Platelet rich plasma for nonhealing diabetic wounds

Clinical Policy ID: CCP.1278

Recent review date: 1/2022

Next review date: 5/2023

Policy contains: Diabetic wounds; platelet-derived growth factors; platelet rich plasma.

This policy is a Sandhills Center Clinical Coverage Policy adopted from AmeriHealth Caritas of North Carolina. These clinical policies are used to assist with making coverage determinations. Sandhills Center's clinical policies are based on guidelines from established industry sources, such as the Centers for Medicare & Medicaid Services (CMS), state regulatory agencies, the American Medical Association (AMA), medical specialty professional societies, and peer-reviewed professional literature. These clinical policies along with other sources, such as plan benefits and state and federal laws and regulatory requirements, including any state- or plan-specific definition of "medically necessary," and the specific facts of the particular situation are considered by Sandhills Center when making coverage determinations. In the event of conflict between this clinical policy and plan benefits and/or state or federal laws and/or regulatory requirements, the plan benefits and/or state and federal laws and/or regulatory requirements shall control. Sandhills Center clinical policies are for informational purposes only and not intended as medical advice or to direct treatment. Physicians and other health care providers are solely responsible for the treatment decisions for their patients. Sandhills Center's clinical policies are reflective of evidence-based medicine at the time of review. As medical science evolves, Sandhills Center will update its clinical policies as necessary. Sandhills Center clinical policies are not guarantees of payment.

Coverage policy

Platelet rich plasma is investigational/not clinically proven and, therefore, not medically necessary for any clinical indication except the following:

- As an adjunct treatment for chronic diabetic wounds, when both criteria are met (Qu, 2020):
  - There is a lack of healing progress with standard wound care (e.g., offloading, infection control, glycemic control, and wound bed preparation including debridement).*
  - Platelet rich plasma is prepared using devices that are U.S. Food and Drug Administration-approved for management of exuding cutaneous wounds, such as diabetic ulcers.

*Note: Generally defined as ulcer reduction of less than 40% after at least four weeks of standard therapy (Wound Healing Society, 2017).

Limitations

Required documentation includes wound history, recurrence, and characteristics (location, staging, size, base, exudates, infection condition of surrounding skin and pain). The rate of wound healing should be evaluated to determine if treatment is optimal (Wound Healing Society, 2017).

Treatment of chronic non-healing diabetic wounds with platelet rich plasma is limited to a duration of up to 20 weeks (Qu, 2020). Continuation of autologous platelet rich plasma for the treatment of chronic non-healing diabetic wounds beyond 20 weeks requires secondary medical review.

Alternative covered services

Primary care and specialty physician (including surgical) evaluation and management including:

- Simple analgesics.
- Anti-inflammatory medications.
- Corticosteroid injections.
- Physical or occupational therapy.
- Immobilization.
- Thermal therapy.
- Reducing workload and increasing rest.
- Relaxation and biofeedback techniques.
- Strengthening and conditioning exercises.
- Stretching exercises and therapeutic massage.

Background

Platelets contain hundreds of growth factors important to healing injuries and regenerating tissue (Roffi, 2013). Platelet rich plasma is a blood derivate containing a higher concentration of platelets and a correspondingly higher concentration of growth factors above levels in peripheral blood. Although the mechanism of action is unclear, laboratory studies suggest a correlation between the increased concentration of growth factors in platelet rich plasma and an increase in the native inflammatory healing cascade.

A wide variation of protocols used for standardization and preparation of platelet rich plasma exists (Dhurat, 2014). It may be produced in an autologous manner or homologous manner from blood from multiple donors. The basic protocols involve a two-stage centrifugation process to separate platelets from blood plasma and red blood cells, require intrinsic or exogenous activation of platelet rich plasma to initiate formation of a fibrin network, and ultrasonographic guidance to inject autologous platelet rich plasma into the injured area. Platelet rich plasma may be leukocyte-rich or leukocyte-poor.

