Surgery for progression after failed radiation therapy

James A. Eastham

Department of Surgery, Urology Service, Memorial Sloan-Kettering Cancer Centre, New York, USA

Introduction

One of the most difficult problems facing urologists and oncologists is the evaluation and management of patients with biochemical recurrence (a rising serum prostate-specific antigen [PSA] level) after definitive local therapy. The initial challenge is to determine whether the PSA originates from local recurrence of cancer, from distant metastases, or from both. If the recurrence is local only, there is an opportunity for cure by additional treatment to the primary site.

After radiation therapy, the interpretation of an 'elevated' PSA can be difficult. Because the prostate remains in place, a detectable serum PSA level might represent only 'normal' prostate or inflammation of residual prostate tissue. In addition, as radiation kills prostate cells, the serum PSA level may actually rise and may not begin to fall until several months after radiation therapy has been completed. The average time to reach a serum PSA nadir following radiation therapy is 18 months, but it can take as long as 2 to 3 years. While there is no defined nadir representing 'cure' after radiation therapy, the ideal serum PSA nadir should be 0.5 ng/ml or lower. The higher the nadir, the more likely that cancer will recur. Regardless of the lowest serum PSA after radiation therapy, a persistently rising level is ominous and often suggestive of recurrence.

Although patients with recurrence after radiation therapy differ in their risk of death from prostate cancer, many will develop local progression and metastasis [1,2]. Clinical local recurrence (an enlarging mass on digital rectal examination) after radiation therapy implies a poor prognosis. Unfortunately, by the time relapse becomes clinically (rather than just biochemically) evident, the cancer has usually progressed beyond the point where salvage therapy might be effective. This has prompted the development of both improved methods for early detection of recurrence, and alternative treatment strategies for radioresistant cancers. The challenge to the clinician, therefore, is to detect local recurrences while the cancer is still amenable to salvage therapy.

Treatment options for men with local recurrence of prostate cancer after radiation therapy include continued observation; immediate, continuous, or intermittent hormonal therapy; and further local therapy with radiofrequency thermal ablation, high-intensity focused ultrasonography, cryoablation, additional radiation therapy (salvage brachytherapy), or salvage radical prostatectomy (Fig. 1) [3]. Only salvage radical prostatectomy has demonstrated the ability to eradicate the cancer for 10 years or more. Candidates for salvage prostatectomy should be otherwise healthy with a life expectancy greater than 10 years, have a cancer that was initially and is still potentially curable with surgery, and have no evidence of severe radiation proctitis or cystitis.

The major difficulty today with salvage radical prostatectomy is that by the time most patients and their physicians will accept the operation, the cancer is already advanced. While stage-for-stage results after salvage radical prostatectomy resemble outcomes of standard radical prostatectomy, the majority of patients undergoing salvage radical prostatectomy have a pathologically advanced cancer including seminal vesicle invasion and/or lymph node metastases. Salvage prostatectomy, while technically challenging, provides excellent local control of radiorecurrent cancer and can eradicate the disease in the majority of patients treated when the cancer is confined to the prostate or immediate periprostatic tissue. As for standard prostatectomy, patient selection is of utmost importance. The chance for cure is substantially greater in those whose recurrence is diagnosed early when the cancer is still confined to the prostate. This chapter will review oncologic and quality-of-life outcomes and technical aspects in men undergoing salvage radical prostatectomy after failed radiation therapy.

Defining recurrence after radiation therapy

Failure of radiotherapy to control localised prostate cancer can be detected by either clinical or laboratory

