The Influence of Demographic Factors on Bone Marrow Aspirate Concentrate Volume Extracted From the Body of the Ilium

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Disclosures: Nothing to disclose.

INTRODUCTION: Bone marrow aspirate concentrate (BMAC) has displayed promising results as a viable solution to improve outcomes in patients undergoing hip arthroscopy for symptomatic labral tears. The literature outlines improved functional outcomes at 2-year follow-up that further expanded at 5-year follow-up. Therefore, the purpose of this study was to identify prognostic factors that may influence BMAC volume when aspirated from the body of the ilium.

METHODS: This study was approved by an IRB. This was a retrospective study analyzing patients who underwent primary hip arthroscopy to treat symptomatic labral tears secondary to femoracetabular impingement (FAI) between 2018-2025. Demographic factors were collected along with intraoperative variables concerning BMAC preparation including bone marrow aspirate (BMA) and BMAC volume. To normalize outcome variables, BMAC ratio was calculated by dividing BMAC by BMA. Body mass index (BMI), age, sex, and comorbidities (i.e. osteoporosis/osteopenia, vitamin D deficiency) were adjusted for using a multivariate linear regression model to investigate the influence of demographic factors on BMAC ratio at the time of surgery.

RESULTS: In total, 74 patients (age, 30.35±9.11) were included for analysis; 47 of whom were male and 27 were female. When adjusting for demographic factors, age displayed a significant influence on BMAC ratio (adjusted mean difference, -0.28; P=0.011). BMI, sex, and comorbidities affecting bone mineral density were not found to affect BMAC ratio in a significant manner (P>0.05 for all).

CONCLUSION: The volume of BMAC extracted from the body of the ilium decreased with patient age. This suggests that bone mineral density may influence BMAC augmentation to treat symptomatic labral tears. Further research is necessary to evaluate the clinical impact of varying BMAC volumes on surgical outcomes.

SIGNIFICANCE: The interest in orthobiologics has grown substantially in the literature, however, there is a paucity of information detailing the characteristics and key contributors to such treatments.

Table 1: Patient Demographics and BMAC Harvest Findings

	n = 74
BMA Volume	117.3 (18.1)
BMAC Volume	5.74 (0.98)
BMAC Ratio[a]	4.96 (0.82)
Age, years	30.4 (9.1)
BMI, kg/m^2	24.6 (3.4)
Sex	
Female	27 (36.5)
Male	47 (63.5)
Laterality	
Right	45 (60.8)
Left	29 (39.2)
Race	
Asian	6 (8.1)
Black or African American	4 (5.4)
White	59 (79.7)
Other or not reported	5 (6.8)

*Data are reported as mean (SD) or No. of patients (%). [a]BMAC ratio was multiplied by 100 for graphing purposes. Abbreviations: BMA, bone marrow aspirate; BMAC, bone marrow aspirate concentrate; BMAC ratio, BMAC/BMA; BMI, body mass index

Table 2: Multivariate Linear Regression Models

		Adjusted Mean Difference	95% CI		P value
			Lower	Upper	
BMAC Ratio	Age, Δ 10 years	-0.28	-0.49	-0.07	**0.011**
	BMI	0.03	-0.03	0.09	0.329
	Female (vs. male sex)	0.04	-0.36	0.43	0.845
	Bone Comorbidities	0.21	-0.49	0.91	0.548

Boldface denotes statistical significance (P<0.05). Abbreviations: BMAC, bone marrow aspirate concentrate; BMI, body mass index; Bone Comorbidities, osteoporosis/osteopenia/vitamin D deficiency

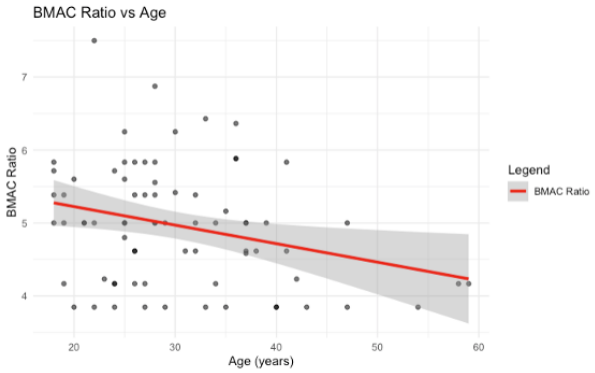

Figure 1. Scatter plot displaying the relationship of BMAC Ratio over Age. BMAC Ratio was multiplied by 100 for graphing purposes.