The U.S. Food and Drug Administration Center for Biologics Evaluation and Research regulates both the systems used to separate out platelets and the clinical use of platelet rich plasma (21CFR640.34). Nearly all of these systems have received 510(k) clearance for producing platelet rich preparations intended to be mixed with bone graft materials to enhance bone graft handling properties in orthopedic practices to treat bony defects (21CFR864.9245). Uses in other fields such as dermatology (for tissue regeneration and scar revision) and chronic wound care (U.S Food and Drug Administration, 2021) are expanding.

Findings

The literature on the safety and effectiveness of platelet rich plasma has been subject to secondary analysis for several clinical indications. The most popular areas are autologous platelet rich plasma administration in orthopedics (Laudy, 2015; Moraes, 2014), dentistry/oral surgery (Hou, 2016), and wound care (Martinez-Zapata, 2016). Limitations in the evidence base that are common to all indications are relatively few, adequately powered published randomized controlled studies, overall low quality studies with high risk of bias, heterogeneous study methods, and variable and incomplete reporting of patient selection criteria, treatment methods, and treatment

outcomes. For all indications, the evidence supporting the superiority of platelet rich plasma is inconclusive or conflicting, and no firm conclusions regarding clinical use can be made.

Few evidence-based guidelines have considered platelet rich plasma in their recommendations. The American Academy of Orthopaedic Surgeons (2013) was unable to recommend for or against growth factor injections and/or platelet rich plasma for patients with symptomatic knee osteoarthritis due to a paucity of evidence. Neither the National Institute for Health and Care Excellence (2015) nor the Wound Healing Society (Lavery, 2016) recommend platelet rich plasma to treat diabetic foot ulcers due to a lack of effect on wound healing improvement.

In 2018, we added five systematic reviews and meta-analyses of five clinical indications for platelet rich plasma: patellar tendinopathy (Andriolo, 2018); temporomandibular joint disorders (Bousnaki, 2018); hip osteoarthritis (Ye, 2018); knee osteoarthritis (Zhang, 2018a); and chronic Achilles tendinopathy (Zhang, 2018b). The evidence base continues to be of low quality with inconclusive or conflicting results. The new information updates earlier findings with no changes to the policy. The policy ID was changed from CP# 05.02.10 to CCP.1278.

In 2019, we updated the citation for Andriolo (2018, updated to 2019, see references). We added several systematic reviews and meta-analyses of platelet-rich plasma products for treatment of bony defects of the knee (Vannabouathong, 2018) and intraoral bones (Dragonas, 2019; Liu, 2019; Strauss, 2018; Yao, 2018), along with several off-label uses: Achilles tendonitis (Wang, 2019); erectile dysfunction (Scott, 2019); androgenic alopecia (Chen, 2018; Gupta, 2018); diabetic foot ulcers (Del Pino-Sedeno, 2019; Li, 2019a); and plantar fasciitis (Al-Boloushi, 2019; Ling, 2018). The new information supports earlier conclusions of insufficient evidence, and no policy changes are warranted.

In 2020, we added evidence-based guidance from the National Institute for Health and Care Excellence (2019) and 11 systematic reviews and meta-analyses examining the effectiveness of platelet rich plasma and platelet-derived factors for treating a number of indications (Catapano, 2020; Chen, 2019b, 2020; Cruciani, 2019; Hsieh, 2019; Li, 2019, 2020; Mao, 2019; Marchitto, 2019; Sundaram, 2019; Xia, 2019). The results confirm previous policy findings, and no policy changes are warranted.

In 2022, we changed the coverage for platelet rich plasma to medically necessary as an adjunct treatment of chronic diabetic wounds based on evidence from an Agency for Healthcare Research and Quality systematic review (Qu, 2020) that would be applicable to the Medicaid population. These results support guidance from the Wound Healing Society (2017) that recommends selective use of adjuvant agents (e.g., topical platelet-derived growth factor for diabetic neurotrophic foot ulcers) when there is a lack of healing progress in response to more traditional therapies (e.g., offloading, infection control, glycemic control, and wound bed preparation).

The Agency for Healthcare Quality and Research systematic review included lower extremity diabetic ulcers (14 randomized controlled trials and one observational study, n = 1,096 patients), lower extremity venous ulcers (seven randomized controlled trials and three observational studies, n = 615 patients), and pressure ulcers (one randomized controlled trial and one observational study, n = 85 patients) (Qu, 2020). In addition, one randomized controlled trial evaluated autologous platelet lysate in patients with venous ulcers. While platelet rich plasma appears safe for all chronic wounds, the evidence was insufficient to determine its benefit in patients with lower extremity venous ulcers or pressure ulcers.

