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ORIGINAL ARTICLE

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Survival after total joint arthroplasty in patients with rheumatoid arthritis. Comparison of the postoperative life expectancies and survival by initial operative years: 1970s and 1980s group versus 1990s group

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Abstract A total of 867 patients with rheumatoid arthritis (RA) underwent 1764 total joint arthroplasties (total hip arthroplasty and/or total knee arthroplasty) over three decades from 1970 to 1999. A survey on their postoperative survival was conducted in December 2000 in which these patients were divided into two groups. The patients who had their initial arthroplasty in the period 1970 to 1989 were classified as the "70s and 80s group," and those who had their initial arthroplasty from 1990 to 1999 were classified as the "90s group." Using the Kaplan–Meier method, their cumulative survival rates were compared. The survival rates of the 70s and 80s group, consisting of 433 patients, were 84.8% at the 5th postoperative year, 60.1% at the 10th year, and 45.3% at the 15th year. Although the survey period of the 90s group is shorter than that of the 70s and 80s group, their survival rates were 90.2% at the 5th year and 84.3% at the 10th year. At present, the life expectancies of the 90s group are good, and their cumulative survival rate is significantly greater than that of the 70s and 80s group ($P < 0.01$). It seems that this improvement has been contributed to by the recent increase in the number of RA patients with good prognoses and the well-timed application of arthroplasty, which decreases the number of patients with poor risk.

Key words Rheumatoid arthritis (RA) · Survivalship analysis · Total hip arthroplasty (THA) · Total knee arthroplasty (TKA)

Introduction

For the last three decades, the treatment for rheumatoid arthritis (RA) has been improved significantly by the progress in drug therapies and surgical procedure. Joint arthroplasty of the lower extremities, especially, has been a substantial aid to patients with RA for restoring to them the functions of their destructive joint involvements, and enabling them to walk. Recently, many reports on the remote results of clinical follow-up observation show that total knee arthroplasty (TKA) is durable enough to provide a survival rate of greater than 90% at the 10th postoperative year.[1–3] Although the long-term results of total hip arthroplasty (THA) is inferior to that of TKA as regards durability, the surgical procedure has been improved significantly by the improvement of the material, modification of the design, and the invention of new surgical techniques.[4,5]

Despite the increase in the survival rate of arthroplasty and the improvement of its postoperative results, the life expectancies of patients with RA still remain poor, and their average life span is shorter when it is compared with that of a healthy control group.[6–8] Even in Japan, it has been reported that the average life span of RA patients is the mid or late sixties, and those with arthroplasty are not exceptional. In this article, we report the results of our research on the life expectancies of RA patients who underwent arthroplasty on their lower extremities over the last three decades, from 1970 to 1999. A comparative study was conducted by dividing these patients into two groups, a "*70s and 80s group*" and "90s *group*," based on the years of their first surgery.

Patients and methods

In our hospital, THA for a patient with RA was first introduced in October 1970, being THA of the *Müller* type on the right hip joint of a female RA patient. Within the three decades up to 1999, arthroplasties of the lower extremity were performed on 1764 cases of 864 RA patients including the first patient. Total hip arthroplasty was performed on 565 joints of 385 patients with RA. The cases for which THA was performed for the neck fracture of the femur were not included in the subject group. Total knee arthroplasty was performed on 1199 joints of 719 patients with

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RA. The numbers of joint replacements at the last survey were one joint replacement in 274 patients, two joint replacements in 378 patients, three joint replacements in 90 patients, and four joint replacements in 123 patients. To clarify the progression of life expectancies, we investigated the 864 patients by dividing them into two groups in accordance with the years of their initial arthroplasty. The patients who had their initial arthroplasty more than 10 years ago (1970–1989) were classified as the "70s and 80s *group*," and those who had their initial arthroplasty in 1990 or later were classified as the "*90s group*." The mean ages and durations of illness of the former group were respectively 57.1 and 15.2 years at the time of the initial arthroplasty, while those of the latter group were 59.5 and 14.5, respectively. There was no significant difference between the two groups regarding these two factors.

