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Functional and Oncologic Outcomes Following Radical Prostatectomy in Men with Multiple Sclerosis

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Abstract

Purpose: To present the first analysis of functional and oncologic outcomes following radical prostatectomy (RP) in men with pre-existing multiple sclerosis (MS). There is currently a complete paucity of data exploring this unique population and their outcomes following prostate surgery.

Methods: We retrospectively reviewed 20 men with MS diagnosed prior to undergoing RP between 2000–2024. Baseline variables included age, MS severity, continence status, erectile function, and oncologic outcomes. De novo incontinence was defined as new urinary incontinence at 1-year post-RP among previously continence men. Erectile dysfunction was defined as persistent inability to achieve or maintain erections sufficient for sexual activity. Biochemical recurrence (BCR) was defined as a postoperative PSA >0.2 ng/mL. Overall survival (OS) was the primary oncologic endpoint.

Results: Median age at RP was 59 years (IQR 55.8-64.2). Most men (93%) had early-stage MS; 20% were on MS disease modifying treatments. Pre-operative urge incontinence was present in 30% (n=6). Among 14 continent men, 36% (n=5) developed de novo stress incontinence after RP. Erectile dysfunction increased from 55% pre-operatively to 80% postoperatively. BCR occurred in 10%, with mean time to recurrence of 3.8 years (SD 1.4). Mean overall survival was 11.6 years (SD 5.4).

Conclusions: This is the first exploratory analysis of outcomes in men with MS who undergo RP. In men with early-stage MS, RP achieved favorable oncologic outcomes, though was associated with higher rates of postoperative urinary incontinence and erectile dysfunction compared with published unselected RP series. RP may be considered for carefully selected men with early MS and localized prostate cancer.

Keywords: Erectile Dysfunction; Multiple Sclerosis; Prostatectomy; Prostate Cancer; Urinary Incontinence

Abbreviations: RP: radical prostatectomy, MS: multiple sclerosis, EDSS: Expanded Disability Status Scale, LUT: lower urinary tract, ED: erectile dysfunction, BCR: biochemical recurrence, OS: overall survival, BOO: bladder outlet obstruction, AUA: American Urological Association, DMT: disease modifying therapy

Introduction

Prostate cancer is the most common solid organ cancer in men in the United States, and is the third-leading cause of cancer-related death in men [1]. At diagnosis, most patients present with organ confined disease, for which radical prostatectomy remains the cornerstone of curative treatment. Notably, surgical candidacy of patients with neurologic disease such as multiple sclerosis (MS) is debated due to concerns around complicated functional recovery postoperatively, particularly regarding bladder and sexual function.

MS is a progressive, inflammatory demyelinating condition of the central nervous system with variable neurologic manifestations. Lower urinary tract (LUT) dysfunction affects up to 90% of individuals with MS, with irritative symptoms such as urgency and urge incontinence being most common, [2] which significantly impacts quality of life (QOL). Urodynamic studies (UDS) in MS often reveal detrusor under or overactivity, or detrusor-sphincter dyssynergia, all of which contribute to impaired bladder storage and emptying [3]. These symptoms may also be compounded by concurrent cognitive deficits, infections, or bladder outlet obstruction (BOO). Sexual dysfunction also has a high prevalence among patients with MS, with estimates between 50-90% of men with MS having erectile dysfunction [4, 5].

In the general population, functional outcomes post-prostatectomy vary widely depending on patient factors and surgical technique. Comorbidities, such as the presence of vascular risk factors (e.g. hypertension, diabetes mellitus, coronary artery disease), have also been linked to poorer postoperative sexual function, and baseline urinary or metabolic conditions may further impact outcomes [6, 7].

As MS symptoms tend to progress with age, along with increased prevalence of prostate cancer in aging populations, clinical overlap between these diseases is likely to rise. Despite this, there is no existing literature that specifically evaluates RP outcomes in men with MS, and very limited data on RP outcomes in men with other neurodegenerative diseases [8]. This gap limits evidence-based guidance for urologists and other clinicians managing these dual diagnoses.

