

Early Morbidity after Total Hip Replacement:

Rheumatoid Arthritis Versus Osteoarthritis

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The authors used the California Health Facilities Discharge data for 1984 and 1985 to compare retrospectively in-hospital morbidity and mortality of all 721 patients with rheumatoid arthritis versus all 8,859 patients with osteoarthritis who underwent a non-emergent, first-time, unilateral total hip arthroplasty. The lengths of hospitalization, in-hospital mortality rates, and incidences of post-operative complications were similar in the two groups except for bigger rates of wound infection and wound dehiscence in the patients with rheumatoid arthritis and a higher rate of thromboembolic events in the osteoarthritis group. The short-term outcome of patients with rheumatoid arthritis appears comparable to that of patients with osteoarthritis.

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PATIENTS who have rheumatoid arthritis (RA), particularly those individuals with advanced articular disease, are frequently referred for internal medicine consultation prior to undergoing major elective orthopedic surgery. Whether advanced RA represents a significant risk factor associated with increased morbidity or mortality following major surgery has not been adequately studied.¹ Case reports and small series document that unusual complications that are directly related to the disease process can occur perioperatively. Examples include difficulty in managing the airway because of cricoarytenoid arthritis,^{2,3} intraoperative fractures due to osteopenia,⁴ and poor wound healing.^{5,6} Complications may also occur secondary to the side effects of drugs used to treat RA, particularly oral corticosteroids and nonsteroidal antiinflammatory agents.⁷⁻⁹

We sought to determine whether early in-hospital morbidity and mortality are increased in patients with RA compared with patients with osteoarthritis (OA) following major orthopedic surgery. Osteoarthritis patients were chosen as the control group because the disease process leading to arthroplasty is localized to joints and not associated with the systemic manifestations that may accompany RA. Using a large data bank that is maintained by the state of California, we analyzed all of the total hip arthroplasties performed in California in 1984 and 1985.

METHODS

The State of California Health Facilities Commission maintains computerized records of all patients discharged from acute care hospitals each year. These records include the hospital facility number; patient age, sex, and race; length of hospitalization; type of admission (emergent, urgent, elective, etc.); principal diagnosis using the International Classification of Disease (ICD) code; principal procedure using the ICD code; up to 24 diagnoses; up to four secondary procedures performed during the hospitalization; source of admission (routine, transfer, emergency room); disposition of the patient (death, routine discharge, etc.); expected principal source of payment (e.g., Medicare, Medicaid, insurance), date from admission to procedure; and the diagnosis-related group (DRG). The patient's hospital number, date of birth, and discharge date are not recorded in order to ensure patient confidentiality, making it impossible to audit specific charts.

Using the data for 1984 and 1985, we examined the lengths of hospitalizations, the frequency of deaths, postoperative complications, and comorbid diseases in patients who had a principal procedure of total hip arthroplasty (ICD 81.51 or 81.59) and who had a principal diagnosis of either RA (ICD 714-714.9) or OA (ICD 715.0-715.98). Patients with any other principal diagnosis who underwent total hip replacement were excluded. Examples of diagnoses that were excluded included fracture of the hip, aseptic necrosis, and revision of a prior total hip replacement. Since we were interested only in elective operations, all admissions that were categorized as "emergent" were excluded. Because some orthopedic surgeons label any advanced arthropathy that destroys all articular cartilage advanced OA (R. Marder, personal communication), we included in the RA group patients who had a primary diagnosis of OA but who also had a secondary diagnosis of RA. Patients who had a second total hip arthroplasty during the same hospitalization or who underwent revision of a prior total hip arthroplasty were excluded.

In order to correlate the length of hospitalization and complication rates with the frequency of total hip arthroplasties at each hospital, we categorized the hospitals into quartiles based on the total number of hip arthroplasties done for any reason at each institution during the two-year period. In addition, the observed ethnic distribution within the OA and RA groups was

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compared with the distribution expected based on age-adjusted 1980 California census data.