Survival or death, or patients lost to follow-up as of December 2000 were investigated. For the patients who changed their hospitals, a follow-up survey was conducted by telephone. The life expectancies of the *70s and 80s group* and the *90s group* after the initial arthroplasty were compared. The life expectancies after the initial THA and those after the initial TKA were compared using the Kaplan–Meier method. For the sake of analytical convenience, patients who died within 2 months after surgery were also divided into a70s and 80s *group* and a 90s *group*, designated as cases of early death.

Results

Analysis of survival rates after the initial arthroplasty (Fig. 1)

Of the 864 patients, 471 (our hospital outpatients: 435; other hospitals: 36) had survived, and 285 had died as of December 2000. The rest of the 108 patients had been lost to follow-up (rate of follow-up: 88.9%). For these 108 patients the last available follow-up results were subjected to the analysis.

The cumulative survival rates of 433 patients of the 70s and 80s *group* after the initial arthroplasty were 84.8% at the 5th year, 60.1% at the 10th year, and 45.3% at the 15th year. The survival curve showed a gradual decline from the early postoperative period onward, with no sudden decrease. The 50% mortality period of all patients was 13 years 5 months postoperatively.

Four hundred and thirty-one patients underwent the initial arthroplasty in 1990 or later. Although the subject period of this 90s *group* is comparatively short, the survival rates were 90.2% at the 5th year and 84.3% at the 10th year. At present, the life expectancies of the 90s *group* are good, and their cumulative survival rate is significantly superior to that of the 70s and 80s *group* ($P < 0.01$).

Analysis of patient survival after THA or TKA (Fig. 2)

Of the 433 patients in the 70s and 80s *group* , 202 underwent THA and 393 underwent TKA as their initial operations. The life expectancies of these patients were analyzed. The cumulative survival rates of the THA group were 81.3% at the 5th year, 51.7% at the 10th year, and 34.9% at the 15th year, and those of the TKA group were 83.6% at the 5th year, 58.4% at the 10th year, and 45.4% at the 15th year. The cumulative survival rate of the THA group is greater than that of the TKA group. At the 10th postoperative year, approximately 50% of the THA group and 40% of the TKA group had not survived. Both of these two groups showed a gradual decline in the survival curve, starting at the early postoperative stage.

The same analysis was conducted on the 431 patients of 90s *group*. In this group 183 patients and 380 patients underwent THA and TKA, respectively. The cumulative survival rates of the THA group were 87.6% at the 5th year and 79.5% at the 10th year, while those of the TKA group were 89.7% at the 5th year and 83.8% at the 10th year. The cumulative survival rate of the 90s group is significantly greater than that of the 70s and 80s group ($P < 0.01$). Although these two groups showed very similar postoperative survival curves up until the 3rd postoperative year, that of the 90s group became significantly superior than that of the other at the 5th year.

