How to Manage Bone Marrow Aspirate Concentrate to Treat Musculoskeletal Disorders: A Systematic Review

CONFLICT OF INTEREST

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The authors declare no financial conflicts to disclosure
INTRODUCTION

- **Bone Marrow Aspirate Concentrate - BMAC:**
  - Bone marrow components derived from distinct cellular origins;
  - Concentrated through centrifugation (minimal separation);
  - Potential advantages:
    - Self-renewal;
    - Differentiation to numerous tissues;
    - Cell migration to injured tissue;
    - Modulation of inflammatory process.
PURPOSE

To help establish the optimal collection and processing method, as well as explore the efficacy of BMAC to treat musculoskeletal disorders in humans.
METHODS

- A search was carried out in 2018 by two independent reviewers:
  - PubMed, Lilacs and Cochrane.
- The Preferred Reporting Items for Systematic Reviews and Meta-Analyzes (PRISMA) checklist was used;
- Levels of evidence classification:
  - Grading System of Recommendations Assessment, Development and Evaluation (GRADE) and Oxford Center for Evidence-Based Medicine.
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**METHODS**

<table>
<thead>
<tr>
<th>Inclusion criteria</th>
<th>Non Inclusion criteria</th>
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<tr>
<td>o Last 5 years;</td>
<td>o Evidence Level IV;</td>
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<td>o Full text;</td>
<td>o In vitro studies;</td>
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- Extracted data included: production process, the site of acquisition, pathologies eligible for treatment, as well as the outcomes and effectiveness of the treatment.
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Selected Articles: 333
Bone Marrow Aspirate Concentrate

Included Articles: 69

Selected Articles: 16

Duplicate Articles: 3

Reviewed Articles: 13

Excluded Articles: 264
- Did not use human subjects;
- Did not mention musculoskeletal disorders;
- Without mention of orthopedic use;
- More than 5 years since publication;
- Used animal subjects.

Excluded Articles: 51
- 19: low levels of evidence;
- 25: mentioned, but without orthopedic use;
- 4: full article not available;
- 4: mentioned, but without use in humans;
- 1: review in progress.
RESULTS

- 13 reviewed articles – 10 from the last 2 years;
- 354 patients;
- Age: 15 - 68 years;
- 5 studies were classified as level of evidence I (Oxford);
- Major pathologies:
  - Osteochondral lesions;
  - Femoral head osteonecrosis.
Site and Quantity of Bone Marrow Aspirate:
- Anterior region of the iliac crest and 50 to 400 ml.

Aspiration Technique:
- Access incisions ranged from 3 to 10 cm, under either anesthesia;
- 3 to 10 aspirations (2 mm between punctures sites);
- 5 ml per aspiration;
- Syringes of 60 ml with anticoagulant and 11 mm needles.
RESULTS

- **Processing Methodology:**
  - Centrifuge: Arteriocyte Magellan® e Harvest SmartPreP 2®;
  - Speed: 3.200 rpm;
  - Time: 15 min;
  - Final volume of processed: 12 to 50 ml;
  - Applied volume: 5 – 50 ml;
  - Application: immediately following processing.
RESULTS

➢ **Review findings:**

➢ **Osteochondral lesions on the Knee:**
  ➢ The articular cartilage resembled native conformation;
  ➢ Clinical and functional scores improvement;
  ➢ Lower risk of graft failure;
  ➢ Durable chondral repair when compared to microfractures.

➢ **Femoral head osteonecrosis and Spinal arthrodesis:**
  ➢ Without differences.

➢ **Tibial pseudoarthrosis:**
  ➢ Greater potential for consolidation;
  ➢ In infected pseudoarthrosis, the infection was treated without antibiotics.

➢ **Partial rotator cuff tears:**
  ➢ Increased proliferation and cell migration to the injury
CONCLUSION

- **Iliac Crest** – main place of aspiration;
- 60 ml syringe containing anticoagulant and 11 mm needle;
- Total volume aspirated between 50 and 60 ml;
- Centrifugation for 15 min (3200 rpm);
- Final volume applied from 5 to 6 ml.
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REFERENCES


