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Wrong to be Right:

Margin Laterality is an Independent Predictor of Biochemical Failure After Radical Prostatectomy

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Abstract

Objectives: To examine the impact of positive surgical margin (PSM) laterality on failure after radical prostatectomy (RP). A PSM can influence local recurrence and outcomes after salvage radiation. Unlike intrinsic risk factors, a PSM is caused by intervention and thus iatrogenic failures may be elucidated by analyzing margin laterality as surgical approach is itself lateralized.

Patients and Methods: We reviewed 226 RP patients between 1991 and 2013 with PSM. Data includes operation type, pre/postoperative PSA, surgical pathology, and margin type (location, focality, laterality). The median follow-up was 47 months. Biochemical recurrence after RP was defined as PSA ≥ 0.1 ng/mL or 2 consecutive rises above nadir. Ninety-two patients received salvage radiation therapy (SRT). Failure after SRT was defined as any PSA ≥ 0.2 ng/mL or greater than presalvage. Kaplan-Meier and Cox multivariate analyses compared relapse rates.

Results: The majority of PSM were iatrogenic (58%). Laterality was associated with differences in median relapse: right 20 versus left 51 versus bilateral 14 months ($P < 0.01$). Preoperative PSA, T-stage, Gleason grade, and laterality were associated with biochemical progression on univariate and multivariate analyses. Right-sided margins were more likely to progress than left (hazard ratio, 1.67; $P = 0.04$). More right-sided margins were referred for SRT (55% right vs. 23% left vs. 22% bilateral), but were equally salvaged. Only T-stage and pre-SRT PSA independently influenced SRT success.

Conclusions: Most PSM are iatrogenic, with right-sided more likely to progress (and sooner) than left sided. Margin laterality is a heretofore unrecognized independent predictor of biochemical relapse and hints at the need to modify the traditional unilateral surgical technique.

Keywords

prostate cancer; biochemical relapse; positive margin; prostatectomy; iatrogenic; salvage radiation therapy

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About one fourth of the patients will experience recurrence after radical prostatectomy (RP).¹ For those with local recurrence, radiation therapy (RT) is the only curative treatment option available. Known factors associated with postoperative biochemical failure include initial preoperative PSA, pathologic T-stage, Gleason score, and positive surgical margins (PSMs).^{2–5} Of these, the only factor not intrinsic to the disease is margin status, which is iatrogenic and thus potentially preventable.

Patients with positive margins are at such high risk for failure that adjuvant radiation is often indicated to prevent progression. Three randomized trials have shown that when compared with observation, immediate postoperative adjuvant RT reduces the risk of biochemical relapse (BCR) in high-risk patients (defined as positive margins or extracapsular disease)^{6–8} and yields an overall survival benefit.⁷ Subgroup analysis of the EORTC trial showed that the benefit from adjuvant radiation was primarily to patients with a positive margin.⁹

By definition, a positive margin is iatrogenic as it is introduced by surgical intervention. The fact that only about half of positive margins will experience BCR within 5 years highlights that the risk of relapse involves additional factors.¹⁰ Various retrospective studies have shown higher relapse rates with positive margins at the apex,¹¹ the bladder neck,¹¹ that are multifocal,¹² or which are long.¹³ The surgical canon has extensively analyzed positive margins to ultimately better understand how to minimize them. In 1998, a comprehensive review of the open RP literature reported overall margin-positive rates of 28%, with a range from 0% to 77%.¹⁴ More contemporary series report reduced rates of PSMs due to preoperative imaging, surgical techniques to avoid inadvertent penetration of the prostatic capsule, and frozen-section analysis.¹⁵ Overall, open versus laparoscopic approaches do not seem to influence the likelihood of positive margins or their progression.^{11,16,17} Although outcomes with various approaches may be comparable, the experience and technique of the surgeon greatly affects the rate of PSMs.¹⁸

We hypothesized that the inherent unilaterality of the physician-patient position during surgery relates to margin positivity and therefore provide an additional explanation, and possible novel solution, to this phenomenon. We aimed to analyze the natural history and behavior of PSMs on biochemical recurrence and its relationship to known risk factors for relapse.

