A 5 to 8 year follow-up study of the Rotaglide mobile bearing total knee arthroplasty

Alastair Hudd · Kumar Kunasingam · David Ricketts · John Bush

Received: 6 January 2008 / Revised: 8 March 2008 / Accepted: 14 March 2008 / Published online: 2 July 2008
© Springer-Verlag 2008

Abstract We report the medium-term outcomes of the Rotaglide mobile bearing total knee arthroplasty (RTK). Between 1994 and 1999, 357 RTK prostheses were implanted at our institution. Of 150 knees attending for follow-up, none had needed revision. Mean American Knee Society Score (AKSS), Oxford knee score and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) score at 8 years were 153.6, 23.1 and 16.5, respectively. Radiological analysis revealed no prosthesis with signs of impending failure requiring revision. Survivorship was 100% in those attending. However, we are aware of two failures requiring revision, both of which were due to infection. We have no reported failures requiring revision due to aseptic loosening. This may be a result of the implant design. Limitations of the study include loss to follow-up and radiological analysis. The RTK gives good to excellent medium-term results and we support its continued use.

Résumé Nous rapportons les résultats à moyen terme de la prothèse à plateau mobile de type Rotaglide. Entre 1994 et 1999, 357 prothèses ont été implantées dans notre établissement. Sur 150 genoux pris en compte dans le suivi aucun n'a nécessité de révision. Les scores AKSS, Oxford et Womac à 8 ans ont été respectivement de 153.6, 23.1 et de

16.5. L'analyse radiologique n'a pas montré de signes de faillite nécessitant une révision. La courbe de survie est de 100% sur cette période. Nous surveillons deux échecs qui ont nécessité une révision dont tous les deux sont secondaires à une infection. Nous n'avons pas non plus rapporté d'échecs nécessitant une révision pour descellement aseptique. Ces bons résultats sont secondaires au design de l'implant. Les limites de cette étude sont les pertes de vue de l'analyse radiologique. Nous pouvons conclure que la prothèse totale du genou de type Rotaglide RTK permet de bons et d'excellents résultats à moyen terme et nous sommes encouragés à poursuivre son utilisation.

Introduction

We have used the original unmodified Rotaglide total knee arthroplasty (RTK) (Corin Medical, Cirencester, UK) since April 1994. In the literature to date only two studies have reported results for the RTK with follow-up of longer than five years [14, 15]. One of these publications was limited to a small series of bilateral total knee arthroplasties comparing the RTK mobile bearing to a fixed bearing total knee arthroplasty (TKA). In addition there are three studies showing short-term results with follow-up of between one and five years [3, 9, 10]. In total, approximately 3,000 RTKs have been implanted worldwide, with about 1,000 of these in the UK. In addition, a slightly modified RTK+ prosthesis has been implanted in approximately 27,000 knees with 6,000 of these in the UK.

The aim of this study was to report medium-term (5 to 8 year) follow-up of the RTK using a concise reporting format which allows comparison to future long-term studies [11].

A. Hudd (✉) · K. Kunasingam · D. Ricketts
Department of Orthopaedics, Princess Royal Hospital,
Haywards Heath, UK
e-mail: aphudd@aol.com

J. Bush
Department of Radiology, Princess Royal Hospital,
Haywards Heath, UK

Materials and methods

Study group

We included in the study patients who had an RTK at our institution from April 1994 to January 1999. Patient details were obtained from the operation register and from a computer database. Five consultants and 11 registrars performed 108 and 42 operations, respectively. Usually, the patient had a combined spinal and general anaesthetic. Patients were routinely mobilised on the first post-operative day. Patellar resurfacing was not routinely performed, this decision being left to the operating surgeon. Drains, if inserted, were only left in for 24–48 hours. The diagnosis was osteoarthritis in 143 knees (95%), rheumatoid arthritis in five knees (3%) and inflammatory arthritis in two knees (1%). The average hospital inpatient stay was 11 days (range: 4–107).

No other prosthesis was used for primary TKA during this period and all prostheses were the original RTK design. A modified 'Rotaglide plus' design was introduced to the market during this period by Corin Medical, but we did not use this.

In the period studied, 357 RTK prostheses were implanted into 317 consecutive patients (357 knees). A total of 52 patients (57 knees) had died and 132 (150) were lost to clinical and radiographic follow-up. This left 133 patients (150 knees) who attended for assessment.

Study design

All surviving patients were contacted and invited to attend a special clinic which was exclusively for RTK patients within this study. All attending patients were assessed clinically and radiographically.

