Joint Arthroplasty Within 10 Years After Primary Charnley Total Hip Arthroplasty

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Abstract

To evaluate the need for joint arthroplasty within 10 years after index primary Charnley total hip arthroplasty (THA) performed for osteoarthritis, we retrospectively reviewed the cases of 2,547 patients, 50 to 75 years old, from 1969 to 1984, with a minimum potential 20-year follow-up. In this article, we report the age, sex, and time data from this study.

For the entire patient population, the 10-year rate of undergoing contralateral THA was 35.0%; ipsilateral hip revision, 6.2%; ipsilateral total knee arthroplasty (TKA), 0.6%; contralateral TKA, 1.9%; and bilateral TKA, 0.2%. The 10-year death rate was 21.8%.

With more than 200,000 THAs being performed in the United States each year, these numbers can guide orthopedic surgeons in their discussions about subsequent arthroplasty procedures on other joints.

Total hip arthroplasty (THA) has been performed for numerous years and has had excellent long-term outcomes. Ten- to 25-year studies have shown prosthesis survivorship ranging from 85% to 96%.[1-4] It has been reported that patients who undergo THA are more likely than the general population to later undergo a contralateral THA.[5,6] Recently, patients with both osteoarthritis (OA) and rheumatoid arthritis more commonly had a contralateral hip replacement as a second total joint arthroplasty.[7] Furthermore, for the OA patients who had a total knee arthroplasty (TKA) as a second surgery, more likely the contralateral knee was replaced.[7] Few age, sex, or time data exist regarding the need for subsequent joint arthroplasty of the hip or knee. In the study reported here, we evaluated the need for arthroplasty within 10 years after index primary Charnley THA performed for OA. We report age, sex, and time data.

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Materials and Methods

We retrospectively reviewed the cases of 2,547 patients (1,425 men, 1,122 women), from 1969 to 1984, who had a primary Charnley THA performed for OA, with a minimum potential 20-year follow-up. Range of age at time of index arthroplasty was arbitrarily selected to be 50 to 75 years. Endpoints evaluated were contralateral THA, ipsilateral hip revision, ipsilateral TKA, contralateral TKA, bilateral TKA, death, and no second procedure. Kaplan-Meier survival methods were used to estimate the cumulative incidence for each event type.[8-10] Kaplan-Meier survival analysis results are given as probabilities that the next event will occur.

Results

During the surveillance period, 1,207 of the 2,547 reviewed patients died (Table I). For the 160 patients who did not undergo any arthroplasty procedure after the index primary Charnley THA, mean surveillance time was 21.9 years.

Table II summarizes the Kaplan-Meier survival estimates for the overall patient population data, and the Figure shows the Kaplan-Meier survival curves for these data. For the entire patient population, the 5- and 10-year rates of undergoing contralateral THA were 29.1% and 35.0%; ipsilateral hip revision, 2.0% and 6.2%; ipsilateral TKA, 0.3% and 0.6%; contralateral TKA, 1.3% and 1.9%; and bilateral TKA, 0.1% and 0.2%. The 5- and 10-year death rates were 7.8% and 21.8%.

Table III summarizes the Kaplan-Meier survival estimates for age. For patients 50 to 59 years old, the 5- and 10-year rates of undergoing contralateral THA were 33.6%

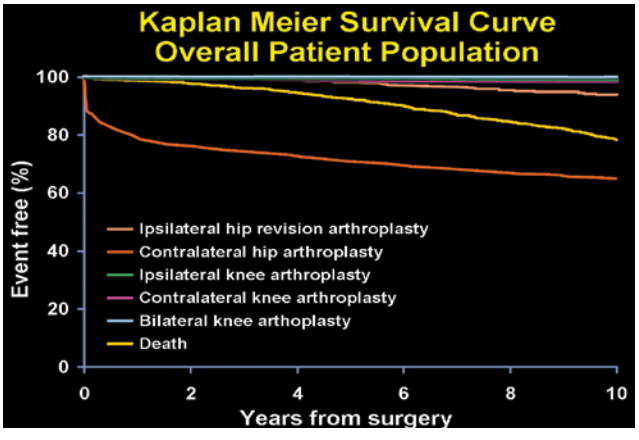

Figure. Kaplan-Meier survival curve (overall patient population).