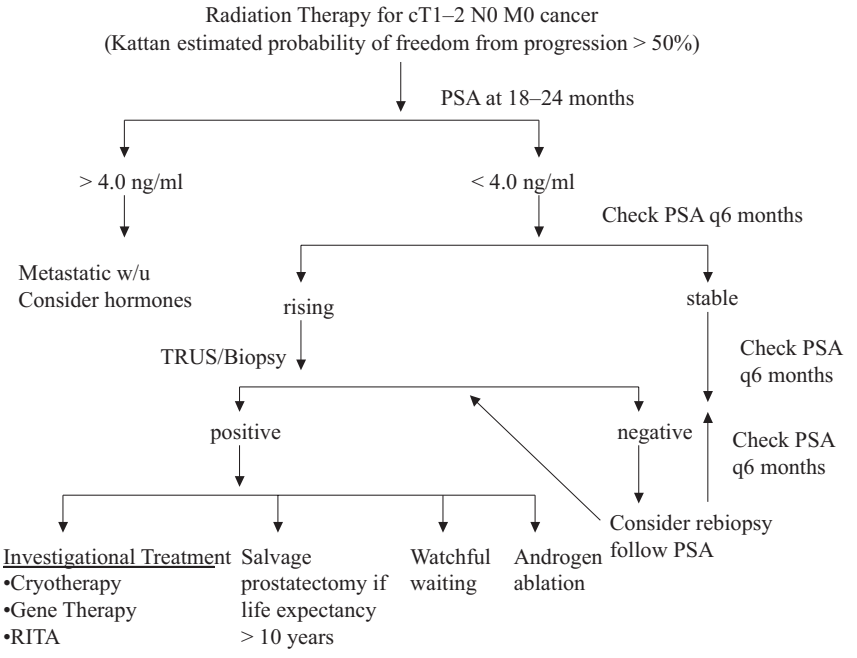
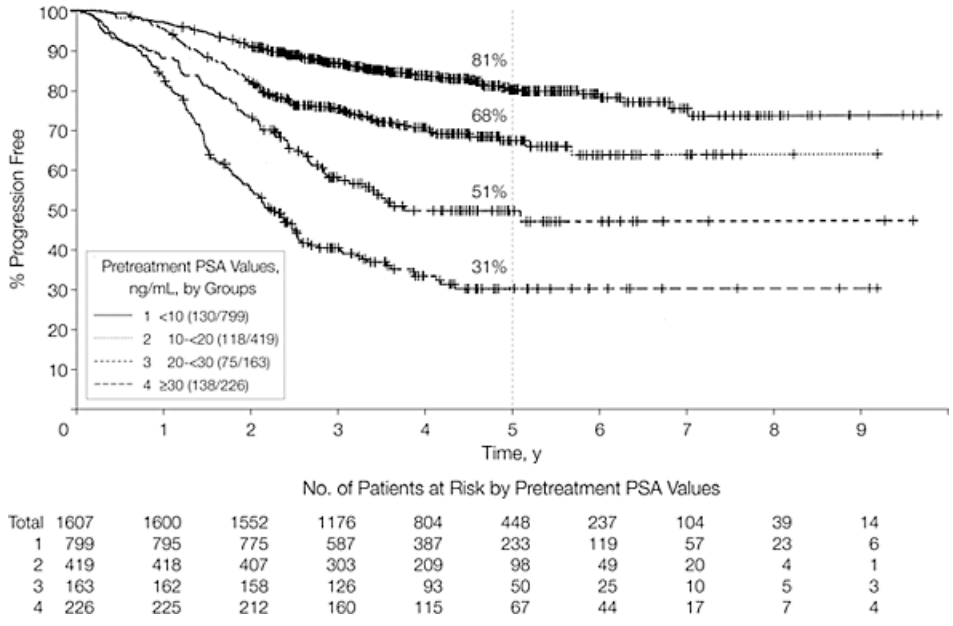


Fig. 1. Algorithm for the management of patients with clinically localised prostate cancer after radiation therapy [3] (w/u, work-up).

findings. Clinical local recurrence is defined as relapse detectable on digital rectal examination and is characterised by signs and symptoms related to local cancer growth, such as urinary outlet obstruction. Clinical local recurrence both predicts and ultimately causes disease dissemination [1,4–6]. Fuks and colleagues estimated that the risk of metastatic spread was four times higher in men with clinical local recurrence after radiation therapy than in patients whose local cancer had been controlled [4]. The 15-year actuarial distant metastases free survival in 351 patients with local control was 77% compared to 24% in 328 patients who developed local relapses. These investigators also correlated the presence or absence of clinical local recurrence with the time of onset of metastatic disease. Patients with clinical local relapse developed metastases sooner than those without. Clinical local recurrence certainly implies a poor prognosis. Patients with it usually have more advanced disease; for these men, additional local therapy is unlikely to result in cure.

