Variability in the Use of Orthopedic Surgery in Patients with Rheumatoid Arthritis in Spain

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ABSTRACT. ***Objective.*** To analyze sociodemographic and clinic-associated factors of patients with rheumatoid arthritis (RA) undergoing any orthopedic surgery (AOS) and total joint replacement (TJR) in Spain.

Methods. A retrospective medical record review was performed in a probabilistic sample of 1379 RA patients from 46 centers distributed in 16 of 19 regions in Spain. Sociodemographic and clinical features, use of drugs, and arthritis-related joint surgeries were recorded following a standardized protocol. Gross domestic product (GDP) data were obtained from the National Statistical Index.

Results. Of 1379 patients, a total of 358 (26%) underwent one or more joint surgeries, and 194 (14%) had a TJR. The median time to first orthopedic procedure was 12.5 years from presentation of RA and the estimated rate was 5.6 surgeries per 100 person-years. The rate of AOS was increased in women, patients with RA with extraarticular complications, with longterm RA (> 10 yrs), with functional grade III-IV, and with persistent inflammatory disease. The risk factors for undergoing a TJR were longterm RA, functional grade III-IV, and extraarticular complications. Patients from regions with higher GDP per capita were more likely to undergo a procedure.

Conclusion. Clinical variables reflecting disease activity and severity are predictors of orthopedic surgery, but geographic and socioeconomic variables were also independently associated with the rate of orthopedic surgery. (First Release June 1 2007; J Rheumatol 2007;34:1485–90)

Key Indexing Terms:
RHEUMATOID ARTHRITIS ORTHOPEDIC SURGERY VARIABILITY

Rheumatoid arthritis (RA) is a chronic inflammatory musculoskeletal disorder, with a high prevalence[1] and a great impact on patients in terms of pain, disability, and life expectancy[2,3]. It is currently assumed that early diagnosis and aggressive treatment improve RA outcomes. However, progressive joint destruction continues in some patients, who will require orthopedic surgery during their disease course[4]. The use of orthopedic interventions in RA, particularly large joint replacement, is considered a marker of disease severity[5], and an indicator of medical management failure[6]. Therefore, patients undergoing an orthopedic surgery have a worse prognosis related to disability and quality of life; and as well create a high demand on healthcare resources and social services, with great socioeconomic consequences[7-9].

As in other health conditions, the use of healthcare resources and indications of procedures would be mainly driven by patient- and disease-related characteristics. However, the medical service provided is often found to be strongly influenced by subjective factors related to the attitudes of individual physicians, institution organization, and/or healthcare service features.

Use of orthopedic surgery for RA in Spain is not extensively documented, and only a few studies in rheumatology settings have been carried out[7]. There are no systematic records or hospital registries of orthopedic surgical procedures for RA, and general knowledge about them is low, even among health professionals.

We investigated the rate of orthopedic surgical procedures in patients with RA in Spain, and examined sociodemographic and clinic-related factors associated with the use of orthopedic procedures in this population.

MATERIALS AND METHODS

Study design, patient sample, and data acquisition. The emAR study ("Estudio Sobre El Manejo de la Artritis Reumatoide" or study on the management of rheumatoid arthritis) was a cross-sectional study designed to assess variability in the management of RA in Spain[10]. It comprised a probabilistic sample of medical records of individuals aged ≥ 16 years diagnosed with RA who were followed at specialized healthcare units. Based on previous reports of our group[7], with accuracy of 5% and an error rate of 5%, we calculated a minimum sample requirement of 1085 medical records of patients that, assuming 15% losses and 15% incomplete records, entailed randomization of 1550 medical records. A proportion of one medical record per 25,000 inhabitants was taken (roughly 125 patients with RA according to prevalence rates for the Spanish population).

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Supported in part by Novartis Pharmaceutics, Barcelona, Spain.

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Accepted for publication March 6, 2007.