For chronic diabetic wounds, study participants were predominantly Caucasian males ranging in age from 40 to 70 years with cardiovascular comorbidities (e.g., smoking, hypertension, peripheral artery disease, or chronic kidney disease). Most wounds were of lower grade and ranged between 2 cm^2 and 4 cm^2. Ten studies reported a minimum one month chronicity of the target ulcer before starting platelet rich plasma treatments. The majority of studies administered treatment once or twice weekly for up to 20 weeks. The length of follow-up after treatment ranged from none to 11 months (median of six weeks).

Compared to management without platelet rich plasma, autologous platelet rich plasma therapy significantly increased complete diabetic wound closure (relative risk 1.20, 95% confidence interval 1.09 to 1.32, moderate strength of evidence), shortened the time to complete wound closure, reduced wound area and depth (low strength of evidence), and had a similar safety profile. There were no significant differences in terms of wound infection, amputation, wound recurrence, or hospitalization. The authors support platelet rich plasma as an adjunct to multidisciplinary and comprehensive diabetic wound care.

Based on the findings of the Qu (2020) evidence review, effective April 13, 2021, the Centers for Medicare & Medicaid Services (2021) will cover autologous platelet rich plasma for the treatment of chronic non-healing diabetic wounds for a duration of 20 weeks, when prepared by devices that are U.S. Food and Drug Administration-approved for management of exuding cutaneous wounds, such as diabetic ulcers. Platelet rich plasma remains not covered for the following indications:

- Autologous platelet derived growth factor for the treatment of chronic, non-healing cutaneous wounds.
- Becaplermin, a non-autologous growth factor for chronic, non-healing subcutaneous wounds.
- Autologous platelet rich plasma for the treatment of acute surgical wounds applied directly to the closed incision.
- Dehiscent wounds.

We added 28 systematic reviews of the safety and effectiveness of platelet rich plasma for other indications published in the last year. The majority examined musculoskeletal indications, of which knee osteoarthritis and tendinopathy were the most commonly studied, but new indications continue to emerge. While platelet rich plasma appears safe to use, low quality studies and inconsistent reporting of patient and study characteristics and platelet rich plasma preparation continue to limit conclusions regarding its effectiveness across medical disciplines, which is reflected by no mention or no support for the treatment in current guidelines (American Academy of Orthopaedic Surgeons, 2014, 2017, 2020, 2021; North American Spine Society, 2020).

References

On November 29, 2021, we searched PubMed and the databases of the Cochrane Library, the U.K. National Health Services Centre for Reviews and Dissemination, the Agency for Healthcare Research and Quality, and the Centers for Medicare & Medicaid Services. Search terms were . Searched terms were: “Platelet-derived growth factor” (MeSH), “platelet rich plasma” (MeSH), and “platelet-rich plasma.” We included the best available evidence according to established evidence hierarchies (typically systematic reviews, meta-analyses, and full economic analyses, where available) and professional guidelines based on such evidence and clinical expertise.

21CFR640.34.

21CFR864.9245.

Al-Boloushi Z, Lopez-Royo MP, Arian M, Gomez-Trullen EM, Herrero P. Minimally invasive non-surgical management of plantar fasciitis: A systematic review. *J Bodyw Mov Ther.* 2019;23(1):122-137. Doi: 10.1016/j.jbmt.2018.05.002.

Al-Hamed FS, Hijazi A, Gao Q, Badran Z, Tamimi F. Platelet concentrate treatments for temporomandibular disorders: A systematic review and meta-analysis. *JDR Clin Trans Res.* 2021;6(2):174-183. Doi: 10.1177/2380084420927326.

American Academy of Orthopaedic Surgeons. Management of anterior cruciate ligament injuries. Evidence-based clinical practice guideline. https://www.aaos.org/globalassets/quality-and-practiceresources/anterior-

cruciate-ligament-injuries/anterior-cruciate-ligament-injuries-clinical-practice-guideline4-24-19.pdf. Published September 5, 2014.

