

Original article

Morbidity and costs of salvage vs. primary radical prostatectomy in older men[☆]

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Abstract

Objectives: Salvage radical prostatectomy (RP) is performed with curative intent following post-radiotherapy recurrence for prostate cancer. While single-center salvage RP outcomes appear promising, little is known about outcomes in the community setting in elderly men. We sought to evaluate utilization, outcomes, and costs of salvage RP vs. primary RP in older men.

Materials and methods: Surveillance, Epidemiology and End Results-Medicare linked data from 1992 to 2007 was used to identify 18,317 men aged 65 years or older who underwent RP from 2002 to 2007. Propensity score analyses were used to compare outcomes and costs for primary vs. salvage RP.

Results: Salvage RP was rare, accounting for 0.5% of RP. Men undergoing salvage vs. primary RP were older, white, and less likely to undergo CT, bone scan and prostate biopsy preoperatively ($P < 0.05$ for all). In adjusted analyses, salvage vs. primary RP was associated with increased 30-day complications (60.1% vs. 22.7%, $P < 0.01$), lengths of stay (mean 7 vs. 3 days, $P < 0.01$), and hospital readmissions within 30 days (30.4% vs. 5.7%, $P < 0.01$). The odds of death within 90 days were higher for salvage vs. primary RP (OR 26.7, 95% CI 12.9–55.1, $P < 0.01$). The median expenditure for salvage RP within 6 months postoperatively was almost twice that for primary RP (US\$30,881 vs. US\$12,431, $P < 0.01$).

Conclusions: Metastatic workup was performed less frequently before salvage vs. primary RP, and morbidity and mortality for salvage RP was high relative to primary RP. Given the morbidity and high cost of salvage RP, guidelines for patient selection and selective referral may optimize outcomes, especially in older men. © 2013 Published by Elsevier Inc.

Keywords: Salvage prostatectomy; Utilization; Outcomes; Radiotherapy

1. Introduction

Prostate cancer (CaP) is the most prevalent solid organ tumor and the second most common cause of death among men in the USA. In 2012, an estimated 241,740 men will be diagnosed with CaP [1]. Over the past 3 decades, stage migration in CaP has resulted in 92% of incident CaPs

presenting as locoregional vs. metastatic [2,3]. While treatments for clinically localized CaP vary, the 2 most common are radical prostatectomy (RP) and traditional radiation therapies (external-beam and brachytherapy) [4]. While radiotherapy is a popular treatment option, 63% of men will experience biochemical recurrence (BCR) within 10 years of radiotherapy [5].

Management of the patient with BCR following radiation therapy in most cases includes androgen deprivation therapy (ADT). Approximately 92% of men with post-radiotherapy BCR will undergo ADT that is noncurative and increases the risk for diabetes, cardiovascular disease, and thromboembolic complications [6,7]. Only

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2% of men with post-radiotherapy BCR will undergo salvage RP [8], perhaps because of ineffective cancer control and greater risk for complications [9,10]. While more recent salvage prostatectomy series suggest improved morbidity and 5-year progression-free survival approaching 55% in all patients (and 86% for men with PSA <4 before salvage RP) [11], these data represent single-institution or multi-institutional cohorts from high-volume oncologic centers [12]. At a population level, the outcomes and costs of salvage RP remain unknown, especially in older men who may not benefit from surgical intervention because of limited life expectancy. The purpose of our population-based study is to evaluate utilization, outcomes, and costs of salvage radical prostatectomy in older men relative to radical prostatectomy as primary therapy as a benchmark.

2. Materials and methods

2.1. Data

Our study was approved by the Brigham and Women's Institutional Review Board; patient data were de-identified and the requirement for consent was waived. We used Surveillance, Epidemiology, and End Results (SEER)-Medicare data for analysis, which is currently comprised of a linkage of population-based cancer registry data from 20 SEER areas with Medicare administrative data and covers approximately 28% of the US population. The Medicare program provides benefits to 97% of Americans aged >65 years [13].

2.2. Study cohort

We identified men aged >65 years initially diagnosed with CaP from 1992 to 2007 who underwent open radical prostatectomy between 2002 and 2007 based on *Physicians' Current Procedural Terminology Coding System, 4th edition* (CPT-4) codes (55,840, 55,842, 55,845 for open radical prostatectomy). Subjects were then grouped into primary or salvage prostatectomy cohorts, with salvage RP defined as surgery 12 months or greater following primary radiotherapy (external beam radiotherapy, brachytherapy, and/or intensity-modulated radiotherapy). We excluded perineal and minimally invasive radical prostatectomy as these were uncommon in the salvage setting, totaling 25 procedures. We excluded men not enrolled in both Medicare Part A and B or who were enrolled in a Medicare health maintenance organization because their claims are not reliably submitted. We restricted our cohort to men with CaP diagnosed as their only cancer. Mean follow-up (\pm standard deviation) for salvage vs. primary RP was 2.0 (\pm 1.9) vs. 4.3 (\pm 2.0) years.

2.3. Outcomes

We examined the utilization of salvage prostatectomy after primary radiotherapy and associated Medicare expenditures in the perioperative and postoperative period.

2.4. Control variables

Age was obtained from the Medicare file; race, census tract measures of median household income and high school education, region, population density (urban vs. rural), and marital status were obtained from SEER registry data. Comorbidity was assessed using the Klabunde et al. modification of the Charlson index during the year before surgery [14]. International Classification of Diseases, 9th Revision (ICD-9) codes were used to identify disease categories, while CPT-4 and Healthcare Common Procedure Coding System code sets were used to identify medical, surgical, and diagnostic services. As CPT-4 codes were utilized to identify complications, data cannot be reported using the Clavien Classification of Surgical Complications but, instead, are presented in a well-established framework by organ system [15]. To increase specificity, only imaging studies designated with a corresponding ICD-9 code for CaP were included.

2.5. Expenditures

To best attribute the costs associated with each surgical setting, we assessed Medicare payments 3 days before the date of surgical admission and 90 days after the date of discharge from all inpatient, outpatient, and carrier claims.

2.6. Statistical analysis

Unadjusted analysis using the Pearson χ^2 statistic was performed to compare demographic and biopsy tumor characteristics for men receiving salvage prostatectomy vs. observation alone, adjusting for clustering by surgeon [16]. In addition, a Pearson χ^2 test was also utilized to compare the use of salvage prostatectomy by clinical and pathologic features.

As men who received salvage RP may differ from those who underwent primary RP in terms of demographic characteristics, we used weighted propensity score methods to adjust for observed differences [17,18]. Propensity score methods control for all observed confounding factors that may influence cohort assignment and outcome using a single composite measure, balancing patient characteristics as would occur in a randomized experiment. Propensity score adjustment was performed using a logistic regression model to calculate the probability of undergoing primary vs. salvage RP based on described covariates and then weighting the data based on the inverse propensity of being in either of the treatment groups [19]. After adjustment, covariate balance was assessed.

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