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Review Article

Long-term oncologic outcomes of radical prostatectomy compared with brachytherapy-based approaches for intermediate- and high-risk prostate cancer

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ABSTRACT

PURPOSE: To review the recently published contemporary long-term outcomes from tertiary care urologic practices comparing brachytherapy-based management strategies and radical prostatectomy (RP) across intermediate- and high-risk groups.

METHODS AND MATERIALS: Literature was reviewed for the past 5 years under the search terms localized prostate cancer, outcomes, brachytherapy, and adical prostatectomy. Abstracts were reviewed and excluded if results were not reported according to the recognized risk groupings or if followup was less than 5 years.

RESULTS: A total of 1237 abstracts concerning adical prostatectomy and 600 concerning brachytherapy were retrieved in the initial search. Of these, 80 met the inclusion criteria, and the articles were retrieved and reviewed in detail.

CONCLUSIONS: For intermediate- and high-risk prostate cancer, brachytherapy-based approaches provide superior long-term oncologic and functional outcomes. Irritative and obstructive symptoms are prominent in the first 6−12 months but resolve by 3 years for all but <5%. High-risk patients do very well with multimodality treatment combining external beam radiotherapy, a brachytherapy boost, and androgen deprivation for 9−12 months.

Keywords: Prostate cancer; Outcomes; Brachytherapy; Radical prostatectomy

Introduction

Prostate cancer is the most common malignancy in men in the developed countries and the second most common cause of cancer death. Recently, active surveillance has been advocated for selected low-risk cancers with the recognition that Gleason 6 disease is rarely a cause of cancer mortality (1, 2). However, intermediate- and high-risk cancers remain a challenge with a goal to improve cure rates while minimizing long-term toxicity and the impact on quality of life.

Many options exist, and ideally all newly diagnosed men with prostate cancer would have the opportunity for a multidisciplinary approach from the beginning to learn about the pros and cons of each option and make an informed choice. Randomized trials comparing the various options are few and small. Attempts to examine published results from single institutions to compare modalities and outcomes are subject to treatment selection bias and frequently the populations are not directly comparable.

This review was undertaken on the occasion of the 10th anniversary of the introduction of ^{125}I prostate brachytherapy in Japan and will compare outcomes for surgical- vs. brachytherapy-based approaches for men with intermediate- and high-risk prostate cancer.

Methods and materials

Literature was reviewed for the past 5 years under the search terms localized prostate cancer, outcomes, brachytherapy, and radical prostatectomy (RP). A total of 1237 abstracts reported RP outcomes and 600 reported brachytherapy outcomes. Abstracts were reviewed and excluded if results were not reported according to recognized risk groupings

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(D'Amico or *National Comprehensive Cancer Network*) or if followup was less than 5 years. Many were technical articles comparing surgical approaches or details of brachytherapy planning or technique, or reported short-term toxicity. Full manuscripts were retrieved for 80 publications and reviewed in detail, including 33 on RP results, 25 on brachytherapy, and 22 that made comparisons between modalities. Only articles reporting results individually for intermediate- and high-risk patients were retained.

Results

Table 1 shows the results of brachytherapy-based treatment regimens for intermediate-risk prostate cancer. With the exception of study by Galalae *et al.* (3), which reported on only 37 patients, the biochemical disease-free rates ranged between 87% and 97% at 5 years, and 82−96% at 10−12 years. The one report beyond 15 years (4) cites an 89% disease-free rate. Table 2 shows the results for RP. In contrast, the biochemical disease-free rates for surgery range from a low of 60% at 5 years from the University of Toronto (5) to 68% disease-free rates at 15 years for the series from Johns Hopkins University (6). One multicenter series, from the Henry Ford Hospital in Detroit, Case Western in Cleveland, University of New York, and University of Toledo is comprised entirely of robot-assisted surgery and reports 62% disease-free rates at 10 years [Fig. 1; (7)].

Table 3 shows the results of brachytherapy-based treatment regimens for high-risk prostate cancer. At 5 years, the disease-free rates range from 71% to 85%, at 10−12 years from 64% to 92%, and the one publication with followup beyond 15 years reports 74% disease-free rates at 16 years (4). Table 4 shows the disease-free rates after RP with high risk defined by the preoperative clinical parameters prostate-specific antigen (PSA), biopsy Gleason score, and clinical T-stage. At 5 years, 40% are failure free, at 10 years 27−54%, and the one report from Hopkins with 15-year followup cites a 60% failure-free rate [Fig. 2; (6)].

Discussion

When comparing the results across different treatment modalities in the absence of randomization, one must acknowledge the many factors that can influence reported outcomes. These include but are not limited to patient selection, definition of failure, treatment specifics (type of surgery and dose of radiotherapy), and philosophy of treatment (stepwise utilization of modalities such as in surgery vs. upfront combination in radiotherapeutic approaches). Insufficient data were found to compare cause-specific or overall survival.

Clearly, patient selection plays a large role in the variability of results within each modality. Even when results are reported for risk groups separately, there is still ample room for patient selection and subsequent bias within each risk group. This is probably most prominent in favorable-risk patients, most of whom may not require any treatment. Liu *et al.* (2) recently published on the frequency of lymph node involvement in Gleason 6 prostate cancer, which may be considered a surrogate for metastatic potential and eventual death from prostate cancer. Of 21,960 patients retrieved from the SEER database with Gleason 6 prostate cancer treated by RP and node dissection, the prevalence of nodal metastases was only 0.48%. Thus, the justification for continuing to treat favorable-risk prostate cancer is that a significant percentage is known to harbor undetected Gleason pattern 4 cancer. Nomograms have been constructed to identify such patients (8−10) preoperatively. Varying proportions of such patients in any series reporting results of treatment for favorable-risk prostate cancer may significantly impact the results. For this reason, this report deals with only intermediate- and high-risk cancers where few would dispute that treatment is indicated.

Definition of failure

For high-risk prostate cancer treated by RP, the 10-year biochemical disease-free rates range from a low of 27% when no adjuvant therapy is used before proven

Table 1
Results of brachytherapy for intermediate-risk prostate cancer

Authors	Year	*N*	Median followup (yr)	bNED	Treatment	Failure definition (PSA, ng/mL)
Dattoli *et al.* (4)	2010	157	10.5	89% at 16 yr	LDR + RT	>0.2
Galalae *et al.* (3)	2014	37	9.6	69% at 10 yr	RT + HDR	
Herbert *et al.* (29)	2012	439	5	94% at 5 yr	LDR + 6-mo ADT	
Kollmeier *et al.* (30)	2013	58	6.5	94% at 8 yr	LDR ± RT ± ADT	
Marina *et al.* (31)	2014	282	8	91% at 8 yr	RT + HDR	
Marshall *et al.* (32)	2014	973	6.5	84% at 12 yr	LDR ± RT ± ADT	
Munro *et al.* (33)	2014	187	5	82% at 10 yr	LDR monotherapy	
Sekiguchi *et al.* (34)	2014	130	6.5	97% at 5 yr	LDR ± 6-mo ADT	
Spratt *et al.* (35)	2013	400	5.3	92% at 7 yr	RT + HDR	
Taira *et al.* (15)	2010	608	7	96% at 12 yr	LDR ± RT	>0.4
Viani *et al.* (36)	2009	65	5.3	87% at 5 yr	RT + HDR	

bNED = biochemical nonevidence of disease; PSA = prostate-specific antigen; LDR = low-dose rate; RT = radiation therapy; HDR = high-dose rate; ADT = androgen deprivation therapy.