American Academy of Orthopaedic Surgeons. Management of osteoarthritis of the hip evidence-based clinical practice guideline. https://www.aaos.org/globalassets/quality-and-practiceresources/osteoarthritis-of-the-hip/oa-hip-cpg_6-11-19.pdf. Published March 13, 2017.

American Academy of Orthopaedic Surgeons. Management of osteoarthritis of the knee (non-arthroplasty). Evidence-based practice guideline. Summary of recommendations. https://www.aaos.org/oak3cpg. Published August 31, 2021. American Academy of Orthopaedic Surgeons. Management of rotator cuff pathology appropriate use criteria. https://www.aaos.org/rcauc. Published September 12, 2020.

Andriolo L, Altamura SA, Reale D, et al. Nonsurgical treatments of patellar tendinopathy: Multiple injections of platelet-rich plasma are a suitable option: A systematic review and meta-analysis. *Am J Sports Med*. 2019 Mar;47(4):1001-1018. Doi: 10.1177/0363546518759674. Epub 2018 Mar 30.

Andronic O, Hincapié CA, Burkhard MD, et al. Lack of conclusive evidence of the benefit of biologic augmentation in core decompression for nontraumatic osteonecrosis of the femoral head: A systematic review. *Arthroscopy.* 2021. Doi: 10.1016/j.arthro.2021.04.062.

Anil U, Markus DH, Hurley ET, et al. The efficacy of intra-articular injections in the treatment of knee osteoarthritis: A network meta-analysis of randomized controlled trials. *Knee.* 2021;32:173-182. Doi: 10.1016/j.knee.2021.08.008.

Belk JW, Kraeutler MJ, Houck DA, et al. Platelet-rich plasma versus hyaluronic acid for knee osteoarthritis: A systematic review and meta-analysis of randomized controlled trials. *Am J Sports Med.* 2021;49(1):249-260. Doi: 10.1177/0363546520909397.

Betzler BK, Chee YJ, Bin Abd Razak HR. Intraosseous injections are safe and effective in knee osteoarthritis: A systematic review. *Arthrosc Sports Med Rehabil.* 2021;3(5):e1557-e1567. Doi: 10.1016/j.asmr.2021.06.006.

Boffa A, Previtali D, Di Laura Frattura G, et al. Evidence on ankle injections for osteochondral lesions and osteoarthritis: A systematic review and meta-analysis. *Int Orthop.* 2021;45(2):509-523. Doi: 10.1007/s00264-020-04689-5.

Bousnaki M, Bakopoulou A, Koidis P. Platelet-rich plasma for the therapeutic management of temporomandibular joint disorders: A systematic review. *Int J Oral Maxillofac Surg.* 2018;47(2):188-198. Doi: 10.1016/j.ijom.2017.09.014.

Brewer CF, Smith A, Miranda BH. The use of platelet-rich products for skin graft donor site healing: A systematic review and meta-analysis. *J Plast Surg Hand Surg.* 2021;55(3):133-140. Doi: 10.1080/2000656x.2020.1846544.

Cai YF, Tian TZ, Chen LY, et al. The effect of platelet-rich plasma on the fusion rate and clinical outcome of spinal fusion surgery: A systematic review and meta-analysis. *PLoS One.* 2020;15(12):e0243204. Doi: 10.1371/journal.pone.0243204.

Catapano M, Catapano J, Borschel G, et al. Effectiveness of platelet-rich plasma injections for nonsurgical management of carpal tunnel syndrome: A systematic review and meta-analysis of randomized controlled trials. *Arch Phys Med Rehabil.* 2020;101(5):897-906. Doi: 10.1016/j.apmr.2019.10.193.

Centers for Medicare & Medicaid Services. National Coverage Determination 270.3 Blood-derived products for chronic non-healing wounds. https://www.cms.gov/medicare-coverage-database/view/ncd.aspx?ncdid=217&ncdver=6&keyword=%22platelet%20rich%20plasma%22&keywordType=starts&areaId=all&docType=NCD,6,F&contractOption=all&sortBy=relevance&bc=1. Effective April 13, 2021.

