



Case Study: Clinical Outcome of Percutaneous Intraosseous Bone Marrow Concentrate (BMC) with Arthroscopy (PIBA) and Platelet-Rich Plasma (PRP) Booster in Severe Osteoarthritis of the Left Hip

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INTRODUCTION

When severe, osteoarthritis is known to affect the joint cartilage as well as the underlying bone, causing pain in addition to limiting joint mobility and function. Because it has become increasingly common for younger adults (<65 years old) to present with advanced degenerative joint disease (DJD), the impact of refining orthobiologic regenerative therapies, with the goal of correcting structural deficiencies and hence preventing or delaying the need for surgery, would be significant.¹ Hence, we are interested in investigating the efficacy of a novel therapy combination termed "PIBA," which utilizes autologous BMC, in addition to a PRP booster in treating moderate-severe osteoarthritis. In this case study, we will evaluate the effectiveness of the above treatment combination on a patient who presented with moderate to severe osteoarthritis in the left hip joint.

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OBJECTIVE

To evaluate the efficacy of PIBA with PRP booster in severe osteoarthritis and subchondral edema of the hip. Pre- and post-treatment assessments in determining efficacy included pain reduction, structural changes, and functional improvement.

CASE

A 43-year-old active male patient presented with severe left hip pain, reduced mobility, and impaired function. Physical exam findings revealed a positive Flexion, Abduction, and External Rotation (FABER) test for ipsilateral hip pain, reduced passive external rotation limited to 30 degrees, absent passive internal rotation, reduced hip extension to the point where he ambulated with a shortened stride on the affected side, and painful hip flexion. The visual analog scale (VAS) score for pain was 8/10. A magnetic resonance (MR)-arthrogram revealed moderate-severe osteoarthritis, osteophytes, and moderate subchondral edema in the acetabulum and femoral head of the left hip. Treatment included arthroscopic lavage using a pediatric arthroscope (Smith & Nephew) with intra-articular autologous BMC injection through the arthroscope followed by percutaneous intraosseous BMC injection under fluoroscopic guidance. The Orthohealing Center has coined the combination of these two procedures "PIBA" (Percutaneous Intraosseous Bone marrow concentrate and Arthroscopy). The patient also received an intra-articular PRP booster injection under ultrasound guidance four weeks post-PIBA. A second magnetic resonance imaging (MRI) study was performed four months after the PRP booster (five months post-operatively) to evaluate the structural impact on the patient's pathology. The patient returned for a follow-up visit after the post procedure MRI to review the images and evaluate clinical outcomes.

MATERIALS AND METHODS

Procedure Techniques:

- PIBA:** The operating physician completed the following steps in a surgical center operating suite in a sterile manner with the patient under monitored anesthesia care (MAC):
 - Obtained 12 cubic centimeters (cc) of BMC using the Marrow Cellution Bone Marrow Aspiration Kit at the posterior superior iliac spine (PSIS) under fluoroscopic and ultrasound (US) guidance.
 - Using US guidance with a curvilinear (5-2 MHz) probe (Sonosite), an orthopedic surgeon inserted a pediatric arthroscope into the anterior hip joint and performed a lavage in this location. However, due to significant osteophytes and bony overgrowth, there was minimal diagnostic value, and the lavage was challenging.
 - Then 4cc of BMC was injected directly into the site waiting five minutes before removing the needle.
 - Afterward, a 13-gauge cannulated drill was guided into the acetabulum at the subchondral edema site under fluoroscopic guidance in anterior-posterior (AP) view after administering local anesthetic. Lateral views confirmed proper placement.
 - 4cc of BMC was injected intraosseously and allowed it to coagulate for five minutes before removing the needle.
 - The same protocol was utilized for the femoral head.

MATERIALS AND METHODS CONTINUED



Figure 1. Percutaneous intraosseous BMC of the acetabulum



Figure 2. Percutaneous intraosseous BMC of the femoral head

- PRP Booster Injection:** The operating physician completed the following steps:
 - Injected the patient with 3cc of 1% lidocaine subcutaneously using a 25-gauge 1 1/2 inch needle after prepping the anterior joint line.
 - Injected 4cc of PRP (Emcyte system: leukocyte poor & RBC free, non-activated) into the anterior joint without resistance using a 22-gauge 3-inch needle under US guidance.

RESULTS

- Imaging:** The post-procedural MRI in comparison to the pre-procedural MR-arthrogram demonstrated the following: interval decrease in trabecular bone edema involving the femoral head and neck in addition to interval resolution of the previously reported trabecular bone edema of the acetabulum.
- Functional Improvement and Pain Relief:** The patient reported the following improvements five months post-PRP booster: a ninety percent improvement in pain in addition to significant improvement in mobility. Daily activities and exercise improved as well: with ability to coach his daughter's soccer team (includes running short distances up and down the sideline), the ability to swim breaststroke, sit cross-legged, and sit for long periods without stiffness. VAS score for pain was reduced to 1/10.
- Physical Exam Findings:** FABER with only minimal feeling of "tightness" at end range, passive external and internal rotation increased to 45 degrees and degrees, respectively; hip extension within normal limits with resolution of abnormal gait pattern, and painless hip flexion.



Figure 3. MR-Arthrogram Pre-Procedure



Figure 4. MRI Post-Procedure

DISCUSSION

A limitation we encountered during this case is that the arthroscopic lavage portion of the PIBA failed due to bone spurs that were present in the hip joint which blocked the arthroscope's ability to travel through the joint. A question that this raises, considering that the patient had considerable improvement in structure, mobility, and pain, is whether or not the arthroscopic portion of the PIBA procedure is crucial for hip joints. Moreover, considering that the patient did not have a change in cartilage morphology, but did have improvement in subchondral edema supported by an MRI study, the next question we raise is whether the subchondral edema is the determining factor in determining the degree of subjective pain. It is not unusual for patients that have bilateral hip arthritis to only have symptoms on one side. Hence, future directions include exploring whether or not edema is the pathological factor that contributes significantly to debility in hip osteoarthritis. We will also continue to collect and evaluate patient data for similar cases to conduct a broader study assessing the efficacy of bone marrow concentrate and platelet-rich plasma regenerative therapies in treating severe osteoarthritis and subchondral edema in the hip.

CONCLUSIONS

The post-procedural MRI study findings strongly suggest that bone marrow concentrate and platelet-rich plasma regenerative therapies paired with appropriate intraosseous intervention improved the clinical outcome for a patient with moderate-severe left-hip osteoarthritis. The reduction of subchondral edema in subsequent imaging also supports the efficacy of this treatment.

REFERENCES

- Sampson, Steven, Angie Botto-Van Bemden, and Danielle Aufiero. "Autologous Bone Marrow Concentrate: Review and Application of a Novel Intra-Articular Orthobiologic for Cartilage Disease." *The Physician and Sportsmedicine* 41.3 (2013): 7-18.