

Total Hip Arthroplasty and Hemiarthroplasty: US National Trends in the Treatment of Femoral Neck Fractures

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Abstract

There is controversy regarding whether total hip arthroplasty (THA) or hemiarthroplasty (HA) is the treatment preferred for displaced intracapsular femoral neck fractures (FNFs). Using the US National Hospital Discharge Survey, we found that, of 12,757 patients admitted for FNF between 2001 and 2010, 4.6% underwent THA and 52.5% underwent HA. More of both procedures were performed over time. Mean age was higher for HA patients. Hospitalization duration and blood transfusion rates were higher for THA. There were region-based differences in frequency of THA and significant hospital-size-based differences in frequency of HA, possibly because of differences in regional training and subspecialist availability. In addition, a larger proportion of THA patients was covered by private insurance.

Femoral neck fractures (FNFs) are a common source of morbidity and mortality worldwide. The increasing number of FNFs in the United States is attributed to increases in number of US residents ≥ 65 years old, the average life span, and the incidence of osteoporosis.¹ Three hundred forty thousand hip fractures occurred in the United States in 1996, and the number is expected to double by 2050.² By that year, an estimated 6.3 million hip fractures will occur worldwide.³ Given the 1-year mortality rate of 14% to 36%, optimizing the management of these fractures is an important public health issue that must be addressed.⁴

Treatment is based on preoperative ambulatory status, cognitive function, comorbidities, fracture type and displacement, and other factors. In physiologically elderly patients with displaced fractures, surgical treatment usually involves either hemiarthroplasty (HA) or total hip arthroplasty (THA). There is controversy regarding which modality is the preferred treatment.

Proponents of HA point to a higher rate of dislocation for FNFs treated with THAs,^{5,6} attributed to increased range of motion.⁷ Proponents of THA point to superior short-term clinical results and fewer complications, especially in mobile, independent patients.⁸

We conducted a study to assess recent US national trends in performing THA and HA for FNFs and to evaluate perioperative outcomes for each treatment group.

Materials and Methods

Data for this study were obtained from the National Center for Health Statistics (NCHS) National

Take-Home Points

- An increasing number of THAs and HAs were performed over time for FNF.
- HA patients tended to be older.
- Hospitalization and blood transfusion rates were higher for THA.
- Hospital size affected the rate of HAs, while hospital location affected the rate of THAs.
- A larger proportion of THA patients had private insurance.

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Hospital Discharge Survey (NHDS) and were imported into Microsoft Office Excel 2010.⁹ The NHDS examines patient discharges from various hospitals across the US, including federal, military, and Veterans Administration hospitals.⁹ Only short-stay hospitals (mean stay, <30 days) and hospitals with a general specialty are included in the survey. Each year, about 1% of all hospital admissions from across the US are abstracted and weighted to provide nationwide estimates. The information collected from each hospital record includes age, sex, race, marital status, discharge month, discharge status, days of care, hospital location, hospital size (number of beds), hospital type (proprietary or for-profit, government, nonprofit/church), and up to 15 discharge diagnoses and 8 procedures performed during admission.⁹

International Classification of Diseases, Ninth Revision (ICD-9) procedure codes were used to search the NHDS for patients admitted after FNF for each year from 2001 through 2010. These codes were then used to identify patients within this group who underwent THA or HA. We also collected data on patient demographics, hospitalization duration, discharge disposition, in-hospital adverse events (deep vein thrombosis [DVT], pulmonary embolism [PE], blood transfusion, mortality), form of primary medical insurance, number of hospital beds (0-99, 100-199, 200-299, 300-499, ≥500), hospital type (proprietary, government, nonprofit/church), and hospital region (Northeast, Midwest, South, West).

Trends were evaluated by linear regression with the Pearson correlation coefficient (*r*). Statistical comparisons were made using the Student *t* test for continuous data, and both the Fisher exact test and the χ^2 test for categorical variables. Significance level was set at *P* < .05. All analyses were performed with IBM SPSS Statistics 22.

Results

Of the 12,757 patients identified as having FNFs (**Figure 1**), 582 (4.6%) underwent THA, 6697 (52.5%) underwent HA, 3453 (27.1%) received internal fixation, and 1809 (14.2%) did not have their surgery documented. There were 164 men (28.2%) in the THA group and 1744 (26.0%) in the HA group (*P* = .27). Mean age was significantly (*P* < .01) higher for HA patients (81.1 years; range, 18-99 years) than for THA patients (76.9 years; range, 19-99 years), and there were significantly (*P* < .01) more medical comorbidities for HA patients (6.4 diagnoses; range, 1-7+ diagnoses) than for THA

