



The use of Photo-Activated Platelet-Rich Plasma in the treatment of knee osteoarthritis in miners: an audit of clinical results and the impact on employment.

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Background

- Knee Osteoarthritis (KOA) is a significant problem globally & in Australia (1,2,3,4).
- Currently conservative treatment guidelines are not followed appropriately & KOA is poorly managed.
- Currently poor evidence to support the use of recommended intra articular injections (e.g. Corticosteroid).
- Assumption that a Total Knee Replacement (TKR) will enable people to continue to work.
- As Occupational Physicians our goal is to help people maintain employment & the health benefits of work.



Risk Factors for KOA

- A cohort study with 22 yrs follow up (10):
 - BMI >30 had a 7 fold increase in developing KOA compared to those with a BMI <25.
 - **Individuals in the most physically demanding job roles had an 18 fold increased risk of developing KOA compared to those in sedentary roles.**
 - 5 fold increased risk of developing KOA in those with a previous knee injury.



Occupational Mining & the development of KOA

- 83.4% obesity rate in Australian Mining (11).
- Significant manual handling & mobilising over rough & uneven ground (12).
- In Australia between 2001 & 2015 body stressing & musculoskeletal disorders represented 39% of workers compensation claims amongst miners, & trauma from slips, trips, & falls accounted for a further 25% (13).
- Marked trend to employ older workers & for workers to work longer before retirement (14, 3).



Knee KOA Clinical Standard of Care 2017

(15)

Step	Overview
Comprehensive Assessment	Detailed history of presenting symptoms and other health conditions, physical examination and psychosocial evaluation.
Diagnosis	Diagnosis on clinical assessment alone, imaging is only performed if an alternative diagnosis is suspected.
Education and self-management	Patient education about osteoarthritis and treatment options available. The patient participates in the development of an individualised self-management plan.
Weight loss and exercise	Weight loss support if obese or overweight, exercises advice, goal setting and referral to appropriate health services as required.
Medicines used to manage symptoms	Medication to manage symptoms according to the Therapeutic Guidelines: Rheumatology
Patient Review	Planned clinical reviews at agreed intervals, if there are worsening symptoms or severe functional impairment that persists despite optimal conservative management, they are referred for specialist management.
Surgery	Patients not responding to conservative treatments are offered timely joint conserving or joint replacement surgery. Arthroscopic procedures are not effective for knee osteoarthritis.



Summary of Conservative Treatments.

Treatment	Evidence
Analgesia	Paracetamol, intermittent NSAID use, infrequent use of opiate medication (16).
Intra articular Injections	Current Australian guidelines recommend Corticosteroid injections for short term pain relief, some evidence Hyaluronic acid is superior (15, 17).
Self-Management	A systematic review indicated a small positive benefit on psychological outcomes with no significant effect on physical function or pain (18).
Weight loss	Meta-analysis indicate that disability can be significantly improved with more than 5.1% weight loss (19)
Exercise	A systematic review demonstrated evidence for the effectiveness of both aerobic walking exercise and quadriceps strengthening in reducing pain and improving physical functioning in patients with KOA (20).
Tai Chi	A Randomised Controlled Trial demonstrated Tai Chi to be effective at improving physical functional capacity, but not pain in patient with KOA (21).
Hydrotherapy	A Randomised Controlled Trial demonstrated hydrotherapy to be effective at improving physical functional capacity, but not pain in patient with KOA (21).
Acupuncture	A systematic review indicated that acupuncture can be effective in significantly reducing pain and improving physical function in patients with KOA (22).
TENS	A systematic review indicated TENS to be effective in significantly reducing pain in patients with KOA (23).
Multi-Modal Physical Therapy	A randomised controlled trial indicated that both home and clinic based programs can significantly reduce pain and improve physical function in patients with KOA (24).
Braces & Orthotics	A systematic review indicated some positive effect in the reduction of pain, but results were mixed, and adverse effects were high (25).



Surgical Treatment for KOA

- Arthroscopy only indicated if true mechanical locking (26).
- TKR effective in relieving pain, improving mobility, restoring function & improving quality of life for people suffering moderate to severe KOA, (27).
- Foote et al – only 30% of recipients reported an improved ability to work (28).
- Further study looking at return to work post TKR – for those in physically demanding jobs only 40% had returned to work 3 months post op & only 62% at 12 months post op (29).



What is PRP?

- PRP has been defined as an autologous derivative of whole blood, with platelet concentrations above baseline (32).
- First used in the 1950's to treat maxillofacial & dermatological conditions.
- PRP contains high concentrations of growth factors, these include transforming growth factor- β , insulin like growth factor, platelet derived growth factor, vascular endothelial growth factor & other proteins which influence bone, muscle, tendon and ligament healing (33).



Evidence for using PRP in the treatment of KOA.

