The Functional Outcome of Total Knee Replacement in Young Patients: A 10-Year Matched Case Control Study

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ABSTRACT
We present the results of a prospective study on the functional outcome from total knee replacement (TKR) in young versus old patients. American Knee Society and pain scores over ten years post TKR were compared using a cohort of young patients (≤ 55 years) and a control group of patients ≥ 56, matched for ASA, body mass index and preoperative condition. A total of 24 young and 24 older knees were analysed. All scores improved significantly over time. There was no statistical differences over 10 years in pain (p = 0.436) and knee performance (0.618). Overall function was consistently higher in the younger group (p = 0.004). TKR in younger patients produces similar outcomes in terms of pain and function compared with older patients and we feel that TKR should not be withheld on account of age alone.

Keywords: Component; Formatting; Style; Styling; Insert

1. Introduction
Total Knee Arthroplasty (TKA) is a proven treatment for severe joint pain in osteoarthritis of the knee. This intervention is well established in the elderly with predictable and reproducible results [1-4]. However, many orthopaedic surgeons are reluctant to perform TKA in younger patients due to the concern that high levels of activity may lead to increasing wear and aseptic loosening. Technical challenges and complications associated with multiple revisions are additional causes for concern in these patients [5]. There are a few reports showing favourable outcomes in the under 55 age group [6-8]. These series contain mainly patients suffering from rheumatoid arthritis and performed by surgeons in specialist centers [9]. It is not clear that these results would be reproducible in general orthopaedic practice [10].

There appears to be no studies comparing the progress of young patients following TKR for osteoarthritis of the knee compared to a control group of matched older patients. The aim of this study was to compare the outcome from total knee replacement (TKR) in young versus old patients in terms of pain and function.

2. Materials and Methods
All patients undergoing TKR in our institution since 1995, have been entered prospectively into a database and followed up at regular intervals. From this database we selected patients undergoing TKR who were under the age of 55 years at the primary procedure, regardless of diagnosis. We excluded those, which had not reached at least 10 years follow-up. Once these had been selected, a second control group was selected from the same database of patients, selecting patients who were over the age of 55yrs at the time of primary procedure, again regardless of diagnosis. The groups were matched for ASA, body mass index and underlying diagnosis.

All patients in the series had demographic and clinical outcome data collected prospectively on admission and at follow up clinics run by a specialist arthroplasty nurse at 10 days pre-operatively and 6 months, 18 months, 3 years, 5 years and 8-10 years post surgery. The operations were performed by six different consultant surgeons or by a trainee under direct supervision. The operations were performed in a filtered air operating theatre with laminar flow. Waterproof single use gowns and drapes were used and surgeon and assistant were double gloved. A tourniquet was used routinely.

Intramedullary referencing was used for the femoral cuts and extra-medullary referencing for the tibia. All patients in the study received either a PFC (1995-1997) or PFC Sigma CR (1998 onwards) total knee replace-
ment (Deputy Orthopaedics, Warsaw, IN) through a me-
dial para-patellar approach with the patient supine. The
patella was not routinely resurfaced, this was only per-
formed when patella wear was severe and the criterion
for resurfacing was at the discretion of the operating
surgeon. All patients had antibiotic prophylaxis with 1 g
Ceftriaxone shortly before inflation of the tourniquet,
pre- and postoperative thromboembolic prophylaxis using
low molecular weight heparin and full length graded
elastic stockings.

Drains were not used routinely. All surgeons used the
same instrumentation and patients underwent the same
postoperative regimen. Wounds were dressed with gauze,
wool and crepe dressings. These dressings were removed
on the first post-operative day and continuous passive
mobilisation was commenced. Blood transfusion was
only performed if the haemoglobin fell below 8.5 g/dl.
The pre- and postoperative haemoglobin, haemoglobin
drop, transfusion received, number of units used, tourni-
quen time, length of procedure and length of hospital stay
(LOS) were noted for each patient.

A transfusion policy was in place throughout the study
in which patients with a post-operative haemoglobin
level of less than 8.5 g/dl were transfused. Patients with a
postoperative haemoglobin level of between 8.5 g/dl and
10 g/dl were only transfused if they displayed clinical
symptoms, and those with a haemoglobin level above 10
g/dl were not transfused. Pre-operative cross matching of
blood was performed only in patients with a pre-oper-
tative haemoglobin level below 11 g/dl.

Change over time was analysed using a factorial re-
peated measures ANOVA test, which allowed for inves-
tigation of difference between groups.

3. Results

We identified 40 Knees in 26 patients who were 55 years
or younger at the time of primary TKR and within a time
frame that would allow 10 years of follow up. Of these 2
patients died prior to final follow up, 2 were revised
within the study period. (1 for infection within 2 years
and one for change of poly at 7 years) and a further 5
were lost to follow up.

35 knees had data at 10 years. These were matched
with older patients from the database with 10 year follow
up. The groups were matched for BMI, ASA and diagno-
sis. 7 knees could not be matched and were excluded.
This left a study group of 24 young and 24 older knees.
17 of each group suffer from Osteoarthritis and 7 from
inflammatory arthritis. This left a study group of 48 pa-
tients, 24 young and 24 older knees.

The average age for the younger group was 49.9 with a
range of (38 - 55) and the older 69.7 (range 57 - 84). The
average BMI for each group was 29 (Table 1).

Average Length of stay was higher for the older group
10.9 days compared to the younger group 8.13 days. This
trend continued in both unilateral and bilateral patient
groups, with bilateral replacements patients stayed an
average of 9.0 days in the young group compared with
11.3 in the older group in contrast to 7.7 and 10.8 days in
the unilateral knee replacement group.