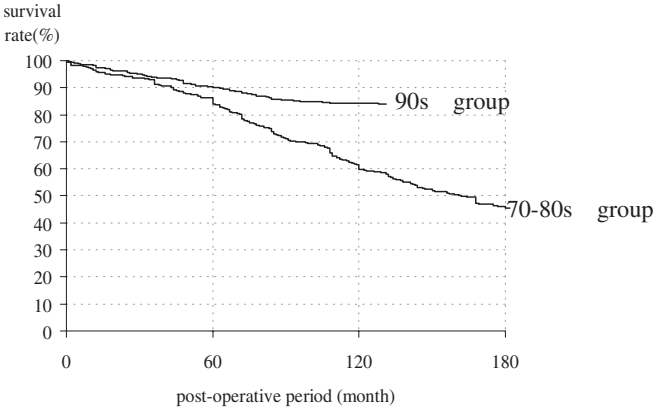

Fig. 1. Analysis of survival rates after the initial arthroplasty

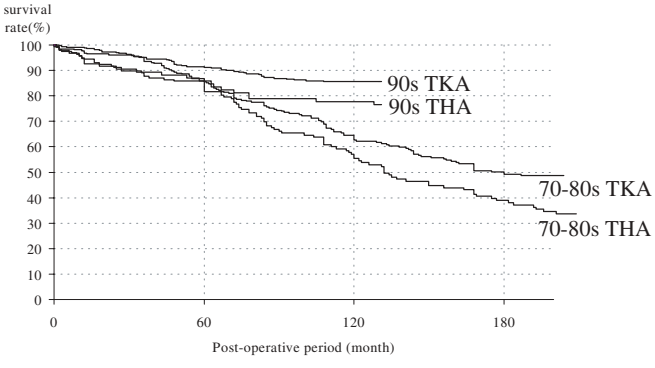

Fig. 2. Analysis of patient survival after total hip arthroplasty (*THA*) or total knee arthroplasty (*TKA*)

Table 1. Review of patients who died within a short time postoperatively

Patient	Age, sex	Year of surgery	Procedure	Survival	Cause of death
KT	54, F	1974	THA	3 days	Respiratory failure
KA	56, M	1975	TKA	1.5 months	Enterogastric bleeding
TI	50, F	1978	TKA	0 days	Cardiac arrest
KM	66, M	1980	TKA	1 month	Renal failure
RS	60, M	1981	TKA	3 days	Acute myocardial infarction
KH	56, F	1983	TKA	3 days	Acute myocardial infarction
HK	56, F	1987	TKA	1.5 months	Heart failure
SS	78, F	1995	TKA	1.5 months	Heart failure
SK	48, M	1997	THA	1.5 months	Renal failure

THA, total hip arthroplasty; TKA, total knee arthroplasty

Review of patients who died within a short time postoperatively (Table 1)

Nine patients who died either very soon after surgery or within 2 months due to general aggravation are listed in Table 1. These patients were among those with severe complications and/or who were in poor general condition preoperatively, comprising three patients in the 1970s, four in the 1980s, and two in the 1990s. Within the 10 years, the 70s and 80s *group* had 3–4 cases of postoperative early death. On the other hand, the 90s *group* had no very early death even though the number of the patients was greater. Their earliest cases were two patients who died one and a half months postoperatively. The number of deceased patients in the postoperative medium term of the 90s group is also smaller.

Discussion

For the last three decades, joint arthroplasty of the lower extremities (THA/TKA) for patients with RA has been improving considerably and significantly decreasing the number of bedridden patients, which contributes to improvement of their activities of daily living (ADL) and quality of life (QOL). Recently, there have been many reports on its stable long-term results, and the technique has been widely used. Although many references have been reported on the cumulative long-term survival rate of joint arthroplasty in RA patients, there has been a limited number of statistical reviews on the postoperative life expectancies and survival rate of RA patients themselves.

Hanyu et al.[9] studied postoperative life expectancies of RA patients who underwent kinematic total knee prosthesis in the 10 years between 1980 and 1985 by employing a life-table analysis. The survival curve of these patients indicated 0.72 at the 5th postoperative year and 0.56 at the 10th year. These results were significantly smaller than the expected survival rates of the control group, which was equivalent to the RA patient group in age and sex. The survival rate of the prosthesis, on the other hand, was 93% at the 10th postoperative year. Therefore, these authors concluded that the problem did not lie in the survival rate of the prosthesis but in the postoperative prognoses of RA patients. By calculating age-standardized mortality ratios (SMRs), Bohm et al.[10] analyzed the postoperative survival of osteoarthritis (OA) and RA patients who underwent TKA. The SMRs of female and male patients with OA |were 1.03 and 3.09, respectively, and those of the RA group were 2.92 for the female patients and 3.09 for the male patients. Their conclusion was that after receiving TKA, the RA patients had a greater mortality rate than either OA patients or controls. Regarding the postoperative life prognosis of THA, Lindberg et al.[11] and Surin and Sundholm[12] reported that RA patients showed a greater mortality rate than either OA patients or patients with a fracture of the neck of the femur. However, Holmberg[13] reported just the opposite.

