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Outcomes After Radical Prostatectomy in Men Receiving Prior Pelvic Radiation for Non-Prostate Malignancies

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Abstract

Purpose—Morbidity associated with salvage radical prostatectomy for locally recurrent prostate cancer after primary radiotherapy is well documented, but little is known about the impact on surgical difficulty and outcomes for radical prostatectomy in men who have had prior pelvic radiotherapy for non-prostate malignancies. We report functional outcomes of 9 patients treated at our institution.

Materials and Methods—From 1993 to 2007, 9 patients underwent radical prostatectomy following external beam radiotherapy for testicular seminoma (6), anorectal cancer (2), and colon cancer (1). Clinical information was obtained from a prospective prostate cancer database.

Results—Radical prostatectomy was completed without identifiable injury to adjacent structures in all 9 patients. Four patients had significant pelvic fibrosis, 3 required bilateral neurovascular bundle resection. Neurovascular bundle preservation was performed in the remaining 6 patients, 4 with good preoperative erectile function. However, no patient recovered erectile function postoperatively at a median follow-up time of 75 months (range 12 to 172). Of preoperatively continent men, 57% required ≤ 1 pad daily and 43% were completely dry, achieving complete urinary control at a median follow-up time of 7.5 months (range 2 to 20). Two patients developed anastomotic stricture, one being associated with concomitant ureteral stricture.

Conclusions—Radical prostatectomy after pelvic radiotherapy for non-prostate malignancies was not associated with increased intraoperative morbidity. However, rates of anastomotic stricture, erectile dysfunction, and urinary incontinence appear to be higher than those observed after radical prostatectomy in men with no prior radiotherapy and comparable to those seen in the salvage radical prostatectomy setting.

Keywords

Perioperative complications; Prostate; Prostate cancer; Radical prostatectomy; Radiotherapy

Introduction

Radical Prostatectomy (RP) is an excellent treatment option for the management of clinically localized prostate cancer.(1-3) The success of RP is measured both by oncologic and functional outcomes, including overall cancer control (freedom from biochemical recurrence and need for adjuvant treatment), postoperative rate of urinary continence, and recovery of erectile function.(4-6) Identifying factors that impact the surgeon's ability to minimize treatment-related morbidity and time to recovery are important to preoperative surgical planning.

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Prior radiation to the pelvis or prostate is known to induce fibrotic changes and alter tissue planes,(7) thereby increasing the complexity of RP and impacting surgical outcomes. These changes are associated with an increased risk for iatrogenic injury to adjacent structures (rectum, blood vessels, bladder, and ureter), and they decrease the likelihood of successfully performing neurovascular bundle (NVB) preservation. Additionally, radiation damages small blood vessels, leading to impaired tissue healing, and results in secondary ischemia and further fibrosis, increasing the risk of postoperative morbidity.(8) This has been most notably documented in patients undergoing salvage RP for locally recurrent prostate cancer after radiation therapy; several studies have demonstrated the potential for higher rates of rectal injury, severe incontinence, strictures, and erectile dysfunction.(9-12)

Because a history of prior abdominal or pelvic radiation for non-prostate malignancies often precludes further pelvic radiation for the treatment of clinically localized prostate cancer, surgery is often the only therapeutic option for these patients. A full understanding of the associated risks and difficulties to be expected in these patients is important both for patient counseling and perioperative surgical planning. In this report, we outline our experience with 9 patients undergoing RP after receiving abdominal or pelvic radiotherapy for non-prostate malignancies.

