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## The Journal of Arthroplasty

journal homepage: [www.arthroplastyjournal.org](http://www.arthroplastyjournal.org)

## Original Article

## Perioperative Complications in Patients With Inflammatory Arthropathy Undergoing Total Hip Arthroplasty

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## ARTICLE INFO

## Article history:

Received 16 August 2015

Received in revised form

7 March 2016

Accepted 9 March 2016

Available online xxx

## Keywords:

complications

inflammatory arthritis

perioperative

total hip arthroplasty

rheumatoid arthritis

## ABSTRACT

**Background:** Limited information exists comparing the short-term complications of the different inflammatory arthropathies (IAs) after total hip arthroplasty (THA). Our objectives were to (1) compare perioperative complications and (2) determine the most common complications between the different IA subtypes compared with patients with osteoarthritis (OA) undergoing primary THA.

**Methods:** The Nationwide Inpatient Sample was used to identify 2,102,238 patients undergoing elective, unilateral THA between 2002 and 2011. Of these, 86,671 (4%) had an IA, including rheumatoid arthritis (RA), psoriatic arthritis, juvenile idiopathic arthritis (JIA), ankylosing spondylitis (AS), and systemic lupus erythematosus (SLE). Preoperative diagnosis, comorbidities, and postoperative complications were determined using International Classification of Disease Clinical Modification version 9 codes. The prevalence of in-hospital medical and orthopedic complications was compared between patients with an IA and OA.

**Results:** When compared with patients with OA, patients with RA, JIA, SLE, and AS had significantly more inpatient medical and orthopedic complications immediately after THA ( $P < .01$ ). Patients with JIA had the highest orthopedic complication rate (2.8%). Specific orthopedic complications by subtype included wound dehiscence for RA and AS periprosthetic fractures for JIA and increased mortality for SLE patients. There were no significant differences in medical or orthopedic complications seen in patients with psoriatic arthritis.

**Conclusion:** Differences exist in postoperative inpatient medical and orthopedic complications among patients with different types of IAs after THA. Our results point out the importance of preoperative optimization in patients with IA and monitoring for selective postoperative complications.

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Inflammatory arthropathies (IA), including rheumatoid arthritis (RA), psoriatic arthritis (PsA), juvenile idiopathic arthritis (JIA), ankylosing spondylitis (AS), systemic lupus erythematosus (SLE), can cause joint destruction leading to pain and disability.

Institutional review board approval is not applicable for this study.

One or more of the authors of this paper have disclosed potential or pertinent conflicts of interest, which may include receipt of payment, either direct or indirect, institutional support, or association with an entity in the biomedical field which may be perceived to have potential conflict of interest with this work. For full disclosure statements refer to doi: <http://dx.doi.org/10.1016/j.arth.2016.03.023>.

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<http://dx.doi.org/10.1016/j.arth.2016.03.023>

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Despite recent improvements in the medical treatment of various IAs, patients suffering from these conditions often go on to require a total hip arthroplasty (THA) [1]. Patients with an IA may be pre-disposed to certain medical and surgical complications after orthopedic surgery because of the fact that they have a systemic disease with multiple organ involvement [2–4]. For instance, depending on the cardiac comorbidities, myocardial infarction has been reported to be between 0.6% and 6.5% in this patient population [2]. Perioperative infection remains a concern in patients with inflammatory arthritis, as surgical site infection has been reported to be 2–4 times higher in patients with RA when compared with osteoarthritis (OA) [3]. The infection risk appears to be increased with the use of immunosuppressive agents in many of these patients. Finally, owing to cutaneous involvement, the

surgical site infection has been reported to be 9–17% higher in patients with PsA [4].

Despite some clinical reports on specific types of IA [1], little information exists comparing the short-term in-patient surgical complications of the various IAs and OA after THA. Our objectives were to (1) compare perioperative inpatient complications and (2) determine the most common inpatient complications between the different IA subtypes compared with patients with OA undergoing primary THA.

