

Case Report

Use of Ultrasound-Guided Platelet-Rich Plasma in the Treatment of Carpometacarpal Osteoarthritis

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Abstract

Introduction

Osteoarthritis (OA) is the most common form of arthritis and can severely affect function and quality of life. Platelet-rich plasma (PRP) is derived from a patient's own blood and has potential as an adjunct to treat OA. However, research has been limited for small joints such as the carpometacarpal (CMC) joint.

Clinical Findings

A 65-year-old Caucasian male complained of bilateral wrist and neck pain after a motor vehicle accident. His initial exam noted swelling, tenderness and pain with movement at the bilateral thumb CMC joints and anatomic snuffboxes. However, there was no strength, range of motion or tactile deficits during examination.

Outcomes

He was found to have moderate to severe OA bilaterally in his left and right CMC joints seen on computed tomography and magnetic resonance imaging. The patient was initially treated with ultrasound (US)-guided steroid injections but did not experience significant improvement. After careful discussion, the patient chose to undergo US-guided injection of PRP into both joints. Follow-up at six weeks after PRP injection revealed that there was functional improvement in both joints as well as objective improvement via the Mayo Wrist Score survey.

Conclusion

US-guided PRP injection can be used as an alternative modality to treat OA of the CMC joints when approaches such as conservative therapy and steroid injections have failed. PRP has not been as well studied as other interventions such as corticosteroid injections, but it may offer less long-term adverse effects and be considered a potential alternative or adjunct to current treatment modalities.

Keywords

osteoarthritis; joint diseases; platelet-rich plasma; sports medicine; carpometacarpal; ultrasound; therapeutics; case report

Background

The 2017 Global Burden of Disease Study reported that osteoarthritis (OA) is the second largest contributor to the years lived with disability among musculoskeletal disorders, accounting for around 7.1% of this burden, which is a statistically significant increase from prior reports.¹ The incidence of OA increases with age and gender (higher in women compared to men).² Population studies have found the highest rates of symptomatic OA in the knee

(240 per 100,000 person-years) with intermediate rates for symptomatic hand OA (100 per 100,000 person-years).³ Goals of care with OA management aim towards minimizing pain, optimizing function and modifying the process of joint damage. Intra-articular corticosteroid injections have the potential for long term damage with higher doses and complications in patients with medical comorbidities.⁴ Therefore, exploration for other treatment modalities such as platelet-rich plasma (PRP) therapy have been explored.

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Figure 1: A) X-ray of the left wrist showing moderate to severe arthritic changes in the base of the thumb in the first CMC joint space, **B)** X-ray of the right wrist showing severe arthritic changes present in the base of the thumb in the first CMC joint space.

Platelet-rich plasma is derived from autologous blood with platelets being the main component. The mechanism of action is thought to involve growth factors mediating the increase of matrix synthesis and collagen production.⁵

This case report utilized the OrthoToolKit Modified Mayo Wrist score, which assesses pain intensity, functional status, range of motion and grip strength.⁶ Scores range from 0 to 25 for each component with a total score of 100; higher scores indicate better wrist function.

Case Presentation

The patient is a 65-year-old obese Caucasian male and former smoker who initially presented to the sports medicine clinic after injuring his neck and wrists in a motor vehicle accident four weeks prior. His medical history was significant for ulcerative colitis, hypertension, osteoarthritis and occasional alcohol use. His surgical history was significant for trigger finger release, carpal tunnel release and bilateral knee replacement. During his initial visit, his physical examination was notable for swelling, tenderness and pain with movement at the bilateral thumb CMC joints and anatomic snuffboxes. However, the patient did not exhibit strength, range of motion, or tactile deficits during examination. An x-ray of the left hand (**Figure 1A**) showed moderate to severe thumb CMC osteoarthritis. An x-ray of the right hand (**Figure 1B**) showed severe thumb CMC osteoarthritis, a possible non-displaced fracture of

the scaphoid bone, and signs of scapholunate dissociation. A magnetic resonance imaging (MRI) scan of both wrists was ordered to rule out a fracture of the scaphoid bone. He was treated symptomatically with oral methylprednisolone and a thumb spica brace.

