Long-term results of retention of the posterior cruciate ligament in total knee replacement in rheumatoid arthritis

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We analysed the long-term results with a mean follow-up of 10.2 years, of 66 total knee replacements in 42 patients with rheumatoid arthritis. In all cases the posterior cruciate ligament was retained.

There were only three complications (4.5%). Revision surgery was necessary in five knees (7.6%), including one (1.5%) with infection. At the final follow-up, 75.8% of knees were rated excellent clinically. Only 15% had an excellent function score. The survival rate of the implant was 90.7% at 19 years.

The clinical, radiological and survivorship analysis shows that the posterior-cruciate-retaining knee arthroplasty performs well in rheumatoid arthritis.

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Total knee replacement (TKR) is the mainstay of treatment of knees affected with rheumatoid arthritis. An unresolved controversy is whether to retain or excise the posterior cruciate ligament (PCL).¹⁻⁴ Few studies have a follow-up of longer than ten years.^{5,6}

We present the long-term results of a prospective study of retention of the PCL in TKR in patients with rheumatoid arthritis.

Patients and Methods

Between 1976 and 1987, one surgeon (GSG) carried out 66 primary TKRs in 42 patients with rheumatoid arthritis, retaining the PCL in all cases. The mean age of the 10 men and 32 women at the time of surgery was 61.3 ± 10.4 years (30 to 77). January 2000 was designated the final follow-up date. At that time, 25 patients (38 knees) had died leaving

17 (28 knees) available for review. No patient was lost to follow-up. All patients were reviewed within one year of their last follow-up. The mean follow-up of all patients was 10.3 ± 5.4 years (0.2 to 19.8) and that of living patients 14.9 ± 1.8 years (12.9 to 19.8).

There were 31 right and 35 left knees. Three (4.5%) had undergone previous surgical procedures. In 43 knees (65.1%) there was a fixed flexion contracture with a mean value of $18.5 \pm 4.8^\circ$ (5 to 30). There were valgus deformities in 38 knees (57.6%). The remaining 28 (42.4%) were in neutral. No knee had a varus deformity.

We used the Total Condylar Prosthesis (Howmedica, Newark, New Jersey) from 1976 to 1982 and the Kinematic Condylar Prosthesis (Howmedica) from 1982 onwards. The overall results of the Kinematic Condylar Knee arthroplasties have recently been published.⁷ The purpose of this paper is only to consider problems related to rheumatoid arthritis. The operative technique has been described previously.¹⁻⁸ The patellae were resurfaced in all knees. All procedures were done without body-exhaust suits or laminar airflow, but antibiotics were routinely administered.

Limb alignment was assessed before and after operation. Clinical evaluation was undertaken at two and six weeks, six months, one year, and at variable intervals after that until the final follow-up. Clinical evaluation was based on the scoring system of the Knee Society,^{9,10} with a score of 85 or more being considered excellent and of less than 60, poor.

Statistical analysis. We used Kaplan-Meier analysis to calculate survivorship and actuarial methods to draw up a life table.¹¹ The first endpoint for survival was removal or revision of any component for any reason, and the second, or 'worst scenario', endpoint was revision and moderate pain (a pain score of less than 45) at final follow-up. We used the Wilcoxon signed-rank test to compare such variables as preoperative and postoperative clinical scores and range of movement. In all analyses, p values of less than 0.05 were considered to be significant. We used analytical software (StatsDirect, Camcode, Herefordshire, UK).

Results

The mean preoperative knee score of 33.6 ± 14.7 points improved significantly to 85.0 ± 29.5 at the final follow-up

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Table I. Actuarial life table for all 66 knees, with an endpoint of revision of a component for any reason

Interval (yr)	Number at start (at risk)	Revised	Intact knees	Lost to follow-up	Withdrawn	Adjusted number of knees at risk	Survival rate (%)	95% Confidence intervals
0 to 1	66	0	66	0	3	64.5	100.0	—
1 to 2	63	1	62	0	6	60	100.0	—
2 to 3	56	1	55	0	2	55	98.3	88.7 to 99.8
3 to 4	53	0	53	0	1	52.5	96.5	86.9 to 99.0
4 to 5	52	2	50	0	2	51	96.5	86.9 to 99.0
5 to 6	48	0	48	0	2	47	92.7	81.8 to 97.2
6 to 7	46	1	45	0	3	44.5	92.7	81.8 to 97.2
7 to 8	42	0	42	0	4	40	90.7	78.9 to 96.0
8 to 9	38	0	38	0	2	37	90.7	78.9 to 96.0
9 to 10	36	0	36	0	2	35	90.7	78.9 to 96.0
10 to 11	34	0	34	0	4	32	90.7	78.9 to 96.0
11 to 12	30	0	30	0	3	28.5	90.7	78.9 to 96.0
12 to 13	27	0	27	0	12	21	90.7	78.9 to 96.0
13 to 14	15	0	15	0	4	13	90.7	78.9 to 96.0
14 to 15	11	0	11	0	3	9.5	90.7	78.9 to 96.0
15 to 16	8	0	8	0	3	6.5	90.7	78.9 to 96.0
16 to 17	5	0	5	0	1	4.5	90.7	78.9 to 96.0
17 to 18	4	0	4	0	2	3	90.7	78.9 to 96.0
18 to 19	2	0	2	0	1	1.5	90.7	78.9 to 96.0
19 up	1	0	1	0	1	—	90.7	78.9 to 96.0