Chen JX, Justicz N, Lee LN. Platelet-rich plasma for the treatment of androgenic alopecia: A systematic review. *Facial Plast Surg.* 2018;34(6):631-640. Doi: 10.1055/s-0038-1660845.

Chen PC, Wu KT, Chou WY, et al. Comparative effectiveness of different nonsurgical treatments for patellar tendinopathy: A systematic review and network meta-analysis. *Arthroscopy.* 2019;35(11):3117-3131.e3112. Doi: 10.1016/j.arthro.2019.06.017.

Chen Z, Wang C, You D, et al. Platelet-rich plasma versus hyaluronic acid in the treatment of knee osteoarthritis: A meta-analysis. *Medicine (Baltimore).* 2020;99(11):e19388. Doi: 10.1097/md.0000000000019388.

Cruciani M, Franchini M, Mengoli C, et al. Platelet-rich plasma for sports-related muscle, tendon and ligament injuries: An umbrella review. *Blood Transfus.* 2019;17(6):465-478. Doi: 10.2450/2019.0274-19.

Del Pino-Sedeno T, Trujillo-Martin MM, Andia I, et al. Platelet-rich plasma for the treatment of diabetic foot ulcers: A meta-analysis. *Wound Repair Regen.* 2019;27(2):170-182. Doi: 10.1111/wrr.12690.

Derwich M, Mitus-Kenig M, Pawlowska E. Mechanisms of action and efficacy of hyaluronic acid, corticosteroids and platelet-rich plasma in the treatment of temporomandibular joint osteoarthritis-a systematic review. *Int J Mol Sci.* 2021;22(14). Doi: 10.3390/ijms22147405.

Dhurat R, Sukesh M. Principles and methods of preparation of platelet-rich plasma: A review and author's perspective. *J Cutan Aesthet Surg.* 2014;7(4):189-197. Doi: 10.4103/0974-2077.150734.

Dragonas P, Schiavo JH, Avila-Ortiz G, Palaiologou A, Katsaros T. Plasma rich in growth factors (PRGF) in intraoral bone grafting procedures: A systematic review. *J Craniomaxillofac Surg.* 2019;47(3):443-453. Doi: 10.1016/j.jcms.2019.01.012.

Fei X, Lang L, Lingjiao H, Wei C, Zhou X. Platelet-rich plasma has better mid-term clinical results than traditional steroid injection for plantar fasciitis: A systematic review and meta-analysis. *Orthop Traumatol Surg Res.* 2021;107(6):103007. Doi: 10.1016/j.otsr.2021.103007.

Gazendam A, Ekhtiari S, Axelrod D, et al. Comparative efficacy of nonoperative treatments for greater trochanteric pain syndrome: A systematic review and network meta-analysis of randomized controlled trials. *Clin J Sport Med.* 2021. Doi: 10.1097/jsm.0000000000000924.

Gazendam A, Ekhtiari S, Bozzo A, Phillips M, Bhandari M. Intra-articular saline injection is as effective as corticosteroids, platelet-rich plasma and hyaluronic acid for hip osteoarthritis pain: A systematic review and network meta-analysis of randomised controlled trials. *Br J Sports Med.* 2021;55(5):256-261. Doi: 10.1136/bjsports-2020-102179.

Gong H, Li K, Xie R, et al. Clinical therapy of platelet-rich plasma vs hyaluronic acid injections in patients with knee osteoarthritis: A systematic review and meta-analysis of randomized double-blind controlled trials. *Medicine (Baltimore).* 2021;100(12):e25168. Doi: 10.1097/md.0000000000025168.

Gupta AK, Mays RR, Dotzert MS, et al. Efficacy of non-surgical treatments for androgenetic alopecia: A systematic review and network meta-analysis. *J Eur Acad Dermatol Venereol.* 2018;32(12):2112-2125. Doi: 10.1111/jdv.15081.

Hamid MS A, Sazlina SG. Platelet-rich plasma for rotator cuff tendinopathy: A systematic review and meta-analysis. *PLoS One.* 2021;16(5):e0251111. Doi: 10.1371/journal.pone.0251111.

Han SB, Seo IW, Shin YS. Intra-articular injections of hyaluronic acid or steroids associated with better outcomes than platelet-rich plasma, adipose mesenchymal stromal cells, or placebo in knee osteoarthritis: A network meta-analysis. *Arthroscopy.* 2021;37(1):292-306. Doi: 10.1016/j.arthro.2020.03.041.

