Total or Partial Knee Replacement for Medial Osteoarthritis of the Knee: 5 Year Results of TOPKAT A Multicentre Randomised Controlled Trial

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The views expressed are those of the author(s) and not necessarily those of the NIHR or the Department of Health and Social Care.
Disclosures – Professor David Beard

- Director of Royal College of Surgeons Surgical Trials Unit – no conflict.
- Oxford: Institutional Grants from Zimmer Biomet (trials) – unrelated no conflict
- Non Exec Director of PRO-MAPP Ltd (Oxford University Spin Out) - no conflict.

No conflicts with this work
Background

- 2017-18; 272,133 knee replacements in UK (UK NJR)
- £1.08 billion
- Wrong operation can cost £30-40 million
- Clinical & cost efficacy of TKA and PKA (antero-medial OA)
- NIHR HTA grant awarded 2009 (5 yr follow up)

Evidence: Small RCT, Cohort:
Liddle et al. BJJ 2015;97-B:793-801.

Null Hypothesis: No difference between PKR and TKR in outcome, survival and cost effectiveness at 1, 5 and (10 years).
Study Design

- **N=500** (250 PKR and 250 TKR)
- **Multi-site, multi-surgeon**
  - (min experience n=10 PKR performed)
- **Expertise design** for surgeons not in equipoise
- **5 yr. main follow up analysis**
- **Self report** (**OKS, AKS, UCLA, HAAS, EQ-5D, Failure, OKS-APQ, transition and satisfaction, LOS, Complications and RE-OPERATION**)

Protocol published

Beard et al. Trials 2013, 14:292
http://www.trialsjournal.com/content/14/1/292
Sites & Patients (Consort)

- Sites = 27
- Number of surgeons = 68

N = 528, 264 per group
Jan 2010 – Sept 2013

94% FU at 5 yrs

High implant representation with NJR

TKR group = 13 (5%) had PKR
PKR group = 31 (11%) had TKR
Results

- **OKS** by group
- 38 PKR: 37 TKR
- 18 pnt change for both procedures
- Diff: 1.04; 95% CI -0.42, 2.50) \( p=0.159 \)
- In favour of PKR
Results

More PKR patients with higher OKS scores

- **OKS** – Kernel Density Plot
  - **Diff:** 1.39; 95% CI 0.12, 2.90)  
    - *p*=0.07

- **AUC:** 36.6 v 35.1  
  - **Diff:** 1.54  
    - 95% CI (0.07, 3.01)  
    - *p*=0.04
## Transition & Patient Satisfaction

*☆ =<0.05*

<table>
<thead>
<tr>
<th></th>
<th>PKR</th>
<th>TKR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfied with Knee</td>
<td>81.5%</td>
<td>76.9%</td>
</tr>
<tr>
<td>Dissatisfied with Knee</td>
<td>6%</td>
<td>9%</td>
</tr>
<tr>
<td>Transition (improved compared to pre-op)</td>
<td>95.2%</td>
<td>90.1%</td>
</tr>
<tr>
<td>Have operation again</td>
<td>91.2%</td>
<td>84.3%</td>
</tr>
</tbody>
</table>

Nearly all other secondary outcomes in favour of PKR
# Re-operations (by treatment received)

50 Re-operations (n=514) in total (36 patients)

<table>
<thead>
<tr>
<th>Procedure</th>
<th>PKR (n=264)</th>
<th>TKR (n=269)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOTAL</strong></td>
<td>22</td>
<td>28</td>
</tr>
<tr>
<td>Revision</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Other procedures</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td><em>MUA</em></td>
<td>-</td>
<td>12</td>
</tr>
<tr>
<td><em>Aspiration</em></td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td><em>Arthroscopy</em></td>
<td>4</td>
<td>-</td>
</tr>
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NB: Revision data from RCT dissimilar to cohort data and registry data
“Composite Failure” (5 years)

- Composite outcome
- Re-operation and / or <4 point improvement in OKS

<table>
<thead>
<tr>
<th>“Failure” of intervention</th>
<th>PKR</th>
<th>TKR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>28</td>
<td>38</td>
</tr>
<tr>
<td>(10.6%)</td>
<td>(14.4%)</td>
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RR 0.74, 95% CI (0.51, 1.08); p-value 0.118
Cost effectiveness (& study strengths & weaknesses)

<table>
<thead>
<tr>
<th></th>
<th>PKR</th>
<th>TKR</th>
</tr>
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<tbody>
<tr>
<td>Total Costs</td>
<td>4,978</td>
<td>5,828</td>
</tr>
<tr>
<td>Initial Surgery</td>
<td>3,886</td>
<td>4,325</td>
</tr>
<tr>
<td>Follow up</td>
<td>1,092</td>
<td>1,504</td>
</tr>
<tr>
<td>Length of Hospital Stay (days)</td>
<td>3.3</td>
<td>4.3</td>
</tr>
</tbody>
</table>

PKR substantially more cost effective

- **Strengths**
  - Largest and longest follow up
  - External validity / generalisation
  - FU response rate
  - Equipoise model

- **Weaknesses**
  - No blinding
  - Some lack of compliance
Discussion

- Largest RCT in world to date – Level 1 evidence
- Study interpretation by 6 independent reviewers

Findings:
- PKR and TKR both give good outcome
- Modest (small) clinical benefit for PKR over TKR
- Revision rates similar between groups (and diff to UK NJR – >6%) – Why?
  - Selection bias in cohorts despite matching?
  - Trial effects?
    - Lower revision threshold for PKR outside a trial
    - Surgeon profile (self selected) – “good” PKR surgeons (PKR is a technically demanding operation)
- Complication and “failure” rate lower in PKR
- Health economic benefit for PKR
Clinical Relevance & Impact

- TKR is safe and useful
- But, providing availability (adequate expertise) exists...

- **PKR is likely Rx of choice** because;
  - General outcome trend at 5 years
  - Achieve more patients with higher outcome at 5 years
  - No evidence of increased revision risk at 5 years
  - Patients more satisfied at 5 years
  - More cost effective (for NHS and beyond)

References: