings reported by case series, the only RCT available showed no significant clinical difference between PRP and saline solution. The main finding of this study was the paucity of high-level literature regarding the application of PRP in the management of patellar and Achilles tendinopathy. However, the clinical data currently available, although not univocal, suggest considering PRP as a therapeutic option for recalcitrant patellar and Achilles tendinopathies

Dragoo, Jason L., et al. "Platelet-Rich Plasma as a Treatment for Patellar Tendinopathy A Double-Blind, Randomized Controlled Trial." ***The American journal of sports medicine*** **(2014): 0363546513518416.**

Background: Previous studies have shown improvement in patellar tendinopathy symptoms after platelet-rich plasma (PRP) injections, but no randomized controlled trial has compared PRP with dry needling (DN) for this condition.
Purpose: To compare clinical outcomes in patellar tendinopathy after a single ultrasound-guided, leukocyte-rich PRP injection versus DN.
Study Design: Randomized controlled trial; Level of evidence, 1.
Methods: A total of 23 patients with patellar tendinopathy on examination and MRI who had failed nonoperative treatment were enrolled and randomized to receive ultrasound-guided DN alone (DN group; n = 13) or with injection of leukocyte-rich PRP (PRP group; n = 10), along with standardized eccentric exercises. Patients and the physician providing follow-up care were blinded. Participants completed patient-reported outcome surveys before and at 3, 6, 9, 12, and 26 weeks after treatment during follow-up visits. The primary outcome measure was the Victorian Institute of Sports Assessment (VISA) score for patellar tendin- opathy at 12 weeks, and secondary measures included the visual analog scale (VAS) for pain, Tegner activity scale, Lysholm knee scale, and Short Form (SF-12) questionnaire at 12 and 26 weeks. Results were analyzed using 2-tailed paired and unpaired t tests. Patients who were dissatisfied at 12 weeks were allowed to cross over into a separate unblinded arm.
Results: At 12 weeks after treatment, VISA scores improved by a mean 6 standard deviation of 5.2 6 12.5 points (P = .20) in the DN group (n = 12) and by 25.4 6 23.2 points (P = .01) in the PRP group (n = 9); at 26 weeks, the scores improved by 33.2 6 14.0 points (P = .001) in the DN group (n = 9) and by 28.9 6 25.2 points (P = .01) in the PRP group (n = 7). The PRP group had improved significantly more than the DN group at 12 weeks (P = .02), but the difference

between groups was not significant at 26 weeks (P = .66). Lysholm scores were not significantly different between groups at 12 weeks (P = .81), but the DN group had improved significantly more than the PRP group at 26 weeks (P = .006). At 12 weeks, 3 patients in the DN group failed treatment and subsequently crossed over into the PRP group. These patients were excluded from the primary 26-week analysis. There were no treatment failures in the PRP group. No adverse events were reported. Recruitment was stopped because interim anal- ysis demonstrated statistically significant and clinically important results.
Conclusion: A therapeutic regimen of standardized eccentric exercise and ultrasound-guided leukocyte-rich PRP injection with DN accelerates the recovery from patellar tendinopathy relative to exercise and ultrasound-guided DN alone, but the apparent benefit of PRP dissipates over time.

Filardo, Giuseppe, et al. "Platelet-rich plasma injections for the treatment of refractory Achilles tendinopathy: results at 4 years." ***Blood Transfusion*** **12.4 (2014): 533.**
Background Chronic Achilles tendinopathy is responsible for a severe reduction in physical performance and persistent pain. There is currently a number of therapeutic options and the local administration of growth factors is an emerging treatment strategy. In particular, platelet-rich plasma (PRP) is a widely used way to provide a local regenerative stimulus for tendon healing. The aim of this study was to document the mid-term results obtained after treating recalcitrant Achilles tendinopathy with injections of high concentrate, leucocyte-rich PRP.
Materials and methods Twenty-seven patients (mean age: 44.6 years; 22 men and 5 women) affected by chronic mid-portion Achilles tendinopathy (7 bilateral, for a total of 34 tendons), refractory to previous treatments, were enrolled. Patients were treated with three ultrasound-guided intra-tendinous injections of PRP at 2-week intervals. Patients were prospectively evaluated at baseline, and then at 2, 6, and up to a mean of 54.1 months of follow-up (minimum 30 months), using the following tools: Blanzina, VISA-A, EQ-VAS for general health, and Tegner scores.
Results The VISA-A score showed a significant improvement: the baseline score of 49.9±18.1 increased to 62.9±19.8 at 2 months (p=0.002), with a further improvement at 6 months (84.3±17.1, p<0.0005), and stable results at 4.5 years (90.0±13.9). The EQ-VAS score also showed a similar positive trend. An evaluation of the activity level confirmed these findings, showing a significant improvement in the Tegner score over time (p=0.017 for the final evaluation). The longer duration of symptoms before treatment was associated with a slower return to sport (p=0.041).
Discussion PRP injections produced good overall results for the treatment of chronic recalcitrant Achilles tendinopathy with a stable outcome up to a medium-term follow-up. Longer symptom duration was related with a more difficult return to sporting activity.