Hohmann E, Tetsworth K, Glatt V. Platelet-rich plasma versus corticosteroids for the treatment of plantar fasciitis: A systematic review and meta-analysis. *Am J Sports Med.* 2021;49(5):1381-1393. Doi: 10.1177/0363546520937293.

Hong M, Cheng C, Sun X, et al. Efficacy and safety of intra-articular platelet-rich plasma in osteoarthritis knee: A systematic review and meta-analysis. *Biomed Res Int.* 2021;2021:2191926. Doi: 10.1155/2021/2191926.

Hou X, Yuan J, Aisaiti A, Liu Y, Zhao J. The effect of platelet–rich plasma on clinical outcomes of the surgical treatment of periodontal intrabony defects: A systematic review and meta–analysis. *BMC Oral Health*. 2016;16:71. Doi: 10.1186/s12903-016-0261-5.

Hsieh TS, Chiu WK, Yang TF, Wang HJ, Chen C. A meta-analysis of the evidence for assisted therapy with platelet-rich plasma for atrophic acne scars. *Aesthetic Plast Surg.* 2019;43(6):1615-1623. Doi: 10.1007/s00266-019-01471-w.

Huang H, Sun X, Zhao Y. Platelet-rich plasma for the treatment of burn wounds: A meta-analysis of randomized controlled trials. *Transfus Apher Sci.* 2021;60(1):102964. Doi: 10.1016/j.transci.2020.102964.

Karjalainen TV, Silagy M, O'Bryan E, et al. Autologous blood and platelet-rich plasma injection therapy for lateral elbow pain. *Cochrane Database Syst Rev.* 2021;9(9):Cd010951. Doi: 10.1002/14651858.CD010951.pub2.

Laudy AB, Bakker EW, Rekers M, Moen MH. Efficacy of platelet-rich plasma injections in osteoarthritis of the knee: A systematic review and meta-analysis. *Br J Sports Med.* 2015;49(10):657-672. Doi: 10.1136/bjsports-2014-094036.

Lavery LA, Davis KE, Berriman SJ, et al. WHS guidelines update: Diabetic foot ulcer treatment guidelines. *Wound Repair Regen.* 2016;24(1):112-126. Doi: 10.1111/wrr.12391.

Li A, Wang H, Yu Z, et al. Platelet-rich plasma vs corticosteroids for elbow epicondylitis: A systematic review and meta-analysis. *Medicine (Baltimore).* 2019;98(51):e18358. Doi: 10.1097/md.0000000000018358.(b)

Li F, Wu C, Sun H, Zhou Q. Effect of platelet-rich plasma injections on pain reduction in patients with temporomandibular joint osteoarthrosis: A meta-analysis of randomized controlled trials. *J Oral Facial Pain Headache.* 2020;34(2):149-156. Doi: 10.11607/ofph.2470.

Li Y, Gao Y, Gao Y, et al. Autologous platelet-rich gel treatment for diabetic chronic cutaneous ulcers: A meta-analysis of randomized controlled trials. *J Diabetes.* 2019;11(5):359-369. Doi: 10.1111/1753-0407.12850.(a)

Ling JF, Wininger AE, Hirase T. Platelet-rich plasma versus corticosteroid injection for lumbar spondylosis and sacroiliac arthropathy: A systematic review of comparative studies. *Cureus.* 2021;13(3):e14062. Doi: 10.7759/cureus.14062.

Ling Y, Wang S. Effects of platelet-rich plasma in the treatment of plantar fasciitis: A meta-analysis of randomized controlled trials. *Medicine (Baltimore).* 2018;97(37):e12110. Doi: 10.1097/md.0000000000012110.

Liu R, Yan M, Chen S, et al. Effectiveness of platelet-rich fibrin as an adjunctive material to bone graft in maxillary sinus augmentation: A meta-analysis of randomized controlled trails. *Biomed Res Int.* 2019;2019:7267062. Doi: 10.1155/2019/7267062.