## Methods

We used the Agency for Healthcare Research and Quality Nationwide Inpatient Sample (NIS) database for our study. The NIS is a stratified, statistically valid survey of hospitals conducted by the federal Healthcare Cost and Utilization Project [5] and is the largest publicly available all-payer inpatient care database in the United States. Hospitals are randomly selected to achieve an approximately 20% representative sample of all US nonfederal hospitals. Sampling weights are provided to produce the national estimates. All discharge records from each of the selected hospitals are collected and form part of the NIS file for a given year. Because of the large size of the database, the NIS is particularly well suited for epidemiologic studies related to specific procedures or diseases in the national population [6,7].

International Classification of Disease Clinical Modification version 9 (ICD-9-CM) procedure codes and NIS variables were used to identify all patients undergoing elective, unilateral primary THA (ICD-9-CM procedure code: 81.51). A total of 2,105,238 patients between 2002 and 2011 were identified including patients' demographics such as age and gender. Of these patients who

underwent THA, 86,671 (4.12%) had an IA, including RA (63,550/73.32%; ICD-9-CM: 740.0), PsA (3818/4.41%; ICD-9-CM: 696.0), JIA (2496/2.90%; ICD-9-CM: 714.3), AS (4252/4.91%; ICD-9-CM: 720.0), and SLE (12,555/14.49%; ICD-9-CM: 710.0). Medical comorbidities were assessed using the 29 variables in the NIS comorbidity measure, which is based on the Elixhauser Comorbidity Index [8]. The 29 comorbidities that comprise the NIS comorbidity measure are listed in Table 1. To identify in-hospital postoperative complications, ICD-9-CM diagnosis codes were used in any of the 14 secondary diagnosis fields. Postoperative complications included central nervous system (CNS; 997.0; 997.00; 997.01; 997.02; 997.09), cardiac (997.1), peripheral vascular (997.2), respiratory (997.3; 997.31; 997.39), gastrointestinal (997.4), genitourinary (997.5), hematoma or seroma (998.1; 998.11; 998.12; 998.13), wound dehiscence (998.3; 998.0; 998.31; 998.32; 998.33), postoperative infection (998.5; 998.51; 998.59), deep vein thrombosis (DVT; 453.4; 453.40; 453.41; 453.42), pulmonary embolism (415.1; 415.19), acute postoperative hemorrhagic anemia (285.1), and mortality (coded within the NIS).

The prevalence of inpatient medical and orthopedic complications was compared between patients with IA and OA. Multivariate logistic regression was used to control for age, gender, and comorbidities. As per the NIS data use agreement, any time the observations (ie, individual records) in any given cell of tabulated data were  $\leq 10$ , they were not individually reported but instead summarized as " $\leq 10$ " [9]. All statistical analyses were performed using SPSS version 21 for Mac (IBM Corp., Armonk, NY). Descriptive statistics were calculated for all variables used within the study. There were few missing values ( $<1\%$ ) for all variables used; cases with missing values were omitted for the purpose of this analysis. Pearson's chi-square test was used to compare variables in the

**Table 1**

Comparison of Baseline Characteristics Between Patients With OA and Patients With Inflammatory Arthritis by Subtype Undergoing Primary Total Hip Arthroplasty.

