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%
TJA: Projections

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

• **2016:**
  – >50% TKA in <65 y.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 joint space, poss osteophytic lipping

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

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

- **Grade 4**
  - Lg osteophytes, marked narrowing joint 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
## Orthopaedic Scores

<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>
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<tr>
<td></td>
<td></td>
<td>HOOS</td>
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<td></td>
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<td>WOMAC</td>
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<tr>
<td>Knee</td>
<td>Knee Society Score (KSS)</td>
<td>Oxford Knee Score</td>
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<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°
<table>
<thead>
<tr>
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<th>THA</th>
<th>BMAC</th>
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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><strong>Post op</strong></td>
<td>None: 80.0%</td>
<td>None: 25%</td>
</tr>
<tr>
<td></td>
<td>Slight: 50%</td>
<td>Slight: 50%</td>
</tr>
<tr>
<td></td>
<td>Moderate: 25%</td>
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</tr>
</tbody>
</table>
Activity Level

- 73% of BMAC Hip recipients returned to sporting activities
Osteoarthritis of the Knee
Total Knee Replacement

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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<td>Physician Global Assessment</td>
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</table>
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

<table>
<thead>
<tr>
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<th>TKA*</th>
<th>BMAC</th>
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<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
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</tr>
<tr>
<td>TKA</td>
<td>(111) 67.05 y/o</td>
<td>(37) 55.35 y/o</td>
</tr>
<tr>
<td>BMAC</td>
<td>(53) 31.99</td>
<td>(37) 27.17</td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TKA</td>
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<tr>
<td>BMAC</td>
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</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 showing Knee Society Assessment Score comparison between TKA and BMAC pre and post operation.](image-url)
Knee Society Function Score

- **TKA**
  - Pre op: 40
  - Post op: 73

- **BMAC**
  - Pre op: 71.15
  - Post op: 90.31

Graph showing Knee Society Function Score improvement from pre-operative to post-operative measurements for TKA and BMAC procedures.
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

Pre BMAC | Post BMAC
---|---
None | 0% | 38%
Mild | 35% | 50%
Moderate | 65% | 12%
Severe | 0% | 0%
Extreme | 0% | 0%
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.