Mao G, Zhang G, Fan W. Platelet-rich plasma for treating androgenic alopecia: A systematic review. *Aesthetic Plast Surg.* 2019;43(5):1326-1336. Doi: 10.1007/s00266-019-01391-9.

Marchitto MC, Qureshi A, Marks D, et al. Emerging nonsteroid-based procedural therapies for alopecia areata: A systematic review. *Dermatol Surg.* 2019;45(12):1484-1506. Doi: 10.1097/dss.0000000000002053.

Martinez-Zapata MJ, Marti-Carvajal AJ, Sola I, et al. Autologous platelet-rich plasma for treating chronic wounds. *Cochrane Database Syst Rev*. 2016;10:CD006899. Doi: 10.1002/14651858.CD006899.pub3.

Medina-Porqueres I, Ortega-Castillo M, Muriel-Garcia A. Effectiveness of platelet-rich plasma in the management of hip osteoarthritis: A systematic review and meta-analysis. *Clin Rheumatol.* 2021;40(1):53-64. Doi: 10.1007/s10067-020-05241-x.

Migliorini F, Driessen A, Quack V, et al. Comparison between intra-articular infiltrations of placebo, steroids, hyaluronic and PRP for knee osteoarthritis: A Bayesian network meta-analysis. *Arch Orthop Trauma Surg.* 2021;141(9):1473-1490. Doi: 10.1007/s00402-020-03551-y.

Moraes VY, Lenza M, Tamaoki MJ, Faloppa F, Belloti JC. Platelet-rich therapies for musculoskeletal soft tissue injuries. *Cochrane Database Syst Rev*. 2014;(4):Cd010071. Doi: 10.1002/14651858.CD010071.pub3.

National Institute for Health and Care Excellence. Diabetic foot problems: Prevention and management. https://www.nice.org.uk/guidance/ng19/chapter/1-Recommendations. Published August 2015. Updated January 2016.

National Institute for Health and Care Excellence. Platelet-rich plasma injections for knee osteoarthritis. Interventional procedures guidance [IPG637]. https://www.nice.org.uk/guidance/ipg637. Published January 23, 2019.

Nauwelaers AK, Van Oost L, Peers K. Evidence for the use of PRP in chronic midsubstance Achilles tendinopathy: A systematic review with meta-analysis. *Foot Ankle Surg.* 2021;27(5):486-495. Doi: 10.1016/j.fas.2020.07.009.

North American Spine Society. Evidence-based clinical guidelines for multidisciplinary spine care. Diagnosis and treatment of low back pain. https://www.spine.org/Portals/0/assets/downloads/ResearchClinicalCare/Guidelines/LowBackPain.pdf. Published 2020.

Phillips M, Bhandari M, Grant J, et al. A systematic review of current clinical practice guidelines on intra-articular hyaluronic acid, corticosteroid, and platelet-rich plasma injection for knee osteoarthritis: An international perspective. *Orthop J Sports Med.* 2021;9(8):23259671211030272. Doi: 10.1177/23259671211030272.

Qu W, Wang Z, Hunt C, Morrow AS, Urtecho M, Amin M, et al. Platelet-rich plasma for wound care in the Medicare population. Technology Assessment Program Project ID 040-353- 492. (Prepared by the Mayo Clinic Evidence-based Practice Center under Contract No. HHSA290201500013I.) Rockville, MD: Agency for Healthcare Research and Quality. http://www.ahrq.gov/research/findings/ta/index.html. September 2020.

Roffi A, Di Matteo B, Krishnakumar GS, Kon E, Filardo G. Platelet-rich plasma for the treatment of bone defects: From pre-clinical rational to evidence in the clinical practice. A systematic review. *Int Orthop*. 2017;41(2):221-237. Doi: 10.1007/s00264-016-3342-9.

Ryan J, Imbergamo C, Sudah S, et al. Platelet-rich product supplementation in rotator cuff repair reduces retear rates and improves clinical outcomes: A meta-analysis of randomized controlled trials. *Arthroscopy.* 2021;37(8):2608-2624. Doi: 10.1016/j.arthro.2021.03.010.

Schneider BJ, Hunt C, Conger A, et al. The effectiveness of intradiscal biologic treatments for discogenic low back pain: A systematic review. *Spine J.* 2021. Doi: 10.1016/j.spinee.2021.07.015.

