BMAC* Intervention Versus Joint Arthroplasty for Arthritis

A Preliminary Report Comparing Outcomes at the Hip and Knee

*BMAC  Bone Marrow Aspirate Concentrate
Between 2005 to 2030, prevalence expected to increase

- THA 174%
- TKA 673%
- Rev. THA 137%
- Rev.TKA 601%

Kurtz et al., AAHKS 2008
TJA: Projections

• 2011:
  – >50% THA in <65 y.o.
  – >50% Rev TKA in <65 y.o.

• 2016:
  – >50% TKA in <65y.o.

• 45-54 y.o. fastest growing group
  – 2005-30 TKA in this group will increase 17-fold
  – 2005-30 THA in this group will increase 6-fold

Kurtz et al., AAHKS 2008
Standard Incision for the THR
Complications of a THA

- Infection
- Thromboembolic events
- Leg-length inequality
- Dislocation
- Limp
- Pain
- Medical Complications
  - MI
  - CVA
Mitchell B Sheinkop, MD

Regenexx Network
Emeritus Professor of Orthopedic Surgery
Rush Medical School
How does a Stem Cell Intervention Outcome Compare to a TJA
Osteoarthritis of the Hip
Kellgren-Lawrence Grading Scale of the Hip

- **Grade 1**
  - Doubtful narrowing of jt space, poss osteophytic lipping

- **Grade 2**
  - Definite osteophytes & narrowing jt space

- **Grade 3**
  - Mod mult osteophytes, jt space narrowing, some sclerosis & poss deformity of bone contour

- **Grade 4**
  - Lg osteophytes, marked narrowing jt space, severe sclerosis & deformity of bone contour
Hip Demographics

• 94 THA in 2007*
  – Mean age of 62.22
  – Mean BMI of 30.18

• 28 BMAC Hip interventions in 2012
  – Mean age of 51.44
  – Mean BMI of 26.40

*Zimmer Total Hip Arthroplasty Device Outcomes Study for VerSys FMT
Available for follow-up at one year

- THR (24) 14 Males/ 10 Females
- BMAC at Hip (18) 12 Males/6 Females
<table>
<thead>
<tr>
<th>REGION</th>
<th>Clinician Completed</th>
<th>Patient Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip</td>
<td>Harris Hip Score</td>
<td>Oxford Hip Score</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HOOS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WOMAC</td>
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<tr>
<td>Knee</td>
<td>Knee Society Score (KSS)</td>
<td>Oxford Knee Score</td>
</tr>
<tr>
<td></td>
<td>Physician Global Assessment</td>
<td>KOOS</td>
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<td>IKDC</td>
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</table>
Harris Hip Score (100 points)

- Pain
- Distance walked
- Activities-shoes, socks
- Public transportation
- Motion
  - Degrees of flexion
  - Degrees of Abduction
  - Degrees of Ext. Rot
  - Degrees of Adduction
- Support
  - Limp
  - Stairs
  - Sitting
Grading for the Harris Hip Score

• Successful result:
  • Post operative + in HHS of >20 points
    • Or
      • <70 Poor
      • 70-79 Fair
      • 80-89 Good
      • 90-100 Excellent
Mean Harris Hip Score

- **THA Preop (101) 56**
- **THA Post (24) 94**
- **BMAC Preop (28) 68.75**
- **Post BMAC (18) 82.89**
Average Hip ROM (Ext › Flex)

- **THA Preop** 75.5°
- **THA Post op** 84.5°
- **BMAC Pre** 87.44°
- **BMAC Post op** 95.24°

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<tr>
<th></th>
<th>Pre</th>
<th>Post (1 year)</th>
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<td><strong>THA</strong></td>
<td>75.5</td>
<td>84.5</td>
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<tr>
<td><strong>BMAC</strong></td>
<td>87.44</td>
<td>95.24</td>
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### Harris Hip Pain Score

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<tr>
<td><strong>Pre op</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mod to marked</td>
<td>77%</td>
<td>Moderate: 93%</td>
</tr>
<tr>
<td>Post op</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>80.0%</td>
<td>None: 25%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Slight: 50%</td>
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<tr>
<td></td>
<td></td>
<td>Moderate: 25%</td>
</tr>
</tbody>
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**TOBI:** The Orthobiologic Institute

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• 73% of BMAC Hip recipients returned to sporting activities
Osteoarthritis of the Knee
Complications are common.

