

Controversies in Hip Arthroplasty Using Registries to Answer Difficult Questions

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The advent of hip arthroplasty to treat hip fractures and hip degeneration has been an extraordinary achievement that has significantly changed the lives of millions of people. Hip hemiarthroplasty involves replacement of the femoral head and neck. Modern total hip arthroplasty (replacement of both the femoral head and acetabulum) was



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developed by Charnley in the 1960s and has allowed generations of surgeons to treat previously disabling hip disease, keeping patients active, productive, and independent.¹ Since the development of these procedures, there has been debate about the techniques used for both fixation and surgical approach, resulting in substantial changes in clinical practice and major differences in technique both locally and internationally.

For much of the history of hip replacement, the femoral stem (the part of the hip prosthesis inserted into the femoral canal) has been affixed to the femur with acrylic bone cement. This is still the practice in much of the world, but over the last several decades surgeons in the US have largely shifted to uncemented femoral stem designs for both hip hemiarthroplasty and total hip arthroplasty. The reasons for this shift were multiple, but a major one apparently was a misunderstanding. Osteolysis, a physiological response largely caused by plastic wear debris, was mistakenly called “cement disease” before the pathophysiology was understood.² Cementless stems can also be simpler and faster to implant. This shift has occurred despite evidence that cemented stems have fewer early failures (including fracture and loosening) and are associated with better long-term survival for many patients, especially those older than 75 years.³ The American Academy of Orthopaedic Surgeons’ *Clinical Practice Guideline on the Management of Hip Fractures in the Elderly*⁴ specifically recommended cementing the femoral stem but the report from the American Joint Replacement Registry⁵ indicated that less than half of femoral stems were cemented in 2018.

Several different operative approaches can be used for hip replacement. Recently, there has been considerable marketing and promotion for the anterior approach to the hip. This is often described as the “new” approach to the hip despite being described by Smith-Peterson⁶ 40 years before the posterior approach was developed. There is uncertainty about the relative merits of these surgical techniques with each having potential advantages and disadvantages.

In this issue of *JAMA*, Okike et al⁷ and Pincus et al⁸ report the results of their studies examining these issues. Okike et al

summarized the outcomes for 12 491 patients who underwent hip hemiarthroplasty for femoral neck fracture in the Kaiser Permanente system from 2009 to 2017. Of the 6042 patients with a procedure involving an uncemented stem, 3% had reoperation for loosening or fracture requiring revision surgery compared with 1.3% of 6449 who had undergone a cemented procedure. Although these proportions are small, these outcomes occurred in a frail population that can least tolerate additional operations and hospitalizations. Although the authors were able to control for most of the variables associated with adverse outcomes, one issue that was not addressed by Okike et al was surgeons’ preference for surgical technique and how this relates to their overall practice. Despite good evidence for cementing, there may have been inconsistent implementation of evidence into clinical practice. Surgeons who cement the femoral stem in hip hemiarthroplasty procedures may be more likely to adhere to various other evidence-based practices, thereby affecting outcomes.

Implant selection also can influence outcomes in hip surgery. Okike et al did not provide information about which implants were used in these procedures. There is significant variation in the risk of requiring revision operations following hip hemiarthroplasty procedures associated with different implants.⁹ The type and selection of implants available to Kaiser Permanente surgeons could have influenced outcomes. Studies of arthroplasty outcomes should specify the types of implants used. Registry data should be reviewed when selecting implants because choosing an implant with a higher failure rate could affect the results of this type of comparison.

In the report by Pincus et al,⁸ the authors examined the results of the 3 most common approaches for hip replacement. The debate over the best approach for hip replacement has been driven largely by surgeon promotion and marketing rather than compelling evidence. The anterior approach is purported to have the fastest recovery but may have higher rates of fracture and nerve injury. The lateral approach has the fewest dislocations, but a greater limp rate, and the posterior approach is the most extensible but historically has resulted in a higher dislocation rate. One recent study found no difference in complications at 30 days (including reoperation and infection) among 1913 patients in a high-volume center who had undergone hip replacement operations using the posterior, lateral, or anterior approach.¹⁰

Pincus et al evaluated outcomes from Ontario, Canada, in the first year following 2995 hip arthroplasties performed

by the anterior approach compared with 2128 and 5855 hips using the lateral and posterior approaches, respectively. These operations were carried out by 298 surgeons at 73 different hospitals between 2015 and 2019. The investigators used propensity score matching^{11,12} in an effort to achieve balance between the compared groups.

Despite having a lower risk of complications by being younger patients who were less obese and by having a lower incidence of diabetes and hypertension, there was a greater risk of major complications (a composite of deep infection requiring surgery, dislocation requiring closed or open reduction, or revision surgery) among patients undergoing surgery with the anterior approach (2%) than among those undergoing a lateral or posterior approach (1%). This population-based study adds important new information to a body of literature that is primarily based on reports from single centers and high-volume surgeons.

One limitation of the study by Pincus et al is that the authors combined patients who had undergone the posterior approach or the lateral approach into a single group and compared them with patients who had undergone the anterior approach. This is not optimal because the lateral and posterior approaches have different complication profiles. To address this problem, Pincus et al conducted a sensitivity analysis that evaluated the lateral and posterior approaches separately and found results that were similar to the primary analysis.

Another limitation of the study by Pincus et al is that 70% of cases in Ontario were performed by the lateral approach. The anterior approach was being increasingly adopted during the timeframe of the analysis. The anterior approach has a significant learning curve and the higher complication rate observed by Pincus et al associated with the anterior approach may have been related to the new use of the procedure in Ontario.¹³

Despite these limitations, this study provides orthopedic surgeons and primary care physicians with important information that may be helpful when having an informed discussion with patients about the risks and benefits of their potential hip surgery.

The studies by Okike et al and Pincus et al in this issue of *JAMA* address some important questions in hip arthroplasty and demonstrate the importance of comprehensive collection of registry data. Many of the complications described by the authors such as early revision, fracture, and infection have relatively low incidence but can be catastrophic for patients and costly for the health care system. Given that there are more than 500 000 hip arthroplasties performed in the US each year and more than 1 million around the world,¹⁴ understanding the best surgical approach is important. Although the absolute rates of adverse outcomes in both studies were low, because of the high volume of these procedures, small differences can result in large numbers of patients who experience major complications requiring additional treatment and surgery.

Optimally, randomized clinical trials should be conducted to definitively answer questions about whether to use cement for the femoral stem or whether to approach the hip anteriorly. However, it may not be feasible or possible to perform such studies.¹⁵ Improved outcomes for hip arthroplasty continue to rely on registry data. However, simply reviewing data such as that collected by the National Surgical Quality Improvement Program (NSQIP) has not been shown to significantly improve outcomes.¹⁶ Through its quality improvement program, Kaiser has demonstrated changes, such as reductions in the use of unicompartmental knee replacement, based on previous analyses of its arthroplasty registry.¹⁷ In the Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI),¹⁸ clinicians attend collaborative-wide meetings several times a year to review data and implement change in clinical practice resulting in improved outcomes.

Controversies remain in hip surgery about the utility of cementing the prosthesis in hemiarthroplasty and the best operative approach for total arthroplasty. Patient outcomes after hip surgery will be improved by maintaining large registries that have comprehensive data collection, including rigorous outcomes data, that are reviewed by surgeons who can use that information to modify their clinical practice.

ARTICLE INFORMATION

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