

Results of Revision Total Knee Arthroplasty

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ABSTRACT

Background/Aim of Study: The results of primary total knee arthroplasties have improved over the years but some still fail, requiring revision. Revision total knee arthroplasty is technically more difficult and has not enjoyed the same success rates as the index operation. The aim of this retrospective study was to review the results of revision total knee arthroplasties carried out at our centre. This is the first study in Singapore on revision total knee arthroplasty.

Methods: A retrospective study where 17 patients (18 knees) had been followed up since their revision operations were clinically assessed. Based on the Knee Society Clinical Scoring System, they were assigned separate knee and function scores (each having a maximum possible 100).

Results: The mean knee score was 76 (range 35 – 93), which rates as good. Of the 18 knees, 67% had excellent or good knee scores. By comparison, the mean function score was 56 (range 0 – 90) which rates as poor and 33% had excellent or good function scores.

Conclusion: Revision total knee arthroplasty achieves good and excellent results in spite of technical difficulties often associated with the revision operation. The difference in mean knee and function scores emphasises that many other factors such as physical strength and stamina affect function. Nevertheless, 15 patients were able to walk out of their house and around their neighbourhood for varying distances. This satisfied their expectations and the poor mean function score may reflect different expectations of patients overseas from whence this scoring system originated.

Keywords: total knee arthroplasty

INTRODUCTION

The results of primary total knee arthroplasty have improved over the years with a better understanding of surgical techniques, instrumentation and component design. This has reduced short-term failure rates from 70%⁽¹⁾ to 1%⁽²⁾ but some primary total knee arthroplasties still fail for reasons^(3,4) which include mechanical failure, infection, pain, instability and fractures of implants. These may require re-operation, which is a difficult and complex problem

as revision of a failed total knee arthroplasty has to overcome a variety of deficits associated with loosening. Massive bone loss and inadequacy of soft tissue lead to multiplane instability which often complicates revision total knee arthroplasty. Thus, by comparison, the overall results of revision total knee arthroplasty have remained unpredictable and do not enjoy the same success rates as the index procedure⁽⁵⁻⁹⁾.

The purpose of this paper was to provide a retrospective review of revision total knee arthroplasties carried out at our centre. For the procedure to be considered a revision total knee arthroplasty, the patient had to have had arthrotomy and replacement of at least 2 of the major components. This is the first local study on revision total knee arthroplasty.

MATERIALS AND METHODS

From December 1991 until March 1997, 22 patients (23 knees) underwent revision total knee arthroplasty at our centre. There were 6 men and 16 women, and the average age at the time of revision operation was 68 years (range, 45 – 78). The case records of only 21 patients (22 knees) were available and a further 4 patients (4 knees) were lost to follow-up, leaving 17 patients (18 knees) who were followed up for clinical assessment of knee and function score. The primary diagnosis leading to primary total knee arthroplasty was osteoarthritis in 16 patients, steroid induced osteoporosis with avascular necrosis of tibial plateau in 1 and rheumatoid arthritis in the remaining 1 patient.

Indications for revision (more than 1 could be involved for each patient) were loosening in 11, pain in 10, instability in 4 and infection in 3 (Table I). The average interval between primary and revision arthroplasties was 4 years and 4 months (range 3 months 3 weeks to 8 years 4 months). Average survival of first implant (from primary arthroplasty to revision arthroplasty/removal of prosthesis with later revision – a 2-stage operation) was 4 years 3 months (range from 16 days to 8 years 7 months). In 15 knees, revision arthroplasty was at the time of removal of the first implant. However, in the remaining 3 knees where revision was indicated due to infection, the average survival of the first implant was 5 months 3

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weeks (range from 16 days to 16 months) and an average interval of 4 months 1 week (range from 2 months 3 weeks to 6 months) between removal of the infected prosthesis and the revision arthroplasty that followed (Table II).

Based on the casenotes, a constrained condylar knee implant was used in 18 operations and posterior stabilised implants used in 3 knees. A total condylar implant was used in only 1 operation.