Materials and Methods

Following Institutional Review Board approval, we identified 9 patients who underwent RP between January 1993 and December 2007 for biopsy-confirmed, clinically localized prostate cancer after having received pelvic and abdominal radiotherapy for non-prostate malignancies. Clinical information was obtained from a prospective prostate cancer database. Table 1 shows the preoperative clinicopathologic features for these patients. These patients had undergone radiation treatment for seminoma, anorectal, and colon cancers (Table 2). Median time from radiotherapy administration to RP was 143 months (range 3 to 590). Two-thirds received directed pelvic radiotherapy, while the remaining patients received a combination of paraaortic, mediastinal, and retrogastric field exposure. The median radiation dose received to the abdomen and pelvis was 3125 cGy (range 2550 to 4500). Clinical and pathologic stage was assigned according to the 2002 TNM system. Preoperative continence and erectile function status was available for all 9 men, with 8 patients reporting full continence and 4 patients with erections suitable for intercourse before undergoing RP.

The technique of retropubic and salvage RP has been described previously.(12,13) Similar to fibrosis in men undergoing salvage RP for local failure after prostatic radiotherapy, the degree of fibrosis encountered after pelvic radiotherapy is variable. NVB preservation was performed in select patients according to preoperative characteristics, ease of dissection, and intraoperative findings.(14) NVB resection was performed if pelvic fibrosis precluded successful release of the NVB or if there was a high degree of suspicion of extracapsular extension based on preoperative or intraoperative findings.

Perioperative and long-term postoperative complications were recorded prospectively. Patients were classified as continent if they were pad-free. Potency was defined as erections that were satisfactory for intercourse with or without phosphodiesterase-5 inhibitors. Patients did not receive neoadjuvant androgen deprivation therapy.

Results

The preoperative and pathologic results are listed in Table 1. Median age at time of RP was 67 years (range 49 to 73). Despite varying amounts of pelvic radiation, all 9 patients were able to successfully undergo standard retropubic RP. Significant pelvic fibrosis was encountered in 4

patients, requiring bilateral NVB resection in 3 men. NVB preservation was performed in 6 patients, including all 4 patients with good preoperative erectile function. No injuries to adjacent structures, including the rectum, ureters, pelvic vasculature, and bladder, were identified intraoperatively. Median estimated blood loss was 1300 mL (range 450 mL to 1600 mL). Median operative time was 180 minutes (range 130 to 360).

Postoperatively, median length of hospital stay was 4 days. No patients were identified as experiencing prolonged anastomotic leakage. Minor complications identified in the early postoperative period included 2 patients with incisional complications requiring local wound care. No thromboembolic events were recorded.

Three patients experienced delayed short-term complications after release from the hospital (Table 3). This included anastomotic stricture developing in 2 of the men 3 and 6 months after surgery, with the earlier event being associated with hospital readmission for management of concomitant ureteral stricture. Both patients successfully underwent a single procedure for stricture management. Additionally, one patient experienced meatal stenosis occurring 2 months postoperatively, requiring urethral dilation.

Of the 8 patients with normal preoperative continence, 7 had evaluable data for review. By 24 months, 57% required ≤ 1 pad daily and 43% were completely dry, achieving complete urinary control at a median follow-up time of 7.5 months (range 2 to 20). Three patients had ongoing urinary leakage requiring ≥ 2 pads per day at last follow-up, although it should be noted that last follow-up was ≤ 6 months after RP in 2 of these men. No patient has undergone an anti-incontinence procedure to improve urinary control. Of the 4 patients with preoperative erections suitable for intercourse, none have experienced return of erections at a median follow-up time of 75 months (range 12 to 172), despite the fact that all underwent NVB preservation.

Discussion

Radical prostatectomy following previous pelvic radiotherapy is a technically challenging operation. To our knowledge, the surgical outcomes in patients undergoing RP for localized prostate cancer after prior pelvic and abdominal radiotherapy for non-prostate malignancies have not been previously reported. In our experience with 9 such patients, RP was associated with acceptable intraoperative morbidity. However, rates of anastomotic stricture, erectile dysfunction, and urinary incontinence are higher than those observed after RP in men with no history of pelvic radiotherapy.