The majority of men with recurrence after radiation therapy for localised prostate cancer are found to have an elevated and rising serum PSA level (biochemical rather than clinical recurrence [2]). In 1997 the American Society for Therapeutic Radiology and Oncology (ASTRO) defined guidelines for PSA recurrence after radiation therapy [7]. While the panel agreed that biochemical failure is not inevitably followed by clinical progression, they did consider it an appropriate endpoint for clinical trials. The ASTRO definition of biochemical recurrence after radiation therapy is three consecutive increases in serum PSA levels at least 6 months apart. The date of biochemical failure is the midpoint between post-irradiation serum PSA nadir and the first of the three increases [7]. While the panel concluded that serum PSA nadir is an important prognostic variable, no absolute value was defined to separate successful from unsuccessful treatments. The ASTRO definition has high specificity, that is, most men with three consecutive rises in serum PSA level over an 18-month period do indeed have cancer recurrence/persistence. However, the definition lacks sensitivity, meaning that many men whose prostate cancer has not been cured with local radiation therapy will not manifest three consecutive rises in serum PSA levels until the cancer has advanced beyond the point were additional local therapy might still be curative.

The interpretation of serum PSA levels after radiation therapy is complicated still further by the difficulty of interpreting the expected rise in serum PSA levels in men who receive temporary neoadjuvant/adjuvant androgen deprivation therapy and by ‘PSA bounce’. PSA bounce is a temporary rise in serum PSA levels within the first 2–3 years after radiation therapy (which occurs in 30 to 40% of brachytherapy patients, and in up to 15% of men receiving external beam therapy). Improved methods of identifying patients with radioresistant prostate cancer are needed if we are to improve patient



No. of Patients at Risk by Pretreatment PSA Values

Total	1607	1600	1552	1176	804	448	237	104	39	14
1	799	795	775	587	387	233	119	57	23	6
2	419	418	407	303	209	98	49	20	4	1
3	163	162	158	126	93	50	25	10	5	3
4	226	225	212	160	115	67	44	17	7	4

Fig. 2. Estimated rates of freedom from biochemical recurrence (by the ASTRO definition) according to pretreatment PSA values. Data represent 1607 patients with stage T1b, T1c, T2, and NX tumours; $P < 0.001$ for all groups [8].

selection and outcomes after local salvage therapies. At present, our best diagnostic tools appear to be the serum PSA nadir and PSA doubling time after radiation therapy.

Shipley and colleagues examined 1765 men with clinically localised prostate cancer (clinical stage T1-T2) treated with radiation therapy between 1988 and 1995 to determine 5- and 7-year PSA recurrence-free rates using the ASTRO definition of disease recurrence [8]. The majority (58%) of patients were older than 70 years and 24% had initial PSA values of 20 ng/mL or higher. All patients were followed for at least 2 years after radiation therapy. For men with a pretreatment serum PSA level <10 ng/ml, the PSA recurrence-free rates at 5 and 7 years were 81% and 72.9%, respectively. In those with pretreatment serum PSA levels of 10–20, 20–30, or >30 ng/ml, the 5-year PSA recurrence-free rates were 68%, 51%, and 31%, respectively (Fig. 2). These investigators also determined that serum PSA nadir was, indeed, a prognostic factor. Men with a serum PSA nadir of ⩽0.5 ng/ml had a 5-year PSA recurrence-free survival of 83% compared to men with a serum PSA nadir of 0.6–0.9, 1.0–1.9, and ⩾2.0 ng/ml, who had 5-year PSA recurrence-free survival of 68%, 56%, and 28%, respectively [8].

Because of the previously described difficulties in defining biochemical recurrence after radiation therapy, a second Consensus Conference was sponsored by ASTRO and the Radiation Therapy Oncology Group [9]. The panel recommended: (1) a rise by 2 ng/mL or more above the nadir PSA be considered the standard definition for biochemical failure after external beam radiation therapy (EBRT) with or without hormonal therapy; (2) the date of failure be defined as the date the PSA rise reached 2 ng/mL above nadir (not backdated). To avoid the artifacts resulting from short follow-up, median follow-up should be at least 2 years longer than the reported interval of control; for example, if the median follow-up is 5 years, control rates at 3 years should be cited. Retaining a strict version of the ASTRO definition would allow comparisons with a large existing body of literature.

Defining local recurrence after radiation therapy

While defining biochemical recurrence after radiation therapy is difficult, even more problematic is identifying the site(s) of disease recurrence in men with a rising serum PSA level after radiation therapy. For salvage therapy to be effective, local recurrences must be diagnosed before they cease to be amenable to salvage therapy. At the same time, diagnostic tests of microscopic or subclinical local recurrence must be both sensitive and specific – that is, they need to identify the majority of clinically threatening cancers.