He returned two weeks later for follow-up, complaining of persistent wrist pain despite compliance with the thumb spica brace for his right thumb. An MRI of the left wrist (**Figure 2A**) showed bone marrow edema in the scaphoid bone, suspicious for a non-displaced fracture, in addition to severe hypertrophic changes in the first CMC joint. An MRI of the right wrist (**Figure 2B**) showed severe changes at the base of the thumb consistent with CMC osteoarthritis as well as multiple erosions at the wrist joint and metacarpal heads, suspicious for rheumatoid arthritis. An autoimmune workup consisting of erythrocyte sedimentation rate, C-reactive protein, antinuclear antibody and rheumatoid factor was ordered. A computed tomogram (CT) was ordered and the patient was started on meloxicam 15 mg once a day.

Four weeks after the initial presentation, the CT of the left wrist (**Figure 3**) revealed significant degenerative joint disease with worse arthritic changes along the first CMC joint space and no visible fracture. The autoimmune workup was negative. The patient continued to complain of bilateral thumb pain without

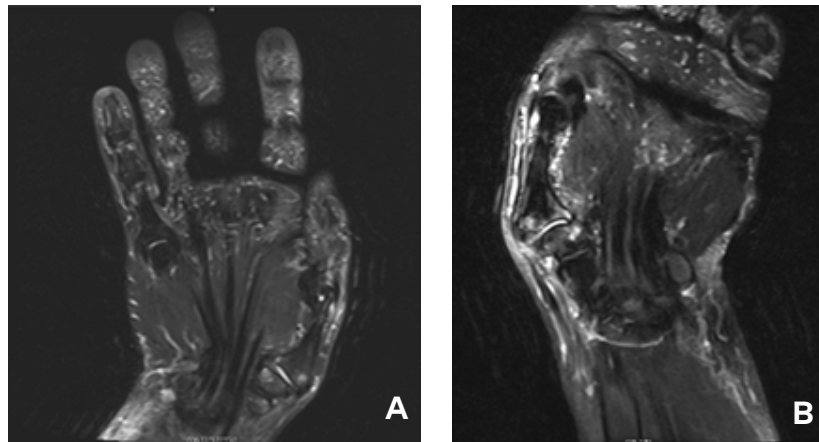


Figure 2: **A)** MRI T2 coronal of the left wrist showing severe hypertrophic change present in the first CMC joint space, **B)** MRI T2 coronal of the right wrist showing severe hypertrophic changes present in the first CMC joint space with superimposed erosive disease.

neurologic deficits. His options were discussed and a plan was made to try steroid injections in both CMC joints under ultrasound (US) guidance to identify proximal aspects of the metacarpal and interface with the carpal bone. The outer plane injection into the bilateral thumb CMC joints was performed containing a mixture of 0.7 cc of 2% lidocaine and 0.7 cc of betamethasone 4 mg. The 15 mg of meloxicam once daily was also continued. He was scheduled for a four-week follow-up appointment.

During the third follow-up visit (eight weeks after the initial appointment), he continued to complain of bilateral pain at the thumb CMC joints. He expressed interest in undergoing a trial of PRP injections in both thumb CMC joints. The mechanism of action, procedure, risks and benefits were discussed with him at length, and he consented to proceeding with PRP, which was scheduled and performed one week later. He was advised to discontin-

ue meloxicam, continue the use of the thumb spica brace to protect and immobilize the affected joint, and apply cold compresses a few times a day for 10-20 minutes to help decrease post-injection pain and swelling.

Three weeks after the PRP injections, he reported minimal relief with worse pain in his right wrist compared to his left. He denied any functional limitations with respect to work and activities of daily living. He scored +35 and +45 on his right and left wrists respectively on the Mayo Wrist Score survey. The right wrist score breakdown was +15 for moderate tolerable pain, +20 for restricted employment, 0 points for less than 30° range of motion and 0 points for 0–25% grip strength. The left wrist score breakdown was +15 for moderate tolerable pain, +20 for restricted employment, +5 for 30°–60° range of motion and +5 for 25–50% grip strength. Options of care were discussed at this time, and he was advised to continue



Figure 3: CT of the left wrist showing arthritic changes along the first CMC joint space.

wearing a thumb spica brace on both hands as needed.