Accepted treatment options for patients with clinically localized prostate cancer include RP, radiation therapy, and active surveillance. However, in patients who have had prior abdominal or pelvic radiation treatment, further radiation increases the risk of accumulating toxicity and side effects. While less invasive approaches to salvage therapy in the setting of radiorecurrent prostate cancer (including prostate cryotherapy, high-intensity focused ultrasound, and radiofrequency ablation) are available, these have not been well studied as primary treatment. Therefore, RP serves as one of the few therapeutic options readily available to these patients.

The impact of prior abdominal and pelvic radiation before RP on surgical outcomes may include higher rates of short- and long-term complications. Nevertheless, the feasibility of surgery after prior radiotherapy has been borne out in several salvage RP series for radiorecurrent prostate cancer.^(10,15) Early series demonstrated salvage RP to be technically challenging and associated with high rates of perioperative complications.^(12,16,17) However, a study comparing outcomes in 100 patients who underwent salvage RP between 1984 and 1992 and those who underwent salvage RP between 1993 and 2003 revealed a significantly lower rate of major complications in the later group (13% versus 33%).⁽¹⁵⁾ This improvement included a reduction in the rectal injury rate from 15% before 1993 to 2% afterwards. However,

rates of anastomotic stricture and urinary incontinence remained higher than those observed for standard RP and did not decrease with surgeon experience. The authors concluded that, with experience and appropriate patient selection, salvage RP following external beam and transperineal interstitial radiotherapy could be performed with acceptable morbidity and local tumor control.

In the current study, the degree of scarring within the pelvis after radiotherapy for non-prostate malignancies was less than that seen after pre-radiotherapy lymph node dissection and retropubic interstitial radiotherapy, and similar to our experience in salvage RP after external beam and transperineal interstitial radiotherapy.(15) Accordingly, RP was completed in all patients with the vast majority undergoing NVB preservation. Most importantly, significant intraoperative complications including rectal or vascular injuries were not encountered in any of our patients. Operative times, length of hospital stay, and estimated blood loss were similar to those results previously published for standard and salvage RP.(15,18) No patients were reported to have thromboembolic events in the perioperative period, and anastomotic leaks were not identified in our small patient cohort.

While perioperative morbidity was acceptable, functional outcomes after RP were disappointing, as none of our patients with normal preoperative erectile function experienced the return of erections despite NVB preserving procedures being documented in all 4 patients. With regards to urinary function, bladder neck contractures and urinary incontinence continue to be more common after pelvic radiation.(6,9,11,12,15) Anastomotic strictures occurred in 22% of our patients, similar to the 22–32% incidence reported after salvage RP and higher than the 6% rate published after standard RP.(15,19,20) Likewise, lower rates of urinary continence mirror those after salvage RP, with 57% requiring ≤ 1 pad in our series.(15,20)

While the small cohort size and significant variation in the field, dose, and timing of radiation received precludes any meaningful conclusions regarding a threshold level of radiation exposure that translates into operative difficulty, the impact of any prior pelvic radiation for non-prostate malignancies on functional outcomes after RP appears significant, and outcomes for these patients are comparable to those seen in patients undergoing salvage RP. Patients need to be appropriately counseled regarding the increased likelihood of bladder neck contracture, urinary incontinence, and erectile dysfunction before undergoing surgery in this setting.

Conclusions

Radical prostatectomy after pelvic radiotherapy for non-prostate malignancies was not associated with increased intraoperative morbidity. However, rates of anastomotic stricture, erectile dysfunction, and urinary incontinence appear to be higher than those observed after RP in men with no history of radiotherapy and comparable to those seen in men the undergoing salvage RP.