While digital rectal examination (DRE) is a routine part of clinical staging, a normal DRE is not evidence for lack of local recurrence. Similarly, induration

Table 1
Complications of salvage radical prostatectomy

Author	Year	No. of patients	EBL (mL)	Strictures (%)	Operative complications (%)		Incontinence[a] (%)	
					Rectal injuries	Other[b]	Mild	Severe
Thompson et al. [16]	1988	5	–	0	0	20	20	60
Link et al. [17]	1991	14	1000	7	0	–	3.6	–
Moul and Paulson [18]	1991	4	800	–	–	100	0	–
Ahlering et al. [19]	1992	11	–	–	0	–	64	–
Pontes et al. [20]	1992	35	–	11.5	6	9	28	17
Stein et al. [21]	1992	11	1100	18	0	27	64	–
Zincke et al. [22]	1992	32	–	19	6.3	25	26.7	–
Brenner et al. [23]	1994	10	1650	10	0	20	10	10
Rogers et al. [11]	1995	40	910	27.5	15	20	58	–
Gheiler et al. [14]	1998	30	1100	13	7	17	23	26

EBL, estimated blood loss.
[a] Severe incontinence implies more than two pads per day, and mild incontinence indicates stress incontinence requiring fewer than two pads per day. [b] Other major operative complications including postoperative haemorrhage, ureteral injury, prolonged anastomotic leakage.

on DRE is not proof of local recurrence, as it might, in fact, represent scar tissue. Local imaging studies with transrectal ultrasonography (TRUS), CT scan, and endorectal MRI have not proven helpful in determining the site of recurrence, but TRUS is useful for biopsy guidance and is performed at the time of systematic prostate biopsy. In most cases imaging studies to detect metastatic disease are negative [2].

Local recurrence after radiation therapy is defined as a persistently rising PSA level in conjunction with a positive needle biopsy of the prostate at least 18 months after completion of radiation therapy. A biopsy taken earlier is unreliable, as the cancer might be regressing [10]. Radiation-induced atypia can be difficult to distinguish from residual cancer with severe radiation changes; care must be taken in evaluating post-radiation prostate biopsies. Bostwick and colleagues have defined strict criteria by which prostate cancer can be histologically differentiated from post-radiation atypia [3]. Because treatment decisions are based primarily on the results of the biopsy, it is critical that the pathologist be skilled in their interpretation.

Salvage radical prostatectomy: Operative and oncologic outcomes

The ultimate goal of early detection of local recurrence of prostate cancer after radiation therapy is to improve the efficacy of salvage therapy and ultimately patient survival. The hypothesis here is that early recurrences will more likely be organ-confined and therefore amenable to salvage strategies. Although salvage radical prostatectomy often succeeds in eradicating locally recurrent cancer, complications are common [11–15]. Several generalisations can be made regarding patient selection for salvage radical prostatectomy. First, the procedure should be reserved for patients with a life expectancy of at least 10 years. Second, patients must have no evidence of metastatic disease; if an initial pelvic lymph node dissection was performed, it must have been negative. Third, salvage surgery should be offered only to those for whom both initial cancer and recurrent cancer are clinically organ-confined and potentially curable with radical prostatectomy. Fourth, patients should have no evidence of severe radiation cystitis or proctitis. Lastly, candidates for salvage surgery should be highly motivated individuals who understand and accept the higher morbidity associated with this approach.

Salvage radical prostatectomy is technically challenging. Reported short-term and long-term complication rates exceed those of standard radical prostatectomy, but with appropriate patient selection and surgical expertise, this procedure has become less hazardous for the patient. The rates of complications in existing salvage prostatectomy series are summarised in Table 1. Overall, mean estimated blood loss and operative time do not differ significantly from the

Table 2
Intraoperative findings and postoperative course in patients undergoing salvage radical retropubic prostatectomy (adapted from Stevenson et al. [24])