Some reports in our hospital on the postoperative life expectancies of RA patients who underwent joint arthroplasty of the lower extremities have been investigated and presented. Asai et al.[14] reported on 93 RA patients who had their initial arthroplasty in the 1970s and more than 10 years of postoperative histories. In that report, he described 47 survivors, 42 deceased, and 4 unknown cases, indicating that nearly half of these cases did not survive. Furusawa et al.[15] investigated the influence of the surgery on the life expectancies of RA patients. They divided the patients into a nonoperated group and an operated group and categorized the operated patients according to the number of joint replacements. The life prognoses of these groups since the onset of RA were investigated and compared with each other. It was found that the surgical procedure did not have any adverse effects on the life expectancies of the RA patients, but contributed to the improvement of ADL and QOL in many cases.

In the present research, the cumulative survival rates of two groups were statistically analyzed using the Kaplan–Meier method. Regarding the 70s and 80s *group* , the cumulative survival rate 10 years after the initial arthroplasty was 60.1%, and those of the THA cases and TKA cases were 51.7% and 58.4%, respectively. These results are consistent with those reported by other researchers, i.e., approximately 40%–50% of patients die within 10 years postoperatively. However, the 90s *group* showed a clear tendency of improvement in their life expectancies as their cumulative survival rates at the 5th and 10th year were 90.2% and 84.3%, respectively.

Table 2. Changes in age at death and duration of illness of 324 deceased RA patients per decade between 1970 and 1999

	Number	Average age at death (years)	Average duration of illness (years)
1970–1979	39	62.2 ± 9.7 ┐ **	11.0 ± 7.2 ┐ **
1980–1989	123	65.3 ± 8.5 ┤ **	16.1 ± 6.8 ┤ **
1990–2002	186	68.7 ± 8.5 ┘	20.7 ± 9.2 ┘

RA, rheumatoid arthritis
** $P < 0.01$

Table 2 shows the changes in age at death and duration of illness of 324 deceased RA patients in our hospital, per decade between 1970 and 1999.[16] In each decade the mean age at the onset of RA is about 50 years, and no significant difference is noted. As time proceeds, however, the duration of the illness and the mean age at death increase. In Japan, similar results have been reported by Irimajiri and Ohta.[6–8] In recent years, these tendencies of prolonged duration of the illness and death in old age have become clearer. One reason for such tendencies is probably the increase in life span of the Japanese over the last three decades. The progress of systematic treatment methods for RA such as drug therapies, surgical procedure mainly by arthroplasties, diagnostic technologies for detecting general complications, and control methods for RA patients may also be other factors. Although it may be indirect, education of RA patients to increase their knowledge of RA and the treatments for it can be another factor.

In the past, the timing of the application of joint arthroplasty of the lower extremities was often too late. When a highly disturbed condition of a joint of the lower extremities is allowed to continue for a long time, it may have adverse effects not only on the neighboring joints but also on the physical and/or mental condition of the patient. In particular, a decrease in the reservation ability of the main organs may cause latent progression of diseases such as amyloidosis, especially in RA patients, and has adverse effects on life expectancy. In recent years, the number of RA patients with poor risk has decreased due to their understanding of arthroplasty and their positive participation in the surgery. This allows us to perform well-timed operations to prevent further progression of joint involvement, and the results have become stable.

In conclusion, the RA patients who underwent arthroplasty in the 1990s have an increased cumulative survival rate and improved life expectancy. The factors involved in these improvements are an increase in life span of the Japanese, improvement of RA treatment over the last three decades, and well-timed application of arthroplasty, which brings improved life expectancy of RA patients and a decrease in the number of cases with poor risk.

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