Complications occurring during the hospitalization that were studied included urinary tract infections (ICD 590.1, 590.8, 599.0), wound infection (ICD 998.5), pneumonia and atelectasis (ICD 481, 482, 518.0, or 997.3), myocardial infarction (ICD 410), intraoperative cardiac complications (ICD 997.1), gastrointestinal complications related to surgery (ICD 997.4), deep vein thrombosis (ICD 451.1, 451.2, 451.8, 453.8, or 997.2), pulmonary embolism (ICD 415.1), hemorrhage (ICD 285.1 or 459.0), or excessive intraoperative bleeding or hematoma (ICD 998.1), wound dehiscence (ICD 998.3), and other complications related to surgery (ICD 998.8). Comorbid conditions that were looked for included malignant neoplasms (ICD 140–210), diabetes mellitus (ICD 250–250.8), hypertension (ICD 401 or 405), congestive heart failure (ICD 428–428.9), cerebrovascular accident (ICD 430–435.9), and chronic obstructive pulmonary disease, including asthma and bronchiectasis (ICD 490–494).

We analyzed the data using procedures contained in the Statistical Analysis System (SAS) software package.¹⁰ Distributions of continuous variables were described using medians, means, and standard deviations. Group comparisons for categorical variables were made using chi-square statistics or Fisher's exact test. The Wilcoxon rank-sum test was used for group comparisons of continuous variables. No corrections were made for multiple comparisons. All p values represent two-tailed tests for significance. Lengths of stay were categorized as "normal" (15 days or less) or "prolonged" (more than 15 days) and evaluated using logistic regression techniques. A stay of over 15 days was chosen to represent a prolonged stay since it was appreciably longer than the median length of stay and was felt to be a clinically appropriate cut-off time. Logistic regression analysis was conducted on cases of patients discharged in 1984 to avoid lead-time bias.^{11, 12} The odds ratio derived from logistic regression is presented as the measure of association between the likelihood of a prolonged stay and various factors of interest. The frequencies of complications in the two groups were compared using the chi-square test after stratifying using ten-year age groups.

RESULTS

A total of 16,346 elective total hip arthroplasties were performed in California during 1984 and 1985. Of the 16,346 patients, 9,056 (55.4%) had OA as a principal diagnosis; 2,506 (15.3%) had a complication of a prior orthopedic prosthesis (ICD 996.4); 2,111 (12.9%) had a femur fracture; 1,389 (8.5%) had aseptic necrosis; 624 (3.8%) had RA; and the remainder had a variety of other principal diagnoses.

TABLE 1

Demographic Features of Patients with Rheumatoid Arthritis and Patients with Osteoarthritis Who Were Discharged after a Unilateral Total Hip Arthroplasty in California during 1984 or 1985

	Osteoarthritis (n = 8,859)	Rheumatoid Arthritis (n = 721)	p*
Sex female	60.2%	75.7%	<0.001
Age			
Mean ± SD	68.5 ± 10.2 years	58.1 ± 15.2 years	<0.001
Median	69 years	61 years	
Race			
White	92.1%	78.2%	<0.001
Black	2.9%	5.4%	<0.001
Hispanic	2.7%	12.1%	<0.001
Asian	0.6%	2.5%	<0.001
Other	1.7%	1.8%	NS
Source of payment			
Medicare	69.9%	54.9%	<0.001
Medicaid/ government	3.0%	10.0%	<0.001
Insurance	25.3%	32.6%	<0.001
Other	1.8%	2.5%	NS

*NS if p > 0.05, not corrected for multiple comparisons.

There were 8,980 patients with the principal diagnosis of OA and 600 patients with the principal diagnosis of RA who were not undergoing a revision arthroplasty or bilateral total hip arthroplasties. For 121 individuals with a principal diagnosis of OA, RA was listed as a secondary diagnosis. Because these individuals probably had RA with secondary degenerative changes and had been miscoded as having a principal diagnosis of OA, we classified them as having RA. This gave a total of 8,859 patients with OA and 721 patients with RA. There were no important demographic differences between the 121 patients with a secondary diagnosis of RA and the 600 patients with a primary diagnosis of RA.

The demographic characteristics of the study population are shown in Table 1. Patients in the RA group were more likely to be female and were younger on average than the OA patients. The ethnic distributions in the two groups were also significantly different, with a greater percentage of whites in the OA group and a higher percentage of blacks, Hispanics, and Asians in the RA group. The source of payment reflected the age distribution of each population, with a higher percentage of Medicare patients in the OA group and a greater percentage of disabled Medicaid recipients or insured patients in the RA group.

In patients with OA, the ratios of the observed to the expected numbers of patients in the various ethnic groups after age adjustment were 1.12 for whites, 0.60 for blacks, 0.34 for Hispanics, and 0.17 for Asians. In patients with RA, the corresponding ratios were 1.00 for whites, 0.91 for blacks, 1.07 for Hispanics, and

0.58 for Asians. There was no difference between the groups in the prevalences of any of the comorbid conditions that we examined except hypertension, which was significantly more common in OA patients than in RA patients, even when controlled for age ($p < 0.001$).