Filardo, Giuseppe, et al. "Platelet-rich plasma for the treatment of patellar tendinopathy: clinical and imaging findings at medium-term follow-up."*International orthopaedics* 37.8 (2013): 1583-1589.

Purpose The purpose of this study was to evaluate the effi- cacy of multiple platelet-rich plasma (PRP) injections on the healing of chronic refractory patellar tendinopathy, and re- port the quality and duration of the clinical improvement up to a medium-term follow-up.

Methods Forty-three patients (mean age, 30.6 years; mean BMI, 24.7; 42 men, one woman) affected by chronic patellar proximal tendinopathy were enrolled in this trial. Eleven patients were affected by bilateral tendinopathy. They underwent three ultrasound guided intra-tendinous injections of five millilitres PRP, two weeks apart from each other. Patients were prospectively evaluated initially, then after two, six, and up to mean 48.6 ± 8.1 months of follow up tools were used: Blanzina, VISA-P, EQ-VAS for general health, and Tegner scores. Patients' overall satisfaction and time to return to sport were also reported.

Results Good and stable results were documented over time, with the VISA-P score increasing from 44.1 ± 15.6 at baseline to 61.4 ± 22.2 at two months, 76.6 ± 25.4 at six months, and 84.3 ± 21.6 at four years' follow-up. The same trend was confirmed by the other scores used, and 80 % of the patients were satisfied and returned to previous sports activities. Significantly poorer results were obtained in patients with a longer history of symptoms, and poor results were also observed in bilateral lesions. No correlation between ultrasonographic and clinical findings could be found.

Conclusions Multiple injections of PRP provided a good clinical outcome for the treatment of chronic recalcitrant patellar tendinopathy with stable results up to medium-term follow-up. Patients affected by bilateral pathology and presenting a long history of pain obtained significantly poorer results.

Gosens, Taco, et al. "Ongoing Positive Effect of Platelet-Rich Plasma Versus Corticosteroid Injection in Lateral Epicondylitis A Double-Blind Randomized Controlled Trial With 2-year Follow-up." *The American journal of sports medicine* 39.6 (2011): 1200-1208.

Background: Platelet-rich plasma (PRP) has been shown to be a general stimulation for repair and 1-year results showed prom- ising success percentages.

Purpose: This trial was undertaken to determine the effectiveness of PRP compared with corticosteroid injections in patients with chronic lateral epicondylitis with a 2-year follow-up.

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

Methods: The trial was conducted in 2 Dutch teaching hospitals. One hundred patients with chronic lateral epicondylitis were randomly assigned to a leukocyte-enriched PRP group (n = 51) or the corticosteroid group (n = 49). Randomization and allocation to the trial group were carried out by a central computer system.

Patients received either a corticosteroid injection or an autol- ogous platelet concentrate injection through a peppering needling technique. The primary analysis included visual analog scale (VAS) pain scores and Disabilities of the Arm, Shoulder and Hand (DASH) outcome scores.
Results: The PRP group was more often successfully treated than the corticosteroid group (P \ .0001). Success was defined as a reduction of 25% on VAS or DASH scores without a reintervention after 2 years. When baseline VAS and DASH scores were compared with the scores at 2-year follow-up, both groups significantly improved across time (intention-to-treat principle). How- ever, the DASH scores of the corticosteroid group returned to baseline levels, while those of the PRP group significantly improved (as-treated principle). There were no complications related to the use of PRP.
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. Future decisions for application of PRP for lateral epicondylitis should be confirmed by further follow-up from this trial and should take into account possible costs and harms as well as benefits.

