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Examining Sex and Gender Disparities in Total Joint Arthroplasty

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Abstract
Background Total joint arthroplasty (TJA) is remarkably successful for treating osteoarthritis: most patients see substantial gains in function. However, there are considerable geographic, racial, and gender variations in the utilization of these procedures. The reasons for these differences are complex.
Questions/purposes We examined sex and gender disparities in TJA.
Methods Through Medline/PubMed searches, we identified 632 articles and from these selected 61 for our review.
Where are we now? A number of factors might explain sex and gender disparities in TJA: underrepresentation in clinical trials, differences in willingness to undergo surgery, pain responses to underlying disease and treatment, patient-physician relationships, treatment preferences, provider-level factors such as physician-patient communication style, and system-level factors such as access to specialist care. Since women have a higher prevalence of arthritis and degenerative joint diseases and overall demand for these procedures will continue to grow, the need to understand why there is a gap in utilization based on gender is imperative.
Where do we need to go? Understanding what exactly is meant by "disparity" is essential because it is possible anatomic factors may have different impacts on utilization from cultural factors. Ideally, information about these factors should be integrated into the decision-making process so that patients and providers can make the most informed choice about whether or not to undergo the procedure.
How do we get there? To better understand all of the potential reasons for how anatomic and cultural factors related to sex and gender might impact decision-making and overall utilization of TJA, more research focusing on these factors must be designed and carried out.

Introduction

While there is plenty of evidence that total joint arthroplasty (TJA) is a remarkably successful treatment for osteoarthritis and degenerative joint disease, resulting in substantial gains in functional status for patients undergoing these procedures [35], there remains considerable geographic, racial, and gender variations in its utilization [13, 23, 25, 61]. The reasons for these variations are complex and include patient-level factors such as treatment preference and anatomic/physiologic factors, provider-level factors such as physician-patient communication style, and system-level factors such as access to specialist care [23]. There are no current studies able to elicit all of the underlying reasons for this multifaceted problem.

In this review, we addressed three main questions related to sex and gender disparities in TJA: (1) Are there sex

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and gender differences in research in general? (2) In what way do sex and gender matter in orthopaedic surgery? (3) How do sex and gender affect decision-making in orthopaedic surgery?

Search Strategies and Criteria

To explore the current state of gender and sex differences as they relate to TJA, a review of the literature was undertaken. The terms "gender," "female," and "sex" were combined with "total joint replacement or arthroplasty," "hip arthroplasty or replacement," and "knee arthroplasty or replacement" in MEDLINE and PubMed. In addition, "pain" and "pain management" were also combined with gender and sex search terms. All articles retrieved (632 after exclusion of duplicates between MEDLINE and PubMed) were examined to determine whether the study had a primary or secondary research purpose of examining sex and gender differences in TJA, provided a review/systematic review of sex and gender differences in pain management or TJA, or noted as a major study flaw the lack of sex or gender subanalyses. Over 200 articles met these criteria. Additional exclusion criteria included articles not in English and articles essentially covering similar information or study results from the same group of authors. A total of 61 articles and reports were included in this review.

Why Are Sex and Gender Important in Research?

One of the major difficulties in determining the impact sex and gender has on the diagnosis and treatment of conditions such as osteoarthritis is the long-term problem of how clinical research is conducted. Despite calls for equality in recruitment and enrollment of clinical trials [34], women have continued to be underrepresented in many areas of research [17, 20, 28, 30, 44, 50, 53, 59]. This may be due to the exclusion of pregnant women from many clinical trials for safety reasons but can also be due to differences in recruiting strategies resulting in few women being enrolled [59].

Even if women are represented, many studies do not provide gender-specific analysis because either the study was not powered sufficiently to allow for subgroup analysis or gender-specific analysis was not a part of the hypothesis being tested [17, 20]. One study found only 24.6% of clinical trial participants in articles published by the *New England Journal of Medicine* were women, and gender-specific analysis was available in only 14% of those trials [44]. Another study showed, among federally funded studies published in major peer-reviewed journals in 2004, only 37% of subjects were women, and gender-specific analysis was present in only 13% of studies [17]. This lack of gender representation and subgroup analysis has led to serious consequences. In 2005, 80% of drugs withdrawn from the US market were due to side effects and other issues impacting women that had not been studied during initial drug trials [50].

Why Are Sex and Gender Important in Orthopaedic Surgery in the United States?

The proportion of the population reporting chronic musculoskeletal problems has increased over the last two decades, with almost twice as many people reporting these conditions than other conditions [33]. In 2005, 59.3 million women and 48.4 million men reported one or more musculoskeletal problems, including chronic joint pain, arthritis, neck pain, and back pain, with women representing the majority in each case. Nearly 15 million people reported their musculoskeletal problems affected their daily lives [33].

Women have a higher prevalence of arthritis when compared to men, with worse symptoms and greater disability [5, 37, 41, 52]. More than 46 million people reported having arthritis (60.8% women), and almost 19 million people reported arthritis affected their ability to do everyday activities (63% women) [33]. Women have different gait patterns in response to osteoarthritis [12], report worse symptoms of knee osteoarthritis than men with similar radiographic severity [10], have increased rates of cartilage loss than men [19], and have greater hip degeneration [7]. Women also seek care from physicians for hip and knee problems more often than men, and this trend has persisted over the last 10 years [3].