Patient outcomes following surgery are shown in Table 2. Over 90% of the patients in each diagnostic group had surgery performed by the end of the first hospital day. Although the mean length of stay was approximately one day longer for patients with RA, this was not statistically significant. The median lengths of stay for the two groups were identical. Seventeen percent of patients with RA stayed in the hospital for over 15 days, compared with 13% of OA patients ($p < 0.003$), and 4% of RA patients stayed longer than 25 days, compared with only 1.7% of OA patients, indicating that a small subgroup of RA patients required more prolonged periods of recovery (see Fig. 1).

We evaluated the associations of sex, age, race, source of payment, principal diagnosis, presence of comorbid diseases, and frequency of hip arthroplasties performed at each facility with length of hospitalization of more than 15 days. The sources of payment were categorized into two groups, governmental payment (Medicare, Medicaid, Title V, and medically indigent services), and non-governmental payment (insurance, self-pay, no charge, Workman's Compensation, health maintenance organization). Age was evaluated as a continuous variable, and the odds ratios for age shown in Table 3 represent the calculated odds ratios for prolonged hospital stay of a 75-year-old patient in comparison with a 55-year-old patient. Significant interaction effects were noted, indicating that the effects of age, race, payment source, and underlying diagnosis (RA versus OA) varied among subgroups of patients. For example, advanced age was associated with prolonged

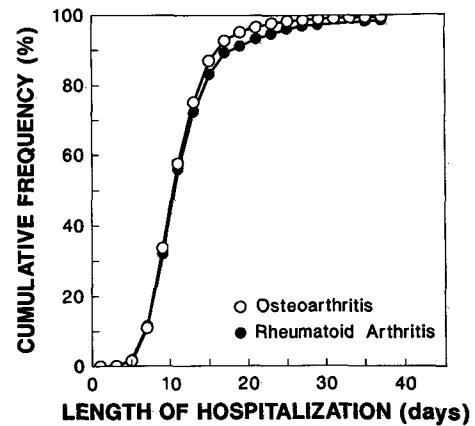


FIGURE 1. Lengths of hospitalization of 721 patients with rheumatoid arthritis and 8,859 patients with osteoarthritis following total hip replacement.

hospital stay, but this effect was seen only in whites. For patients depending on a governmental pay source, RA was weakly associated with prolonged hospital stay. Female sex was associated with prolonged hospital stay in all subgroups of patients. Dispositions of patients in the two groups were similar. Thirty OA patients died during hospitalization (0.34%) versus no RA patient, a finding that was not statistically significant.

The frequencies of selected intraoperative and postoperative complications are shown in Table 4. There was no correlation between the total number of hip arthroplasties performed at a given facility and the length of hospitalization or frequency of complications. Most of the complications were isolated; only 2% of the patients had two of the complications studied, and only 0.3% had three of the complications studied. There was a statistically significant increase in the frequencies of wound infection and wound dehiscence in patients with RA, and an increased frequency of deep vein thrombosis or pulmonary embolism in patients with OA. For wound infection and wound dehiscence, these findings remained statistically significant after controlling for the confounding effects of age by stratification. For deep vein thrombosis or pulmonary embolism, the result was of borderline statistical significance after controlling for age.

DISCUSSION

Our results suggest that the articular and systemic features of RA play a negligible role in affecting early postoperative outcomes following elective total hip arthroplasty, at least in patients who are deemed to be suitable candidates for this operation. In fact, RA patients did extremely well, having an in-hospital mortality over the two-year period of 0% and requiring only minimally longer hospitalization compared with the patients with OA.