	1984–1994 Early group ($n = 52$)	1995–2002 Contemporary group ($n = 54$)
Operative time, mean, min (range)	207.3 (155–285)	227.8 (140–540)
With nerve graft	–	241.3
Without nerve graft	207.3	221.4
Blood loss		
Median amount, mL (range)	1000 (100–2400)	900 (350–3300)
% patients transfused	26.4	13.2
Units transfused, intraoperative	1.6	1.9
Intraoperative complication		
Rectal injury	6 (11.5%)	1 (1.9%)
Ureteral injury	2 (3.8%)	1 (1.9%)
Length of hospital stay, mean, days (range)	8.7 (4–16)	3.6 (3–7)
Postoperative complications		
Re-explore for bleeding	2 (3.9%)	0
Ureterovesical junction stricture	1 (1.9%)	0
Vesicourethral/perineal fistula	1 (1.9%)	1 (1.9%)
Septic shock	1 (1.9%)	0
Thrombophlebitis	1 (1.9%)	0
Additional major procedure		
Colostomy closure	2 (3.9%)	0
Ureteral reimplantation	1 (1.9%)	0
Delayed cystectomy	1 (1.9%)	1 (1.9%)[a]
Optical urethrotomy for stricture	24 (46.2%)	10 (18.5%)

[a] 14 months after salvage radical prostatectomy.

values for standard radical prostatectomy. However, up to 15% of patients in these series had rectal injuries, and as many as 25% had some other early complication of surgery, such as ureteral transection, prolonged anastomotic leakage, or pulmonary embolism. Rectal and other intraoperative injuries are especially common in patients who had previous pelvic lymphadenectomy. In a series from Rogers and colleagues, 31% of patients who had previously undergone pelvic surgery had a surgical complication, compared with only 9% of patients who received external-beam radiation alone [11].

Our group has performed over 120 salvage radical prostatectomies. Salvage surgery can be safely performed after failed external beam radiotherapy, brachytherapy (open or ultrasound-guided), or combinations of these techniques. Most of our patients (90%) were treated with a retropubic approach, although early in our series we used a combined abdomino-perineal approach for selected patients (10%) who had had open brachytherapy and pelvic lymphadenectomy. Early in our series (before 1995), the mean estimated blood loss, transfusion requirements, and average hospital stay were greater than for standard radical prostatectomy. We believe this is attributable to both our relative inexperience with the surgical approach at that time as well as the fact that most of these patients had undergone prior open pelvic surgery. In the past 10 years, however, the morbidity of the operation has improved substantially (Table 2). Rectal injuries occurred in 12% of patients we treated before 1995, but are now rare (Table 2). With full bowel preparation before the operation, rectal injuries can be repaired primarily without altering postoperative recovery. Using current surgical techniques, salvage radical prostatectomy is technically feasible, with intraoperative and immediate postoperative outcomes similar to those with standard radical prostatectomy.

Despite these improvements in results of salvage radical prostatectomy, long-term complications remain high. Bladder neck contractures have continued to

Table 3
Pathologic findings in 100 men undergoing salvage radical prostatectomy between 1984 and 2003 (adapted from Secin et al. [28])

Finding	Percentage of patients			*P*-value
	Overall ($n=100$)	1984–1994 ($n=48$)	1995–2003 ($n=52$)	
Organ-confined	32	17	46	0.002
Extraprostatic	45	67	25	0.005
Seminal vesicle invasion	38	50	27	0.003
Positive surgical margin	29	31	8	0.004
Positive lymph nodes	9	4	14	0.02

be problematic. Approximately 20% of contemporary patients in our series have developed an anastomotic stricture (Table 2). Although risk factors for urinary incontinence have not been specifically examined after salvage surgery, the development of an anastomotic stricture is a risk factor for urinary incontinence after standard radical prostatectomy [25]. Careful attention to surgical detail, with a mucosa-to-mucosa anastomosis, is critical to preventing an anastomotic stricture.

In addition, the risk of urinary incontinence remains high. For our entire series of patients undergoing salvage radical prostatectomy, the overall rate (95% confidence limits) of recovery of urinary control was 62% (49–75%). For the period before 1995, 57% (39–75%) of patients recovered urinary control, while after 1995 the rate of recovery improved to 74% (54–94%). This likely reflects not only an improvement in surgical technique, but better targeted radiation therapies leading to better preservation of the sphincteric mechanism. An artificial urinary sphincter and/or sling procedure has been performed in 20% of patients.