At his follow-up visit at six weeks post PRP injections, he continued to have bilateral wrist pain. Despite the persistent pain, his wrist outcome survey scored improved to +75 and +85 on his right and left wrists respectively. The right wrist score breakdown was +15 for moderate tolerable pain, +25 for returned to regular employment, +25 points for greater than 120° range of motion and +10 points for 50–75% grip strength. The left wrist score breakdown was +20 for mild occasional pain, +25 for returned to regular employment, +25 for greater than 120° range of motion and +15 for 75–99% grip strength. The plan was to continue the rehabilitation protocol with strength exercises and bracing as needed.

At the patient's 12-week follow-up visit, post PRP injections (21 weeks after initial appointment), he reported increasing pain in his right thumb but his left thumb felt well. He was given options for repeat PRP injections or an evaluation with an orthopedic surgeon. He was advised to continue his strengthening regimen while also using his thumb spica braces as needed.

Discussion

The use of PRP injections for OA has been rapidly evolving. However, there is no consensus on its efficacy yet. A 2016 systematic review of 13 trials examining the risks and benefits of PRP in sports medicine showed no improvement compared to standard intervention across a variety of musculoskeletal tissues when assessing pain scores and physical activity/function.⁷ It is important to note this systematic review was not specific to OA as it examined the efficacy of PRP in a variety of musculoskeletal disorders such as tendinitis, fasciitis and bursitis in addition to OA. There also exist multiple studies reporting improvement in pain scores and physical activity/function using PRP in ligaments and tendons involving the ankle and knee.⁸⁻¹⁰ Furthermore, a 2015 meta-analysis of 10 trials assessing PRP injections for knee OA, which encompassed 1,110 patients, revealed statistically better outcomes in favor of PRP based on pain reduction when compared to hyaluronic acid and placebo injections.¹¹ Lastly,

a 2017 systematic review of 29 trials looking at PRP for degenerative cartilage disease including the knee and hip, which encompassed 2,668 patients, concluded that there is clinical evidence to support the benefit of PRP in the treatment of knee and hip OA in regards to pain and functionality when compared with treatments including hyaluronic acid, exercise, acetaminophen and saline injections.¹²

Of note, it has been reported in literature that there may be a lack of significant long-term improvement over a period of 12–18 months with the use of steroid injections in the CMC joint.^{13,14} Steroid injections may be helpful for early stage thumb CMC arthritis, but additional injections can lead to weakening of the joint.¹⁵ Furthermore, there have been adverse effects documented with the use of corticosteroid injection, which can be seen as soon as three months, such as osteonecrosis, accelerated OA progression, subchondral insufficiency fracture, complications of osteonecrosis, rapid joint destruction and cartilage damage.^{16,17} Studies examining PRP in the knee joint showed no major short-term (three months to one year) or long-term (greater than one year) adverse effects other than minor injection site reactions such as pain, bleeding, tenderness, swelling and bruising at the injection site.^{18,19}

Because the pathophysiology of OA is essentially the same regardless of joint size, PRP should be effective in small joints like the CMC joint of the hand as it is in large weight-bearing joints like the knee. A search of current literature revealed a paucity of studies relating to PRP injections in the small joints, such as the hands, with a majority of literature published around large joints, such as the hip and knee. At this time there are no standardized approaches to treating OA with PRP as there are different protocols and platelet centrifugation processes.^{20,21}

Conclusion

This case report details US-guided steroid injection followed by US-guided PRP injection in a 65-year-old male with bilateral CMC joint osteoarthritis. He did not report any significant improvement after five weeks of steroid injections. After the PRP injection, he seemed to objectively improve, yet, subjectively, he did

not feel his pain and functionality had returned to baseline in the right CMC joint in light of these findings. However, he was able to return to work and daily living activities.

The scope of this study was hindered by a lack of baseline Mayo wrist scores prior to undergoing PRP and lack of long-term follow-up beyond six weeks. Efforts to build upon this study include obtaining imaging studies to look at structural changes in the CMC joint. Further research is needed in order to establish a standardized method for implementing PRP therapy as there has been a paucity of research in this area, specifically in small joints such as CMC, and the use of US guidance and the protocol for extracting autologous platelets from a patient's blood.

Conflicts of Interest

The authors declare they have no conflicts of interest.

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