Balancing training and outcomes in total knee replacement: A ten-year review

A. Faulkner [a,*], M.J. Reidy [a], P.S.E. Davies [a], W. Wang [b], N. Buddhadev [c], L. Johnston [b], B. Clift [a]

[a] NHS Tayside, Department of Trauma and Orthopaedics, Ninewells Hospital, Dundee, United Kingdom
[b] Institute of Motional Analysis and Research, Tayside Orthopaedics and Rehabilitation Technology Centre, United Kingdom
[c] Columbia Asia Hospital, Thaltej, Ahmedabad, Gujarat 380059, India

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ABSTRACT

Introduction: 10-year study examining differences in total knee arthroplasty (TKA) functional outcomes and survivorship in patients operated on by consultant and trainee orthopaedic surgeons.
Method: Data was prospectively collected from all elective TKAs performed at our three linked institutions. Patient demographics, surgeon grade, and length of hospital stay were recorded. Outcomes pre-operatively and at 1, 3, 5, 7 and 10 years included mortality, need for revision surgery and function as documented by the patients' Knee Society Score.
Results: 686 patients were included in the study. 450 (65.5%) patients were operated by consultant surgeons and 236 (34.4%) by trainees. On multivariate analysis no significant differences were observed between groups in length of hospital stay (p = 0.695), implant survival (p = 0.422), and function (p = 0.507) at 10 years. On Cox regression analysis no significant difference was observed in mortality (p = 0.209) at 10 years. 4 patients over this time period were lost to formal follow up.
Conclusion: No significant difference was observed in the TKA outcomes between consultants and trainees 10 years post-operatively.

Introduction

Total knee arthroplasty (TKA) is one of the most common procedures performed by orthopaedic surgeons; 160,000 such operations are performed each year in England and Wales alone.[1] For trainee surgeons, the development of competence through operative experience is fundamental.[2]

A delicate balance exists between ensuring excellent care and outcomes for patient and the need to train the next generation of surgeons. With unit level and potentially surgeon level data being made publically available in registries, consultants and their operative outcomes are under closer scrutiny.[2,3] The literature surrounding trainee and trainer outcomes remains contentious, with a review of 43,343

patients finding increased risk of 30-day complications with trainee involvement in arthroplasty.[4]

This study aims to investigate whether there is any significant short or long term difference in function, complications and implant survival up to 10 years when cases are performed by a trainee surgeon at our institution.

Methods

All elective primary TKAs performed in three linked institutions within our region in 2003−2004 were included. Patients requiring revision TKAs were excluded. A retrospective review of prospectively collected data through the regional arthroplasty database was conducted, after obtaining Institutional Caldicott guardianship. Primary outcomes were patient survival, implant survival and Knee Society Scores (KSS). Surgeon grade was determined by the primary surgeon in the operating note and recorded as either consultant or trainee. This was a cohort study reflecting normal practice and there was therefore no randomisation of patient.

Patient demographics including age, sex, body mass index (BMI), surgeon grade, and length of hospital stay, were recorded. Outcomes including revision rate and mortality were also recorded. Pre-operative KSS and post-operative score at 1, 3, 5, 7 and 10 years were documented.

Statistical analysis

This was performed using Statistical Package for Social Sciences (SPSS) version 22.0 (manufactured by IBM corporation, Armonk, New York) for Windows. Univariate analysis (ANOVA) was used to identify variables for multivariable analysis (MANOVA) to compare length of hospital stay within groups. Cox regression carried out was used to compare implant and patient survival between consultants and trainees. Univariate analyses were first carried out to identify variables of interest in multivariable analysis. The Mann Whitney U test was conducted for non-parametric data between groups. Significance of 5% and confidence of 95% were used in all analyses.

Results

Losses to follow−up, mortality and revision surgery are listed in Table 1. 686 patients were included: 321 males and 365 females. Mean age 69.92 (Range 30−94, SD 9.079). And mean BMI 29.8 kg/m^2 (Range 15.1−48.3, SD 5.31). The primary diagnoses for TKA were osteoarthritis (639, 93.1%), rheumatoid arthritis (35, 5.1%), post-traumatic arthritis (5, 0.7%), tibial plateau fracture (2, 0.3%), graft versus host disease (1, 0.1%), juvenile idiopathic chronic arthritis (1, 0.1%), osteonecrosis (2, 0.3%), and tuberculosis (1, 0.1%).

A total of 450 patients (65.6%) were operated by consultants and 236 (34.4%) by trainees. Breakdown of age, BMI and length of hospital stay between consultant and trainee is detailed in Table 2 and details of the type of implants used are detailed in Table 3. Those patients who withdrew from functional follow up continued to be followed up for implant survival and mortality.

Length of stay

The mean length of hospital stay for all patients was 8.13 days (Range 2−55, SD 4.098). For consultants it was 8.0 days and for trainees it was 8.39 days. In the univariate analysis age, gender, implant and knee society score pre-operatively reached the threshold for significance in the multivariate model. In multivariate analysis the choice of implant and post-operative protocol was significant. Surgeon grade did not have a significant effect on length of stay (p = 0.113 and 0.695 respectively). There were no interactions with other dependent variables (Table 4).

Patient survival

In the univariate analysis patient diagnosis reached threshold for significance in the multivariate model (Table 5). Surgeon grade did not have a statistically significant effect on patient survival (p = 0.209, p = 0.298) (Table 6).

Implant survival

34 revision procedures were performed during the study period. Of the primary surgeries 26 cases were performed by consultants and 8 by trainees. In univariate analysis, complication and length of hospital stay reached significance for inclusion in multivariate model. In multivariate analysis the development of a complication was significant in implant survival (Table 7). Surgeon grade did not have an effect on implant survival to revision (p = 0.422). Figure 1 demonstrates the Kaplan Meier curve for implant survival.

Table 1 − Loss of follow up during study period.					
Post-operative year	Died	Revision	Withdrawal from follow up	Loss to follow up	Patients remaining (n)
1	2	4	1	0	679
3	19	11	5	2	642
5	36	6	16	2	582
7	34	4	23	0	521
10	65	6	13	0	437
>10	21	3	7	0	406
Totals	177 (25.8)	34 (4.95)	65 (9.47)	4 (0.58)	