To our knowledge, this study offers the first evaluation of functional and oncologic outcomes following RP in men with MS, focusing on continence, erectile function, and overall survival. Our aim is to inform individualized surgical planning and shared decision-making in this vulnerable patient population.

Methods

Following Institutional Review Board (IRBe 25-008446) approval, we conducted a retrospective review of all men who underwent RP at a single institution between 2000 to 2024. We included men who had obtained a formal diagnosis of MS by a neurologist prior to RP. This was based on clinical history, neurologic examinations, MRI brain (if available), and the 2017 McDonald criteria. The recently published 2025 MS diagnostic criteria largely encompass the same population [9], and all patients included in this study would meet the updated criteria.

Patients with at least 1-year postoperative follow-up were included. Baseline data included age, MS disease severity (classified by the Expanded Disability Status Scale [EDSS]), continence status, erectile function, and oncologic outcomes. De novo incontinence was defined as new urinary incontinence at 1-year after surgery among men who were continent preoperatively. Erectile

dysfunction was defined as the persistent inability to achieve or maintain an erection for sufficient or satisfactory sexual performance. Biochemical recurrence (BCR) was defined as a postoperative PSA >0.2 ng/mL. Overall survival (OS) was used as the primary oncologic outcome.

We examined electronic medical records (EMR) or return surveys (including the IIEF [International Index of Erectile Function] and the IPSS [International Prostate Symptoms Score]), at minimum 1-year post RP to determine if they had urinary incontinence, ED, or biochemical failure. The type of incontinence (stress, urge, or mixed) was determined on the basis of clinical records and urodynamic testing, where available. Pathological and surgical characteristics such as TNM stage, Gleason score, and nerve bundle preservation status were recorded. Data were analyzed descriptively.

Results

A total of 11,270 men underwent RP at our institution during the study period. Of these, 21 men had a pre-operative diagnosis of MS. One patient was excluded due to incomplete follow up data, leaving a final cohort of 20 men. The mean age at MS diagnosis was 53.8 years (SD ±12.5). The mean age at RP was 60.5 years (SD ±6.2). Mean BMI at RP was 29.1 (SD±4.6). The average time from MS diagnosis to RP was 4.7 years (range 2 months to 41.2 years). All patients had an EDSS <4, representing early-stage disease and full ambulatory capacity. 30% were on MS disease-modifying therapy pre-operatively. Mean pre-operative PSA was 8.14ng/mL (SD ± 6.62) (Table 1). Four patients (20%) were noted to be on MS disease-modifying therapy (DMTs) at the time of surgery (interferon beta-1b [n=3] and glatiramer acetate [n=1]).

Preoperative urodynamic studies (UDS) (n=3) demonstrated heterogeneous bladder dysfunction. One patient had uninhibited detrusor contractions resulting in precipitous voiding at maximum bladder capacity, a post void residual of 100cc, and urodynamic evidence of BOO. The second patient exhibited a large-capacity, mid-fill noncompliant acontractile bladder, and was unable to generate a void and requiring catheterization for emptying. The third patient demonstrated mid-fill noncompliance with poor detrusor contractility, voiding only with pressures generated from impaired compliance and leaving a post-void residual of 230cc. None demonstrated stress incontinence during testing. At 1-year follow up, all three patients were clinically continent of urine without the need for pads. However, no postoperative urodynamic studies were performed, therefore postoperative voiding parameters could not be objectively assessed. Clinical continence status was used as a surrogate outcome.