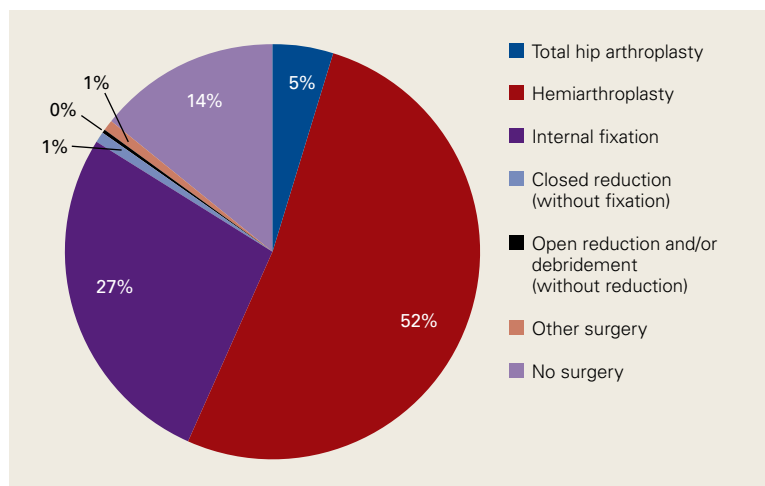


Figure 1. Distribution of surgical procedures performed for femoral neck fractures.

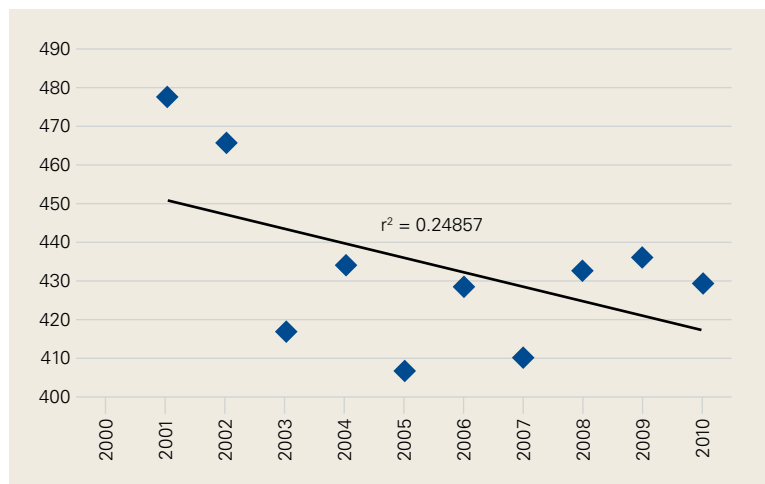


Figure 2. Femoral neck fracture prevalence over time.

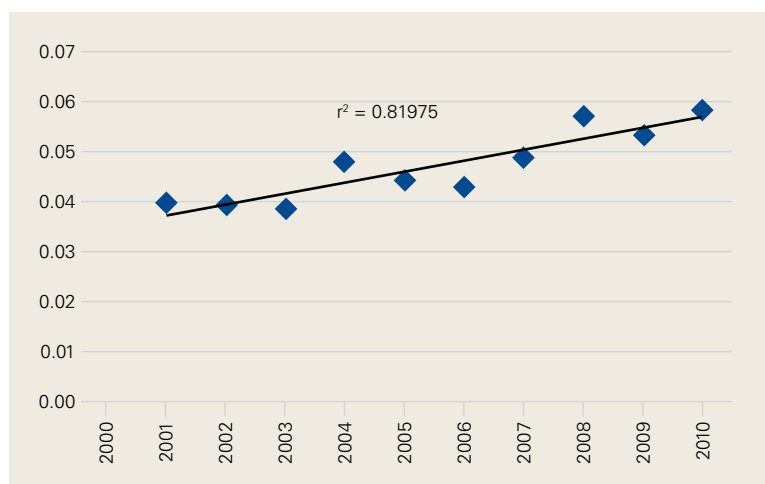


Figure 3. Proportion of femoral neck fractures treated with total hip arthroplasty over time.

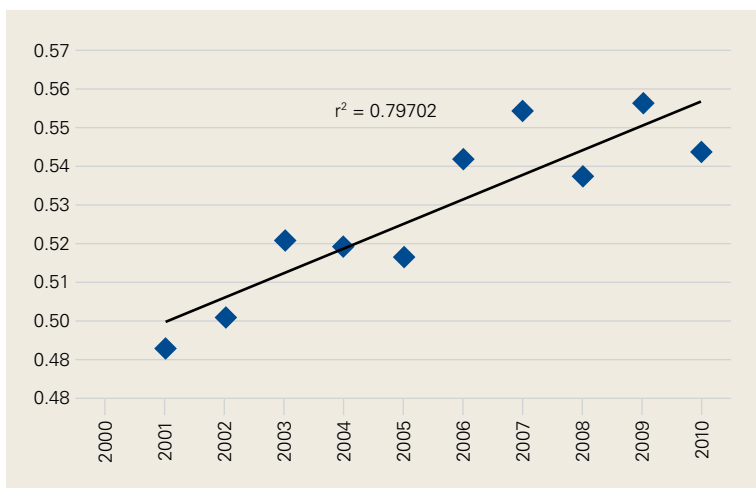


Figure 4. Proportion of femoral neck fractures treated with hemiarthroplasty over time.

