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Trends in Primary and Revision Hip Arthroplasty Among Orthopedic Surgeons Who Take the American Board of Orthopedics Part II Examination



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ABSTRACT

Background: A certified list of all operative cases performed within a 6-month period is a required prerequisite for surgeons taking the American Board of Orthopaedic Surgery Part II oral examination. Using the American Board of Orthopaedic Surgery secure Internet database containing these cases, this study (1) assessed changing trends for primary and revision total hip arthroplasty (THA) and (2) compared practices and early postoperative complications between 2 groups of examinees, those with and without adult reconstruction fellowship training.

Methods: Secure Internet database was searched for all 2003–2013 procedures with a Current Procedural Terminology code for THA, hip resurfacing, hemiarthroplasty, revision hip arthroplasty, conversion to THA, or removal of hip implant (Girdlestone, static, or dynamic spacer).

Results: Adult reconstruction fellowship-trained surgeons performed 60% of the more than 33,000 surgeries identified (average 28.1) and nonfellowship-trained surgeons performed 40% (average 5.2) ($P < .001$). Fellowship-trained surgeons performed significantly more revision surgeries for infection (71% vs 29%) ($P < .001$). High-volume surgeons had significantly fewer complications in both primary (11.1% vs 19.6%) and revision surgeries (29% vs 35.5%) ($P < .001$). Those who passed the Part II examination reported higher rates of complications (21.5% vs 19.9%).

Conclusion: In early practice, primary and revision hip arthroplasties are often performed by surgeons without adult reconstruction fellowship training. Complications are less frequently reported by surgeons with larger volumes of joint replacement surgery who perform either primary or more complex cases. Primary hip arthroplasty is increasingly performed by surgeons early in practice who have completed an adult reconstructive fellowship after residency training. This trend is even more pronounced for more complex cases such as revision or management of infection.

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Total hip arthroplasty is a remarkably successful surgical procedure with a predictable improvement in patient activity and well-being. The numbers of both primary and revision total hip arthroplasties performed are increasing dramatically [1]. However,

little is known about current trends in primary and revision total hip arthroplasty procedures, the level of advanced training by those who perform these procedures, and the rates of postoperative complications for surgeons with and without adult reconstruction fellowship training.

All orthopedic residency graduates are required to take the American Board of Orthopaedic Surgery (ABOS) Part I and II examinations to ensure the highest standards of training for the next generation of orthopedic surgeons in the United States. A certified list of all operative cases performed within a 6-month period (July to December) is a prerequisite to taking the Part II oral examination.

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The ABOS has collected and maintained data on these cases since 1999. This unique database contains valuable information about the surgeons who are performing hip replacements and the evolving practice patterns in this rapidly growing field.

The sharply increasing numbers of total hip arthroplasty procedures have outpaced our knowledge of who is performing these surgeries, their level of advanced training, and associated rates of complications. The purpose of this study was to (1) assess changing trends over time for primary and revision total hip arthroplasty and (2) compare practices and early postoperative complications of surgeons with adult reconstruction fellowship training and those without this training who took the Part II examination for the first time.

We analyzed ABOS data that were self-reported by Part II examination candidates. Our goal was to evaluate the volume of primary and revision total hip arthroplasty surgeries performed by the orthopedic surgeons (adult reconstruction fellowship trained vs nonadult reconstruction fellowship trained) and to assess the rate of readmission/reoperations and different medical and orthopedic complications.

Methods

This investigation analyzed case data entered into a secure Internet database (SCRIBE) of the ABOS by surgeons taking the Part II examination for the first time from years 2003 to 2013. Those surgeons who were taking the Part II examination for the second or third time were not included in this study.

All graduates of residency programs in orthopedic surgery are required to take the ABOS examinations. More than 650 surgeons annually report data on more than 75,000 cases performed more than a 6-month period. All applicants are informed that the case list data that they submit may be used for research purposes after deidentifying the data; their signed application grants permission for use of these data. This study was considered exempt from review by the Emory University and University of Michigan human research protection programs.

The SCRIBE database was searched for all procedures with a Current Procedural Terminology (CPT) code of 27130 (total hip arthroplasty-hip resurfacing); 27125, 27236 (hemiarthroplasty); 27134, 27137, 27138 (revision hip arthroplasty); 27132 (conversion to total hip arthroplasty), and 27090, 29091 (removal of hip implant).