Preoperative urinary incontinence was present in 30% (n=6) of patients; all with documented urge incontinence (UI). Among the men who were continent preoperatively (n=14), 35.7% (5/14) developed de novo incontinence at 1-year, all with stress incontinence (SI) (Figure 1). The majority only required 1 pad/day, with only one patient requiring 3 pads/day and ultimately undergoing an artificial urinary sphincter (AUS) procedure to resolve their incontinence. Six patients completed a postoperative International Prostate Symptom Score (IPSS) with an average score of 11 out of 35 (i.e. moderate symptoms). None were noted to have undergone postoperative urodynamic testing. Notably among the six patients with pre-operative incontinence, four of them regained normal urinary continence postoperatively. Additionally, one previously catheter-dependent patient regained voiding ability and urinary continence post RP.

Erectile dysfunction (ED) was present in 55% of patients preoperatively, with the majority utilizing phosphodiesterase 5 (PDE-5) inhibitors. Postoperatively, the rate of ED increased to 80% at 1-year, with nearly 70% of this group requiring ED therapy (Figure 1). Bilateral nerve-sparing RP was performed in 90% of cases, with one patient undergoing unilateral nerve-sparing.

All had pathologic Stage T2 disease or less, with pathologic Grade Groups (GG) including GG 1 (n=7), GG 2 (n=9), GG 3 (n=3), GG 4 (n=1). Biochemical recurrence (BCR) occurred in 10%, with a mean time to recurrence of 3.8 years (SD ±1.4).

Four men received adjuvant therapy, either androgen deprivation therapy (n=2), and/or external beam radiotherapy (n=3). In all cases, recurrence developed >1-year post-RP thus the adjuvant interventions did not influence the reported outcome measures. Mean overall survival post-RP was 11.6 years (SD ±5.4).

Table 1: Baseline Characteristics

	Mean (±SD)	Median (IQR)
Age at MS diagnosis (years)	53.8 ± 12.5	56.0 (48.5–60.2)
Time from MS diagnosis to RP (years)	6.55 ± 10.25	2.35 (0.37–9.38)
Age at RP (years)	60.5 ± 6.2	59.0 (55.8–64.2)
Pre-op PSA (ng/mL)	8.14 ± 6.62	6.05 (4.54–7.52)
BMI (kg/m^2)	29.1 ± 4.6	28.2 (26.7–31.5)
Time to BCR (years)	3.83 ± 1.38	4.13 (3.13-4.49)
Overall Survival (years)	11.58 ± 5.37	10.43 (7.27-15.87)