Scott S, Roberts M, Chung E. Platelet-rich plasma and treatment of erectile dysfunction: Critical review of literature and global trends in platelet-rich plasma clinics. *Sex Med Rev.* 2019;7(2):306-312. Doi: 10.1016/j.sxmr.2018.12.006.

Strauss FJ, Stahli A, Gruber R. The use of platelet-rich fibrin to enhance the outcomes of implant therapy: A systematic review. *Clin Oral Implants Res.* 2018;29 Suppl 18:6-19. Doi: 10.1111/clr.13275.

Sundaram K, Vargas-Hernández JS, Sanchez TR, et al. Are subchondral intraosseous injections effective and safe for the treatment of knee osteoarthritis? A systematic review. *J Knee Surg.* 2019;32(11):1046-1057. Doi: 10.1055/s-0039-1677792.

U.S. Food and Drug Administration. 510(k) Premarket Notification database. Searched using product code PMQ). Updated December 13, 2021.

Vannabouathong C, Del Fabbro G, Sales B, et al. Intra-articular injections in the treatment of symptoms from ankle arthritis: A systematic review. *Foot Ankle Int.* 2018;39(10):1141-1150. Doi: 10.1177/1071100718779375.

Wang C, Fan H, Li Y, et al. Effectiveness of platelet-rich plasma injections for the treatment of acute Achilles tendon rupture: A systematic review and meta-analysis. *Medicine (Baltimore).* 2021;100(41):e27526. Doi: 10.1097/md.0000000000027526.

Wang Y, Han C, Hao J, Ren Y, Wang J. Efficacy of platelet-rich plasma injections for treating Achilles tendonitis: Systematic review of high-quality randomized controlled trials. *Orthopade.* 2019;48(9):784-791. Doi: 10.1007/s00132-019-03711-y.

Wound Healing Society. Chronic wound care guidelines. Abridged version. https://woundheal.org/files/2017/final_pocket_guide_treatment.pdf. Published 2017.

Xia Y, Zhao J, Xie J, Lv Y, Cao DS. The efficacy of platelet-rich plasma dressing for chronic nonhealing ulcers: A meta-analysis of 15 randomized controlled trials. *Plast Reconstr Surg.* 2019;144(6):1463-1474. Doi: 10.1097/prs.0000000000006281.

Xiang XN, Deng J, Liu Y, et al. Conservative treatment of partial-thickness rotator cuff tears and tendinopathy with platelet-rich plasma: A systematic review and meta-analysis. *Clin Rehabil.* 2021;35(12):1661-1673. Doi: 10.1177/02692155211011944.

Yao W, Shah B, Chan HL, Wang HL, Lin GH. Bone quality and quantity alterations after socket augmentation with RHPDGF-BB OR BMPS: A systematic review. *Int J Oral Maxillofac Implants.* 2018;33(6):1255-1265. Doi: 10.11607/jomi.6542.

Ye Y, Zhou X, Mao S, Zhang J, Lin B. Platelet rich plasma versus hyaluronic acid in patients with hip osteoarthritis: A meta-analysis of randomized controlled trials. *Int J Surg*. 2018 Apr 5;53:279-287. Doi: 10.1016/j.ijsu.2018.03.078.

Zhang HF, Wang CG, Li H, Huang YT, Li ZJ. Intra-articular platelet-rich plasma versus hyaluronic acid in the treatment of knee osteoarthritis: A meta-analysis. *Drug Des Devel Ther*. 2018;12:445-453. Doi: 10.2147/dddt.s156724.(a)

Zhang YJ, Xu SZ, Gu PC, Du JY, Cai YZ, Zhang C, Lin XJ. Is platelet-rich plasma injection effective for chronic achilles tendinopathy? A meta-analysis. *Clin Orthop Relat Res*. 2018;476(8):1633-1641. Doi: 10.1007/s11999.0000000000000258.(b)

Policy updates

10/2016: initial review date and clinical policy effective date: 2/2017

12/2018: Policy references updated. Policy ID changed.

12/2019: Policy references updated.

12/2020: Policy references updated.

2/2022: Policy references updated. Coverage modified.