Clinical results and survivorship of the navigated Columbus total knee arthroplasty at five year follow-up

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Introduction: Computer-assisted total knee arthroplasty (TKA) is becoming more widespread. Indeed a survey by Friederich *et al.* showed that 33.1% of the ESSKA/SGO-SSO surgeons who responded to the survey use navigation for at least 50% of their TKAs with 25% of surgeons using navigation for 75% or more of their TKAs [1]. The navigated Columbus knee is a relatively new implant with no published medium or long term follow-up. Its extensive use within our dedicated arthroplasty centre led to this five-year clinical and radiological review.

Materials & Methods: This was a retrospective cohort study. The data have been collected as a normal part of the patients' treatment and recorded either in case notes, the departmental proprietary database or as radiographic images. Eligible patients were identified from departmental and hospital databases. The only inclusion criterion was that the patients had had a navigated Columbus primary TKA implanted between March 2005 and December 2006 using the image free OrthoPilot™ navigation system (Aesculap, Tuttlingen, Germany).

In addition to demographic and operative details, the following data were collected from the five-year follow-up appointment: range of motion (ROM), patient satisfaction, Oxford knee score (OKS) and radiological outcome (radiolucency and component position according to the Knee Society TKA scoring system). The Knee Society Score (KSS) was also computed. All complications, re-admission and revision surgeries were identified by request to the Scottish Information Services Division responsible for the Scottish Arthroplasty Project. They provided data on all cases of re-admission to any hospital in Scotland and the associated complications. For the survival data hospital records and the national PACS (Picture Archiving and Communication System) were used to identify the last know date when the patient was alive and the prosthesis was still in place. Descriptive statistics were used to describe the cohort and Kaplan-Meier analysis was used for the survival data.

Results: The study cohort was 219 knees in 205 patients (90 male, 116 left). Mean age was 69 years (48-89) and mean BMI 32.2 (SD 5.8). 95.4% of TKAs were performed by one surgeon (FP). Of these, 87 were lost to follow-up for various reasons including death due to unrelated causes and inability to travel to follow up appointments (due to the wide geographical area that the hospital serves). However the X-rays for 14 of the patients who were followed-up locally were analysed. Another 5 patients were excluded due to incomplete data.

Of the 219 knees operated on, twenty-one had a complication; ten still had intermittent mild to moderate pain, three had wound problems, one had a washout, one had DVT/PE within ninety days and one was diagnosed with patellar clunk syndrome. The remaining five patients had revision TKA (revision rate 2.3%), four for infection and one due to aseptic loosening (revision rate excluding infection 0.5%). Two of the infected revisions were done following their five year review and their X-ray was included in the radiological analysis. The Kaplan-Meier survival analysis (Figure 1) showed that the implant survival at 5.05 years was 96.2% (95% CIs 92.5%, 99.9%).

127 knees were reviewed at the follow-up clinic with a mean follow-up time of 59.8 months (SD 2.12). These include the five patients that were revised. Of these 96.4% were satisfied with their operation. The mean Oxford knee score had reduced from 42.5 (SD 8.2) pre-operatively to 23.4 (SD 9.2). The median KSS was 87 with 7 patients having a score less than 60. With regards to the KSS function score, the median score was 90. Mean fixed flexion was 1° (SD 2.8°, range 0° to 15°) with four patients having a fixed flexion of 6° or more. Mean maximum flexion was 100° (SD 10.2°, range 60° to 120°) with two patients having flexion less than 80°.

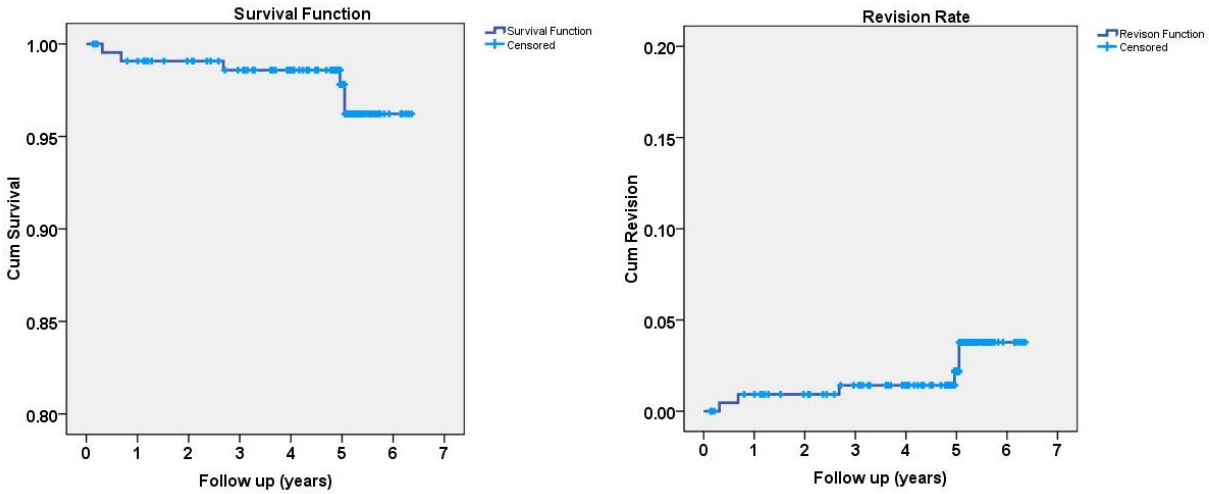

Figure 1: Plots from Kaplan-Meier survival analysis a) cumulative survival function b) cumulative revision rate

X-ray analysis of 138 knees showed that fifteen patients had a radiolucent line. Ten of these were not present at one year, six being at the tibial component. The component alignment was assessed from the five year short-leg X-rays using Ewald's [2] evaluation criteria (Table 1).

	Angle (SD)
Femoral flexion angle (α angle)	97.3 (3.2)
Tibial angle (β angle)	87.1 (7.6)
Femoral flexion angle (γ angle)	4.6 (2.0)
Tibial angle (σ angle)	87.8 (2.8)
Tibiofemoral angle (Ω angle)	5.6 (2.4).

Table 1: Post-operative component alignment

Discussion: The revision rate in our department (2.3%) is similar to that cited by the 2011 National Joint Registry report [3] (2.5%) with a very low revision rate (0.5%) for reasons other than infection (1.83%). This also compares favourably with national five year all-cause revision rate for cemented implants (3.08%). Furthermore, our revision rate when using the Columbus implant compares satisfactorily with other implants, both conventional and navigation. One study using a conventional TKA implant showed an all-cause revision rate of 3% [4]. The results in our study, show that the Columbus knee implant is functioning well at five years with a high satisfaction rate amongst patients.

References

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