Medical records were randomly selected by stratified sampling from regions and hospitals. First, each autonomous community or region into which Spain is administratively divided was assigned with a number of medical records to be reviewed that was proportional to the regional population. Those regions found to have < 25 records based upon these criteria were called on to assign a minimum of 25 records to be reviewed. A list of hospitals by region was obtained from the 1996 National Hospital Index. Hospitals without rheumatology or internal medicine services were excluded. Subsequently, a weighted random selection of hospitals in each region was performed, adjusting the likelihood of being selected to their respective population. The number of hospitals selected in each region was estimated to assure a 5-fold population of patients with RA that was assigned to each region. Rheumatology or internal medicine services of randomly selected hospitals were contacted by mail requesting their participation. If no answer was received 3 weeks later, the superintendent of the service was contacted by telephone to request participation in the study or elucidate the reasons for nonparticipation. Hospitals that refused to participate were replaced by the next hospital in the randomization list. Reasons for nonparticipation were inability to provide a nonbiased list of RA patients (53.3%), lack of interest in the study (16.6%), referral of RA patients to other hospitals (13.3%), and other reasons (16.6%). A list of all RA patients followed up during 1997 and 1998 was requested from the hospitals, irrespective of the number of contacts with the patients or whether those contacts corresponded to inpatient or outpatient settings. A systematic sampling was then performed of patients living in the same region. Records that did not correspond to patients with RA were substituted by the next patient record in the random list from the same hospital. However, patients not located and/or those with incomplete data were not replaced.

All patient data were extracted from medical records by trained investigators in each region. In cases in which records were incomplete or not located, a minimum data set was obtained to confirm that there were no differences with the population included in the study. All dates were collected in standardized questionnaires.

Quality control of data entered in the study database included several strategies: (1) an instruction manual with definitions and criteria for every query to assure homogeneity in collecting data; (2) a pilot study, with 6 investigators and 185 medical records, assessed feasibility and identified potential errors and misleading questions; (3) a review of each questionnaire by a single investigator before data entry; and (4) the database design included further strategies to detect inconsistencies and missing fields at data entry. No systematic errors were detected and less than 2% of random errors were detected (and corrected).

Data on gross domestic product (GDP) per capita in each region were obtained from the National Statistical Institute of Spain for 1997 (all data 2000 US dollars). This study was approved by the ethics committees of the participating hospitals.

Variables. To analyze variables associated with orthopedic surgery in RA patients, 2 primary outcomes were established: (1) any orthopedic surgery (AOS), defined as the presence of at least one RA-related orthopedic surgery including primary and secondary total joint arthroplasty at any location, reconstructive joint surgery, resections, joint fusions, and synovectomy. Fractures or infection-related surgeries were excluded; (2) total joint replacement (TJR), defined as total replacement of a joint at any location from the beginning of the RA. Revision surgery was considered as a new RA-related surgery if first replacement was considered RA-related (i.e., it was not a consequence of fracture or any other condition). TJR as a consequence of fractures were not included. To assess variability in the primary outcomes, the following independent variables were considered: (1) sociodemographic variables including sex, age, marital status (married vs not married), education level (any study degree vs no studies), social status (assessed as lower, middle, or upper depending on the patient's occupation according to the protocol of the Spanish Society of Epidemiology[11]), region of residency, regional GDP per capita distributed in 3 groups (I: $6048.4 to 7661.3; II: $7661.4 to 10,887.1; and III: $10,887.2 to 12,500), and permanent work disability. (2) Disease related variables, including the date of RA onset and diagnosis, disease duration (short-term RA as < 10 yrs of RA duration vs longterm RA as ≥ 10 yrs disease duration), American College of Rheumatology (ACR) functional class or grade, range of values for erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) throughout the study period, maximum and minimum number of tender and swollen joints during the study period, rheumatoid factor (RF), extraarticular complications, and comorbid medical conditions. (3) Pharmacological variables such as drugs prescribed in the last 2 years including maximum and minimum doses of disease modifying antirheumatic drugs (DMARD), nonselective nonsteroidal antiinflammatory drugs (NSAID), corticosteroids, analgesics, gastric protection, and drugs for treatment or prophylaxis of osteoporosis. And (4) specialization of principal physician (rheumatology vs internal medicine).

For the purposes of the study, patients were classified in 3 groups based on the number of swollen joints and acute phase reactants. Patients were classified as having non-active disease when the number of swollen joints was = 5 and ESR and CRP were normal in the best and worst evaluation; relapsing active disease when the number of swollen joints was > 5 and ESR and/or CRP was abnormal in the worst evaluation and the number of swollen joints was = 5 and ESR and CRP were normal in the best evaluation during the study period; and persistent active disease when the number of swollen joints was > 5 and ESR and/or CRP was abnormal in the best and worst evaluation.

