



Tina Sotis. *Napoleon and Josephine* ©2000. Oil on canvas, 18" × 18".

*Urinary incontinence is a common adverse effect of therapy for localized prostate cancer but can be treated effectively.*

# Urinary Incontinence Following Treatment of Localized Prostate Cancer

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**Background:** *Urinary incontinence (UI) following treatment for localized prostate cancer is a significant adverse consequence most commonly seen after radical prostatectomy. UI can significantly impair the quality of life of patients who can otherwise expect a long survival.*

**Methods:** *The authors review past and present literature on UI following treatment for localized prostate cancer. Special focus is placed on the rate of UI following different modes of therapy, the effect of posttreatment UI on patients' quality of life, and the success of different methods used to treat the incontinence.*

**Results:** *Postprostatectomy UI has been reported in 25%-70% of cases, but few patients report being significantly bothered by the symptom. Postradiation adverse effects are mainly acute inflammatory, while late complications are rare but usually more serious. Comparative studies estimate UI following prostatectomy to be two times more common than following radiation, and surgical patients are three times more likely to continue to use pads. Watchful waiting carries a risk of incontinence related to prostate tumor progression. Several interventions can improve UI.*

**Conclusions:** *UI is the most common adverse consequence from treatment for localized prostate cancer. All of the possible treatment modalities carry some risk of UI. Providing accurate information to patients allows them to make informed decisions regarding treatment and can improve the quality of life in the posttreatment period.*

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## Introduction

Carcinoma of the prostate is the second-leading cause of cancer death in men today. The number of new diagnoses has dramatically increased over the last 15 years, peaking in 1992 probably due to mass screening using PSA. Therefore, as the number of new cases has increased, so has the demand for a curative treatment with the focus on maximizing long-term survival.

Nevertheless, all potential therapies are not without complications. The complications as well as the benefits of different treatment modalities may influence decision making regarding therapy and thus must be discussed with the patient.

Urinary incontinence (UI) is a common side effect that has a substantial impact on quality of life. Many different methods of quality of life assessment have been used when evaluating incontinence after prostate cancer treatment. Physician estimation of patient satisfaction is more favorable than that reported in self-administered patient questionnaires. Post-prostatectomy UI, when defined as *any* leakage, occurs in 25%-70% of cases, but few patients report being significantly bothered by the incontinence. Moreover, the rate of urine leak tends to decrease with time over the first year posttreatment. The leak rate also diminishes as a result of medical treatment and physiotherapy. Postradiation adverse effects are mainly acute inflammatory, while late complications are rare but usually more serious. Comparative studies estimate that UI is two times more common after prostatectomy than after radiation and that surgical patients are 3 times more likely to use pads. Observational follow-up carries a risk of incontinence related to prostate tumor progression. A consideration of potential curative effect related to adverse effect is important in the final treatment decision. Whereas each treatment for local-

ized prostate cancer has its own range of adverse effects, incontinence is the most common. Providing accurate information allows patients to make informed decisions on treatment choice and improves the quality of life in the posttreatment period.

## Incidence and Clinical Presentation

### *Incontinence Following Radical Prostatectomy*

Reports on the prevalence and incidence of incontinence following radical prostatectomy vary widely in the literature due to differences in definitions of urinary incontinence (UI), methods of data collection, length of follow-up, and techniques used in surgery (Table).<sup>1-9</sup> Urinary continence may be considered as no leak at all for some authors<sup>5</sup> or less than one pad per day for others.<sup>10</sup> Some authors use a scoring system,<sup>11</sup> while others do not offer a precise definition.<sup>4,8,12</sup> Discrepancies exist between surgical audit<sup>8,9</sup> and patient questionnaires<sup>1,2,4,6</sup> in which reports may include small yet bothersome amounts of urine loss or urgency. Following radical prostatectomy, the prevalence of incontinence at 1 month after surgery is high, ranging from 4% to 87%.<sup>13,14</sup> However, UI tends to diminish over time, and recovery is observed in most cases in 1 to 6 months following

Studies on Incontinence and Pad Use Following Radical Prostatectomy, and Studies Reporting Comparative Prostatectomy and Radiation Treatment for Localized Prostate Cancer