The patients were clinically assessed by one of two authors neither of whom had performed any of the primary RTK arthroplasties. Both were Senior House Officers at the time of the study. The first three patients assessed by each observer were also seen by the other observer to try and

Fig. 1 AKSS scores

Fig. 2 Oxford knee scores

reduce inter-observer bias. There was no statistically significant difference between observers in any of the clinical scores obtained.

The clinical outcomes were assessed using three scoring systems: the American Knee Society Score (AKSS) [6], Oxford knee score (OKS) [4] and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) score [8]. Radiographic analysis was performed by a Consultant Musculoskeletal Radiologist (JB) using the system described by Ewald [5]. This conforms to the concise reporting format suggested by Poss et al. [11].

Statistical analysis

Kaplan-Meier survivorship analysis was performed using the following endpoints: revision for any cause, revision for aseptic loosening of the femoral component, revision for aseptic loosening of the tibial component and revision for aseptic loosening of the patellar component.

Results

At follow-up there were 52 males (59 knees) and 81 females (91 knees) with a mean age at operation of 70 years (56–91)

Fig. 3 WOMAC scores

Table 1 Clinical scores and radiolucency

Total radiolucency (mm)	No.	Year 5			No.	Year 6		
		AKSS	OKS	WOMAC		AKSS	OKS	WOMAC
0–4	5	179.4	16.8	5.6	7	161.9	17.7	10.1
5–9	2	164	19	7	2	159.5	14	7.5
>10	0				0			
	No.	Year 7			No.	Year 8		
		AKSS	OKS	WOMAC		AKSS	OKS	WOMAC
0–4	14	150.1	22.6	12.4	23	164.7	25.3	17.8
5–9	8	150.8	23	11.4	3	170	21	21
>10	0				0			

and mean age at follow-up of 80 years (66–100). There were 73 left-sided and 77 right-sided RTKs. Patellar resurfacing had been performed in 64 of 150 knees (42.7%).

All 150 knees (100%) were still in situ at follow-up. The mean time to follow-up was 79 months (range: 60–96, median: 84 months). We are aware that there were two revisions needed in patients who were lost to follow-up. Both of these were revised for infection between two and three years after the primary RTK. One had a successful two-stage revision procedure and the other underwent a revision which failed due to recurrent infection. This patient's knee was subsequently arthrodesed.

The mean AKSS scores were 164.1 at five years, 158.3 at six years, 159.3 at seven years and 153.6 at eight years (median: 175, 169, 159 and 153, range: 96–200, 71–200, 108–200 and 83–200, respectively) (Fig. 1). The mean Oxford knee scores were 19.9 at five years, 20.7 at six years, 21.8 at seven years and 23.1 at eight years (median: 17, 17.5, 20 and 21, range: 12–36, 12–44, 12–39 and 13–46, respectively) (Fig. 2). The mean WOMAC scores were 11.8 at five years, 11.4 at six years, 11 at seven years and 16.5 at eight years (median: 8, 4, 6 and 13, range: 0–46, 0–63, 0–60 and 0–70, respectively) (Fig. 3).

At follow-up we obtained radiographs of 64 knees. Radiographic analysis revealed 49 components with 0–4 mm of total radiolucency, 15 with 5–9 mm and none with 10 mm or more (Table 1).

The mean femoral anteroposterior (AP) valgus angle was 96.4° (range: 90–108°) and mean lateral flexion angle 4.3°

(range: –10 to 10°). The mean tibial AP position was 88.0° (range: 80–95°). Therefore, the mean tibial position was 2° varus. The mean tibial posterior slope was 8.1° (range: 0–18°). Overall, the tibiofemoral angle was 4.4° valgus.

Survivorship analysis revealed an overall survival of 100% at eight years for this cohort (Table 2). This represents the best case scenario. We are aware of two revisions for infection and the worst case survivorship would be 50%.

Discussion

Our results support the continued use of the Rotaglide total knee arthroplasty prosthesis.

The limitations of the study include the high loss to follow-up (150 knees, 50%) and low number of patients with radiographs available for analysis at the time of the study. Only the two revisions mentioned were recorded. Both of these were due to deep infection and both were revised between two and three years. Interrogation of the department's revision database (Manchester Orthopaedic Database) picked up these two revisions, but did not reveal any more of the 150 missing knees as having been revised at the time of the study.