PATIENTS AND METHODS

Patient Selection

Following Institutional Review Board approval, a review of the entire surgical database of RP patients between 1991 and 2013 identified 226 patients with PSMs. Data represents outcomes from the operations of 37 surgeons, with 61% (138/226) of the data coming from only 2 urologists (1 open retropubic surgeon with over 25 y and 1 robotic surgeon with over 10 y of experience). Patients with positive lymph nodes, those who received neoadjuvant or adjuvant ADT and those who received immediate postoperative adjuvant RT were excluded. Surgeons were interviewed, operative reports were reviewed, and data collected included preoperative PSA, surgical pathology (T-stage, Gleason grade, margin location, margin focality, margin laterality), and postoperative PSA. The mean follow-up after prostatectomy

was 67 months (median, 47 mo). Ninety-two patients were treated with salvage radiation therapy (SRT) (72Gy/40 fractions) in our department from January 2009 to December 2013. Failure after SRT was defined as any PSA > the presalvage value, or PSA ≥ 0.2ng/mL. The mean follow-up after salvage radiation was 47 months (median, 33 mo).

PSA Follow-up

Only patients with PSA follow-up were included in the analysis. Ultrasensitive PSA was introduced in 2000, with a reported threshold at 0.01 ng/mL. Our institution favors an early salvage strategy of tracking postoperative ultrasensitive PSA and referring to radiation oncology with elevated or rising PSA values. First postoperative PSA was at a median time of 3 months and typically followed every 3 months for the first 2 years thereafter. The median follow-up was 47 months. For the purpose of analysis, BCR after RP was defined as PSA ≥ 0.1 ng/mL or 2 consecutive rises above nadir. BCR after SRT was defined as any PSA measurement greater than the presalvage PSA, or PSA ≥ 0.2 ng/mL. Patients were censored at last follow-up or at the time of adjuvant therapy (radiotherapy or androgen deprivation). There were no known deaths in this cohort at the time of last follow-up.

Statistical Analysis

The primary end point of this study was BCR after RP or after salvage RT. Progression-free survival (PFS) was estimated using the Kaplan-Meier method, calculated from the date of surgery. Differences between groups were determined by the log-rank test. Frequency comparisons of various risk factors (stratified by margin laterality) were evaluated by the χ^2 test. Multivariate Cox proportional hazards regression modeling was used to examine whether laterality predicted BCR, adjusting for clinicopathologic factors (iPSA, pathologic T-stage, Gleason sum, and surgical approach). Probability values <0.05 were considered statistically significant.

RESULTS

Characteristics of the study patients are listed in Table 1. The majority of patients had organ-confined disease (pT2) and thus most positive margins were iatrogenic (58%). For the entire cohort, the 5-year biochemical PFS rate was 35% and the median time to BCR was 24 months. Given the expected higher relapse rates with our more sensitive definition of BCR of PSA ≥ 0.1, the validity of the cohort was confirmed by analyzing progression rates with a conventional BCR value of PSA ≥ 0.2 ng/mL that were comparable with historical controls.

The median time to BCR is stratified by margin laterality (Fig. 1). Right-sided margins were more likely to relapse than left-sided margins (5-year BCR-free survival right 30% vs. left 49%, $P<0.01$), and at earlier times (median time to relapse, right 20 mo vs. left 51 mo). There were no significant differences between margin laterality and any other risk features (Table 1).

We then compared margin laterality with traditional risk factors used to predict biochemical PFS. On univariate analysis, BCR is associated with T-stage, iPSA, Gleason grade, and laterality (Table 2). There were no differences in outcome with open retropubic versus robotic surgical approaches or margin location. On multivariate analysis, all 4 factors

independently predicted for biochemical failure. The greatest risks were conferred by preoperative factors, Gleason 8 (hazard ratio [HR], 3.4) and iPSA 10 (HR, 2.5). With regards to postoperative risk factors, bilateral positive margins (HR, 1.6) independently predicted biochemical failure, whereas left-sided margins were significantly less likely to progress compared with right (HR, 0.6). In other words, right-sided margins were an independent risk factor for biochemical failure (HR, 1.7; $P=0.04$).