Table. Prevalence of Total Hip Arthroplasty and Hemiarthroplasty by Hospital Characteristics

Hospital Characteristic	Prevalence, %	
	Total Hip Arthroplasty	Hemiarthroplasty
Beds, n		
0-99	3.8	47.4
100-199	4.8	54.3
200-299	4.6	56.0
300-499	4.4	52.0
≥500	5.8	50.8
<i>P</i>	.10	<.01
Type		
Proprietary	5.6	45.9
Government	4.2	47.6
Nonprofit/church	4.4	54.0
<i>P</i>	.12	<.01
Region		
Northeast	4.4	52.2
Midwest	4.4	53.7
South	5.2	51.0
West	3.3	55.5
<i>P</i>	.01	.07

patients (6.1 diagnoses; range, 1-7 diagnoses).

There was no clear trend in prevalence of FNFs between 2001 and 2010 ($r = 0.25$; **Figure 2**).

During this period, fracture prevalence ranged from 406 to 477 per 100,000 admissions. However, there was increased frequency in use of both sur-

gical techniques for FNFs over time: THA ($r = 0.82$; **Figure 3**) and HA ($r = 0.80$; **Figure 4**). The rate of THAs for FNFs increased from 4.2% for 2001 to 2005 to 5.0% for 2006 to 2010 ($P = .04$); similarly, the rate of HAs for FNFs increased from 51.0% for 2001 to 2005 to 54.7% for 2006 to 2010 ($P < .01$).

Hospital stay was longer ($P < .01$) for THA patients (7.7 days; range, 1-312 days) than for HA patients (6.7 days; range, 1-118 days), and blood transfusion rate was higher ($P = .02$) for THA patients (30.4%) than for HA patients (25.7%), but the groups did not differ in their rates of DVT (THA, 1.2%; HA, 0.80%, $P = .50$), PE (THA, 0.52%; HA, 0.72%, $P = .52$), or mortality (THA, 1.8%; HA, 2.9%; $P = .16$). Discharge disposition varied with surgical status ($P < .01$): 23.2% of THA patients and 11.6% of HA patients were discharged directly home after their inpatient stay, and 76.8% of THA patients and 88.4% of HA patients were discharged or transferred to a short- or long-term care facility.

Hospital size (number of beds) affected the number of HAs performed ($P < .01$) but not the number of THAs performed ($P = .10$; **Table**). Hospital location (Northeast, Midwest, South, West) affected THA frequency ($P = .01$), but not HA frequency ($P = .07$; **Figure 5**). In contrast, hospital type (proprietary, government, nonprofit/church) affected the HA rate ($P < .01$) but not the THA rate ($P = .12$; **Table**).

Private medical insurance provided coverage for 14.3% of THAs and 9.1% of HAs, and Medicare provided coverage for 80.9% of THAs and 86.0% of HAs ($P < .01$).

Discussion

The NHDS data showed a preference for HA over THA in the treatment of FNFs and suggested THA was favored for younger, healthier patients while HA was reserved for older patients with more comorbidities. Despite being younger and healthier, the THA group had higher transfusion rates and longer hospitalizations, possibly because of the increased complexity of THA procedures, which generally involve more operative time and increased blood loss. The resultant higher transfusion rate for THAs likely contributed to longer hospitalizations for FNFs. However, the THA and HA groups did not differ in their rates of DVT, PE, or mortality.

Multiple studies have noted no differences in mortality, infection, or general complications between THA and HA for FNF.^{9,10,11} THA patients have better functional outcomes, including Harris and Oxford hip scores and walking distance, but

higher dislocation rates,^{8,10-12} and HA patients are at higher risk for reoperation because of progressive acetabular erosion.^{8,10,11}

We noted an increase in use of both THA and HA for FNF over the study period (2001-2010). In a review of operative treatment for FNF by surgeons applying for the American Board of Orthopaedic Surgery certification between 1999 and 2011, Miller and colleagues¹³ found a similar increase in the THA rate over time, but decreases in the HA and internal fixation rates, with candidates in the “adult reconstruction” subspecialty showing a particularly strong trend toward THA use.