Our study has 17 patients (18 knees) followed up for an average of 28 months (range, 11 to 70 months). The clinical findings were assessed in these patients using the Knee Society Clinical Scoring System⁽¹⁰⁾. The system has 2 scores, the first score (knee score) is based on pain, range of motion and stability of the knee. Based on this scoring system, deductions in score were made depending on presence and degree (if any) of flexion contracture, extensor lag or alignment. All the measurements were made by the same person using a goniometer to ensure consistency and accuracy. The second score is based on function, considering the distance a patient can walk, the usage of stairs and deductions being made for the use of walking aids. This relies on the patient and relatives reporting on

the patient's function. The maximum score for both is 100 points. On the basis of these scores, the knees were rated as excellent (85 or more points), good (70 – 84 points), fair (60 – 69 points) and poor (< 60 points)⁽¹¹⁾.

The same system allows categorisation of patients based on their general health status and condition of the contralateral limb. Accordingly, 15 patients were in category A (unilateral total knee arthroplasty other knee asymptomatic, or bilateral with opposite knee successfully replaced) 1 in category B (unilateral total knee arthroplasty, other knee symptomatic) and 1 patient in category C (multiple arthritis or medical infirmity).

The mean operation time was 144 minutes (range: 70 minutes – 225 minutes).

RESULTS

The mean knee score in the 18 knees was 76 (range, 35 to 93), with 7 knees (38.9%) graded excellent, 5 knees (27.8%) good, 4 knees (22.2%) fair and 2 knees (11.1%) rated poor. Seventeen knees had no or only mild, occasional pain. The average range of motion was 95°. By clinical assessment, all 18 knees were stable (< 5mm maximum movement in any position) in the anteroposterior axis. In the mediolateral axis, 8 knees were found to be unstable. Six knees were found to be in misalignment, 5 of these were misaligned > 6°.

The mean functional score was 56 (range, 0 to 90), with 1 knee (8.3%) excellent, 5 knees (25%) good, 3 knees (8.3%) fair and 9 knees (58.4%) poor. There were 2 patients who scored 0 functionally. Of these 2 patients, 1 had a knee score of 93 (excellent) but was hampered in function due to severe deformity of the contralateral knee, for which she refused a revision operation. The other patient with a functional score of 0 was demented and bedbound. There were 10 patients (10 knees) who could walk at least 5 blocks, 1 patient was housebound and another unable to walk. Only 1 patient (1 knee) was able to climb stairs normally both going up and down while 14 patients (15 knees) required holding the railing both going up and down stairs. Two patients were not able to use the stairs at all. Eight patients were able to walk without the use of aids.

DISCUSSION

Revision total knee arthroplasty has rendered variable results. Insall reported 89%⁽³⁾ rated good or excellent at follow-up while Bryan had 67%⁽¹²⁾ rated satisfactory in his series. However, there is difficulty making comparisons as different types of revision surgery, implants, difference in length of follow-up and varying criteria for success or failure are used. In our study, we found that 67% had good or excellent knee scores but this figure dropped to 33% when considering functional scores. Previous studies have not scored the knee and function separately but function comprised only a portion of the overall score used to rate the knees in those studies.

Table I – Indications for revision total knee arthroplasty

| Indication | Number of patients | Percentage |
|-------------|--------------------|------------|
| Loosening | 11 | 64.8 |
| Pain | 10 | 58.8 |
| Instability | 4 | 23.5 |
| Infection | 3 | 17.6 |