Data analysis. We estimated the rate of AOS and TJR with 95% confidence intervals. To examine the distribution of sociodemographic, clinical, and pharmacological variables among AOS and TJR, we used Student's t test, Mann-Whitney U test, or contingency tables appropriate to the type of variable. Bivariate regression analyses were performed to find associations between AOS or TJR and secondary variables. Afterwards, 2 multivariate regression models were run to identify predictive independent factors associated with AOS and TJR. The results of logistic regression analyses were expressed in odds ratios and 95% CI as the probability to undergo an orthopedic intervention. The criterion to include a variable in the multivariate models was reaching a $p < 0.10$ in the bivariate analysis. All regression models were adjusted by region. All analyses were performed using Stata 7.0 statistical software (Stata Corp., College Station, TX, USA).

RESULTS

Study population. A total of 9299 eligible records of RA patients were identified in the designated hospitals, and 1550 were randomly selected for review. Fifty-three records from 3 regions were not reviewed because none of their hospitals agreed to participate in the study, and 118 records were not located or were incomplete for the purposes of the study. Thus, the final sample comprised 1379 records of RA patients, distributed in 16 of the 19 regions of Spain. Missing and incomplete records were equally distributed among the regions.

Sociodemographic and clinical features of patients are shown in Table 1.

Rate of orthopedic surgery. A total of 358 patients (26%) underwent any orthopedic surgery during the disease course, and 194 (14%) patients had a TJR. The median time to first orthopedic procedure was 12.5 years from the onset of RA symptoms, and the rate of AOS was 5.6 procedures per 100 person-years from the beginning of RA, while the rate of TJR was 3.2 interventions per 100 person-years. Table 1 illustrates the social, demographic, and clinical characteristics of patients with AOS and TJR.

There was a marked variability in the percentage of RA patients with either AOS or a TJR related to the region of residence. Thus, the rate of AOS ranged from less than 10% to

Table 1. Sociodemographic and clinical baseline features of the study population: patients with any orthopedic surgery (AOS) and total joint replacement (TJR). Values are expressed as number (%) unless otherwise indicated.

	Study Population	AOS	TJR
Total	1379 (100)	358 (26)	194 (14)
No. female	1013 (73)	287 (80)	152 (78)
Age at disease onset, yrs*	51 [39–61]	48 [36–57]	50 [38–60]
No. married	1048 (76)	272 (76)	149 (77)
Education level; any study degree	1130 (82)	290 (81)	157 (81)
Social status			
Lower	483 (35)	108 (30)	54 (28)
Middle	869 (63)	243 (68)	138 (71)
Upper	27 (2)	7 (2)	2 (1)
GDP per capita groups			
I	297 (22)	55 (15)	31 (16)
II	535 (39)	126 (35)	71 (36)
III	547 (39)	177 (50)	92 (48)
Permanent work disability	69 (5)	28 (8)	19 (10)
Longterm RA	579 (42)	233 (65)	134 (71)
Functional grade III-IV	455 (33)	196 (55)	124 (64)
RA with PID	206 (15)	100 (28)	54 (28)
RF-positive	1048 (76)	286 (80)	157 (81)
Extraarticular complications	510 (37)	175 (49)	104 (54)
Associated comorbidity	511 (37)	149 (42)	89 (46)
Use of DMARD	1286 (94)	338 (94)	184 (95)
Combined therapy	368 (29)	114 (32)	62 (34)
Use of corticosteroids	984 (72)	273 (77)	148 (77)
Medical service-Rheumatology	1227 (89)	323 (90)	177 (91)

GDP: gross domestic product per capita groups: I = $6048–7661, II = $7661.4–10,887.1, III = $10,887–12,500; PID: persistent inflammatory disease; DMARD: disease modifying antirheumatic drug. * Median [25/75 percentiles].

more than 50% of patients depending on the community, while the rate of TJR varied from less than 5% to more than 40%. These differences were also substantial after grouping regions by level of GDP per capita (Figure 1). In Group III, 36% of patients underwent AOS and 21% TJR, whereas in Group I, the findings were 23% and 13%, respectively.