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References

1. Gibbons RP, Correa RJ Jr, Brannen GE, Weissman RM. Total prostatectomy for clinically localized prostatic cancer: long-term results. *J Urol* 1989 Mar;141(3):564–6. [PubMed: 2918593]

2. Han M, Partin AW, Pound CR, Epstein JI, Walsh PC. Long-term biochemical disease-free and cancer-specific survival following anatomic radical retropubic prostatectomy. The 15-year Johns Hopkins experience. *Urol Clin North Am* 2001 Aug;28(3):555–65. [PubMed: 11590814]
3. Hull GW, Rabbani F, Abbas F, Wheeler TM, Kattan MW, Scardino PT. Cancer control with radical prostatectomy alone in 1,000 consecutive patients. *J Urol* 2002 Feb;167(2 Pt 1):528–34. [PubMed: 11792912]
4. Bianco FJ Jr, Scardino PT, Eastham JA. Radical prostatectomy: long-term cancer control and recovery of sexual and urinary function (“trifecta”). *Urology* 2005 Nov;66(5 Suppl):83–94. [PubMed: 16194712]
5. Han M, Partin AW, Zahurak M, Piantadosi S, Epstein JI, Walsh PC. Biochemical (prostate specific antigen) recurrence probability following radical prostatectomy for clinically localized prostate cancer. *J Urol* 2003 Feb;169(2):517–23. [PubMed: 12544300]
6. Zincke H, Oesterling JE, Blute ML, Bergstralh EJ, Myers RP, Barrett DM. Long-term (15 years) results after radical prostatectomy for clinically localized (stage T2c or lower) prostate cancer. *J Urol* 1994 Nov;152(5 Pt 2):1850–7. [PubMed: 7523733]
7. Stone HB, Coleman CN, Anscher MS, McBride WH. Effects of radiation on normal tissue: consequences and mechanisms. *Lancet Oncol* 2003 Sep;4(9):529–36. [PubMed: 12965273]
8. Bullard KM, Trudel JL, Baxter NN, Rothenberger DA. Primary perineal wound closure after preoperative radiotherapy and abdominoperineal resection has a high incidence of wound failure. *Dis Colon Rectum* 2005 Mar;48(3):438–43. [PubMed: 15719190]
9. Stein A, Smith RB, deKernion JB. Salvage radical prostatectomy after failure of curative radiotherapy for adenocarcinoma of prostate. *Urology* 1992 Sep;40(3):197–200. [PubMed: 1523739]
10. Thompson IM, Rounder JB, Spence CR, Rodriguez FR. Salvage radical prostatectomy for adenocarcinoma of the prostate. *Cancer* 1988 Apr 1;61(7):1464–6. [PubMed: 3345498]
11. Zincke H. Radical prostatectomy and exenterative procedures for local failure after radiotherapy with curative intent: comparison of outcomes. *J Urol* 1992 Mar;147(3 Pt 2):894–9. [PubMed: 1538491]
12. Rogers E, Ohori M, Kassabian VS, Wheeler TM, Scardino PT. Salvage radical prostatectomy: outcome measured by serum prostate specific antigen levels. *J Urol* 1995 Jan;153(1):104–10. [PubMed: 7526002]
13. Eastham JA.; Scardino PT. Radical Prostatectomy for Clinical Stage T1 and T2 Prostate Cancer. In: Vogelzang, NJ.; Scardino, PT.; Shipley, WU.; Debruyne, FMJ.; Linehan, WM., editors. *Comprehensive Textbook of Genitourinary Oncology*. 3rd. Philadelphia: Lippincott Williams & Wilkins; 2006. p. 166-89.
14. Masterson TA, Stephenson AJ, Scardino PT, Eastham JA. Recovery of erectile function after salvage radical prostatectomy for locally recurrent prostate cancer after radiotherapy. *Urology* 2005 Sep;66(3):623–6. [PubMed: 16140090]
15. Stephenson AJ, Scardino PT, Bianco FJ Jr, DiBlasio CJ, Fearn PA, Eastham JA. Morbidity and functional outcomes of salvage radical prostatectomy for locally recurrent prostate cancer after radiation therapy. *J Urol* 2004 Dec;172(6 Pt 1):2239–43. [PubMed: 15538239]
16. Lerner SE, Blute ML, Zincke H. Critical evaluation of salvage surgery for radio-recurrent/resistant prostate cancer. *J Urol* 1995 Sep;154(3):1103–9. [PubMed: 7543608]
17. Moul JW, Paulson DF. The role of radical surgery in the management of radiation recurrent and large volume prostate cancer. *Cancer* 1991 Sep 15;68(6):1265–71. [PubMed: 1873780]
18. Dillioglulugil O, Leibman BD, Leibman NS, Kattan MW, Rosas AL, Scardino PT. Risk factors for complications and morbidity after radical retropubic prostatectomy. *J Urol* 1997 May;157(5):1760–7. [PubMed: 9112522]
19. Eastham JA, Kattan MW, Rogers E, Goad JR, Ohori M, Boone TB, et al. Risk factors for urinary incontinence after radical prostatectomy. *J Urol* 1996 Nov;156(5):1707–13. [PubMed: 8863576]
20. Ward JF, Sebo TJ, Blute ML, Zincke H. Salvage surgery for radiorecurrent prostate cancer: contemporary outcomes. *J Urol* 2005 Apr;173(4):1156–60. [PubMed: 15758726]