We evaluated several factors for their associations with a hospital stay of more than 15 days. Of these, only

TABLE 2

Selected Outcomes for Patients with Rheumatoid Arthritis and Patients with Osteoarthritis Following Total Hip Arthroplasty

	Osteoarthritis (n = 8,859)	Rheumatoid Arthritis (n = 721)	p*
Length of hospitalization			
Median	11 days	11 days	NS
Mean \pm SD	11.7 \pm 5.2 days	12.7 \pm 8.6 days	NS
Mean for men	11.2 \pm 5.2 days	12.6 \pm 11.9 days	NS
Mean for women	12.1 \pm 5.0 days	12.7 \pm 7.2 days	NS
Disposition			
Routine discharge	78.3%	79.3%	NS
Skilled nursing facility	9.0%	7.8%	NS
Home health service	11.1%	9.4%	NS
Other	1.3%	3.5%	NS
Death	30 (0.34%)	0 (0.0%)	NS

*Not corrected for multiple comparisons.

female sex was consistently associated with prolonged hospital stays in all patients subgroups. Similar findings were reported by Salvati and co-workers in a study that examined the length of hospital stay following bilateral total hip arthroplasty.¹³ The reasons for this finding are unclear and may relate to differences in treatment, medications, or biological or social factors. The associations of other factors with longer hospital stays were not uniform in all patient subgroups. In general, the associations of these factors with prolonged hospital stays were not strong and were of limited clinical value in predicting outcomes. Further studies could help to determine whether these observed associations are valid or are the result of bias or type I error.

A major difference between this study and previous studies is that by including essentially every patient who received a total hip arthroplasty in the state of California, referral bias was eliminated. While this data bank provides very useful information, certain limitations should be kept in mind, including the absence of important clinical information that may affect outcome, such as the extent of the rheumatic disease, the results of laboratory tests, functional status, and medications. For example, there is no means of ascertaining what percentage of patients with a diagnosis of RA satisfy the American Rheumatism Association classification criteria for this disease. Review of specific medical records is not possible since the information is entered in a fashion that ensures strict confidentiality.

TABLE 3

Odds Ratio Estimates for Longer Lengths of Stay Following Total Hip Arthroplasty

	Odds Ratio	95% Confidence Interval
Age (75 vs. 55 years)		
White	1.99*	(1.61–2.45)
Non-white	0.94	(0.66–1.34)
Sex (female vs. male)	1.34*	(1.14–1.58)
Race (non-white vs. white)		
75-year-old, non-government pay source	0.49	(0.22–1.10)
75-year-old, government pay source	0.91	(0.65–1.97)
55-year-old, non-government pay source	1.03	(0.54–1.97)
55-year-old, government pay source	1.93*	(1.24–2.99)
Diagnosis (rheumatoid arthritis vs. osteoarthritis)		
Non-government pay source	0.70	(0.36–1.34)
Government pay source	1.60*	(1.16–2.23)
Pay source (government vs. non-government)		
Whites, rheumatoid arthritis	2.25*	(1.10–4.58)
Blacks, rheumatoid arthritis	4.20*	(1.68–10.46)
Whites, osteoarthritis	0.98	(0.76–1.26)
Blacks, osteoarthritis	1.82	(0.87–3.82)

*Odds ratio is statistically different from 1.0 (p < 0.05, two-tailed).

TABLE 4

Complications Occurring During Hospitalization for Total Hip Arthroplasty

	n = 8,859 Osteoarthritis (%)	n = 721 Rheumatoid Arthritis (%)	p*
Complications directly related to surgery			
Cardiac event	1.2	1.0	NS
Bleed/hematoma	1.2	1.9	NS
Wound infection	0.8	1.7	0.01
Wound dehiscence	0.1	0.6	<0.001
Gastrointestinal problem			
Other	0.6	0.4	NS
Other	2.2	2.4	NS
Postoperative complications			
Urinary tract infection	3.3	3.3	NS
Pneumonia	1.8	2.1	NS
Myocardial infarction	0.4	0.1	NS
Hemorrhage	3.9	4.2	NS
Deep vein thrombosis or pulmonary embolism	1.2	0.3	0.07
Death	0.34	0.0	NS

*Age-adjusted, stratifying by ten-year age groups.

The accuracy of this database depends on a correct diagnosis by the discharging physician and proper coding by the hospital medical records department. Because misclassification of patients with respect to the principal diagnosis may have a direct effect on any analysis, we attempted to identify patients with RA who carried a principal diagnosis of OA. A total of 121 of 8,980 OA patients (1.3%) had a secondary diagnosis of RA, and these cases were reclassified as RA patients for analysis. The demographic characteristics of this group were similar to those of the 600 patients who had a principal diagnosis of RA.

