

Conservative Management of Knee Osteoarthritis Utilizing Bone Marrow Aspirate Concentrate

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BACKGROUND

Knee osteoarthritis (KOA) affects 35% of adults aged 65 years and older.¹ Unlike traditional conservative treatments, bone marrow aspirate concentrate (BMAC) injections have a high concentration of interleukin-1 receptor antagonist, which blocks the inflammatory signaling of interleukins 1, 6, and 8 and downstream cartilage breakdown by matrix metalloproteases.^{2,3} Previous studies have been inconsistent about reporting patient-specific data, such as prior knee injuries, previous knee surgeries, alcohol consumption, smoking status, and comorbidities.⁴ Despite popularity in the literature, long-term outcomes are warranted to determine the longevity of BMAC injections as most studies do not report results of greater than 12 months.⁵

We hypothesize BMAC injections, along with conservative care, will provide short- and long-term relief of pain associated with KOA.

METHODS

Retrospective chart review on patients with KOA who received BMAC injections (47 patients/71 knees, 26 males, 21 females, average age 64±9 years).

60cc of bone marrow was aspirated from the posterior iliac crest under CT and ultrasound guidance, centrifuged and concentrated to 10cc, and injected into the knee joint with ultrasound guidance.

NSAIDs withheld 10 days prior and 3 months after injection.

Compartment specific off-loading knee brace was utilized while non-weightbearing for 3 weeks post-injection and full-weightbearing with the brace for another 3 weeks.

Patients were followed at fixed intervals up to 3 years post-injection using a 0-10 pain scale and assessment of adverse events, additional treatments, and safety of the treatment.