Authors	No. of Patients	Method	Mean Follow-up	% Incontinence (any leakage)	% Wearing Pad
Talcott et al <sup>1</sup>	98	Questionnaire	3 mo 12 mo	48 25	58 38
Litwin et al <sup>2</sup>	564	Questionnaire	18.7 mo	35	35
Bates et al <sup>3</sup>	87	Questionnaire	22 mo	69	24
Wei et al <sup>4</sup>	482	Questionnaire	24 mo	25.8 NS 35.4 non-NS	1.5 NS 5.3 non-NS
Gray et al <sup>5</sup>	167	Questionnaire	2.7 yrs	43	20
Shrader-Bogen et al <sup>6</sup>	132	Questionnaire	32 mo Rad: 41 mo	46.3 19.4	52.3 15.4
McCammon et al <sup>7</sup>	203	Questionnaire	3.4 yrs Rad: 6.4 yrs	62 29	33.7 8.7
Steiner et al <sup>8</sup>	399	Physician evaluation	1-7 yrs	No clear definition	11
Catalona et al <sup>9</sup>	1,870	Physician evaluation mostly, questionnaire	4 yrs	No clear definition	8 (17 if age >70 yrs)
NS = nerve-sparing technique Rad = comparative radiation group					

surgery. Talcot et al<sup>15</sup> reported 58% of patients using pads at 3 months but 35% at 12 months, while Davidson and colleagues<sup>16</sup> noted a 56% rate of pad use in the period immediately following urethral catheter removal but 21% UI at 3 months.

Age is a risk factor for incontinence. Two series<sup>17,18</sup> reported that the risk of UI is higher in men over 70 years of age than in men younger than age 70. Modified surgical techniques also may improve continence: nerve-sparing technique was noted as having a higher continent rate than nonsparing technique.<sup>9,19</sup> There is increased efficacy with bilateral vs unilateral preservation of the neurovascular bundles. Multivariate analyses<sup>4</sup> demonstrate that patient age and the interaction of nerve-sparing technique with age have a positive effect on postoperative urinary continence when any leakage was considered. Therefore, nerve-sparing technique appears to be more effective in younger than in older patients and tends to be performed more often in younger patients. On the contrary, preservation of the bladder neck does not improve the UI rate but may shorten the recovery interval of postoperative incontinence.<sup>20</sup> Comparison between the perineal vs retropubic route did not demonstrate a clear difference in the rate of UI incidence.<sup>5</sup> Urinary control may also be affected by tension, fatigue, or depression.<sup>21</sup> Some patients describe complete continence in the morning but leakage in the afternoon or after a sustained effort.

The most common clinical presentation is stress incontinence associated with coughing or other physical efforts that increase abdominal pressure. Stress incontinence results from incompetence of the external sphincter associated with shortening of functional urethral length and suppression of bladder neck and intra-urethral pressure.<sup>22,23</sup> Urge incontinence presents as urine loss following a pressing need to void; it is often caused by detrusor hyperactivity with uninhibited contractions of the detrusor muscle. This may be an amplification of preoperative asymptomatic phenomena due to age or associated comorbidities, but it may also result from bladder denervation due to surgical injury. Mixed incontinence is defined as combined stress and urge incontinence. The respective role of external sphincter deficiency or detrusor abnormality can be determined by urodynamic studies. This examination is not required in the postoperative period, but when incontinence persists, it permits comprehensive treatment.

### *Incontinence Following Radiotherapy*

External-beam radiation and radioactive iodine-125 or palladium seeds are becoming more wide-

spread in the treatment of localized prostate cancer. Complications of radiotherapy differ from those associated with surgery. Acute disorders occurring within 6 months of treatment are mainly inflammatory and often transitory. Late complications, which are often more serious, may occur months or years following the completion of treatment.