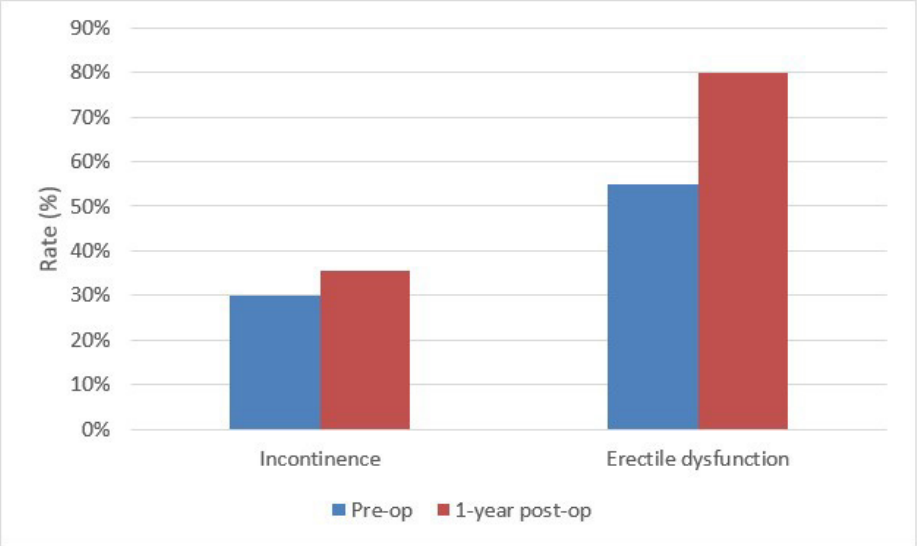

Figure 1: Rates of Pre- and Post-Operative Functional Outcomes

Discussion

This cohort of men with MS undergoing RP for prostate cancer demonstrated higher rates of de novo post-operative urinary incontinence (35.7%) and erectile dysfunction (ED) (80%) compared with published rates in the general RP population (8–15% at 12–14 months and 56-87% at 18-24 months, respectively) [10-13]. While data in the MS cohort is lacking, a 2006 study by Routh et al., [8] reported mild postoperative incontinence (24% at 1-year post-RP) in a cohort of Parkinson's disease patients suggesting that a pre-operative diagnosis of a neurologic disease does not preclude favorable continence outcomes.

Though it is understood that other neurologic conditions affect the lower urinary tract and sexual function, the exclusive focus on an MS cohort in this study was deliberate, reflecting both cohort availability and disease-specific conditions. Conversely, the outcomes of patients with MS have never been reported, and the condition represents a distinct neurologic entity with heterogenous central nervous system involvement, variable disease progression, and evolving immunomodulatory therapies that uniquely influence lower urinary tract function and sexual health [14].

Preoperative UDS in a subset of this cohort demonstrated heterogenous patterns of neurogenic bladder dysfunction, including impaired compliance, reduced contractility, and variable detrusor overactivity. Despite this heterogeneity, all three men with available pre-operative UDS achieved urinary continence following RP. Furthermore, 4 out of 6 men with preoperative urge incontinence subsequently regained urinary control at 1-year postoperatively. The etiology of urinary dysfunction in MS is complex, but in this subgroup, symptoms were likely neurogenic rather than sphincteric given their UI. These findings together suggest that baseline abnormalities in bladder physiology and preoperative UI should not be absolute predictors of poor functional outcomes.

Prior studies in non-selected populations demonstrate that RP leads to a significant reduction in BOO and, in a subset of patients, a reduction in detrusor overactivity, subsequently alleviating urinary urgency by removal of prostatic obstruction. A systematic review by Yao, et al., reported baseline BOO in 19-67% of men undergoing RP, with all comparative studies demonstrating a postoperative decrease in obstruction [7, 15]. Our findings align with these observations, however the lack of postoperative UDS in our cohort limited our ability to directly compare objective voiding parameters pre- and postoperatively. Despite this, present findings remain clinically relevant, as patient-reported outcomes and pad usage provide important functional endpoints.

Among those that developed de novo incontinence, the majority required only 1 pad/day, indicating mild post-RP incontinence. Only one patient required up to 3 pads/day and subsequently underwent an artificial urinary sphincter (AUS) procedure. The literature supports that most men with a mild post-RP incontinence can be managed conservatively with pelvic floor muscle training, lifestyle modification, and, if indicated, pharmacotherapy [16, 17]. For moderate to severe incontinence (usually >2 pads/day), surgical intervention is generally indicated, with AUS considered the gold standard for SI after RP. AUS implantation achieves social continence in approximately 80-94% of men, with high patient satisfaction and improved quality of life [18-19]. However, these outcomes in men with underlying neurologic disease, such as MS, may be less favorable and are not clearly defined in literature.

Erectile dysfunction was prevalent in the preoperative setting (55%) with de novo dysfunction seen in only 25% postoperatively. These rates parallel the general population (56-87% at 18-24 months postoperatively), with bilateral nerve-sparing surgery conferring a modest benefit [10-12, 20]. The elevated rates of incontinence and ED are consistent with prior literature demonstrating that comorbidity and baseline functional impairment (both common in MS and correlated with neurological disability) are key predictors of adverse outcomes following radical prostatectomy (RP) [12].