Infection is the most common problem.
Kellgren-Lawrence Knee OA Grading Scale

- Grade 1
- Grade 2
- Grade 3
- Grade 4
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Knee Society Score (knee & function)

- Pain
- Total Range of Flexion
- Flexion Contracture
- Extension Lag
- Stability
  - Antero-posterior
  - Mediolateral
- Alignment (varus/valgus)
- Walking
- Stairs
- Walking aids used
Grading for Knee Society Score (Knee Score & Function Score)

- Score 80-100       Excellent
- Score 70-79        Good
- Score 60-69        Fair
- Score below 60     Poor
# Knee Demographics

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<thead>
<tr>
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<th>TKA*</th>
<th>BMAC</th>
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<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TKA</td>
<td>(111) 67.05 y/o</td>
<td></td>
</tr>
<tr>
<td>BMAC</td>
<td>(37) 55.35 y/o</td>
<td>(37) 27.17</td>
</tr>
<tr>
<td>BMI</td>
<td>(53) 31.99</td>
<td></td>
</tr>
</tbody>
</table>
Available for follow-up at one year

- TKA (N=71) 43 Males/28 Females
- BMAC at Knee (N=26) 15 Males/11 Females
Knee Society Assessment Score

- **TKA**
  - Pre op 48
  - Post op 80
- **BMAC**
  - Pre op 69.08
  - Post op 82.44

![Graph comparing TKA and BMAC scores pre and post operation](image)
<table>
<thead>
<tr>
<th>Procedure</th>
<th>Pre-op</th>
<th>Post-op</th>
</tr>
</thead>
<tbody>
<tr>
<td>TKA</td>
<td>40</td>
<td>73</td>
</tr>
<tr>
<td>BMAC</td>
<td>71.15</td>
<td>90.31</td>
</tr>
</tbody>
</table>

**Knee Society Function Score**

![Graph showing improvement in function scores pre and post-operations for TKA and BMAC.](image-url)
Knee Range of Motion

- **TKA**
  - Pre op 108°
  - Post op 113°

- **BMAC**
  - Pre op 123°
  - Post op 124°
Physicians Global Assessment of the Knee

- **None:** no pain, no symptoms and no limitation of function
- **Mild:** mild pain, mild symptoms and mild limitation of function
- **Moderate:** moderate pain, moderate symptoms and moderate limitation of function
- **Severe:** severe pain, severe symptoms and severe limitation of function
- **Extreme:** extreme pain, extreme symptoms and extreme limitation of function
## Physician Global Assessment of the Knee

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<thead>
<tr>
<th></th>
<th>Pre BMAC</th>
<th>Post BMAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0%</td>
<td>38%</td>
</tr>
<tr>
<td>Mild</td>
<td>35%</td>
<td>50%</td>
</tr>
<tr>
<td>Moderate</td>
<td>65%</td>
<td>12%</td>
</tr>
<tr>
<td>Severe</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Extreme</td>
<td>0%</td>
<td>0%</td>
</tr>
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![Bar chart showing the percentage distribution of Physician Global Assessment pre and post BMAC](chart.png)
Patient Factors in Sports After a TJA

Only 65% of patients active in sports prior to a TJA are able to return to sports

Bradbury et al., Am J Sports Med
• Joint pain, function not always better after joint replacement surgery!

(Between 1996-2011 479TJR /202 analyzed)

• By year two after surgery, average was 10-point improvement in pain and disability score. A 9-point improvement is considered “minimal important difference”. Reached in only 54%
TJA and Sports

• High activity level post TKA associated with:
  - Worse long term results, patient dissatisfaction, higher revision rates, lower implant survivorship
    Kilgus et al., CORR

• Increased risk of failure
  - Age <60yrs
  - Excessive loading
  - High intensity activity
Athletics After TJA

• Return to exercise does not necessarily imply return to sports

• Most pts after TJA pursue lower-intensity, lower impact activities (e.g., golf, walking)

• Our patient population is interested in higher intensity, high-impact sports (e.g., skiing, running, basketball, cycling, fly fishing)
Summary:

1) In general, patients decrease athletic participation, intensity, and diminish types of activity after TJA

2) Patients restore and increase athletic participation, intensity after BMAC