Table I. Categorization of Overall Patient Population by Age and Procedure

Age (y)	Contralateral THA	Ipsilateral Hip Revision	Ipsilateral TKA	Contralateral TKA	Bilateral TKA	Death	No Event	Total
50–59	237	78	1	8	3	140	68	535
60–69	458	109	8	20	2	619	78	1294
70–75	208	28	4	14	2	448	14	718
Total	903	215	13	42	7	1207	160	2547

Abbreviations: THA, total hip arthroplasty; TKA, total knee arthroplasty.

and 41.7%; ipsilateral hip revision, 3.2% and 10.6%; ipsilateral TKA, 0.3% and 0.3%; contralateral TKA, 1.0% and 1.6%; and bilateral TKA, 0.2% and 0.2%. The 5- and 10-year death rates for these patients were 2.7% and 7.0%. For patients 60 to 69 years old, the 5- and 10-year rates of undergoing contralateral THA were 28.9% and 34.8%; ipsilateral hip revision, 1.5% and 5.8%; ipsilateral TKA, 0.2% and 0.6%; contralateral TKA, 1.2% and 1.7%; and bilateral TKA, 0.1% and 0.2%. The 5- and 10-year death rates for these patients were 7.1% and 18.9%. For patients 70 to 75 years old, the 5- and 10-year rates of undergoing contralateral THA were 26.0% and 29.8%; ipsilateral hip revision, 2.1% and 3.7%; ipsilateral TKA, 0.6% and 0.6%; contralateral TKA, 1.6% and 2.7%; and bilateral TKA, 0.2% and 0.2%. The 5- and 10-year death rates for these patients were 12.6% and 36.3%.

Table IV summarizes the Kaplan-Meier survival estimates for sex. For men, the 5- and 10-year rates of undergoing contralateral THA were 29.7% and 35.9%; ipsilateral hip revision, 2.4% and 7.2%; ipsilateral TKA, 0.3% and 0.5%; contralateral TKA, 1.3% and 1.8%; and bilateral TKA, 0.1% and 0.2%. The 5- and 10-year death rates for men were 10.5% and 26.5%. For women, the 5- and 10-year rates of undergoing contralateral THA were 28.4% and 34.0%; ipsilateral hip revision, 1.6% and 5.2%; ipsilateral TKA, 0.3% and 0.6%; contralateral TKA, 1.2% and 2.1%; and bilateral TKA, 0.2% and 0.2%. The 5- and 10-year death rates for women were 4.4% and 16.2%.

Discussion

Studies have shown that, after primary THA for OA, the most common second joint to be replaced is the contralateral hip.[5-7] However, these studies did not evaluate a specific hip prosthesis or did not report age and sex data. In the present study, we evaluated the need for joint arthroplasty after index Charnley THA. The Charnley THA was chosen for evaluation because of its excellent long-term survivorship.[4] We are not aware of any studies that address age, sex, and time data for a specific hip prosthesis. Although our study was a retrospective Mayo Total Joints Registry review, its large patient population and long-term follow-up add validity to the data. By being specific with our inclusion criteria and endpoints, we minimized the bias generated from the Mayo Total Joints Registry review.

Our results showed that patients aged 50 to 59 had a 41.7% chance of undergoing a contralateral THA, and a 1.6% chance of undergoing a contralateral TKA, within 10 years after a Charnley THA. With more than 200,000 THAs and 400,000 TKAs performed each year in the United States, these numbers can guide orthopedic surgeons in their discussions about subsequent arthroplasty procedures on other joints.[11]

Previous investigators have speculated that biomechanical factors may play a role in the evolution of end-stage OA of the lower extremities to contralateral joint involvement.[7] Patients might compensate for abnormal forces across a diseased joint and thereby unload it, causing increased compensatory forces across the contralateral joint. If a patient already had OA in the contralateral joint, one could hypothesize that the compensatory forces would lead to OA progression and possibly to hip or knee arthroplasty. In one study, in patients with unilateral THA, the probability of OA progressing in the contralateral diseased hip was 78.6% at 10 years, with a 53.8% chance of arthroplasty being performed.[12]

Regarding revision hip arthroplasty after a primary Charnley THA, our data showed that patients aged 50 to 59 at 10 years had a 10.6% probability of undergoing a revi-

Table II. Kaplan-Meier Survival Estimates by Total Patient Population

	5-Year Estimates			10-Year Estimates		
	P (Event)	95% CI		*P* (Event)	95% CI	
Contralateral THA	29.1%	27.3%	30.9%	35.0%	33.0%	36.9%
Ipsilateral hip revision	2.0%	1.4%	2.7%	6.2%	5.0%	7.4%
Ipsilateral TKA	0.3%	0.1%	0.6%	0.6%	0.2%	0.9%
Contralateral TKA	1.3%	0.8%	1.8%	1.9%	1.3%	2.6%
Bilateral TKA	0.1%	0.0%	0.3%	0.2%	0.0%	0.4%
Death	7.8%	6.6%	9.0%	21.8%	19.8%	23.8%

Abbreviations: THA, total hip arthroplasty; TKA, total knee arthroplasty; *P*, probability; CI, confidence interval.