Other studies show differences between men and women in the prevalence of osteoarthritis-related pain, with persistent pain being more common in women [4, 11, 46]. These differences persist with any kind of musculoskeletal pain [56] and indicate women are more likely to report this type of pain compared to men [14]. In terms of sex and gender differences in pain response after orthopaedic procedures and/or surgery, studies show less conclusive results, somewhat due to lack of standardization in the measurement of pain [14]. However, there is some evidence that women report more pain postoperatively, more intense pain overall, and reduced activities of daily living due to pain compared to men [45, 47]. Whether this difference is due to real differences in actual physical response to pain, due to delays in seeking treatment, or due to the influence of social and psychologic factors (ie, men are supposed to tolerate pain better than women) is unknown [25, 31, 57].

Does Sex and Gender Affect Decision-Making in Orthopaedic Surgery?

Since the successful treatment of arthritis and related conditions often requires TJA, it is logical to believe the demand for these procedures will continue to increase [3]; actual demand is already outpacing predicted demand for both THA and TJA [26, 27]. While there is underuse of TKA for moderate to severe arthritis in both genders, the degree of underuse is more than three times as great in women as in men [22], even though women make up a majority of patients receiving TJA [33]. Studies indicate women have a worse functional state before TJA, suggesting women are operated on at a more advanced stage in the course of their disease [15, 25, 38]. There are similar concerns about sex and gender differences in the utilization of THA, which may affect women's health status by prolonging the pain and disability of those who would benefit from the procedure. Gender disparities are evident by a decrease in the overall use of TJA in women. However, for those with the same level of preoperative disease severity, women and men derive comparable functional improvement after TJA [25, 38].

Studies indicate disparities in the utilization of TJA among subgroups could be due to differences in patients' preferences or willingness for surgery [8, 13, 51], and this has been true in decisions about treatments in other specialties [18, 24, 32, 36, 48]. These differences exist due to the patients' perceptions of benefits from TJA, lack of personal experiences with surgery, and trust [54]. Women express more concern than men regarding anesthesia, pain management [15], and recovery after TJA [9]. Also, women are often more willing to accept continued functional decline and less willing to accept the risks of surgery and disruption of their role of family caregiver [24], which can lead to delays in treatment.

However, studies are conflicted about the role gender plays on willingness to undergo TJA. Some suggest education level, not gender or income, predicts whether a patient has a TJA [21]. Others show gender is not the only factor influencing treatment decisions; age and race/ethnicity might also play a role [8, 13]. Disparities in the rate of THAs might not follow the same patterns as disparities in TJAs, making the debate even more complicated [16].

Additionally, physicians are more likely to recommend TKA to a male patient than a female patient, suggesting physicians contribute to the gender-based disparity in the utilization rates of TKAs [6]. A number of studies suggest this is not a new phenomenon in how providers approach diagnosis and treatment decisions based on gender [1, 2, 29, 39, 40, 42, 43, 49, 55, 58, 60].

Discussion

We have pointed out several possible reasons for sex and gender disparities in TJA, including underrepresentation in clinical trials [34], differences in willingness to undergo surgery [9, 15, 54], pain response to underlying disease and treatment [14, 46, 56], and patient-physician relationships [6].

We bring to the reader's attention a number of limitations of the literature and our review. First, this was not a comprehensive review of all potential sources of information on the topic. We limited our search to MEDLINE and PubMed databases, which could have led to us missing pertinent information. Second, we included studies regardless of the level of evidence, mostly because there are so few clinical trials or high-level evidence-based studies exploring sex and gender differences as a primary study aim. Third, we limited our discussion to articles on gender and sex differences with respect to hip and knee arthroplasty and pain. There could be differences between women and men in utilization of other types of orthopaedic surgery or in the prevalence of comorbidities that could lead to different interpretations of exactly what "disparity" might mean with respect to sex and gender in TJA.

Where do we need to go? Due to the shortcomings of studies analyzing specific sex and gender disparities in TJA, we can conclude more research is needed in determining exactly how sex and gender impact the disease states leading to the need for TJA, as well its influence on other demographic, cultural, and functional status indicators determining short- and long-term outcomes (such as implant survival, reduced pain, better functional status, improved patient satisfaction) of the procedure. Sex and gender disparity in TJA is a good example of the complicated picture of healthcare disparities overall, where multiple factors play a role in patients' access to diagnostic care and treatment and in the decision-making process for both the patient and the provider. We can say there are a multitude of factors leading to overall disparity, as most patients do not fall under just one category of inequality.

How do we get there? The term "disparity" assumes a particular group is not receiving adequate care for a particular disease solely on the basis of being in that group. We believe prospective research in TJA should be designed (and powered from a statistical perspective) to explore the physiologic and cultural differences between men and women related to utilization of the procedure, long-term improvements in functional status, decreased pain, and increased quality of life. It is likely having better information may show the solutions to reducing disparities might differ for gender differences (ie, cultural and social factors) versus sex/physiologic differences, as well as help to prioritize specific interventions.

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