

Platelet-rich plasma injection for symptomatic relief of disability associated with traumatic knee arthritis: a case report

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Abstract

Multimodality is the mainstay of osteoarthritis (OA) treatment and intra-articular platelet-rich plasma (PRP) injection is gaining acceptance due to its regenerative properties and being minimally invasive. We present a young woman with Kellgren-Lawrence grade 3 post-traumatic OA in the left knee who refused surgery and opted for pain clinic follow-up. Five PRP injections in intervals of 4 to 9 months were administered in the past 2 years in addition to oral analgesia when necessary. Five ml of PRP was prepared via the double-spin open method and injected under ultrasound guidance to the left knee joint. Visual analogue scale (VAS) for pain was recorded at pre-procedure, and at 1-week and 1-month post-procedure. The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) was recorded at pre-procedure and 1-month post-procedure. PRP injection successfully reduced the VAS from 5 to 3 at both 1-week and 1-month post-procedure, and resulted in a WOMAC reduction of 54% with improvement in all WOMAC subscales at 1-month post-procedure. Our case showed that PRP injection demonstrated a positive effect on pain relief and physical function improvement in traumatic knee OA.

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Introduction

Knee osteoarthritis (OA) is a multifactorial, common, progressive joint disease which causes chronic pain and functional disability. The global prevalence is 16% with an incidence of 203 per 10,000 person-years, thus contributing to a major global health burden.¹ While multimodality is the mainstay of OA treatment, intra-articular platelet-rich plasma (PRP) injection is gaining acceptance.^{2,3}

Case presentation

A 35-year-old woman with a history of left upper tibial plateau fracture treated with internal fixation and subsequent implant removal in 2010 initially presented to the Orthopedic Department with progressive left popliteal fossa swelling after a fall and unable to flex her left knee for 5 months in late 2018. She had also been diagnosed with smear-negative pulmonary tuberculosis and completed antituberculosis treatment in 2019. The diagnosis was extensive OA in the left knee with osteomyelitic changes in the tibia and femoral condyles. Arthroscopic debridement and synovial biopsy of the left knee were performed in January 2019. The tissue and synovial fluid cultures were both negative. As she was not keen for total knee replacement, the patient was then referred to the Pain Clinic in June 2019 for chronic pain in the left knee pain with an average visual analogue score (VAS) of 8 on movement. For analgesia, she was prescribed oral celecoxib 200 mg once daily and paracetamol 1 g when necessary.

The option of PRP injection was offered to her in February 2020. A total of 4 injections in intervals of 4 to 9 months were administered until September 2021. At this juncture, the average pain score on movement had dropped by 3 points from 8 to an average of 5, accompanied with reduction in the need for daily oral analgesia. Her functional improvement was not objectively documented.

During the clinic visit in June 2022, she reported VAS of 0 at rest and 5 upon movement. Her weight had increased from 48 kg in 2019 to 58.2 kg. The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) was 37/96, equal to 39%. She scored 7/20 in the pain subscale, 2/8 in the stiffness subscale, and 28/68 in the physical function subscale. On examination, she was able to ambulate without assistance with a slight limping gait. The knees were not swollen, erythematous, or

warm. There was no tenderness upon palpation of both knees. The right knee had a full range of motion. Left knee flexion was 90° with extension of -10°, which showed a fixed flexion contracture. Weight-bearing X-ray showed Kellgren-Lawrence Grade 3 OA changes.

We proceeded with the fifth PRP injection. Five ml of PRP were obtained from the patient's own 20 ml venous blood with the double-spin open method using the centrifuge machine. The first spin was 25,000 revolutions per minute (RPM) for 8 minutes in a serum clot activator tube and the second spin was 20,000 RPM for 8 minutes in a plain vacuum tube. PRP was administered to the left knee joint under ultrasound guidance with Stimuplex A 22-G, 80 mm needle (B. Braun, Melsungen, Germany) under aseptic condition. The procedure was uneventful. Post-procedure, the left knee was passively flexed and extended to allow the PRP to spread throughout the joint. She was then discharged with oral celecoxib 200 mg capsule when necessary (5 doses/month) and oral paracetamol 1 gm when necessary (5 doses/month).

Upon review after 1 week of the procedure, she reported a VAS of 0 at rest and 3 upon movement in the left knee. At 1-month post-procedure, her VAS scores were the same. The WOMAC score was 17/96, equal to 17.7%. The pain subscale was 4/20, the stiffness subscale was 1/8, and the physical function subscale was 12/68. This showed a 54% improvement from the pre-procedure score with better scoring in all subscales. There were no reported post-procedure side effects (pain, bleeding, stiffness or swelling) at the injection site. At the last follow-up, the patient reported being able to jog twice a week for weight reduction, which she was not able to do previously. However, there was no significant improvement on the range of motion in the left knee. Table 1 summarizes the results for VAS and WOMAC.