- A recent systematic review of the use of PRP in the treatment of KOA determined that PRP injections had clinically significant improvements for up to 12 months post injection, & that WOMAC scores were significantly better than hyaluronic acid injections at 3 and 12 months (34).
- A further systematic review supported this finding, & also reported that the risk of adverse events with the use of PRP was no greater than other intra articular injection treatments (35).
- A recent meta-analysis specifically looking at leukocyte rich versus leukocyte poor PRP, concluded that leukocyte poor PRP was more effective in the treatment of KOA (36).



2019 NICE Guidelines on PRP for KOA.

- “Current evidence on platelet-rich plasma injections for knee osteoarthritis raise no major safety concerns. However, the evidence on efficacy is limited in quality. Therefore this procedure should only be used with special arrangements for clinical governance, consent, and audit or research” (37).
- BUT a 2019 Australian review reported that PRP injections have a low risk of harm & provide benefit for greater than 12 months (38).
- A further 2018 review concluded that “abundant high quality evidence supports the use of LP-PRP for osteoarthritis of the knee” (39).



Audit Overview:

- Aim: Review the outcome of Photo activated, leukocyte poor PRP in the treatment of KOA in 41 miners.
- Method: Retrospective clinical audit of routine data collected from the clinic. Inclusion criteria grade 3 or 4 KOA diagnosed on MRI or arthroscopy.
- The exclusion criteria were a medical condition requiring the patient to take aspirin or clopidogrel (interference with platelets), systemic or inflammatory joint disease, history of crystalline arthropathy, cancer or other tumour-like lesions, immunosuppression or current infection, pregnancy or lactation, or any allergy to any substance used in the treatment, and any knee surgery within the 4 months prior to PRP treatment.



Audit Overview:

- 41 coal mine workers treated in 2017 – all results included in the audit.
- Patients were treated with 3 injections given 1 every 2 weeks.
- Numeric Rating Scale (NRS) was used for outcomes.
- NRS scores were recorded at baseline, 6 and 12 months.
- Statistical analysis was done using a 2 tailed T test.



Demographics:

Ethnic Origin	Indigenous Australian 2 Caucasian 39
Male	36
Female	5
Age (yrs)	Mean 56.4 (36 – 70)
Age of those seen by a surgeon (yrs)	Mean 59.6 (45-70)
BMI	Mean 32.8 (26.3-39.8)
History of smoking	26
Operator Job Role	23
Diesel Fitter Job Role	13
Boiler Maker Job Role	5



Change in NRS score from baseline to 6 months post initial PRP treatment

Number of patients	41
Mean baseline NRS Score	7.4 (4-10)
Mean NRS score 6 months post treatment	2.1 (0-7)
Probability	<0.001



Change in NRS score from baseline to 12 months post initial PRP treatment.

Number of Patients	23
Mean Baseline NRS	7.0 (4-10)
Mean NRS 12 months post treatment	1.9 (0-7)
Probability	<0.001

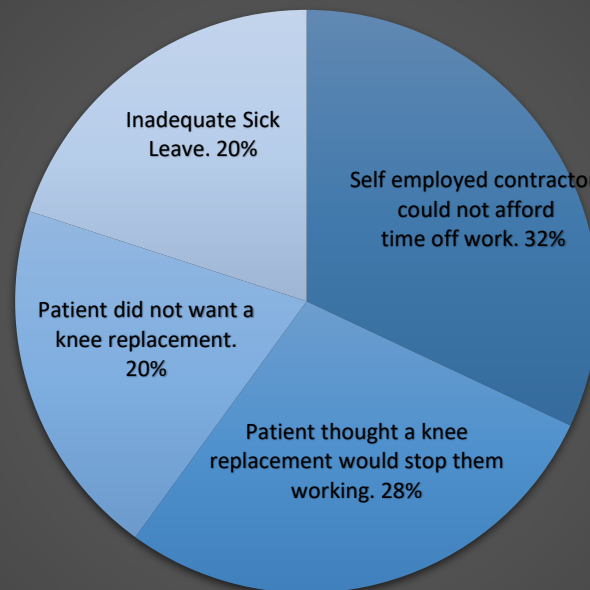


Change in NRS scores in patients who were recommended total knee replacement or high tibial osteotomy by treating surgeon, at 6 months post initial PRP treatment.

Number of patients	25
Mean baseline NRS	7.5 (4-10)
Mean NRS 6 months post treatment	2.5 (0-10)
Probability	<0.001
Percentage of patients treated successfully with PRP (%)	84%
Percentage of patients who failed PRP treatment and progressed to surgery (%)	16%



The reasons why patients initially declined surgery.





Conclusion.

- Treatment of KOA was safe & effective in improving pain & maintaining employment (**90% of patients at 12 months**).
- 4 patients who opted for surgery – 2 had not returned 4 months post op, 1 left employment & was on the public waiting list at 3 months, 1 had a non union from a high tibial osteotomy & had not returned to work at 7 months post op.
- Currently conservative treatment largely under utilized.
- More high quality studies required, specifically larger Randomised Controlled trials looking at light activated LP-PRP.



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