Acute radiation prostatocystitis due to external-beam radiation often causes frequency, nocturia, urgency, or urge incontinence as well as hematuria, or transient retention. The incidence of major acute complications (cystitis and proctitis either alone or together) has been reported as 10% for major symptoms.<sup>24</sup> However, none of these required operative intervention. Late complications include UI due to a fibrotic contracted bladder, damaged sphincter, and hemorrhagic cystitis. The incidence of late complication is reported to be from 5% to 12%,<sup>24,25</sup> and the incidence increases as the radiation dose increases. In a study of 551 patients with a 30-month follow-up, Zagars et al<sup>26</sup> reported a 12% urinary complication rate for patients receiving radiation doses between 64 and 67.9 Gy compared with 23% for those receiving doses between 68 and 71 Gy. The symptoms resolved satisfactorily except for 5% of patients who required cystectomy or urinary diversion. The overall incidence of UI after radiotherapy for prostate cancer reported by Griffith and Neal<sup>27</sup> is 3% to 7%, but Lee and colleagues<sup>28</sup> reported only 4 cases of incontinence (intermittent grade 2 or higher) of 758 radiated patients, leading to a 1.3% actuarial incontinence rate at 5 years.

Prostate-associated surgery increases the risk of incontinence. In their review of 272 patients treated with external radiotherapy and different types of prostate surgery, Fowler et al<sup>29</sup> found that UI was not related to primary tumor stage but to the surgical procedure. Incontinence developed in 1% of patients undergoing only needle prostate biopsy. However, when associated with transurethral prostate resection, the rate was 5.5% when the surgery was performed before radiotherapy and 33% when completed after radiotherapy. Adjuvant external radiotherapy (at a dose of 60 Gy) after radical prostatectomy was analyzed by Van Cangh and associates<sup>30</sup> in a prospective study of 100 patients. No difference was observed in the 24-month follow-up, with 77% patients remaining totally dry in the irradiated group vs 83% in the surveillance group. With regard to salvage prostatectomy following radiation therapy, the incontinence rate of this rare modality was reported as 58%-64%.<sup>31,32</sup>

With brachytherapy, irritative symptoms are more specifically limited to the prostate but may induce a prostatitis leading to urinary retention. Arterbery et al<sup>33</sup>

evaluated the acute effects in 51 patients during the first 6 months and found that increased urinary frequency had occurred in 40%, dysuria in 17%, and urgency and incontinence in 3%. At 6 months, symptoms were improved and no patient had incontinence, but they reported hesitancy in 25% and urinary stream weakness in 35%. Using diagnosis code, Benoit and colleagues<sup>34</sup> estimated the occurrence of UI to be 6.6% in a study of 2,124 men in a population of Medicare patients with a follow-up from 2 to 3 years. This 6% rate at 3 years was confirmed by another study.<sup>35</sup> Additional data are needed even if brachytherapy appears to carry a low long-term risk of UI.

A combination of external-beam radiotherapy and brachytherapy increases the likelihood of adverse effects. Joly et al<sup>36</sup> reported the results of a self-administered questionnaire involving 71 patients 4 years after combined treatment and found a 41% incontinence rate (severe in 9%) and 32% dysuria rate (severe in 9%). Intestinal and erectile complications were also increased in this patient population.

### *Incontinence Following Other Treatments*

Cryotherapy is used less frequently today as refinements in other techniques (surgery or radiotherapy) have lessened their previously high rate of complications. In a recent study on cryotherapy for prostate cancer, Badalament and colleagues<sup>37</sup> reported 43% of patients using pads for incontinence and a 10% rate of bladder outlet obstruction due to urethral sloughing. Further studies are required to better document the incidence of these adverse effects and the long-term efficacy of this procedure.

Watchful waiting may not be considered a true treatment but rather scheduled surveillance. Nevertheless, it reveals features of the natural history of the disease. Some degree of UI may occur as a result of prostatic disease progression or other comorbidities. Since results of the large-scale Prostate Cancer Intervention Versus Observation Trial (PIVOT) are not anticipated until 2010, comparison of treatment-related symptoms and the natural history of disease-related symptoms could be drawn from only a few comparative studies. An incontinence rate of 27% was reported in a Danish sample of men followed 3.3 years with deferred treatment.<sup>38</sup> The high prevalence in this questionnaire study is explained by their strict definition of incontinence as any dripping or leaking. During this period of time, patients experienced a transurethral prostate resection in 31% of cases. Patients undergoing expectant management are likely to be bothered by incontinence, and this must be taken into account in decisions regarding treatment.