McCarrel, Taralyn M., et al. "Considerations for the use of platelet-rich plasma in orthopedics." *Sports Medicine* 44.8 (2014): 1025-1036.
Abstract The use of platelet-rich plasma (PRP) is expanding to numerous medical fields, including orthopedic surgery and sports medicine. The popularity of this new treatment option has prompted a rapid increase in research endeavors; however, the differences in application technique and the composition of PRP have made it difficult to compare results or make any firm conclusions regarding efficacy. The purpose of this article is twofold. First, to recommend details that should be provided in basic science and clinical PRP studies to allow meaningful comparisons between studies which may lead to a better understanding of efficacy. Second, to provide an understanding of the different PRP preparations and their clinical relevance. There are biochemical rationales for the use of PRP because it addresses several aspects of the healing process, including cell proliferation and tissue matrix regeneration, inflammation, nociception, infection, and hemostasis, all of which will be addressed. Given the current understanding of the importance the composition of PRP plays in tissue regeneration, it is likely that our future understanding of PRP will dictate ‘customizing’ the PRP preparation to the specific pathology of interest. The potential complications following PRP use are minor, and thus it appears to be a safe treatment option with a variety of potentially beneficial effects to injured musculoskeletal tissues

Mishra, Allan K., et al. "Platelet-Rich Plasma Significantly Improves Clinical Outcomes in Patients With Chronic Tennis Elbow A Double-Blind,

Prospective, Multicenter, Controlled Trial of 230 Patients." *The American Journal of Sports Medicine* (2013): 0363546513494359.

Background: Elbow tenderness and pain with resisted wrist extension are common manifestations of lateral epicondylar tendinopathy, also known as tennis elbow. Previous studies have suggested platelet-rich plasma (PRP) to be a safe and effective therapy for tennis elbow.
Purpose: To evaluate the clinical value of tendon needling with PRP in patients with chronic tennis elbow compared with an active control group.
Study Design: Randomized controlled trial; Level of evidence, 2.
Methods: A total of 230 patients with chronic lateral epicondylar tendinopathy were treated at 12 centers over 5 years. All patients had at least 3 months of symptoms and had failed conventional therapy. There were no differences in patients randomized to receive PRP (n = 116) or active controls (n = 114). The PRP was prepared from venous whole blood at the point of care and contained both concentrated platelets and leukocytes. After receiving a local anesthetic, all patients had their extensor tendons needled with or without PRP. Patients and investigators remained blinded to the treatment group throughout the study. A successful outcome was defined as 25% or greater improvement on the visual analog scale for pain.
Results: Patient outcomes were followed for up to 24 weeks. At 12 weeks (n = 192), the PRP-treated patients reported an improvement of 55.1% in their pain scores compared with 47.4% in the active control group ($P = .163$). At 24 weeks (n = 119), the PRP-treated patients reported an improvement of 71.5% in their pain scores compared with 56.1% in the control group ($P = .019$). The percentage of patients reporting significant elbow tenderness at 12 weeks was 37.4% in the PRP group versus 48.4% in the control group ($P = .143$). Success rates for patients at 12 weeks were 75.2% in the PRP group versus 65.9% in the control group ($P = .104$). At 24 weeks, 29.1% of the PRP-treated patients reported significant elbow tenderness versus 54.0% in the control group ($P = .009$). Success rates for patients with 24 weeks of follow-up were 83.9% in the PRP group compared with 68.3% in the control group ($P = .037$). No significant complications occurred in either group.
Conclusion: No significant differences were found at 12 weeks in this study. At 24 weeks, however, clinically meaningful improvements were found in patients treated with leukocyte-enriched PRP compared with an active control group.

Reurink, Gustaaf, et al. "Platelet-rich plasma injections in acute muscle injury." *New England Journal of Medicine* 370.26 (2014): 2546-2547.

Platelet-rich plasma (PRP) injections are increasingly used in patients with sports-related injuries, but data from randomized trials to assess their efficacy are lacking. We performed a randomized trial to assess whether PRP was efficacious in hamstring strain, the most common acute muscle injury.

In a double-blind, placebo-controlled trial conducted in three study centers, we randomly assigned 80 competitive and recreational athletes with acute hamstring muscle injuries (as confirmed on magnetic resonance imaging) to receive intramuscular injections of PRP or isotonic saline as a placebo. The patients, clinicians, and physiotherapists were all unaware of study-group assignments. Each patient received two 3-ml injections with the use of a sterile ultrasonography-guided technique; the first injection was administered within 5 days after the injury and was followed 5 to 7 days later by the second injection. The PRP was prepared with the use of a commercially available system (Arthrex ACP double-syringe system). Patients in the two study groups performed an identical, daily, progressively phased, criteria-based rehabilitation program, which was based on the best available evidence.