Fig. 1

Graphs showing the survival rates of the implants for the 42 patients (66 knees) who had TKR with PCL retention. Graph 1 (○), survival endpoint is revision of a component for any reason; graph 2 (□), 'worst scenario' survival endpoint is revision and moderate pain.

($p < 0.0001$). The clinical results were excellent in 50 knees (75.8%) and poor in eight (12.1%). The mean preoperative function score of 36.5 ± 19.1 points improved to 39.6 ± 34.4 , which was not significant ($p = 0.574$). At the final follow-up, function scores were excellent in only 15% of knees.

There was a significant difference in flexion, $106.36 \pm 37.0^\circ$ at follow-up compared with $88.7 \pm 29.3^\circ$ before operation ($p < 0.0001$). About 79% of knees had 100° of flexion or more. There was collateral instability of 5° to 10° in 6% of knees; the remaining 94% were stable. Fixed flexion contracture was present in seven knees (10.6%) and averaged $6.5 \pm 3.2^\circ$ at follow-up. Overall, knee alignment

was a mean of 5.9° of valgus (0 to 10). At the final follow-up there was less than 2 mm of cement-bone lucency in five femoral (7.6%), 12 tibial (18.2%) and six (9.1%) patellar components. Lucency of more than 2 mm was not observed.

There were three complications (4.5%); two patients had wound dehiscence and one a delayed supracondylar fracture. At the final follow-up, five knees (7.6%) had failed. Of these, one (1.5%) had been revised for infection, three (4.5%) for aseptic loosening and one for instability.

Table I is a life table for all 66 knees. Figure 1 shows the survival of the implant. Taking removal or revision of a component for any reason as the endpoint (graph 1), there

was an survival rate of 90.7% from 8 to 19 years (confidence interval (CI), 79 to 96). Using the 'worst scenario' as the endpoint (graph 2), the implant survival rate was 85.2% (CI 72.3 to 92.4) at ten years and 75.8% (CI 56.4 to 87.3) at 19 years.

Discussion

About 1% of the population has rheumatoid arthritis,¹² a progressively disabling disease which usually affects many joints. Up to 93% of patients with long-standing rheumatoid arthritis have at least one, and often both, knees affected.¹² TKR, which aims to relieve pain and improve function, has become the principal procedure in the treatment of knees destroyed by rheumatoid arthritis. Most reports quote rates of survival of the implant of 90% to 97%^{3,13-17} with a follow-up of less than ten years. Few studies have longer follow-up.^{5,6}

There is debate about whether to retain or excise the PCL.¹⁸⁻²⁰ Laskin and O'Flynn³ reported a higher rate of failure with PCL retention in TKR in patients with rheumatoid arthritis. Recently, Schai et al⁵ described a survival rate of 97% at 13 years in patients in whom the PCL had been retained at TKR. Using the Total Condylar Prosthesis and excising the PCL, Rodriguez et al⁶ had good to excellent results in 81% of cases and a survival rate of the implant of 91% at 15 years. In our study, the survival rate of the implant remained at 90.7% from eight to 19 years. The clinical results were excellent in 75.8% of knees. The less striking improvement in function reflects both the advancing age of the patients over the period of follow-up and the effects of progressive systemic disease involving many joints.

In long-term studies, the number of patients often decreases because of death from natural causes. Higher rates of mortality have been reported in patients with rheumatoid arthritis than in those with osteoarthritis.²¹ At a follow-up of more than 13 years, over 60% of our patients had died. There was one death within three months of surgery.

The rate of infection of 1.5% in our study is similar to that shown previously¹ and lower than that reported by others.^{6,15}

The number of patients in our study is small, but it has uniformity and is complete; a single surgeon carried out all the TKRs, patients received uniform postoperative care, and none was lost to follow-up. The satisfactory clinical and radiological results support the use of PCL-retaining knee arthroplasty in rheumatoid arthritis.

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