It is rather interesting to note that about twice as many right-sided positive margin patients were referred to Radiation Oncology for salvage RT as compared with left sided (55% vs. 23%, Table 3), in accord with the observed predominance and earlier failure of right-sided positive margins. Given that laterality appeared to be an independent risk factor for biochemical progression, we aimed to determine if it also affected the success of SRT (Table 3). Factors significantly associated with PFS after salvage RT included: laterality (median PFS, 61 mo right vs. left 53 mo vs. bilateral 24 mo; $P=0.02$), T-stage (median PFS, 92 mo organ confined vs. 32 mo extraprostatic disease; $P<0.01$), and presalvage RT (median PFS, 42 mo if presalvage PSA ≥ 0.2 vs. not reached if presalvage PSA <0.2 ; $P=0.02$). On multivariate analysis only T-stage (HR, 3.5; $P<0.01$) and presalvage RT PSA (HR, 2.6; $P=0.02$) remained significant.

DISCUSSION

Our study identified margin laterality as an independent risk factor for biochemical recurrence after RP. Right-sided margins were more likely to relapse, and to relapse earlier, than left-sided margins. The behavior of right-sided margins was not associated with increased incidence, surgical expertise, or intrinsic high-risk factors (T-stage, PSA, or Gleason grade). As a positive margin is produced by surgery it is naturally related to that intervention, and surgical technique is lateralized. With the open procedure, the surgeon stands on one side of the patient (and stays on that side) to perform all aspects of the resection in a lateralized manner (dissecting tissue planes, nodal evaluation, neurovascular tissue mobilization). Although robotic approaches place the robot in midline, the dissection is also lateralized. Interviews with both open and laparoscopic surgeons revealed slight differences in technique between surgical approach and urologists, but mobilization of the prostate tended to consistently begin on the right side first. Although right-sided margins were not more common, they were more likely to fail and do so earlier, identifying a suboptimal technique on that side.

With the increased risk of progression of right-sided margins, it is not surprising that the majority of patients referred for salvage radiation indeed have positive margins lateralized to the right (55% right, 23% left, 22% bilateral). They were, however, equally successfully salvaged with RT. So while patients with right-sided margins need not necessarily be radiated sooner than left-sided margins, they should perhaps have closer interval follow-up in light of their increased risk of relapse. As shown in Table 3, early initiation of salvage RT at PSA <0.2 has notably better success than delayed salvage, so it would be prudent to follow higher risk patients more closely to optimize their outcomes.

RP provides excellent long-term prostate cancer-specific survival,¹⁹ but about one fourth of patients will eventually fail.¹ Positive margins after RP are an obvious risk factor for local recurrence, and often an indication for adjuvant radiation. Modern series report positive margin rates of 13.5%, 16.3%, and 22.8% for robotic, laparoscopic, and open approaches, respectively.²⁰ Not all positive margins, however, will progress to biochemical failure. Attempts to prevent positive margins have been successful, with rates and locations of positive margins having been shown to improve with changes in surgical technique.^{21,22}

Prior studies have examined how techniques like nerve-sparing might affect the incidence of positive margins,¹⁶ but margin laterality itself has not been explored. The vast majority of prostate cancers (up to 70%) are bilateral, and thus positive margin laterality is unlikely to be caused by tumor laterality.²³ The majority of cases in the present study were iatrogenic (pT2), suggesting that suboptimal surgical technique impacts lateralized margins.

The surgical literature reports that approximately half of the patients with positive margins experience progression within 5 years.^{10,24} A multi-institutional prostate cancer-specific mortality nomogram does not include margin status as it was not seen to influence outcome.^{25,26} Another study showed that time to metastatic disease, castrate-resistant disease, prostate cancer-specific mortality, or all-cause mortality did not differ significantly between patients with negative or positive margins.¹² In contrast, a SEER analysis revealed that PSMs were an independent predictor of prostate cancer-specific mortality on multivariate analysis (HR, 1.7).²⁷ Mixed results for these clinical endpoints reflect the fact that positive margins themselves are heterogeneous with a spectrum of potential outcomes.

In addition to its retrospective single-institution nature, limitations of the present study include the dependence of a PSA-based measure to define recurrence and insufficient follow-up to determine whether earlier detection of BCR translates into better salvage outcomes or improved distant metastatic and overall survival outcomes. We can state that our data are representative as our 5-year BCR-free survival rate (55%) is identical to other series, including the adjuvant RT trials.⁶⁻⁸ Whether immediate adjuvant RT is beneficial versus salvage radiation at the earliest confirmation of biochemical failure will be addressed in 3 open randomized trials: RADICALS, GETUG-17, and RAVES.²⁸⁻³⁰ However, the data suggest that positive margins progress at different rates, and some might be more or less likely to benefit from adjuvant radiation. This was clearly shown in the subgroup analysis of the EORTC trial concluding that the benefit from adjuvant radiation was primarily to patients with a positive margin.⁹

