Population Based Trends in the Surgical Treatment of Benign Prostatic Hyperplasia

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Purpose: Laser prostatectomy has increased in popularity in the last decade. However, traditional transurethral resection of the prostate remains common. To understand decisions about the use of laser prostatectomy vs transurethral prostate resection, we evaluated trends in transurethral surgery for benign prostatic hyperplasia in an all payer data set, focusing on patient and provider factors associated with the receipt of laser prostatectomy.

Materials and Methods: Using Florida State Inpatient Database and Ambulatory Surgery Database, we identified patients who underwent laser prostatectomy or transurethral prostate resection from 2001 to 2009. We calculated surgery rates with time, stratified by procedure type. We used multilevel regression to examine patient (age, race and comorbidity level) and provider (surgeon volume) factors associated with the receipt of laser prostatectomy vs transurethral prostate resection.

Results: While the overall rates of transurethral surgery remained stable during the study period ($p = 0.227$), laser prostatectomy use increased 400% from 25 to 114 procedures per 100,000 men ($p < 0.001$), replacing about half of all transurethral prostate resections. Patients were less likely to undergo laser prostatectomy if they were older (OR 0.65, 95% CI 0.61–0.70) and less healthy (OR 0.48, 95% CI 0.45–0.51). While these factors were predictive of surgery type, most of the variation in laser prostatectomy use (69%) was determined by the urologist seen by the patient.

Conclusions: Laser prostatectomy use has increased in the last decade at the expense of transurethral prostate resection, driven largely by provider effects. However, elderly and more infirm patients are least likely to undergo it, raising concern about underuse in this population.

Key Words: prostate, prostatic hyperplasia, laser therapy, transurethral resection of prostate, aged

Abbreviations and Acronyms

BPH = benign prostatic hyperplasia

SASD = State Ambulatory Surgery Database

SID = State Inpatient Database

TURP = transurethral resection of prostate

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BENIGN prostatic hyperplasia is the most common benign neoplasm in men.[1] Its prevalence increases with age, such that more than 3/4 men older than 70 years have lower urinary tract symptoms secondary to BPH.[2] The economic impact of BPH is substantial with costs exceeding $3 billion annually.[3] As the American population ages, the public health burden of BPH will only grow.[4] Understanding how care is currently delivered for this highly prevalent disease will help identify opportunities to improve efficiency of care in the future.

Surgical treatment for BPH has been dominated by TURP for many decades. Indeed, TURP is the first mini-

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mally invasive treatment of BPH and it provides excellent long-term outcomes. However, as technology evolved, the surgical management of BPH changed in the last decade with laser prostatectomy increasing in popularity after the introduction in 2000 of GreenLight™ laser vaporization.[5,6] Based on available limited comparative effectiveness data, laser prostatectomy may have several advantages, including shorter hospital stay and catheterization time, a lower risk of clot retention and no risk of transurethral resection syndrome.[7–9] In fact, a recent study showed favorable outcomes after laser prostatectomy even in men who underwent surgery while on anticoagulation.[10]

While most of these studies were limited by the lack of long-term followup, the reported advantages may make laser prostatectomy particularly well suited for elderly men with significant comorbidity. However, despite the potential advantages of laser prostatectomy, TURP has remained the most common procedure performed in the elderly population.[6]

To understand decisions about the use of laser prostatectomy vs TURP, we evaluated recent trends in transurethral surgery for BPH in an all payer data set, focusing on patient and provider factors associated with the receipt of laser prostatectomy.

METHODS

Database and Patients

We used the Florida files of the Healthcare Cost and Utilization Project SASD and SID, which capture 100% of outpatient and inpatient hospital discharges, respectively, in a given year. We chose Florida for 2 reasons. 1) It is one of the larger and more ethnically diverse states participating in the Healthcare Cost and Utilization Project. 2) It captures discharges from various practice locations, including freestanding ambulatory surgery centers. We abstracted all 96,134 discharges for TURP (CPT codes 52601, 52612, 52614, 52620 and 52630, and ICD-9-CM code 60.29) and laser prostatectomy (CPT codes 52647, 52648 and 52649, and ICD-9-CM code 60.21) between 2001 and 2009. We excluded from analysis 11,768 patients with a diagnosis of prostate cancer, and 410 with a code for TURP plus laser prostatectomy. We also excluded 100 men younger than 40 years because they were unlikely to have BPH.[11]

Covariate Identification

We obtained patient level data, including age, race (white, black or Hispanic vs other), primary payer (private or Medicare vs other) and discharge diagnoses, from SASD and SID. Comorbidity was measured using the clinical comorbidity index of Deyo et al for administrative databases.[12] We calculated patient socioeconomic status at the ZIP Code level using methods described by Diez Roux et al.[13] Surgeons were identified using the encrypted surgeon identifiers from SASD and SID. Surgeon volume, a physician level factor, was measured by counting the total number of transurethral procedures for BPH (TURP and laser prostatectomy) per year for each surgeon. We then categorized yearly surgeon volume into low—1 to 3 cases, medium—4 to 14 or high—15 to 179 based on terciles of transurethral surgery cases for BPH.

Statistical Analysis

To examine the use of transurethral surgery for BPH with time, we calculated population based rates for each year and procedure (TURP and laser prostatectomy). For these rates the numerator was the total number of TURP and laser prostatectomy procedures performed in a year and the denominator was the census population estimate for male residents 40 years old or older for that year for Florida. We then adjusted these rates for patient age using direct standardization.[14] Time trends in adjusted rates were assessed by Poisson regression.

Our primary outcome was receipt of laser prostatectomy vs TURP. We used the chi-square test to assess bivariate associations of patient, surgeon and regional factors with laser prostatectomy. We fit a series of logistic random intercept models to identify factors associated with receipt of laser prostatectomy. These models allowed us to account for the nested structure of our data, ie patients nested within physicians, while adjusting for physician and regional characteristics.[15]

We first examined the association of age and comorbidity with receipt of laser prostatectomy, controlling for year. To understand the impact of confounding, we added covariates (race, regional socioeconomic status and surgeon volume) in stepwise fashion. We examined whether payer type would explain some associations of age and comorbidity with receipt of laser prostatectomy by adding primary payer to the models. To evaluate the extent to which the treating physician explains the type of surgery undergone by the patient, we calculated the physician intraclass correlation coefficient in these logistic random intercept models.[15] To illustrate our findings, we calculated the predicted probabilities of receiving laser prostatectomy from logistic regression models. To examine whether differential coding of comorbidity in the inpatient (SID) and outpatient (SASD) data sets affected our results, we performed sensitivity analysis stratified by location of service.

All analyses were done using Stata®, version 12SE. All tests were 2-tailed and we set the probability of a type 1 error at 0.05 or less. The University of Michigan Medical School institutional review board exempted this study from review.

RESULTS

Between 2001 and 2009 we identified 54,399 TURP and 29,457 laser prostatectomy procedures. During the study period, age adjusted laser prostatectomy rates increased more than fourfold from 25 to 114/100,000 men ($p < 0.001$), while the overall transurethral surgery rate for BPH remained stable at 248/100,000 men in 2001 vs 233/100,000 in 2009 ($p = 0.227$, fig. 1).

Table 1 lists the results of bivariable analysis. Laser prostatectomy was inversely related to age