Table II – Summary of main patient data and knee and function

| Patient | SCORES | | | |
|---------|------------------|--|------------|----------------|
| | Sex/Age revision | Survival of first implant | Knee score | Function score |
| 1 | Female/65 | 15 mths | 91 | 50 |
| 2 | Male/75 | 7 yrs 8 mths | 70 | 50 |
| 3 | Female/72 | 7 yrs 10 mths | 93 | 0 |
| 4 | Female/71 | 7 yrs 6 mths | 75 | 90 |
| 5 | Female/77 | 7 yrs 8 mths | 68 | 80 |
| 6* | Female/61 | Right: 8 yrs 4 mths Left: 7 yrs 11 mths | 88 88 | 45 45 |
| 7 | Male/68 | 2 yrs 9 mths | 67 | 45 |
| 8 | Female/69 | 5 yrs 5 mths | 69 | 75 |
| 9 | Male/45 | 2 yrs 2 mths | 55 | 80 |
| 10 | Female/75 | 8 yrs 7 mths | 93 | 80 |
| 11 | Female/77 | 8 mths | 69 | 45 |
| 12 | Male/75 | 4 yrs | 74 | 65 |
| 13 | Female/57 | 4 yrs 9 mths | 79 | 55 |
| 14 | Male/70 | 4 yrs 1 mth | 72 | 80 |
| 15 | Female/67 | 16 days** | 86 | 60 |
| 16 | Female/77 | 1 yr 4 mths** | 35 | 0 |
| 17 | Female/70 | 1 mth** | 90 | 60 |

* This patient had rheumatoid arthritis and underwent bilateral revision total knee arthroplasties.

** These patients had 2 stage operations due to infection. Thus, survival of the first implant only considers the interval from the primary operation to the time of removal of the infected prosthesis. The revision arthroplasties were carried out later (average of 4 months after the removal of the infected implant, range: 3 – 5 months).

It is interesting to note that although 7 knees were rated excellent, only 1 knee had an excellent function score. One patient had rheumatoid arthritis and underwent bilateral revision total knee arthroplasties. Her primary operations had been successful and survival of implants was about 8 years on both knees until which time, loosening of the implants and pain were indications for revision. Having undergone bilateral revision arthroplasties, she had excellent knee scores but was rated poor in function. This could be due to the fact that many other factors influence function in addition to the knee (which itself is important). Physical strength, stamina, layout of surroundings and family encouragement to be sedentary in view of a patient's age, all play an important part. Many of the patients' families discouraged their walking out of the house for long distances and as such they gradually walked less and less although their knees were good or excellent. Moreover, in modern day Singapore, there is not a need to be able to walk unlimited distances or > 10 blocks on a regular basis such that the function of these patients is acceptable. Many of the patients expressed satisfaction with their knees and function despite not being able to use stairs without holding the handrail and walking unlimited distances. Perhaps the functional score is too exacting in this aspect. The expectations of our local patients with regards to their function may be different from overseas from whence these scoring systems originate.

Correct alignment of the leg can allow revision total knee arthroplasty success rates to approach that of primary total knee arthroplasty⁽¹³⁻¹⁵⁾. This however, is a challenge with loss of bone stock quality and soft tissue inadequacy. Modular total knee arthroplasty systems allow accurate preoperative planning and a wide range of choice intraoperatively. In our series, constrained condylar knee prostheses were used in 78% (14 knee of cases, 64% of these cases being good or excellent). Another study yielded satisfactory results in using a modular semiconstrained system for revision total knee arthroplasty⁽¹³⁾.

There is a higher complication rate⁽¹⁶⁾ after revision total knee arthroplasty than after primary total knee arthroplasty but there were no post-op complications in our study.

CONCLUSION

The chief limitation of this study is the small number of cases and relatively short follow-up period. This is to be expected as they represent the small number of primary total knee arthroplasties which fail and require revision (though not all were revised). At our centre, there were 383 primary total knee arthroplasties and only 8 revision total knee arthroplasties in 1996. However, the number of revision operations will

continue to rise as the number of primary total knee arthroplasties has increased tremendously since the early 1990s. There were 11 revision operations from 1991 – 1995, but 8 revision operations in 1996 alone by comparison. As this is the first local report on revision total knee arthroplasty, it is hoped that it will contribute information on this subject for future research and comparison. Future studies may include preoperative assessment with roentgenographic evaluation in addition to postoperative assessment.

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