CONCLUSIONS

Most positive margins were iatrogenic, consistent with the limitations of the surgical technique, and thus it is quite possible that a simple change in the lateral surgical approach can affect surgical margins. Consideration could be made for the surgeon to move during the operation, to mobilize the prostate from different anatomic perspectives, or perhaps an extra margin should be taken from the side that was mobilized first. Margin laterality is a heretofore unrecognized independent risk factor for progression and changes in surgical

methods might help reduce the quality or quantity of lateralized margins, which might ultimately decrease biochemical failure rates.

REFERENCES

1. Hull G, Rabbani F, Abbas F, et al. Cancer control with radical prostatectomy alone in 1,000 consecutive patients. *J Urol*. 2002; 167:528–534. [PubMed: 11792912]
2. D'Amico AV, Whittington R, Malcowitz SB, et al. The combination of preoperative prostate specific antigen and postoperative pathological findings to predict prostate specific antigen outcome in clinically localized prostate cancer. *J Urol*. 1998;160 (pt 1):2096–2101. [PubMed: 9817331]
3. Graefen M, Karakiewicz PI, Cagiannos I, et al. Validation study of the accuracy of a postoperative nomogram for recurrence after radical prostatectomy for localized prostate cancer. *J Clin Oncol*. 2002;20:951–956. [PubMed: 11844816]
4. Graefen M, Karakiewicz PI, Cagiannos I, et al. International validation of a preoperative nomogram for prostate cancer recurrence after radical prostatectomy. *J Clin Oncol*. 2002;20: 3206–3212. [PubMed: 12149292]
5. Kattan MW, Wheeler TM, Scardino PT. Postoperative nomogram for disease recurrence after radical prostatectomy for prostate cancer. *J Clin Oncol*. 1999;17:1499–1507.
6. Bolla M, van Poppel H, Tombal B, et al. European Organisation for Research and Treatment of Cancer, Radiation Oncology and Genito-Urinary Groups. Postoperative radiotherapy after radical prostatectomy for high-risk prostate cancer: long-term results of a randomised controlled trial (EORTC trial 22911). *Lancet*. 2012; 380:2018–2027. [PubMed: 23084481]
7. Thompson IM Jr, Tangen CM, Paradelo J, et al. Adjuvant radiotherapy for pathologically advanced prostate cancer: a randomized clinical trial. *JAMA*. 2006;296:2329–2335. [PubMed: 17105795]
8. Wiegel T, Bottke D, Steiner U, et al. Phase III postoperative adjuvant radiotherapy after radical prostatectomy compared with radical prostatectomy alone in pT3 prostate cancer with postoperative undetectable prostate-specific antigen: ARO 96-02/AUO AP 09/95. *J Clin Oncol*. 2009;27:2924–2930. [PubMed: 19433689]
9. Van der Kwast TH, Bolla M, Van Poppel H, et al. EORTC 22911. Identification of patients with prostate cancer who benefit from immediate postoperative radiotherapy: EORTC 22911. *J Clin Oncol*. 2007;25:4178–4186. [PubMed: 17878474]
10. Ouzzane A, Rozet F, Salas RS, et al. Positive surgical margins after minimally invasive radical prostatectomy in patients with pT2 and pT3a disease could be considered pathological upstaging. *BJU Int*. 2014;113:586–591. [PubMed: 23889763]
11. Choo MS, Cho SY, Ko K, et al. Impact of positive surgical margins and their locations after radical prostatectomy: comparison of biochemical recurrence according to risk stratification and surgical modality. *World J Urol*. 2014;32:1401–1409. [PubMed: 24362883]
12. Mauermann J, Fradet V, Lacombe L, et al. The impact of solitary and multiple positive surgical margins on hard clinical end points in 1712 adjuvant treatment-naïve pT2–4 N0 radical prostatectomy patients. *Eur Urol*. 2013;64:19–25. [PubMed: 22901983]
13. Sooriakumaran P, Ploumidis A, Nyberg T, et al. The impact of length and location of positive margins in predicting biochemical recurrence after robotic-assisted radical prostatectomy with a minimum follow-up time of five years. *BJU Int*. 2015;115: 106–113. [PubMed: 24119144]
14. Wieder JA, Soloway MS. Incidence, etiology, location, prevention and treatment of positive surgical margins after radical prostatectomy for prostate cancer. *J Urol*. 1998;160:299–315. [PubMed: 9679867]
15. Schlomm T, Tennstedt P, Huxhold C, et al. Neurovascular structure-adjacent frozen-section examination (NeuroSAFE) increases nerve-sparing frequency and reduces positive surgical margins in open and robot-assisted laparoscopic radical prostatectomy: experience after 11,069 consecutive patients. *Eur Urol*. 2012;62:333–340. [PubMed: 22591631]
16. Røder MA, Thomsen FB, Berg KD, et al. Risk of biochemical recurrence and positive surgical margins in patients with pT2 prostate cancer undergoing radical prostatectomy. *J Surg Oncol*. 2014;109:132–138. [PubMed: 24155174]