SCRIBE data are verified by sampling during examination and are collected in a standard format under clear, uniform instructions. These data include the International Classification of Diseases, Ninth Revision, Clinical Modification code, the CPT code, and the patient demographics. Since 2003, fellowship training and the geographic region of practice have also been included in the database. Complications are physician reported and are entered from drop-down menu lists containing medical and surgical categories. The outcome measures are limited to pain, deformity, function, and patient satisfaction. All reported cases were included in the present analysis, even those lacking postoperative follow-up. The high-volume surgeon was defined as one who performed more than 50 primary or more than 10 revision total hip arthroplasties in the 6-month reporting period.

Statistical Analysis

Normal distribution of the values was checked by means of the Shapiro-Wilk normality test for each series of measurements. Analysis of data with normal distribution used the paired Student *t* test and independent sample *t* test. Analysis of data without normal distribution used related-samples Wilcoxon signed rank test and

independent sample Mann-Whitney U test. Linear regression was used to determine trend across time. Statistical analysis was performed using MedCalc (MedCalc Software, Ostend, Belgium) version 11.3 and SPSS (IBM, Armonk, NY) version 21.

Results

Part II examination takers in years 2003–2013 reported 19,861 (60%) hip surgeries (including primary and revision total hip arthroplasty, hemiarthroplasty, hip resurfacing arthroplasty, and irrigation and debridement or removal of implant for treatment of infection) performed by 707 adult reconstruction fellowship-trained candidates. During this same period, 2601 examination takers without adult reconstruction fellowship training performed 13,369 (40%) hip surgeries (Table 1). The average number of hip arthroplasties performed per surgeon differed significantly ($P < .001$) between adult reconstruction fellowship-trained and nonfellowship-trained groups, average 28.1 vs 5.2 surgeries, respectively. The average percentage of submitted cases that were related to hip arthroplasties performed by adult reconstruction fellowship-trained surgeons increased from 21.1 in 2003 to 34.9 in 2013 ($R^2 = 0.83$, $P = .0001$). This increased from 4.2 to only 5.7 for nonfellowship-trained surgeons ($R^2 = 0.4$, $P = .04$) (Fig. 1). This shows that the number of the hip arthroplasties performed over the study period increased significantly for adult reconstruction fellowship-trained surgeons, and these surgeons are doing more subspecialty surgeries than general orthopedic cases. It should be remembered that these numbers represent only the cases submitted by candidates for the Part II examination; they may not reflect the true distribution of cases among orthopedic surgeons in the United States.

We compared the percentage of adult reconstruction fellowship-trained surgeons in 6 regions of the United States in 2003 and 2013 (northeast, southeast, midwest, south, northwest, southwest, and Pacific). The percentage of adult reconstruction fellowship-trained surgeons who take the Part II examination is increasing in all the regions (Fig. 2). This evaluation shows the highest increases in the southeast and southwest regions and the smallest increase in the south.

Except for years 2006, 2007, and 2010, the percentage of arthroplasty cases performed by adult reconstruction fellowship-trained surgeons has increased each year, and the overall trend is increasing (Fig. 1). If the first year of the study period (2003) is compared with the latest (2013), a statistically significant difference ($P < .001$, chi-square) is found, further supporting the hypothesis that the percentage of hip replacements by adult reconstruction fellowship-trained surgeons has increased.

For Part II examination takers in 2003–2013, there were 4710 (71%, average 7.7 cases per surgeon) complex hip procedures performed by 617 adult reconstruction fellowship-trained candidates, and 1892 (29%, average 2.2 cases per surgeon) complex hip procedures performed by 855 nonfellowship-trained candidates ($P < .001$). Again, these numbers may not represent the true distribution of complex operations performed by the wider community of orthopedic surgeons in the United States.

For primary total hip arthroplasty, adult reconstruction fellowship-trained surgeons reported complications in 2639 of 15,151 surgeries (17.4%). Nonfellowship-trained surgeons reported 2313 cases with complications of a total of 11,477 surgeries (20.2%). This difference is statistically significant ($P < .0001$). For revision and complex total hip arthroplasty, fellowship-trained surgeons reported that 1503 of 4710 surgeries (31.9%) had complications. Nonfellowship-trained surgeons reported complications in 617 of 1892 procedures (32.6%) ($P = .5817$).

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