Erectile dysfunction has been considered almost inevitable after salvage radical prostatectomy, but in selected cases one or both neurovascular bundles can be preserved. While overall post-surgical potency is low, many men have erectile dysfunction before the surgery. Overall, we were able to preserve neurovascular bundles in 45 men in our series (one neurovascular bundle in 39 men and both in six). Importantly, in men undergoing neurovascular bundle preservation, we have not had a positive surgical margin in the area where the nerve bundle was preserved. While follow-up is short, results suggest that in selected patients potency can be maintained even in the salvage setting [26]. Although we have had success in using nerve grafts in men undergoing radical prostatectomy who have had one or both neurovascular bundles resected, outcomes in the salvage setting have been disappointing [27]. Additional follow-up is required to determine the success of nerve grafting in this patient population, especially in those men receiving bilateral nerve grafts.

The major problem today with salvage radical prostatectomy is that the cancer is already advanced by the time most patients and their physicians will accept the operation. In the our initial series of patients treated with salvage prostatectomy before 1995, 54% had pathologically advanced cancer, defined as seminal vesicle invasion and/or lymph node metastases (Table 3) [28]. Preoperative serum PSA levels, but not clinical stage or biopsy grade, had a positive correlation with pathologic stage [11,28]. Our data suggest that the lower the serum PSA level at the time of salvage surgery (preferably <4.0 ng/ml), the more likely the opportunity for cure (Fig. 3) [28]. This

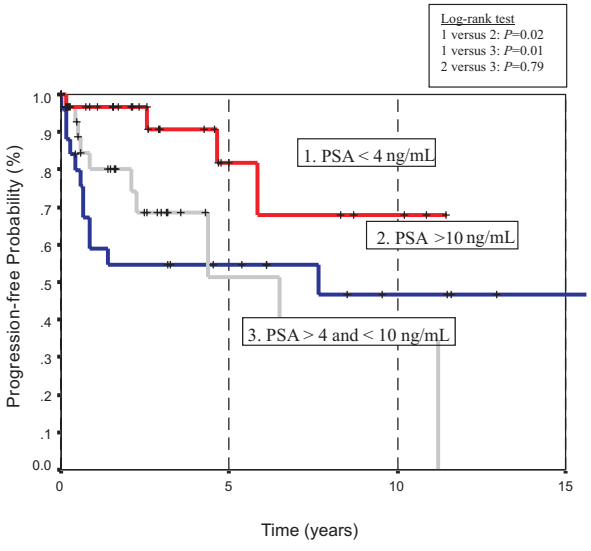


Fig. 3. Risk of recurrence after salvage radical prostatectomy according to preoperative serum PSA level. Men with a serum PSA level <4 ng/mL were more likely to remain cancer-free than men with higher preoperative serum PSA levels [28].

Table 4
Outcomes after salvage radical prostatectomy

Authors	*N*	Clinical stage	Non-progression rate, %		Clinical non-progression rate, %		Cancer-specific survival rate, %	
			5 year	10 year	5 year	10 year	5 year	10 year
Rogers *et al.* [11]	38	T1–3 N0NX	55	33	83	67	95	87
Amling *et al.* [29]	108	T1b-N+	70	44	–	42	90	60
Gheiler *et al.* [14]	40	T2–3N0	47	–	88	–	–	–
Bianco *et al.* [28][a]	106	T1–3 N0NX	61	43	90	81	99	94

[a] Includes the 38 patients detailed in reference 8 [9].

Table 5
Long-term cancer control outcomes after salvage radical prostatectomy [28]

Pathology	Percentage free from biochemical recurrence ($N = 100$)	
	5-year	10-year
Organ confined	86.0	86.0
Extraprostatic extension	61.6	41.0
Seminal vesicle invasion	47.6	32.6
Positive lymph nodes	60.0	–

further highlights the need for methods of defining cancer persistence/recurrence following radiation therapy other than the ASTRO definition.

Cancer control outcomes from several salvage radical prostatectomy series are summarised in Table 4. For our overall series of patients treated with salvage radical prostatectomy, the 15-year non-progression rate was 29% and the 15-year cancer-specific survival rate was 64%. The 5-year actuarial non-progression rate was 86% for patients with organ-confined cancer (pT2N0), 61% for those with extracapsular extension, and 48% for those with seminal vesicle invasion (Table 5).