| Baseline Characteristics                      | OA (n = 2,018,567) | RA (n = 63,550)            | JIA (n = 2496)               | AS (n = 4252)                | SLE (n = 12,555)        | PsA (n = 3818)         |
|-----------------------------------------------|--------------------|----------------------------|------------------------------|------------------------------|-------------------------|------------------------|
|                                               | n (%)              | n (%)                      | n (%)                        | n (%)                        | n (%)                   | n (%)                  |
| Age, y, mean (range)                          | 66 (0–104)         | 63 (15–98)                 | 33 (9–74)                    | 53 (18–89)                   | 53 (15–89)              | 59 (17–87)             |
| Female                                        | 1,128,540 (56)     | 47,413 (75)                | 1721 (70)                    | 847 (20)                     | 10,995 (88)             | 1995 (52)              |
| AIDS                                          | 1808 (0.1)         | 21 ( $<0.1$ ) <sup>a</sup> | 0 (0)                        | 0 (0)                        | 0 (0)                   | 0 (0)                  |
| Alcohol abuse                                 | 23,771 (1.2)       | 414 (0.7) <sup>a</sup>     | 25 (1.0)                     | 50 (1.2)                     | 71 (0.6) <sup>a</sup>   | 99 (2.6) <sup>a</sup>  |
| Chronic coronary artery disease               | 254,982 (13)       | 7431 (11) <sup>a</sup>     | 19 (0.8) <sup>a</sup>        | 304 (7.1) <sup>a</sup>       | 1118 (8.9) <sup>a</sup> | 453 (12)               |
| Deficiency anemia                             | 278,091 (14)       | 12,251 (19) <sup>a</sup>   | 471 (19) <sup>a</sup>        | 647 (15) <sup>a</sup>        | 2805 (23) <sup>a</sup>  | 539 (14)               |
| Chronic blood loss anemia                     | 39,800 (2.0)       | 1357 (2.2) <sup>a</sup>    | 54 (2.2)                     | 71 (1.7)                     | 309 (2.5) <sup>a</sup>  | 69 (1.8)               |
| Congestive heart failure                      | 47,954 (2.4)       | 1826 (2.9) <sup>a</sup>    | 18 (0.7) <sup>a</sup>        | 80 (1.9)                     | 429 (3.4) <sup>a</sup>  | 68 (1.8)               |
| Chronic pulmonary disease                     | 255,804 (13)       | 10,072 (16) <sup>a</sup>   | 124 (5.1) <sup>a</sup>       | 375 (8.9) <sup>a</sup>       | 2021 (16) <sup>a</sup>  | 492 (13)               |
| Coagulopathy                                  | 33,264 (1.7)       | 1172 (1.9) <sup>a</sup>    | 53 (2.2)                     | 100 (2.4) <sup>a</sup>       | 518 (4.2) <sup>a</sup>  | 104 (2.7) <sup>a</sup> |
| Depression                                    | 171,640 (8.6)      | 6835 (11) <sup>a</sup>     | 200 (8.2)                    | 306 (7.2) <sup>a</sup>       | 1664 (13) <sup>a</sup>  | 498 (13) <sup>a</sup>  |
| Diabetes uncomplicated                        | 245,704 (12)       | 7408 (12) <sup>a</sup>     | 51 (2.1) <sup>a</sup>        | 344 (8.1) <sup>a</sup>       | 1071 (8.6) <sup>a</sup> | 508 (13)               |
| Diabetes with chronic complications           | 18,731 (0.9)       | 601 (1.0)                  | 0 (0)                        | 45 (1.1)                     | 93 (0.7)                | 58 (1.5) <sup>a</sup>  |
| Drug abuse                                    | 9186 (0.5)         | 301 (0.5)                  | 28 (1.1) <sup>a</sup>        | 64 (1.5) <sup>a</sup>        | 160 (1.3) <sup>a</sup>  | 32 (0.8) <sup>a</sup>  |
| Hypertension (with and without complications) | 1,156,502 (58)     | 34,200 (54) <sup>a</sup>   | 388 (16) <sup>a</sup>        | 1833 (43) <sup>a</sup>       | 6752 (54) <sup>a</sup>  | 2129 (56)              |