Table III. Kaplan-Meier Survival Estimates by Age

	Age 50–59 Years			Age 60–69 Years			Age 70–75 Years		
	P (Event)	95% CI		*P* (Event)	95% CI		*P* (Event)	95% CI	
5-Year Estimates									
Contralateral THA	33.6%	29.4%	37.6%	28.9%	26.4%	31.4%	26.0%	22.7%	29.2%
Ipsilateral hip revision	3.2%	1.4%	4.9%	1.5%	0.7%	2.3%	2.1%	0.9%	3.4%
Ipsilateral TKA	0.3%	0.0%	0.8%	0.2%	0.0%	0.4%	0.6%	0.0%	1.2%
Contralateral TKA	1.0%	0.0%	2.0%	1.2%	0.5%	1.8%	1.6%	0.6%	2.7%
Bilateral TKA	0.2%	0.0%	0.7%	0.1%	0.0%	0.3%	0.2%	0.0%	0.5%
Death	2.7%	1.1%	4.2%	7.1%	5.5%	8.7%	12.6%	9.7%	15.4%
10-Year Estimates									
Contralateral THA	41.7%	37.2%	45.8%	34.8%	32.1%	37.5%	29.8%	26.2%	33.3%
Ipsilateral hip revision	10.6%	7.2%	13.9%	5.8%	4.1%	7.4%	3.7%	5.5%	1.9%
Ipsilateral TKA	0.3%	0.0%	0.8%	0.6%	0.1%	1.1%	0.6%	0.0%	1.2%
Contralateral TKA	1.6%	0.3%	2.9%	1.7%	0.8%	2.5%	2.7%	1.2%	4.2%
Bilateral TKA	0.2%	0.0%	0.7%	0.2%	0.0%	0.6%	0.2%	0.0%	0.5%
Death	7.0%	4.2%	9.7%	18.9%	16.3%	21.5%	36.3%	31.9%	40.4%

Abbreviations: THA, total hip arthroplasty; TKA, total knee arthroplasty; *P*, probability; CI, confidence interval.

Table IV. Kaplan-Meier Survival Estimates by Sex

	Men			Women		
	P (Event)	95% CI		*P* (Event)	95% CI	
5-Year Estimates						
Contralateral THA	29.7%	27.2%	32.0%	28.4%	25.7%	31.0%
Ipsilateral hip revision	2.4%	1.4%	3.4%	1.6%	0.7%	2.4%
Ipsilateral TKA	0.3%	0.0%	0.6%	0.3%	0.0%	0.7%
Contralateral TKA	1.3%	0.6%	1.9%	1.2%	0.5%	2.0%
Bilateral TKA	0.1%	0.0%	0.3%	0.2%	0.0%	0.5%
Death	10.5%	8.6%	12.4%	4.4%	3.0%	5.8%
10-Year Estimates						
Contralateral THA	35.9%	33.2%	38.4%	34.0%	31.0%	36.7%
Ipsilateral hip revision	7.2%	5.4%	8.9%	5.2%	6.8%	3.6%
Ipsilateral TKA	0.5%	0.0%	0.9%	0.6%	0.1%	1.2%
Contralateral TKA	1.8%	0.9%	2.6%	2.1%	1.1%	3.2%
Bilateral TKA	0.2%	0.0%	0.6%	0.2%	0.0%	0.5%
Death	26.5%	23.6%	29.3%	16.2%	13.5%	18.8%

Abbreviations: THA, total hip arthroplasty; TKA, total knee arthroplasty; *P*, probability; CI, confidence interval.

sion procedure. This percentage fits with current revision rates after primary Charnley THA.[4,13] With regard to sex, we did not detect a significant male–female predominance. Men had 5- and 10-year probabilities of 29.7% and 35.9%, respectively, and women had 5- and 10-year probabilities of 28.4% and 34.0%, respectively.

We have shown that contralateral hip arthroplasty occurs at a rate of 41.7% within 10 years after primary Charnley THA for patients aged 50 to 59. These numbers will allow orthopedic surgeons to inform patients better as to subsequent procedures on other joints.

Authors' Disclosure Statement

Dr. Trousdale wishes to note that he receives royalties from DePuy and Wright Medical. Dr. Pagnano wishes to note that he is a paid consultant to and receives royalties for hip and knee products from Zimmer and he is a paid consultant to and receives royalties for knee products from DePuy. The other authors report no actual or potential conflict of interest in relation to this article.

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