Pathological findings at the time of salvage radical prostatectomy

For men who are candidates for localised salvage therapy, the oncologic efficacy may be affected by the anatomic and pathologic features of cancers within the irradiated prostate gland. We characterised and mapped the prostate cancers in 46 consecutive salvage radical prostatectomies performed at our institution between 2000 and 2004 [30]. A single uropathologist obtained detailed pathologic data, including the anatomic distribution and volume of cancer from the 46 whole-mount salvage prostatectomy specimens. Seventy cancer foci were identified in 46 patients, with a median cancer volume of 6.8 cc. All the foci were located in the peripheral zone, with 3 foci extending into the transition zone. Forty-three cancer foci (61.4%) were located in the apex of the prostate. Because most focal therapies tend to 'spare' the periurethral area, we examined this area of the specimen in detail. The median distance from the cancer foci to the urethra was the smallest at the apex and greatest at the base. The overall median distance from cancer to the urethra was 3.8 mm. Thirty-one patients (67%) had cancer located within 5 mm of the urethra and 3 patients (7%) had cancer directly involving the urethra (Table 6; Fig. 4). The anatomic and pathologic features in our series of salvage radical prostatectomy specimens demonstrate that a significant portion of cancers are distributed in regions of the prostate (apex and periurethral) that may be technically challenging to treat with local

Table 6
Pathologic characteristics in 46 salvage radical prostatectomy specimens

Tumour location ($n = 70$)	No. of foci	%
Apex	43	61.4
Mid gland	43	61.4
Base	23	32.9
Peripheral Zone (PZ)	70	100.0
Transition Zone (TZ)	3	4.3

Median distance to urethra (mm)	Value	Range
Overall	3.8	0.0–18.4
Apex	4.1	0.0–10.8
Mid	6.5	0.0–17.1
Base	13.8	1.3–22.3
Median tumour volume (cc)	6.8	<0.01–15.9

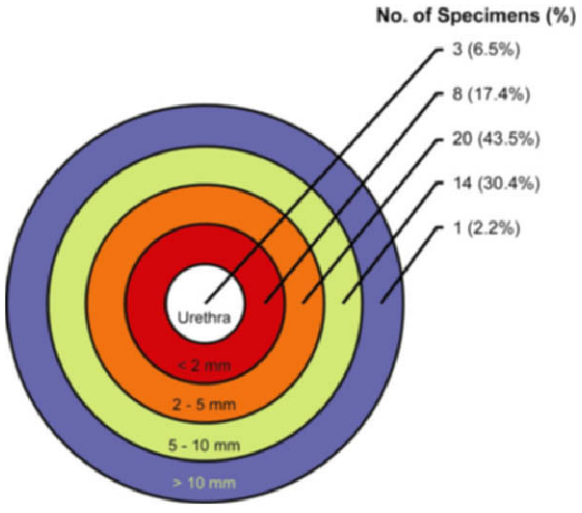


Fig. 4. Periurethral tumour distribution derived from 46 salvage radical prostatectomy specimens [30].

ablative therapies such cryotherapy or brachytherapy. Long-term studies of local ablative therapies without the use of neoadjuvant/concurrent hormonal therapy are needed to determine their oncological efficacy in patients with radiorecurrent or resistant prostate.

Surgical principles: Open salvage radical prostatectomy

A successful salvage radical prostatectomy requires careful surgical planning. This starts preoperatively. The extent of local disease should be carefully assessed. Findings on digital rectal examination and the results of the prostate biopsy are carefully noted. We prefer to label each biopsy core individually to best characterise the amount and location of any tumour. We have also found endorectal MRI to be useful for local tumour assessment. The intraoperative examination of the prostate will also help determine the extent of dissection required to maximize the likelihood of complete cancer removal.

We have found that a standard, retrograde approach to salvage prostatectomy starting with the apical dissection is successful in the vast majority of cases. However, the apex, especially in the midline posteriorly, often proves to be the most difficult area of dissection. If dissection of the apex off the anterior rectal wall proves difficult, do not hesitate to move somewhat more laterally to better define the plane between the prostate and rectum (Fig. 5). Do one side and then the other side, moving to areas where the dissection is easier and progress can be made. Once the appropriate plane has been defined, the