| Hypothyroidism                                | 240,692 (12)       | 9443 (15) <sup>a</sup>     | 96 (3.9) <sup>a</sup>        | 236 (5.6) <sup>a</sup>       | 1960 (16) <sup>a</sup>  | 401 (11) <sup>a</sup>  |
| Liver disease                                 | 15,370 (0.8)       | 574 (0.9) <sup>a</sup>     | 24 (1.0)                     | 50 (1.2) <sup>a</sup>        | 195 (1.6) <sup>a</sup>  | 74 (1.9) <sup>a</sup>  |
| Lymphoma                                      | 6294 (0.3)         | 220 (0.3)                  | 0 (0)                        | $\leq 10$ (0.1)              | 36 (0.3)                | 16 (0.4)               |
| Fluid and electrolyte disorder                | 145,555 (7.3)      | 5455 (8.6) <sup>a</sup>    | 128 (5.2) <sup>a</sup>       | 270 (6.4)                    | 1140 (9.1) <sup>a</sup> | 239 (6.3)              |
| Metastatic cancer                             | 2384 (0.1)         | 84 (0.1)                   | 0 (0)                        | 0 (0)                        | $\leq 10$ ( $<0.1$ )    | $\leq 10$ (0.1)        |
| Other neurologic disorders                    | 52,106 (2.6)       | 1788 (2.8) <sup>a</sup>    | 46 (1.9)                     | 56 (1.3) <sup>a</sup>        | 676 (5.4) <sup>a</sup>  | 119 (3.1)              |
| Obesity                                       | 240,578 (12)       | 6615 (10) <sup>a</sup>     | 147 (6.0) <sup>a</sup>       | 330 (7.8) <sup>a</sup>       | 1360 (11) <sup>a</sup>  | 484 (13)               |
| Paralysis                                     | 6558 (0.3)         | 214 (0.3)                  | 15 (0.6)                     | $\leq 10$ (0.1) <sup>a</sup> | 72 (0.6) <sup>a</sup>   | 15 (0.4)               |
| Peripheral vascular disease                   | 39,755 (2.0)       | 1277 (2.0)                 | $\leq 10$ (0.2) <sup>a</sup> | 61 (1.4)                     | 277 (2.2)               | 71 (1.9)               |
| Psychoses                                     | 25,521 (1.3)       | 785 (1.2)                  | 15 (0.6) <sup>a</sup>        | 41 (1.0)                     | 233 (1.9) <sup>a</sup>  | 32 (0.8)               |
| Pulmonary circulation disorders               | 11,364 (0.6)       | 584 (0.9) <sup>a</sup>     | 15 (0.6)                     | 15 (0.4)                     | 221 (1.8) <sup>a</sup>  | 25 (0.7)               |
| Renal failure                                 | 46,447 (2.3)       | 1649 (2.6) <sup>a</sup>    | 20 (0.8) <sup>a</sup>        | 115 (2.7)                    | 1090 (8.7) <sup>a</sup> | 74 (1.9)               |
| Solid tumor without metastasis                | 22,268 (1.1)       | 514 (0.8) <sup>a</sup>     | 0 (0)                        | 50 (1.2)                     | 61 (0.5) <sup>a</sup>   | 19 (0.5) <sup>a</sup>  |
| Peptic ulcer disease without bleeding         | 2492 (0.1)         | 136 (0.2)                  | 18 (0.7) <sup>a</sup>        | 25 (0.6) <sup>a</sup>        | 22 (0.2)                | 0 (0)                  |
| Valvular heart disease                        | 79,899 (4.0)       | 2589 (4.1)                 | 75 (3.1)                     | 129 (3.1) <sup>a</sup>       | 629 (5.0) <sup>a</sup>  | 107 (2.8) <sup>a</sup> |
| Weight loss                                   | 5371 (0.3)         | 325 (0.5) <sup>a</sup>     | $\leq 10$ (0.4)              | 18 (0.4)                     | 71 (0.6) <sup>a</sup>   | 5371 (0.3)             |

OA, osteoarthritis; RA, rheumatoid arthritis; JIA, juvenile inflammatory arthritis; AS, ankylosing spondylitis; SLE, systemic lupus erythematosus; PsA, psoriatic arthritis.

<sup>a</sup>  $P < .05$  when compared with OA patients.

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