17. Shapiro EY, Scarberry K, Patel T, et al. Comparison of robot-assisted and open retropubic radical prostatectomy for risk of biochemical progression in men with positive surgical margins. *J Endourol.* 2014;28:208–213. [PubMed: 24044423]
18. Eastham JA, Kattan MW, Riedel E, et al. Variations among individual surgeons in the rate of positive surgical margins in radical prostatectomy specimens. *J Urol.* 2003;170(pt 1):2292–2295. [PubMed: 14634399]
19. Gerber GS, Thisted RA, Scardino PT, et al. Results of radical prostatectomy in men with clinically localized prostate cancer. *JAMA.* 1996;276:615–619. [PubMed: 8773633]
20. Sooriakumaran P, Srivastava A, Shariat SF, et al. A multinational, multi-institutional study comparing positive surgical margin rates among 22393 open, laparoscopic, and robot-assisted radical prostatectomy patients. *Eur Urol.* 2014;66:450–456. [PubMed: 24290695]
21. Ahlering TE, Eichel L, Edwards RA, et al. Robotic radical prostatectomy: a technique to reduce pT2 positive margins. *Urology.* 2004;64:1224–1228. [PubMed: 15596205]
22. Guru KA, Perlmutter AE, Sheldon MJ, et al. Apical margins after robot-assisted radical prostatectomy: does technique matter? *J Endourol.* 2009;23:123–127. [PubMed: 19178174]
23. Nogueira L, Wang L, Fine SW, et al. Focal treatment or observation of prostate cancer: pretreatment accuracy of transrectal ultrasound biopsy and T2-weighted MRI. *Urology.* 2010;75:472–477. [PubMed: 19643467]
24. Epstein JI, Pizov G, Walsh PC. Correlation of pathologic findings with progression after radical retropubic prostatectomy. *Cancer.* 1993;71:3582–3593. [PubMed: 7683970]
25. Eggener SE, Scardino PT, Walsh PC, et al. Predicting 15-year prostate cancer specific mortality after radical prostatectomy. *J Urol.* 2011;185:869–875. [PubMed: 21239008]
26. Stephenson AJ, Kattan MWEastham JA, et al. Prostate cancer-specific mortality after radical prostatectomy for patients treated in the prostate-specific antigen era. *J Clin Oncol.* 2009;27:4300–4305. [PubMed: 19636023]
27. Wright JL, Dalkin BL, True LD, et al. Positive surgical margins at radical prostatectomy predict prostate cancer specific mortality. *J Urol.* 2010;183:2213–2218. [PubMed: 20399459]
28. Parker C, Clarke N, Logue J, et al. RADICALS (Radiotherapy and Androgen Deprivation in Combination after Local Surgery). *Clin Oncol.* 2007;19:167–171.
29. Richaud P, Sargos P, Henriques de Figueiredo B, et al. Postoperative radiotherapy of prostate cancer (GETUG-17). *Cancer Radiother.* 2010;14:500–503. [PubMed: 20810300]
30. Trans Tasman Radiation Oncology Group (TROG 08–03) RAVES trial: radiotherapy—adjuvant versus early salvage. Available at: <http://clinicaltrials.gov/ct2/show/NCT00860652>.

FIGURE 1.

Kaplan-Meier biochemical recurrence-free survival rates after radical prostatectomy, as stratified by the laterality of positive margins.

TABLE 1.