Pain scores (p = 0.025) (Figure 1) and American Knee
Society “Knee” (p < 0.001) (Figure 2) and “Function” (p <
0.001) scores (Figure 3) changed significantly over time.
There were however no statistical differences over the 10
year period in pain (p = 0.436) and knee performance
(0.618) but overall function was higher throughout the
period in the younger group (=0.004).

The greatest difference is seen in the function scores
with the young group scoring 69.3 at ten years and the
older group scoring 54.5 (p < 0.05). It would appear that
the younger patients achieve and maintain a higher func-
tion after TKA. A decline is seen between 5 and ten
years that is reflected in the older group also. Both
groups are seen to decline at 10 years post arthroplasty
but the reasons for this are not clear. There is no increase
in the revision rate for either group at this time. The de-
cline may reflect a change in the activity profile of pa-
tients in both groups who are, by definition, 10 years
older.

The function scores are better for the younger knees
and remain so for longer. This difference may be due to
the general decline in mobility with advancing years. For
example the patient who uses a stick will lose points.

4. Discussion

The aim of this study was to compare functional out-
comes for young patients undergoing TKA with older
patients. The population at risk is likely to remain fit and
active for longer and many are keen to maintain an active
lifestyle despite joint disease [11]. As a result younger
patients are presenting to orthopaedics services request-
инг joint replacement [12].

Table 1. It shows patient demographics.

<table>
<thead>
<tr>
<th></th>
<th>Young</th>
<th>Older</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Age</td>
<td>49.9</td>
<td>69.7</td>
</tr>
<tr>
<td>Median age</td>
<td>53</td>
<td>71</td>
</tr>
<tr>
<td>Range</td>
<td>38 - 55</td>
<td>57 - 84</td>
</tr>
<tr>
<td>Average BMI</td>
<td>29.3</td>
<td>29.7</td>
</tr>
<tr>
<td>Male</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>Female</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>Bilateral</td>
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<td>6</td>
</tr>
<tr>
<td>Osteoarthritis</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Inflammatory</td>
<td>7</td>
<td>7</td>
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</tbody>
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TKA is routinely performed in older patients with osteoarthritis of the knee. There are reservations about offering this procedure to younger patients as their higher demands may lead to premature failure and subsequent revision. Harrysson et al. looked at a large cohort of patients and demonstrated higher revision risk for patient under 60 compared to their older counterpart. They note that the risk is related to the year of surgery and better results may be seen with newer implant technology [5]. Gloe et al. demonstrated a 14 year survival of 85% of cemented TKA in those under 55 year old. They showed revision risk was unaffected by younger age or diagnosis. [10]

A systematic review reported Implant survivorship between 90.6% and 99% during the first decade and between 85% and 96.5% during the second decade of fol-
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Patients aged less than 55 years undergoing TKA can achieve similar outcomes at 10 years post procedure in terms of pain and function compared with older patients when matched for ASA grade, BMI & diagnosis. This information is useful in counseling and consenting patients prior to surgery. Careful patient selection remains critical in achieving these outcomes. We suggest that TKA should not be withheld in patients under 55 years of age purely on grounds of age alone.

5. Acknowledgements

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Conflict of interest statement: None of the authors has received or will receive benefits for personal or professional use from a commercial party directly or indirectly related to the subject of this article. However, benefits have been received which have been solely directed to a non-profit making research fund with which one or more of the authors are associated.

REFERENCES


low-up. Mean American Knee Society clinical and functional scores increased by 47 and 37 points [7]. Ranawat et al report on a cohort of younger patients, Most of who suffered from rheumatoid arthritis. They highlight a radiographic lucency in 30% but it is unclear the clinical significance of this as they report a ten year survival of 96%.

The data presented here suggests that recipients of TKA gain similar functional & subjective benefit regardless of age and follow a similar course in the years following surgery. It is suggested from the results of our study that the younger patients achieve and maintain a higher function after TKA. The function scores are better for the younger knees and remain so for longer. Overall function was higher throughout the period in the younger group (p = 0.004). This difference may be due to the general decline in mobility with advancing years rather than specifically relating to TKA. It is important to note that both groups are seen to decline at 10 years post arthroplasty. This may herald an increase in the rate of revision for both groups as at 10 - 15 yr. There is not a marked decline in AKSS in the younger patients compared to the control. The trends between both groups remain similar with a decline between 5 and 10 years. We have made no observation regarding survivorship in either group as this lies out-with the scope of this study which was to look at the matched trends pain and functional outcome following TKA in patients under 55years of age. We aim to provide a separate study looking at survivorship of TKA at 10 years post procedure.

Our results suggest younger patients achieve similar results from TKA, in terms of pain and function, which are comparable and even superior to older patients when matched for ASA, Diagnosis and BMI. This agrees with other evidence suggesting good or excellent results after TKA [7,10,13]. Care must be taken in interpreting these results as a small number of patients were available at 10 years for review and represents a potential weakness in our study. This potential source of error may have occurred by those with poor outcomes self-selecting out by not returning for follow up.

The data does show a decline in AKSS between five and ten years. This may represent the beginning of potential problems for the younger patients with TKA. However it is interesting to note that this is not peculiar to the younger patients and this trend is seen in the matched controls as well. It is clear that this cohort of younger patients gained significant benefit from TKA continued to have good function at ten years of follow up. This highlights the importance of patient selection pre-operatively and setting realistic expectations of patients we consent for surgery. We plan to continue to observe this cohort through their second decade post TKA to see how the pain and function alters and when they come to revision.
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