Improving Flexion in TKA
The influence of the Approach
Sebastien Parratte, Jean-Manuel Aubaniac
Jean-Noël Argenson
Sainte Marguerite Hospital, Marseille, France
www.chirurgie-arthrose.com

Basic TKA
+ Pain release
= Function improvement

Standard Approach
• Invasive surgery
• Longer recovery time

Year 2000: T Coon and A Tria
Minimally Invasive Of the knee
Limit the surgical trauma
• Faster recovery
• Return to the ADL and physical activities

MIS in TKA
Prothèses totales du genou par miniséquence
A Parratte, X. Rocher, J-N. Argenson
Limited approach
No eversion of the patella

Early results
• Faster recovery of the flexion in the first three months
• Comparable at one year
• 2 cm more proximal in the quad: NO difference
• Positionning comparable
Potential Problems

Varus Knee: different options

Anatomical background

Question

Goals of the study

Theoretical advantages?
- Faster recovery
- ROM
- Pain
- Hospital stay

Potential Draw-backs
- Technically challenging
- Implant malposition
- Increase surgical time
- Skin, septic complications

Limited skin incisions

Boni et al, JBJS, 2004
Pagnano et al, CORR 2006
Pagnano et al, J of Arthroplasty 2006

Bonuti et al, JBJS Am, 2004
Pagnano et al, CORR 2006
Pagnano et al, J of Arthroplasty 2006

MAYO CLINIC

Potential Problems

Varus Knee: different options

Anatomical background

Question

Goals of the study

Hypothesis: MIS Subvastus approach will improve early objective results after TKA
MIS Subvastus vs mini-para-patellar
No eversion of the patella in both groups

Material and Methods

• Study Design:
  Randomized Prospective Comparative Study

20 patients TKA Standard Approach
Post-op 2 months Gait analysis Strength Testing Subjective survey

20 patients TKA MIS-Subvastus Approach

Material and Methods

• Gait Analysis
  • 10 camera real-time system (Motion Analysis, Santa Rosa, CA)
  • Ground Conditions
    - Level – 15 m walkway
    - Stairs – 7 steps
        • Ascend
        • Descend

Material and Methods

• Strength Testing
  Biodex Systems 3 Pro
  Isometric Strength Flexion Extension

Material and Methods

• Subjective evaluation
  - Patient Milestone: pain, medications, crutches…
  - SF12: Health related QOL questionnaire
  - Knee Osteoarthritis Outcomes Score (KOOS)
  - self-administered questionnaire (8 to 10 mn)
  - Free access: www.koos.nu
  - "Improved WOMAC”
  - Validated and correlated with SF-36 QOL questionnaire

Material and Methods

Results

Gait Pattern: NO difference

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Preop</th>
<th>Postop</th>
<th>Preop</th>
<th>Postop</th>
<th>P value</th>
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</thead>
<tbody>
<tr>
<td>Spatio-temporal parameters Level Walking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Double limb support (%)</td>
<td>32 ± 6</td>
<td>29 ± 4</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Involved single limb support (%)</td>
<td>34 ± 4</td>
<td>38 ± 2</td>
<td>0.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking speed (m/s)</td>
<td>0.85 ± 0.15</td>
<td>0.97 ± 0.10</td>
<td>&lt;0.001</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Cadence (steps/min)</td>
<td>31.58 ± 5.72</td>
<td>35.68 ± 5.61</td>
<td>&lt;0.0001</td>
<td>0.46</td>
<td></td>
</tr>
<tr>
<td>Stride length (m)</td>
<td>0.99 ± 0.14</td>
<td>1.09 ± 0.13</td>
<td>&lt;0.0001</td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td>Kinematics / Kinetics Level walking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knee varus angle (°)</td>
<td>8.02 ± 3.52</td>
<td>3.88 ± 4.21</td>
<td>0.005</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knee valgus angle (°)</td>
<td>1.58 ± 3.06</td>
<td>5.66 ± 3.10</td>
<td>&lt;0.0001</td>
<td>0.05</td>
<td></td>
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<tr>
<td>Knee varus moment (Nm/kg)</td>
<td>0.41 ± 0.18</td>
<td>0.32 ± 0.08</td>
<td>0.005</td>
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<tr>
<td>Ankle plantarflexion moment (Nm/kg)</td>
<td>1.08 ± 0.18</td>
<td>1.18 ± 0.14</td>
<td>&lt;0.0001</td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td>Knee power generation (W/kg)</td>
<td>0.25 ± 0.14</td>
<td>0.52 ± 0.18</td>
<td>&lt;0.0001</td>
<td>0.46</td>
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</tr>
<tr>
<td>Ankle power generation (W/kg)</td>
<td>1.45 ± 0.55</td>
<td>1.69 ± 0.51</td>
<td>&lt;0.0001</td>
<td>0.46</td>
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</tr>
<tr>
<td>Upstairs Knee flexion angle (°)</td>
<td>80.45 ± 5.17</td>
<td>89.23 ± 2.72</td>
<td>0.009</td>
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<tr>
<td>Downstairs Knee extension moment (Nm/kg)</td>
<td>0.20 ± 0.06</td>
<td>0.31 ± 0.02</td>
<td>0.007</td>
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<td></td>
</tr>
<tr>
<td>Knee power absorption (W/kg)</td>
<td>1.37 ± 0.44</td>
<td>1.55 ± 0.46</td>
<td>0.038</td>
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<td></td>
</tr>
</tbody>
</table>