Table 1

Preoperative and Postoperative Clinicopathologic Characteristics

PREOPERATIVE CHARACTERISTICS	No. (%)
Median Age (range)	67 (49, 73)
Median PSA (range)	5.48 (3.6, 29.9)
Gleason Sum	
2–6	2 (22)
7	5 (56)
8–10	2 (22)
Clinical Stage	
T1b–T1c	8 (89)
T2a	0
T2b	0
T2c–T3a	1 (11)
Continent	8 (89)
Potent	4 (44)
PATHOLOGIC CHARACTERISTICS	No (%)
RP Gleason Sum	
2–6	2 (22)
7	5 (56)
8–10	2 (22)
ECE	3 (33)
SM+	3 (33)
LN+	1 (11)
SVI+	2 (22)

Abbreviations: PSA- prostate specific antigen, RP- radical prostatectomy, ECE- extracapsular extension, SM- surgical margin, LN- lymph node, SVI- seminal vesicle invasion.

Table 2

Initial Radiation Characteristics

Patient	Pre-RT Diagnosis	Radiation Field	Radiation Dose (cGy)	Time between RT and RP (months)
1	Anal cancer	PA, pelvis, groin	4500	3
2	Seminoma	PA, pelvis	3550	42
3	Seminoma	PA, pelvis, retrogastric	2700	590
4	Seminoma	PA	2550	77
5	Seminoma	PA, pelvis, mediastinum	2500	278
6	Seminoma	PA, pelvis	2500	104
7	Colon cancer	PA	4000	143
8	Seminoma	unknown	unknown	480
9	Colorectal	Pelvis	4500	216

Abbreviations: RT- radiotherapy, cGy- centigray, RP- radical prostatectomy, PA- paraaortic

Table 3

Perioperative Characteristics

Patient No.	Age at RP (years)	OR Time (minutes)	EBL (mL)	NVB Preservation	Hospital LOS (days)	Complication	Treatment of Complication
1*	69	430	1500	bilateral	9	Meatal stenosis (2 months postop)	Meatal dilation
2	62	181	1500	bilateral	3	none	
3	73	160	1300	none	4	none	
4	49	136	1300	bilateral	2	none	
5	64	343	800	bilateral	4	BNC (6 months postop)	Single office dilation
6	58	unknown	1400	bilateral	9	none	
7**	68	360	800	bilateral	6	Wound separation	Wound care
8	69	130	450	none	2	Wound infection	Wound care
						BNC, Ureteral stricture (3 months postop)	DVIU, ureteral dilation and stenting
9	67	180	1600	none	2	none	

* Combined procedure of low-anterior rectal excision and radical prostatectomy for synchronous anorectal and prostate cancers

** History of multiple prior abdominal surgeries performed through lower midline incision

Abbreviations: RP- radical prostatectomy, OR- operating room, EBL- estimated blood loss, NVB- neurovascular bundle, LOS- length of stay, BNC- bladder neck contracture, DVIU- direct vision internal urethrotomy