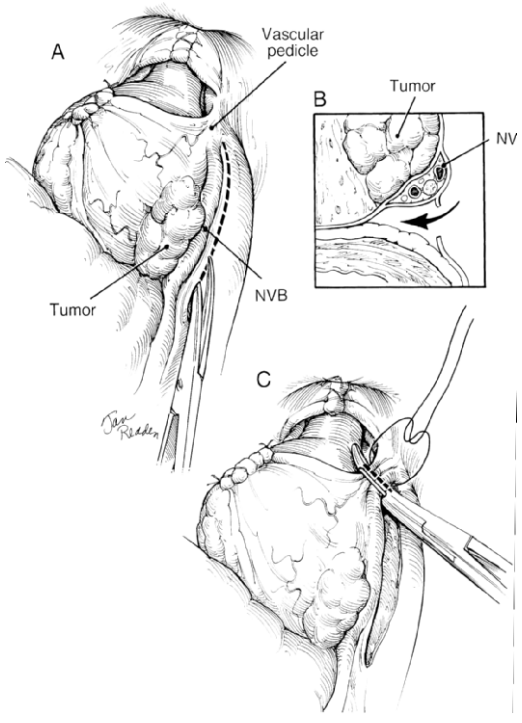


Fig. 5. Lateral approach to dissection of the prostate off the anterior rectal wall. The thin fascia overlying the lateral rectum is incised, exposing the perirectal fat. This plane is sharply developed, mobilising the lateral aspect of the prostate off the anterior rectal wall. NVB, neurovascular bundle.

dissection can continue to further mobilize the apex in the midline off the rectum. Blunt dissection of the prostate off the rectum is not recommended. Rather, we recommend staying below Denonvilliers' fascia and sharply mobilising the prostate cephalad. You are in the correct plane when the fat of the anterior rectal wall is seen. This will reduce the likelihood of a positive surgical margin in this area.

While many of the patients undergoing salvage radical prostatectomy have erectile dysfunction preoperatively or have suspicion for extraprostatic extension of their cancer, nerve-sparing can be attempted in selected cases. The correct plane is similar to standard radical prostatectomy, but the dissection will be more difficult. While blunt dissection with either a Kitner dissector and/or a right-angled clamp may be attempted, sharp dissection is usually required. We often try to best identify the appropriate area of dissection by starting adjacent to the urethra rather than on the prostate. This often is an easier area of dissection and does not risk inadvertent entry into the prostate.

Lastly, no attempts should be made to preserve the bladder neck. A wide resection is routinely performed. The bladder neck is then closed and a new 26–30 F

opening is made that will serve as the anastomotic site. We routinely evert the bladder mucosa to promote a mucosal-to-mucosal anastomosis.

Salvage laparoscopic radical prostatectomy

Salvage surgery has been described using a minimally invasive approach. The largest series to date is from Vallancien and colleagues, who reported their results from seven patients treated using a laparoscopic approach between 2000 and 2002 after failure of either external beam radiation therapy (five patients) or brachytherapy (two patients) [31]. Average operating time was 190 min (range 170–210 min). There were no intraoperative complications or transfusions. None of the patients had preservation of the neurovascular bundles. On pathologic examination of the resected specimens, three had extraprostatic extension (pT3a), three had seminal vesicle invasion (pT3b), and one had invasion of the bladder neck (pT4a). The positive surgical margin rate was 28%. With follow-up ranging from 4 to 21 months, five of seven patients (71%) were continent and none developed an anastomotic stricture, but two have had biochemical failure. While these functional results (continence and anastomotic strictures) are excellent compared to open salvage radical prostatectomy, the positive surgical margin rate was much higher (28% versus 8%), even though no attempts were made to preserve the neurovascular bundles. Whether or not this translates into a higher rate of failure awaits further follow-up.

Conclusions

Salvage radical prostatectomy is a technically challenging procedure that provides excellent oncologic outcomes in appropriately selected men with radiorecurrent prostate cancer. The procedure will eradicate the disease in a high proportion of patients treated when the cancer is confined to the prostate or immediate periprostatic tissue. As with any oncologic surgery, patient selection and careful surgical planning are of utmost importance. Patients should be in good health with a life expectancy greater than 10 years, have a local tumour proven by biopsy, and have no evidence of metastatic disease. Preferably the presurgical serum PSA level will be less than 4 ng/mL. As outcomes continue to improve, patients may be more willing to accept this treatment option after failure of definitive radiation therapy. Improved methods to identify radiorecurrent prostate cancer while it is still confined to the prostate are needed to enhance oncologic outcomes after salvage prostatectomy.

Conflict of interest statement

None declared.

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