RESULTS

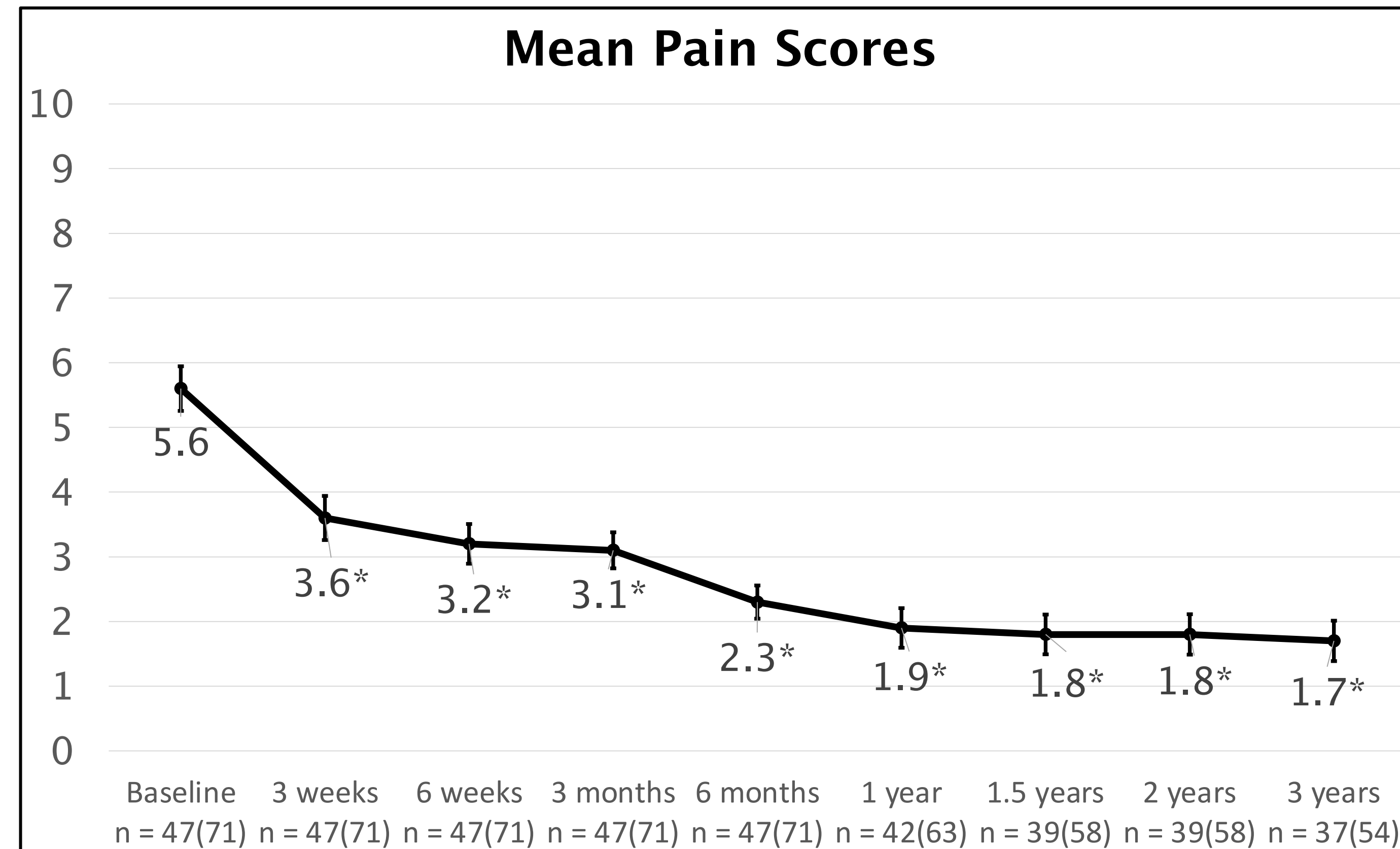


Figure 1: Mean pain scores (+/- SEM) over a 3-year period for patients with KOA treated with intra-articular BMAC injections
n = patients (knees) at each follow-up
*p<.001; .05 alpha level; Wilcoxon signed-rank test

Group	Knees	% of Group with Additional Treatment	p
Prior Meniscus Injury	23	17	0.296
No Meniscus Injury	37	30	
Prior Knee Surgery	24	4	0.004*
No Knee Surgery	46	35	
Alcohol Use	43	26	0.612
No Alcohol	25	20	
Former Smoker	16	31	0.513
No Smoking	52	23	
Comorbidities	52	25	0.816
No Comorbidities	18	22	

Table 1: Percentages of different groups from the overall patient population that received an additional treatment after BMAC injection
*.05 alpha level; Univariate ANOVA

	Prior Knee Surgery	No Knee Surgery	p
Baseline Mean Pain	5.6	5.7	0.888
3 Week Mean Pain	2.8	4	0.056
6 Week Mean Pain	2.4	3.6	0.047*
3 Month Mean Pain	2.4	3.4	0.082

Table 2: Mean pain scores for patients with a prior knee surgery versus no knee surgeries up to 3 months
*.05 alpha level; Univariate ANOVA

DISCUSSION

Patients received significant pain relief as early as 3 weeks post-injection. Pain relief improved and persisted up to 3 years (Figure 1). No adverse events reported for any patient.

Patients with a prior knee surgery were associated with a lower occurrence of requiring additional treatments to decrease their KOA pain (Table 1). This was not observed for any other group of patients in our population.

Patients with a prior knee surgery were no different regarding baseline mean pain scores compared to patients with a knee surgery. However, patients with a prior surgery were trending toward lower scores at the 3rd week and had lower scores at the 6th week compared to the non-surgical patients. This suggests patients with a prior knee surgery receive better improvements earlier on compared to patients without a knee surgery (Table 2).

CONCLUSIONS

BMAC injections, along with conservative management, represents a safe and effective treatment for knee osteoarthritis pain for up to 3 years. Patients with a prior history of a knee surgery reported higher short-term benefits and were less likely to need an additional treatments compared to non-operative patients. Few patients (3 patients, 5 knees) progressed to knee arthroplasty suggesting this approach to be a viable alternative.

REFERENCES

- Mora JC, Przkora R, Cruz-Almeida Y. Knee osteoarthritis: pathophysiology and current treatment modalities. *Journal of pain research*. 2018;11:2189-2196.
- Woodell-May J, Steckbeck K, King W. Potential Mechanism of Action of Current Point-of-Care Autologous Therapy Treatments for Osteoarthritis of the Knee-A Narrative Review. *Int J Mol Sci*. 2021;22(5)
- Ziegler CG, Van Sloun R, Gonzalez S, et al. Characterization of Growth Factors, Cytokines, and Chemokines in Bone Marrow Concentrate and Platelet-Rich Plasma: A Prospective Analysis. *Am J Sports Med*. 2019;47(9):2174-2187.
- Murray IR, Robinson PG, West CC, et al. Reporting Standards in Clinical Studies Evaluating Bone Marrow Aspirate Concentrate: A Systematic Review. *Arthroscopy*. 2018;34(4):1366-1375.
- Cavallo C, Boffa A, Andriolo L, et al. Bone marrow concentrate injections for the treatment of osteoarthritis: evidence from preclinical findings to the clinical application. *Int Orthop*. 2021;45(2):525-538.