All patients in this cohort had an MS-EDSS <4, representing early-stage disease. In large population-based studies, an EDSS score <4 is associated with preserved mobility and lower rates of severe LUTS and sexual dysfunction [21-22]. This provides important context for interpreting the observed functional outcomes after RP in this group, as the risk of severe urinary and sexual dysfunction increases with higher EDSS scores and greater neurological impairment [23-25]. Thus, these results may not be generalizable to men with more advanced MS, who are at higher risk for baseline and post-surgical morbidity, emphasizing the need for careful patient selection.

The pathophysiology underlying these outcomes is multifactorial. MS is characterized by demyelination and neurodegeneration within the central nervous system, leading to detrusor overactivity, detrusor-sphincter dyssynergia, and impaired voluntary sphincter control [3, 26, 27]. These mechanisms predispose to both urge and stress incontinence, and may be exacerbated by surgical disruption of the sphincteric and pelvic support structures during RP [7, 28]. Additionally, MS-related sexual dysfunction is common and multifactorial, involving both neurogenic and psychogenic components [20, 23, 26]. The additive effect of RP on these baseline deficits likely explains the higher rates of postoperative morbidity observed in this cohort.

Oncologic outcomes in this MS cohort were comparable to those reported in the general population, with BCR occurring in 10% and mean OS of 11.6 years. These results are consistent with large registry and population-based studies, which demonstrate that RP achieves excellent long-term cancer control. For example, contemporary series report prostate cancer-specific mortality rates of less than 10% at 15 years post-RP, and 10-year BCR rates ranging from 10% to 30% [28-31]. The American Urological Association (AUA) recommends RP as definitive local therapy for men with intermediate- or high-risk disease and adequate life expectancy, with treatment decisions guided by comorbidity and functional status [32].

The increasing use of DMTs in MS also has important implications for surgical outcomes. In this cohort, only a minority of patients were on DMTs prior to surgery, with none on high-efficacy immunosuppression. However, the landscape of MS management is rapidly evolving, with multiple studies reporting significantly increased risk of surgical site infections in those on potent immunosuppressants, such as monoclonal antibodies [33, 34]. Though the relationship between MS-DMTs and cancer risk is less clear, the immunosuppressive effects raise theoretical concerns about impaired tumor immune surveillance [35]. Ongoing vigilance in this cohort is warranted as the treated population ages, and exposure durations increase.

Based on these observations, RP may be considered in carefully selected men with MS, particularly those with early-stage disease (EDSS <4) and preserved mobility. Preoperative UDS should be performed when feasible to characterize baseline bladder function and guide counselling, as abnormalities do not necessarily preclude continence recovery. Postoperatively, close follow-up is advisable with repeat UDS considered in patients with persistent LUTS or refractory incontinence. Multidisciplinary input, including neurology and pelvic floor rehabilitation, may further optimize outcomes in this population.

Limitations of this study include the small sample size and retrospective design, and absence of standardized postoperative urodynamic data, limiting statistical power and precluding definitive conclusions regarding mechanisms of urinary dysfunction or generalizability to broader neurologic populations. Nevertheless, given the rarity of this clinical intersection, this data provides important preliminary insight and our findings suggest that RP is feasible in carefully selected men with early-stage MS, achieving cancer control comparable to the general population while carrying slightly higher functional risks. Multidisciplinary care, long-term follow-up, and further research that includes standardized pre- and postoperative UDS, are warranted to optimize outcomes in this vulnerable population.

Conclusion

Radical prostatectomy remains a valuable and appropriate treatment option for ambulatory men with MS and localized prostate cancer. Albeit the rates of post-operative urinary incontinence and ED are mildly higher in this group compared to the general population, the increase is modest, and the majority of men experience only mild to moderate symptoms. Notably, some patients with preoperative UI can experience improvement in urinary control following surgery. Additionally, oncologic outcomes remain favorable. These findings support the continued use of RP in men with MS, provided comprehensive preoperative counseling is undertaken to set realistic expectations regarding functional outcomes and to facilitate shared decision-making.

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Conflict of Interest Disclosure

The authors declare no conflicts of interest.

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