The primary outcome was the time until patients could resume their sports activity during 6 months of follow-up. In an intention-to-treat analysis, we used a Cox proportional-hazards model to analyze the treatment effect. We assessed the rate of reinjury within 2 months after the resumption of sports activity as a secondary outcome measure. Adjustment was planned for baseline variables that changed the treatment effect by at least 10%, but none met this criterion. The study was sponsored by Arthrex Medizinische Instrumente and the Royal Netherlands Soccer Association.

For the primary outcome analysis, no patients were lost to follow-up. The median time until the resumption of sports activity was 42 days (interquartile range, 30 to 58) in the PRP group and 42 days (interquartile range, 37 to 56) in the placebo group (hazard ratio in the PRP group, 0.96; 95% confidence interval [CI], 0.61 to 1.51; P=0.66) (Figure 1) FIGURE 1Timing of Resumption of Sports Activity after Acute Hamstring Injury.). The reinjury rate was 16% in the PRP group and 14% in the placebo group (odds ratio, 1.17; 95% CI, 0.33 to 4.18; P=0.81). There were no serious adverse events.

Although the 95% confidence interval still allows for a small chance that there was a clinically relevant between-group difference, our study demonstrated no benefit for intramuscular PRP injections, as compared with placebo injections, in patients with acute hamstring injuries.

Siclari, Alberto, et al. "Cartilage repair in the knee with subchondral drilling augmented with a platelet-rich plasma-immersed polymer-based implant." ***Knee Surgery, Sports Traumatology, Arthroscopy*** **22.6 (2014): 1225-1234.**

Purpose The aim of our study was to analyse the clinical and histological outcome after the treatment of focal car- tilage defects in non-degenerative and degenerative knees with bone marrow stimulation and subsequent covering with a

cell-free resorbable polyglycolic acid–hyaluronan (PGA-HA) implant immersed with autologous platelet-rich plasma (PRP).
Methods Fifty-two patients (mean age 44 years) with focal chondral defects in radiologically confirmed non- degenerative or degenerative knees were subjected to subchondral drilling arthroscopically. Subsequently, defects were covered with the PGA-HA implant immersed with autologous PRP. At 2-year follow-up, the patients' situation was assessed using the Knee Injury and Osteo- arthritis Outcome Score (KOOS) and compared to the pre- operative situation and 3–12-month follow-up. Biopsies (n = 4) were harvested at 18–24 months after implantation and were analysed by histology and collagen type II immune staining.
Results At 1- and 2-year follow-up, the KOOS showed clinically meaningful and significant (p \ 0.05) improvement in all subcategories compared to baseline and to 3-month follow-up. There were no differences in KOOS data obtained after 2 years compared to 1 year after the treatment. Histological analysis of the biopsy tissue showed hyaline-like to hyaline cartilage repair tissue that was rich in cells with a chondrocyte morphology, proteo- glycans and type II collagen.
Conclusions Covering of focal cartilage defects with the PGA-HA implant and PRP after bone marrow stimulation improves the patients' situation and has the potential to regenerate hyaline-like cartilage.
Level of evidence mCase series, Level IV.

Tietze, David C., Kyle Geissler, and James Borchers. "The Effects of Platelet-Rich Plasma in the Treatment of Large-Joint Osteoarthritis." *Physician and Sportsmedicine* 42.2 (2014).
Context: Osteoarthritis (OA) is a common and costly condition with both operative and nonoperative treatments available. Platelet-rich plasma (PRP) is emerging as a treatment option for a variety of musculoskeletal pathologies, including OA.
Objective: To evaluate the effectiveness of intra-articular PRP injection in the treatment of large-joint OA.
Data Sources: PubMed, Web of Knowledge, Scopus, and the Cochrane Database were searched. The references of all articles that met the inclusion criteria were manually searched for additional articles.
Study Selection: English studies that enrolled human participants were included, with level of evidence I to IV.
Results: Thirteen articles met the inclusion criteria: 12 focused on knee OA, and 1 on hip OA. All studies showed statistically significant improvement in patient outcome scores with PRP. Platelet-rich plasma has a statistically significant benefit in knee OA when compared with hyaluronic acid. The benefit from PRP appears to last between 6 and 12 months.
Conclusion: Platelet-rich plasma may be an effective treatment for knee OA. However, because of the low level of evidence, small sample sizes, and wide variability in treatment, no definitive recommendations can be made at this time.

Vetrano, Mario, et al. "Platelet-rich plasma versus focused shock waves in the treatment of jumper's knee in athletes." ***The American journal of sports medicine*** **41.4 (2013): 795-803.**

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/mm^2 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.