Does Bone Marrow Aspirate Concentrate Use Improve Hip Arthroscopy Outcomes? A Systematic Review

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INTRODUCTION: Various orthobiologic therapies have been studied to treat articular cartilage defects in conjunction with hip arthroscopy. Bone marrow aspirate concentrate (BMAC) has emerged as a promising concomitant technique due to its high connective tissue progenitor concentration. The purpose of this study is to provide an aggregate of literature evaluating the effect of BMAC on patient-reported outcome scores (PROs) following hip arthroscopy.
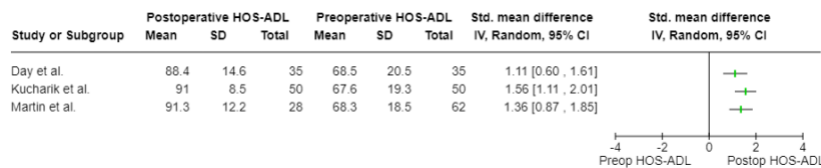
METHODS: The Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines were followed when querying Pubmed, Cochrane Trials, and Scopus in January 2023. The following keywords were used in the search: (bone marrow) and (hip arthroscopy). Articles were included if they reported on preoperative and postoperative outcomes for patients undergoing hip arthroscopy with concomitant bone marrow aspirate concentrate and were written in English. Forest plots were created to assess preoperative and postoperative PROs reported between three or more studies. Heterogeneity was assessed using I^2. Statistical significance was defined as $P < 0.05$.

RESULTS: The initial search identified 138 studies, of which 5 were included in the review. All five studies were level III evidence. A total of 252 hips undergoing BMAC and hip arthroscopy performed between 2010 to 2020 were evaluated with latest follow-up ranging from 12 to 24 months. The average age of patients in the studies varied between 32.8 to 48.5 years. All five studies reported improved postoperative outcome scores after BMAC and hip arthroscopy. Two studies reported p-values and patients undergoing BMAC and hip arthroscopy achieved significant improvement in all PROs. Two studies reported clinical benefit and showed patients achieving rates of MCID of at least 70% in multiple PROs. Two studies reported survivorship of 100% and 85.7%. All five studies reported sub-analysis between BMAC and hip arthroscopy and a control group. Three studies reported superior outcomes in the BMAC and hip arthroscopy group, while another study reported findings that trended toward favoring the BMAC and hip arthroscopy group.
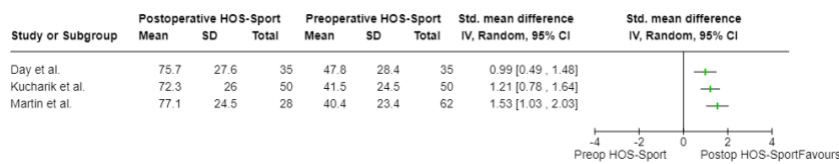
DISCUSSION: The main findings of this paper were that (1) patients who underwent BMAC and hip arthroscopy demonstrated improved postoperative patient-reported outcomes, (2) survivorship rates after BMAC and hip arthroscopy were high, with conversion rates to total hip arthroplasty reported as 0% and 14.3%, and 3) three studies that compared BMAC with hip arthroscopy to a control group without BMAC demonstrated superior outcomes in the BMAC group. This systematic review suggests that BMAC can potentially be a helpful treatment for patients in the OA gap who have articular pathology that may not warrant total hip arthroplasty. Further level 1 studies need to be conducted to evaluate the potential of BMAC with hip arthroscopy.

One limitation of this review is that it included only retrospective studies with low levels of evidence which limit the generalizability of the results. Furthermore, the various control groups used limits any true comparison of how BMAC affects outcomes in patients undergoing hip arthroscopy. Also, patients undergoing BMAC underwent several different concomitant procedures which may influence PROs. Lastly, the study period of the included studies ranged from 2010-2020 and surgical techniques have evolved over that time period.
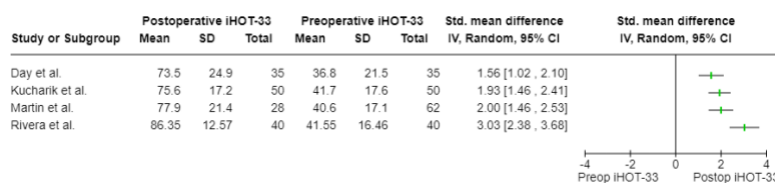
SIGNIFICANCE/CLINICAL RELEVANCE: Favorable postoperative patient-reported outcomes and high survivorship rates show bone marrow aspirate concentrate may be helpful in patients undergoing hip arthroscopy. However, due to the small sample size and lack of standardized control groups, the results are inconclusive.

Study or Subgroup	Postoperative HOS-ADL			Preoperative HOS-ADL			Std. mean difference IV, Random, 95% CI
	Mean	SD	Total	Mean	SD	Total	
Day et al.	88.4	14.6	35	68.5	20.5	35	1.11 [0.60 , 1.61]
Kucharik et al.	91	8.5	50	67.6	19.3	50	1.56 [1.11 , 2.01]
Martin et al.	91.3	12.2	28	68.3	18.5	62	1.36 [0.87 , 1.85]

Figure 1. Forest Plot for Hip Outcome Score – Activities of Daily Living

Study or Subgroup	Postoperative HOS-Sport			Preoperative HOS-Sport			Std. mean difference IV, Random, 95% CI
	Mean	SD	Total	Mean	SD	Total	
Day et al.	75.7	27.6	35	47.8	28.4	35	0.99 [0.49 , 1.48]
Kucharik et al.	72.3	26	50	41.5	24.5	50	1.21 [0.78 , 1.64]
Martin et al.	77.1	24.5	28	40.4	23.4	62	1.53 [1.03 , 2.03]

Figure 2. Forest plot for Hip Outcome Score – Sports Specific Subscale

Study or Subgroup	Postoperative iHOT-33			Preoperative iHOT-33			Std. mean difference IV, Random, 95% CI
	Mean	SD	Total	Mean	SD	Total	
Day et al.	73.5	24.9	35	36.8	21.5	35	1.56 [1.02 , 2.10]
Kucharik et al.	75.6	17.2	50	41.7	17.6	50	1.93 [1.46 , 2.41]
Martin et al.	77.9	21.4	28	40.6	17.1	62	2.00 [1.46 , 2.53]
Rivera et al.	86.35	12.57	40	41.55	16.46	40	3.03 [2.38 , 3.68]

Figure 3. Forest Plot for International Hip Outcome Tool