These findings reflect a general propensity toward femoral head replacement rather than preservation through open reduction and internal fixation (ORIF). Recent studies have found that ORIF carries a 39% to 43% rate of fixation failure and need for secondary revision, as well as risks of avascular necrosis, malunion, and nonunion.^{1,14-16} This need for secondary surgery makes ORIF ultimately less cost-effective than either THA or HA.^{16,17} Most authors would recommend arthroplasty for FNF in elderly patients with normal mental function^{1,16,18} and would reserve ORIF for young patients with good bone stock, joint space preservation, and reducible noncomminuted fractures.^{1,19}

Our study results suggest that smaller hospitals (<100 beds) tend to have lower rates of HA ($P < .01$, significant) and THA ($P = .10$, not significant; Table), possibly because FNF patients who present to these hospitals may be referred elsewhere because of regional differences in the availability of orthopedic traumatologists and arthroplasty subspecialists. Surgeon volume affects postoperative outcomes and may play a role in referral patterns.²⁰ Ames and colleagues²⁰ found that HA performed for FNF by surgeons with high-volume THA experience (vs non-hip-arthroplasty surgeons) had lower rates of dislocation, superficial infection, and mortality.

Regional differences were significant for THA alone, with the highest THA rates in the South (5.2%) and the lowest in the West (3.3%; Figure 5). There were no clear regional trends for HA. Possible explanations include a propensity toward a more aggressive approach in these regions, increased regional prevalence of acetabular disease, regional surgeon preferences, and regional differences in patient characteristics (eg, increased prevalence of obesity in the South).²¹

HA rates were highest for nonprofit/church hospitals and lowest for proprietary hospitals, whereas THA rates did not differ by hospital type. Possible

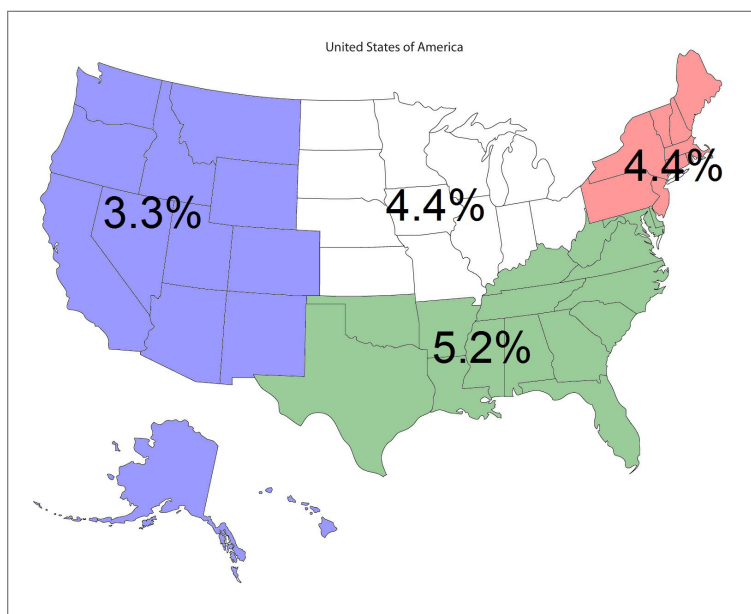


Figure 5. Rates of total hip arthroplasty in different regions of the United States.

explanations include an older, less mobile nonprofit/church patient cohort that is more amenable to HA, and surgeon preference.

THA patients were more likely to be covered by private medical insurance than by Medicare—a finding in agreement with Hochfelder and colleagues,²² who found that, compared with federal insurance and self-pay patients, private insurance patients were 41% more likely to undergo THA than HA or internal fixation for FNF. We think that the age difference between our THA and HA groups contributed to the insurance variability in our study.

Our study had several limitations. It was conducted to examine the rates of THA and HA after FNF, not to survey treatment types, including ORIF and nonoperative management. The NHDS database does not provide information on HA implant type (unipolar, bipolar), use or nonuse of cement with HA, or surgical approach. Surgical approach could influence the rate of postoperative dislocation, an outcome measure that was not examined in this study. Last, the NHDS database tracks admissions and discharges, not patients. When a patient is discharged, collection of information on the patient's postoperative course stops; a patient who returns even only 1 day later is recorded as a new or unique patient. Therefore, intermediate or long-term outcome information is unavailable, which likely led to an underrepresentation of DVT, PE, and mortality after these THA and HA procedures.

There was a trend toward femoral head replacement rather than ORIF in the treatment of FNF. Cognitively functional and independent elderly patients, and patients with osteoarthritis or rheumatoid arthritis, may benefit from THA, whereas HA may be better suited to cognitively dysfunctional patients.^{23,24} The NHDS reflects an increasing trend toward arthroplasty over ORIF, but the exact treatment choice is affected by hospital type, size, location and surgeon preference, training, and subspecialization.

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This paper will be judged for the Resident Writer's Award.