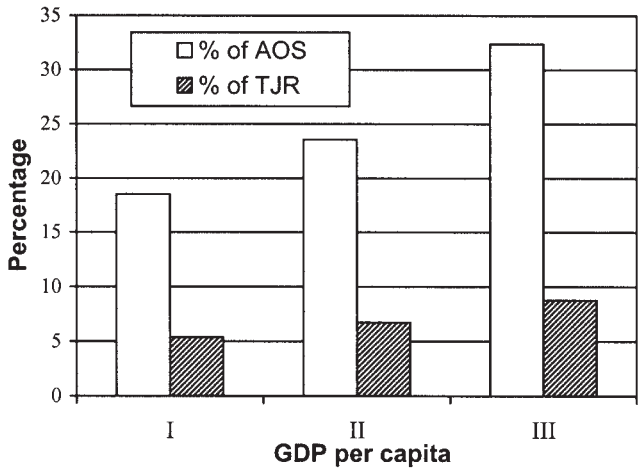

Figure 1. Rates of any orthopedic surgery (AOS) and total joint replacement (TJR), for regions of Spain grouped according to level of gross domestic product (GDP) per capita: Group I = $6048–7661; Group II = $7661.4–10,887.1; Group III = $10,887.2–12,500.

Variables associated with AOS or TJR. The probability of undergoing AOS (Table 2) was increased in female patients, younger patients, those with longterm disease, a poor functional ability (as reflected by ACR functional classification and/or permanent work disability status), persistent active disease despite treatment, positive RF disease, and presence of extraarticular complications and significant comorbidity. Notably, the odds ratio for undergoing AOS during their disease was 1.72 (95% CI 1.34–2.19) in patients living in regions grouped within the highest level of GDP per capita (Group III) compared with the other groups. When variables were entered into a multivariate regression model (Table 2), female sex, longterm disease, having ACR functional grade III/IV, the presence of extraarticular complications, and living in a region with the highest level of GDP per capita (OR 1.81, 95% CI 1.27–2.58) remained associated with a higher risk for having undergone AOS.

The same strategy of analysis was followed using as the dependent variable the fact of having had any TJR during the development of RA (Table 3). As observed for AOS, female patients, longterm disease, functional class III-IV, persistent active disease, extraarticular complications, and/or significant comorbidity revealed a higher risk for TJR. As well, patients living in regions with the highest level of GDP per capita had a higher likelihood of undergoing a TJR, in both the bivariate

Table 2. Bivariate and multivariate analysis related to any orthopedic surgery.

	Bivariate			Multivariate		
	OR	95% CI	p	OR	95% CI	p
Female	1.64	1.22–2.20	0.001	1.49	1.01–2.17	0.047
Age at disease onset	0.98	0.97–0.99	0.001		—	
GDP per capita group III	1.72	1.34–2.19	0.000	1.81	1.27–2.58	0.013
Permanent work disability	1.94	1.16–3.22	0.011		—	
Longterm RA	3.44	2.57–4.61	0.000	2.58	1.78–3.75	0.000
Functional grade III–IV	3.61	2.78–4.67	0.000	2.33	1.60–3.40	0.000
RA with PID	3.26	2.38–4.47	0.000	1.53	1.00–2.50	0.049
RF-positive	1.38	1.03–1.86	0.034		—	
Extraarticular complications	1.87	1.46–2.38	0.000	1.52	1.09–2.14	0.014
Associated comorbidity	1.28	1.01–1.65	0.045		—	
Use of DMARD, combined therapy	1.41	1.08–1.83	0.011		—	
Use of steroids	1.39	1.07–2.24	0.020		—	

Only variables with $p < 0.1$ in the bivariate and $p < 0.05$ in the multivariate analysis are shown. GDP: gross domestic product per capita group III = $ 10,887–12,500; PID: persistent inflammatory disease.

Table 3. Bivariate and multivariate analysis related to total joint replacement.

	Bivariate			Multivariate		
	OR	95% CI	p	OR	95% CI	p
Female	1.37	0.95–1.97	0.091		—	
GDP per capita group III	1.37	1.01–1.87	0.039	1.59	1.02–2.58	0.040
Permanent work disability	2.21	1.24–3.93	0.007		—	
Longterm RA	4.22	2.87–6.21	0.000	3.01	1.94–4.66	0.000
Functional grade III–IV	4.71	3.38–6.55	0.000	2.99	1.96–2.67	0.000
RA with PID	2.41	1.67–3.47	0.000		—	
Extraarticular complications	2.12	1.56–2.88	0.000	1.75	1.15–2.67	0.009
Associated comorbidity	1.50	1.11–2.04	0.009		—	
Use of DMARD, combined therapy	1.35	0.97–1.87	0.074		—	

Only variables with $p < 0.1$ in the bivariate and $p < 0.05$ in the multivariate analysis are shown. GDP: gross domestic product per capita group III = $ 10,887–12,500; PID: persistent inflammatory disease.