Table 1. Results for the VAS pain scale and WOMAC score

Pain scale		Pre-procedure	1-week post-procedure	1-month post-procedure
VAS for pain	At rest	0	0	0
	Upon movement	5	3	3
WOMAC	Pain	7/20	-	4/20
	Stiffness	2/8	-	1/8
	Physical function	28/68	-	12/68
	Total (%)	37/96 (39)	-	17/96 (17.1)

VAS: visual analogue scale; WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index

Discussion

The growing burden of OA highlights the need for a proactive approach in its management. However, the Malaysian Clinical Practice Guidelines (CPG) on the Management of Osteoarthritis, published in 2013, recommended a linear step-up algorithm and has not been updated to date.² Each approach is only introduced after failure of previous management with persistent OA symptoms. A revised consensus by Yeap *et al.* has suggested a multimodal approach as the mainstay of OA management, which includes pharmacological and non-pharmacological intervention.² Treatment must be individualized to fulfil the patient's expectation. Non-pharmacological treatment included patient education, weight loss, exercise programs, knee unloading, and soft braces/knee sleeves. Pharmacological management included symptomatic slow-acting drugs for OA, topical and oral non-steroidal anti-inflammatory drugs, paracetamol, short-term weak opioids, intra-articular hyaluronate, and intra-articular corticosteroids (IACS).²

Regenerative treatment in the form of intra-articular PRP and mesenchymal stem cell injections have also been included in the injection-based therapy as a potential joint remodeling approach.³ Surgical intervention, either total or partial knee replacement, is recommended for patients with severe knee OA. Bourne *et al.* showed that one-fifth of patients were not satisfied with the outcome of total knee arthroplasty; the artificial implant has a lifespan of only 10 to 15 years, which is not suitable for young patients.⁴

In 2017, an update on PRP for treatment of OA was reported by the Health Technology Assessment Section of Ministry of Health Malaysia.⁵ PRP is defined as a mixture of autologous plasma that has highly concentrated platelets and associated growth factors including hepatocyte growth factors, vascular endothelial growth factors, platelet-derived growth factors and transforming growth factors with other bioactive components derived after whole blood centrifugation and separation.⁶ These have been shown to promote cell recruitment, proliferation, and angiogenesis and further induce a regenerative response by balancing the anabolism and catabolism in the damaged structures, including cartilage, and altering the microenvironment of OA disease progression.⁷ PRP injection to the knee joint is minimally invasive, may assist in the repair of the injured tissue, and is currently a management option for knee OA. PRP has many other known applications in dentistry, dermatology, ophthalmology, plastic, maxillofacial, and cardiothoracic surgeries.^{4,7}

PRP is gaining wide acceptance due to its minimal adverse effects compared to exogenous compounds.⁷ The double-spin open method is the preferred method of preparation due to its lower cost and better platelet yield as compared to the

single-spin method.⁸ Nevertheless, the optimal centrifuge parameters have not been concluded yet.⁸

A recent comprehensive consensus guideline on knee pain assigned a level 1 recommendation to safety and efficacy of intra-articular PRP for knee pain and improvement in function.³ Studies have shown that improvement for pain and function decline starting at 6 to 9 months post-PRP injection; the optimal frequency of PRP injections remains unclear. Huang *et al.* showed that at 12 months post-intervention, all patients had significant improvement in terms of VAC and WOMAC compared to pre-procedure.⁹ The group that received 3 injections per month showed better results than those with 1 and 2 injections per month, but there was no significant improvement in terms of range of motion of the knee among the 3 groups and between pre-intervention and at 12 months post-intervention.⁹ However, Patel *et al.* suggested that a single injection was as effective as double PRP injections for 6 months in terms of pain improvement.¹⁰ In our case, the interval of PRP injection was determined by the status of the patient's physical function and pain score.

We chose PRP instead of IACS because PRP has demonstrated better improvement over IACS in longer follow-up.¹¹ In their randomised controlled study, Elksniņš-Finogejevs *et al.* showed that both injections improve the short-term pain scores with knee function in those with mild to moderate OA.¹¹ There was no significant difference in pain reduction between the 2 types of injection up to the 6-month follow-up.¹¹ This may be attributed to the benefit of PRP in regenerating the joint micro-environment rather than just controlling the inflammation.^{7,10} PRP injection also shows significant pain reduction compared to intra-articular hyaluronate with moderate evidence.³

WOMAC was used in our case report due to its disease-specific, self-administered characteristics, which help to measure pain and physical disability for people with knee and hip OA. Hmamouchi *et al.* has suggested a 16% reduction of the total WOMAC score from baseline, which is a clinically important difference and is associated with slightly better improvement on the transition scale.¹² We successfully reported a baseline WOMAC score of 39 % that decreased to 17.7 % which is a reduction of 54% post-PRP injection.

Conclusion

PRP injection demonstrated a positive effect on pain relief and physical function improvement associated with knee OA. However, more randomized controlled studies are needed to standardize PRP preparation and to determine optimal injection intervals for management of knee OA.

Declarations

Informed consent for publication

Informed consent for publication was obtained from the patient.

Competing interests

None to declare.

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