The Manchester Orthopaedic Database has previously been shown to be highly accurate at our institution and the method of data entry has not changed since previous studies [1, 12]. We also conducted a search of 42 sets of notes from

Table 2 Kaplan-Meier survivorship

Years	At risk at start of year	Censored	At risk at end of year	Number revised	Proportion surviving this year	Cumulative survival (%)	95% Confidence
0–1	150	0	150	0	150/150=1	100	0
1–2	150	0	150	0	150/150=1	100	0
2–3	150	0	150	0	150/150=1	100	0
3–4	150	0	150	0	150/150=1	100	0
4–5	150	0	150	0	150/150=1	100	0
5–6	150	20	130	0	130/130=1	100	0
6–7	130	54	76	0	76/76=1	100	0
7–8	76	39	37	0	37/37=1	100	0

patients who had been lost to follow-up due to non-attendance. None of these were found to have been revised.

In light of the above we are of the opinion that the survivorship of the RTK knee is likely to be close to the 100% calculated by the best case scenario. If the known two revisions are the only failures then the survivorship would be 99% at 5–8 years. We do not have any evidence to support the worst case scenario being likely; however, without 100% attendance at follow-up this is impossible to prove.

Radiographic analysis reveals that no components had greater than 10 mm of radiolucency indicating impending failure [5]. Furthermore, there was no statistically significant difference in clinical scores between those with 0–4 mm and 5–9 mm of radiolucency.

The RTK compares favourably with other total knee arthroplasties at medium-term follow-up. At a similar time of follow-up survivorship of the Insall Bernstein II knee arthroplasty is 93.7–95.8% [7], the Nexgen 95.9–99.5% [2], the PFC 95.6–98.2% [13] and Kinemax over 96% [16]. Our study shows survivorship of the order of 99% with no revisions for aseptic loosening. This may be due to the tolerance to wear created by the design of the prosthesis.

Conclusion

The Rotaglide total knee arthroplasty offers patients good to excellent outcomes at 5–8 years. We support its continued use.

References

1. Barrie JL, Marsh DR (1992) Quality of data in the Manchester orthopaedic database. *BMJ* 304:159–162
2. Bozic KJ, Kinder J, Menegini M, Zurakowski D, Rosenberg AG, Galante JO (2005) Implant survivorship and complication rates after total knee arthroplasty with a third-generation cemented system: 5 to 8 years follow-up. *Clin Orthop* 430:117–124
3. Crova M, Olivero C (2000) Rotating knee prosthesis, surface or hinge replacement. *Orthopade* 29:543–544
4. Dawson J, Fitzpatrick R, Murray D, Carr A (1998) Questionnaire on the perceptions of patients about total knee replacement. *J Bone Joint Surg Br* 80(1):63–69
5. Ewald FC (1989) The Knee Society total knee arthroplasty roentgenographic evaluation and scoring system. *Clin Orthop* 248:9–12
6. Insall JN, Dorr LD, Scott RD, Scott WN (1989) Rationale of the Knee Society clinical rating system. *Clin Orthop* 248:13–14
7. Li PLS, Zamora J, Bentley G (1999) The results at ten years of the Insall-Burnstein II total knee replacement. *J Bone Joint Surg Br* 81B(4):647–653
8. Lingard EA, Katz JN, Wright RJ, Wright EA, Sledge CB, Kinemax Outcomes Group (2001) Validity and responsiveness of the Knee Society Clinical Rating System in comparison with the SF-36 and WOMAC. *J Bone Joint Surg Am* 83(12):1856–1864
9. Polyzoides AJ, Tsakonas A (1993) The Rotaglide knee replacement: results of the first 311 cases. *Proceedings of the Rotaglide Total Knee Course*, 29 October 1993
10. Polyzoides AJ (1996) The Rotaglide total knee Arthroplasty. *J Arthroplasty* 11:453–459
11. Poss R, Clark CR, Heckman JD (2002) A concise format for reporting the longer-term follow-up status of patients managed with total knee arthroplasty. *J Bone Joint Surg Am* 84:1105–1106
12. Ricketts D, Newey M, Patterson M, Hitchin D, Fowler S (1993) Markers of data quality in computer audit: the Manchester Orthopaedic Database. *Ann R Coll Surg Engl* 75:393–396
13. Schai PA, Thornhill TS, Scott RD (1998) Total knee arthroplasty with the PFC system. *J Bone Joint Surg Br* 80:850–858
14. Watanabe T, Tomita T, Fujii M, Hashimoto J, Sugamoto K, Yoshikawa H (2005) Comparison between mobile-bearing and fixed-bearing knees in bilateral total knee replacements. *Int Orthop* 29(3):179–181
15. Wilson CJ, Fitzgerald B, Tait GR (2003) Five year review of the Rotaglide total knee arthroplasty. *Knee* 10:167–171
16. Wright RJ, Sledge CB, Poss R, Ewald FC, Walsh ME, Lingard EA (2004) Patient-reported outcome and survivorship after Kinemax total knee arthroplasty. *J Bone Joint Surg Am* 86-A:2464–2470