(OR 1.37, 95% CI 1.01–1.87) and the multivariate analysis (OR 1.59, 95% CI 1.02–2.58).

DISCUSSION

Orthopedic surgery is a part of RA management that should be considered when joint function does not improve or is notably worse despite other treatments, when incapacitating pain persists, or when there are potentially serious or limiting neurological complications. Total joint replacement might be considered as an outcome of end-organ damage in RA, indicating failure of other therapies. We found a marked geographical variability in the use of orthopedic surgery in patients with RA in Spain, which could not be explained only on the basis of patient-related sociodemographic variables or disease-related biological features.

In this cross-sectional study we found that up to 26% of patients with RA had undergone any orthopedic procedure during their disease course, and 14% had at least a TJR during the same period. Around the world, published rates of orthopedic surgery in RA are variable[12,13] in countries with different and similar models of healthcare systems. It has been suggested that rates of RA-related surgical procedures might be decreasing in recent years, reflecting changes in disease severity, management, and health outcomes of patients. However, despite new treatments and trends in the management of RA, orthopedic surgery and especially TJR will continue to be a major outcome of the disease and a marker of treatment failure[14].

It has been described that TJR might be predicted by self-report assessments of severity and function, as well as by different laboratory, radiographic, and clinical variables, including the Disease Activity Score[4], Health Assessment Questionnaire[6], or the presence of subcutaneous nodules[15,16]. As well, it has been reported that women are more likely to undergo orthopedic surgery in the course of their disease than men[2,3,5,17]. This might reflect cosmetic concerns, different patterns of pain perception, and/or a greater extent of the disease, as suggested by some authors[16], as well as a greater social burden. Moreover, our results showed an independent relationship among female sex, poor functional ability, per-

sistent inflammatory activity, and extraarticular complications of RA with a higher risk of undergoing any type of orthopedic surgery, including TJR. Indeed, the most predictive factors for surgery in our study were clinical variables related to RA activity and severity. However, we observed that irrespective of other clinical and sociodemographic variables, both AOS and TJR were also influenced by the region in Spain in which RA patients live, that is, the likelihood of undergoing an orthopedic procedure was higher in patients living in regions with the highest range of per capita income than in those living in the other regions.

Variability in clinical practice has been widely demonstrated in systems with and without universal health insurance coverage in a broad range of medical procedures[18], and the major causes of the variability include uncertainty in decision making[19], socioeconomic issues[20], and the volume of specialists and how active they are in the use of a given technology[21]. Regional variations have been described in the management of RA regarding the patterns of drug usage[10,22], access to specialist services[21,23], and rates of outpatient consultation or hospitalization[24,25]. In the same way, the indications for and numbers of orthopedic surgical procedures vary widely in different regions[26,27], and this might be explained by hospital-related factors and patient characteristics[28], the availability of orthopedic surgeons[26], the volume of procedures in a particular setting[29], or orthopedic surgeons' opinions about or enthusiasm for different procedures[30].

Socioeconomic issues as a factor in variations in healthcare received by patients with musculoskeletal disorders have been documented both in health systems with universal insurance coverage[31,32] and in those without it[33]. In patients with low socioeconomic status, RA is more prevalent[34] and the effects and the mortality of the disease are greater[35,36], and those patients made significantly less use of healthcare services, including use of additional specialists such as orthopedic surgeons[32]. Our results showed an independent relationship between per capita income of the region of residence of patients with RA and the likelihood of undergoing any orthopedic surgery or TJR. It has been reported that socioeconomic-related differences are not due to less need or less willingness to undergo surgery in patients with lower socioeconomic status[31].

This was a retrospective cross-sectional study based on medical record review and was not designed to identify predictive factors for an orthopedic surgery. On the other hand, this was a multicenter study of a probabilistic and representative sample of 1379 patients with RA, and our results are similar to those of previous reports[6,15], so we consider that our outcomes are fairly accurate.

We found that disparities in the rate of orthopedic surgery exist irrespective of clinical status or other sociodemographic variables, indicating that inequality in accessing surgery might be related to organizational or health system-related issues that made it more likely that patients with RA would receive an orthopedic surgical procedure in regions of Spain with higher incomes. Awareness that these differences exist, even in health systems with universal coverage, should be the first step to correct the health disadvantages of patients with RA in lower socioeconomic groups, by establishing appropriate indications and guidelines for these and other medical procedures.

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