The overall mortality rate and frequency of complications that we observed confirm similar findings reported by others.¹⁴⁻¹⁸ In the only other study that has analyzed the early complication rate following total hip arthroplasty, Coventry and co-workers evaluated the outcomes following the first 2,012 hip arthroplasties that were performed at the Mayo Clinic between 1969 and 1974.¹⁷ Although no comparison was made between the outcomes of patients with RA and those of patients with OA, the mortality rate (0.4%), the superficial wound infection rate (1.3%), and the cardiac complication rate (1.7%) reported by these investigators were similar to our own findings. Poss and co-workers, in a large series of 305 patients with OA and 205 patients with RA who underwent hip arthroplasty,¹⁴ documented the advanced nature of the rheumatoid process in their group of RA patients, with 30% having some instability of the cervical spine and approximately 50% requiring oral corticosteroids.¹⁹ Unfortunately, the overall complication rate (0.35%) and

the death rate (0.38%) were not analyzed according to the primary diagnosis in their study.

We found that patients with RA had significantly higher rates of early wound infection and wound dehiscence, although the frequencies of these problems were low. This finding is consistent with prior reports suggesting that RA patients are more likely to develop surgical wound complications than are control patients. Garner and co-workers reported higher rates of wound infection and failure of primary wound closure following several types of surgery in patients with RA compared with a heterogeneous control group; these complications were strongly associated with use of oral corticosteroids.⁵ Several reports in the orthopedic literature have indicated that the incidence of late infection involving the joint prosthesis is higher in patients with RA compared with those with OA.^{15, 18, 20} Since our database includes only in-hospital complications, we have no data on the numbers of patients who developed an infected prostheses after discharge.

Although the incidence of deep vein thrombosis or pulmonary embolism was very low in the OA group, it was lower in the RA group. In approximately 50% of patients not given prophylaxis for venous thrombosis, asymptomatic deep vein thrombosis occurs following hip arthroplasty,²¹⁻²³ and 2–15% of patients develop clinically evident pulmonary embolism or thrombophlebitis.²⁴ The frequency of these complications was much lower in our study, perhaps because the patients were discharged before clinical thromboembolic events occurred or were recognized. In an earlier report that noted a higher incidence of thromboembolic events in patients undergoing total hip arthroplasty, the mean length of hospitalization was more than 22 days, whereas the mean duration of hospitalization in our study was 11–12 days.²⁵ The lower rate of thromboembolic events in patients with RA compared with OA is consistent with findings reported by other investigators.²⁶⁻²⁸

One interesting finding in our study relates to the ethnic compositions of the groups. In patients with RA, the observed ethnic distribution was comparable to the ethnic distribution expected based on age-specific 1980 census data. This extends previous studies showing that the prevalences of RA among whites and blacks in the United States²⁹ are similar to that in the Hispanic population as well. In contrast, in the OA group we observed a greater number of whites than expected based on age-specific 1980 census figures, whereas there were fewer than the expected number of blacks, Hispanics, and Asians. This finding suggests that advanced OA of the hip may be less common in blacks, Hispanics, and Asians than in whites. There have been previous studies suggesting that Chinese³⁰ and Japanese³¹ have very low incidences of advanced OA of the hip, but there has been no study in the United States that has compared the prevalences of hip OA amongst the

various ethnic groups. It is possible that less access to and utilization of surgical care due to social and economic factors among black, Hispanic, and Asian patients with OA contributed to our findings. The fact that the observed-to-expected ratio was close to 1 in black and Hispanic patients with RA suggests that this was not a major factor. However, the OA group was older on average compared with the RA group, and decreased access to care for older Asians, blacks, and Hispanics may have contributed to this observation.

Further studies are needed to determine whether any specific features of RA are associated with adverse outcomes following major surgery. A prospective cohort study with collection of predefined clinical data would be necessary to define specific risk factors. Different surgical procedures also need to be studied in order to generalize the results.

In conclusion, our data suggest that outcomes following total hip arthroplasty are comparable in patients with RA and OA. Our finding that RA patients had a higher rate of wound infection and wound dehiscence with a lower rate of thromboembolic events compared with patients with OA supports previously reported results.

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The family doctor is a figure without whom the family cannot exist in a developed society. He knows the needs of each member of the family, just as the mother knows their tastes. There's no shame in taking to him some trivial complaint you'd never take to the outpatient clinic, which entails getting an appointment card and waiting your turn, and where there's a quota of nine patients an hour. And yet all neglected illnesses arise out of these trifling complaints. How many adult human beings are there, now, at this minute, rushing about in mute panic wishing they could find a doctor, the kind of person to whom they can pour out the fears they have deeply concealed or even found shameful?—ALEXANDER SOLZHENITSYN, in *Cancer Ward*