Table 4

Health and Quality of Life Outcomes

27/01/12
Results
Patient rated outcomes: NO difference

Table 3

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Non involved knee flexion (N.m)</th>
<th>Non involved knee extension (N.m)</th>
<th>Involved knee flexion (N.m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sports (/100)</td>
<td>62.93 Mean ± 52.14</td>
<td>52.14 Mean ± 49.84</td>
<td>71.5 Mean ± 58.94</td>
</tr>
<tr>
<td>ADL (/100)</td>
<td>62.93 Mean ± 52.14</td>
<td>52.14 Mean ± 49.84</td>
<td>71.5 Mean ± 58.94</td>
</tr>
<tr>
<td>Symptoms (/100)</td>
<td>62.93 Mean ± 52.14</td>
<td>52.14 Mean ± 49.84</td>
<td>71.5 Mean ± 58.94</td>
</tr>
<tr>
<td>Pain (/100)</td>
<td>62.93 Mean ± 52.14</td>
<td>52.14 Mean ± 49.84</td>
<td>71.5 Mean ± 58.94</td>
</tr>
</tbody>
</table>

Results
Delay to Return to ADL: NO difference

Table 2

<table>
<thead>
<tr>
<th>Table 2</th>
<th>To walk 6 block distance</th>
<th>To take care in normal daily activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>21.06 ± 13.42 ± 15.16</td>
<td>11.13 ± 12.35 ± 12.64</td>
</tr>
<tr>
<td>Post</td>
<td>21.06 ± 13.42 ± 15.16</td>
<td>11.13 ± 12.35 ± 12.64</td>
</tr>
</tbody>
</table>

Discussion => Real revolution
Not the approach of the knee but the approach of the patient
=> Peri-operative management
- Patient conditioning
- Pain management
  - multi-modal
  - Preemptive
- Faster rehabilitation program

Culture…

[Images of patients and cultural activities]
TKA Soft Tissue

Useful Length Extensor Mechanism

Shape of the approach more than size

Posterior aspect

Fixation and cement
Optimal implantation
Spaces
Stability/mobility

Instability After Total Knee Arthroplasty
Pr Aubaniac, JM, and M. N. Argenson
An Arthroplasty Core Seminar, American Academy of Orthopaedic Surgeons

Approach in TKA = Bone and ligaments
FRONTAL: « Known one »
SAGITTAL: « forgotten »
AXIAL: « Mystery »
Align 3D and fill the envelope!!!

Kinematics?

Kinematic Pattern
Preserve ACL
S Parratte, JM Aubaniac, JN Argenson
AAOS 2009
Knee Society 2009
Pr Aubaniac 1977

Same pattern
Not as good

Bicompartmental experience
Preserve ACL
Since October 2008
Conclusion

• Not only the approach of the knee but the approach of the patient

• Knee prosthesis basic principals: spaces

• Is it possible to really obtain good kinematics without preserving the four bar mechanism?