Cohort Descriptive Characteristics

	Entire Cohort n = 226 (%)	Right + Margin n = 95 (42%)	Left + Margin n = 68 (30%)	Bilateral + Margin n = 39 (17%)	P
Median time to BCR (PSA = 0.1) (mo)	24	20	51	14	<0.01*
5 y BCR-free survival (%)	35	30	49	17	
Median time to BCR (PSA = 0.2) (mo)	86	67	122	27	<0.01*
5 y BCR-free survival (%)	55	52	74	33	
Surgical type (n [%])					
Open retropubic	148 (65)	56 (60)	46 (68)	25 (64)	0.62**
Robotic	78 (35)	39 (40)	22 (32)	14 (36)	
Preoperative PSA (n [%])					
iPSA < 10	165 (73)	65 (68)	57 (84)	27 (69)	0.11**
iPSA ≥ 10	60 (27)	30 (32)	11 (16)	12 (31)	
Surgical pathology (n [%])					
pT2	132 (58)	56 (59)	45 (66)	17 (44)	0.11**
pT3/4	94 (42)	39 (41)	23 (34)	22 (56)	
Gleason 6	53 (23)	19 (20)	19 (28)	6 (15)	0.73**
Gleason 7	138 (61)	59 (62)	40 (59)	27 (70)	
Gleason ≥ 8	35 (16)	17 (18)	9 (13)	6 (15)	
Margin location (n [%])					
Apex	82 (36)	34 (30)	34 (45)	14 (37)	0.29**
Posterolateral	87 (39)	51 (45)	24 (32)	12 (32)	
Base	28 (12)	11 (9)	9 (12)	8 (21)	
Anterior	30 (13)	18 (16)	8 (11)	4 (10)	
Margin focality (n [%])					
Unifocal	147 (68)	74 (80)	53 (80)	NA	0.86**
Multifocal	70 (32)	18 (20)	13 (20)	NA	

* P-value from Kaplan-Meier estimates compared by the log-rank test.

** P-value from frequency comparisons by the χ^2 test.

BCR indicates biochemical recurrence; NA, not applicable.

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TABLE 2.
Univariate and Multivariate Analysis of Factors Associated With Time to Biochemical Failure After RP

	Univariate <i>P</i>	Median Time to Biochemical Failure (mo)	Multivariate <i>P</i>	Exp (Coef) [95% Lower-Upper]
pT2 vs. pT3/4	< 0.01	39 vs. 16	0.01	1.6 [1.1-2.3]
iPSA < 10 vs. iPSA ≥ 10	< 0.01	36 vs. 15	< 0.01	0.4 [0.3-0.7]
Gleason 6 vs. 7 vs. 8	< 0.01	64 vs. 24 vs. 10	< 0.01	Gleason 8: 3.4 [1.8-6.1] Gleason 7: 1.4 [0.9-2.3]
Right vs. left vs. bilateral	< 0.01	20 vs. 51 vs. 14	0.04 0.04	Bilateral: 1.6 [1.0-2.5] Left: 0.6 [0.4-1.0]
Open retropubic vs. robotic	NS	NA	NA	
Margin at apex vs. other location	NS	NA	NA	

NA indicates not applicable; NS, not significant.

TABLE 3.

The Impact of Risk Factors on Salvage RT Outcomes

	n (%)	Univariate <i>P</i>	Median PFS (mo)	3 y PFS (%)	Multivariate <i>P</i>	Hazard Ratio
Overall + margin cohort	92		60	68		
Laterality						
Right	47 (55)	0.02	61	64	NS	
Left	20 (23)		53	94		
Bilateral	19 (22)		24	44		
T-stage						
pT2	46 (50)	< 0.01	92	86		
pT3/4	46 (50)		32	49	< 0.01	3.5 [1.5-8.5]
Presalvage RT PSA						
PSA < 0.2 vs.	51 (58)	0.02	Not reached	78	0.02	2.6 [1.1-5.6]
PSA 0.2	37 (42)		42	54		
iPSA < 10	59 (63)	NS				
vs. iPSA 10	34 (37)					
Gleason 6	17 (18)	NS				
vs. 7	58 (63)					
vs. 8	18 (19)					
Open retropubic vs.	62 (67)	NS				
Robotic prostatectomy	30 (33)					
Apex	38 (42)	NS				
vs. Other location	53 (58)					

NS indicates not significant; PFS, progression-free survival; RT, radiation therapy.