## Effect on Quality of Life

Consideration of health-related quality of life has a substantial impact on men facing the difficult choice of primary treatment for early-stage prostate cancer. The potential adverse effects may have a substantial impact on their physical and psychological well-being. In this context, urinary “bother” refers to the degree of annoyance or interference caused by impairment in urinary function. The level of physical abnormality does not necessarily correlate with or predict the level of “bother.” Individual appreciation may also change with the period of time from the onset of adverse effect. For example, occasional leakage of a few drops of urine may bother some men at first but later they adapt to their impairment, while others will not adapt. Longitudinal studies<sup>2,15</sup> with patient questionnaires have demonstrated that men undergoing radical prostatectomy tend to have more leakage, and those undergoing external radiation tend to have more frequency and urgency. Urinary function during the immediate posttreatment period appears to be better after radiation than after surgery. However, both treatments carry the same rate of urinary “bother” by the end of first year, and this remains constant through the second year as well. Comparative studies with follow-up more than 2 years after radiation or prostatectomy reported a twofold less rate of incontinence and threefold less use of pads in the radiation group vs the surgery group.<sup>6,7</sup> Despite these impairments, patients generally express a high level of satisfaction regardless of the treatment chosen. Because irradiated patients are, on average, older than surgical patients, McCammon et al<sup>7</sup> conducted an age-adjusted study in 257 patients responding to a questionnaire. In this study, adjustment for age did not alter results. He confirmed that physician estimation of UI was more favorable than the patient-reported outcome. In surgical patients, 62% claimed to leak urine but only 33.7% used pads, whereas in the radiation group, 29% claimed to leak urine but only 8.7% used pads. Nevertheless, a “bother” estimate over 7 on a scale from 1 to 10 was reported in only 3.2% of surgical patients, and this did not differ significantly from radiated patients. In addition, several studies<sup>39,40</sup> have suggested that men are more concerned about potential adverse effects related to treatment than their spouses are. Women are more willing to favor life expectancy and de-emphasized the significance of potential adverse effects.

Poor communication or lack of information from health care professionals also adversely affects quality of life in the early posttreatment period.<sup>41,42</sup> Providing accurate information to patients about potential adverse effects when facing a treatment and offering follow-up care may alleviate the feeling of abandonment often reported by patients.

## Assessment of Urinary Incontinence

When treating a patient suffering from incontinence, an accurate and thorough clinical history is the first major step in the assessment process. The history provides information regarding preoperative leakage, medical and surgical history, current medications, and a detailed description of urinary and associated symptoms. The patient is asked about the onset of UI and the number of accidents during a typical day and night, as well as stress, urge, or mixed incontinence, the volume of leakage, the type and number of pads, previous treatments and their effectiveness, and associated symptoms such as frequency, dysuria, and incomplete voiding. It is recommended that they establish a voiding diary, a quality of life questionnaire and, if feasible, a 24-hour pad test. The physical examination focuses on neurologic function, abdomen, genitalia, and rectum. Laboratory tests include a urinalysis and culture to screen for urinary tract infection and a prostate-specific antigen test at proper intervals following treatment. A postvoid residual volume can be estimated by catheterization or, more often, by ultrasonography. If incomplete voiding is revealed, a cystoscopy is indicated to exclude a bladder neck stenosis.

When a patient fails the first medical therapy, or in the presence associated neurogenic disease, a urodynamic study is required. Urodynamic studies of UI in patients following radical prostatectomy demonstrated sphincteric deficiency as the major or sole cause in approximately two thirds of patients.<sup>43</sup> Isolated blad-

der overactivity occurred in only 6%, but overactivity was associated with sphincter deficiency in one third of patients. An obstructed voiding pattern may be due to an outlet stricture (clinically relevant in only 6% of patients, usually located at the vesico-urethral anastomosis and occasionally in the more distal urethra) or to impaired detrusor contractility resulting from operative neurological injury and fibrosis.

## Treatment

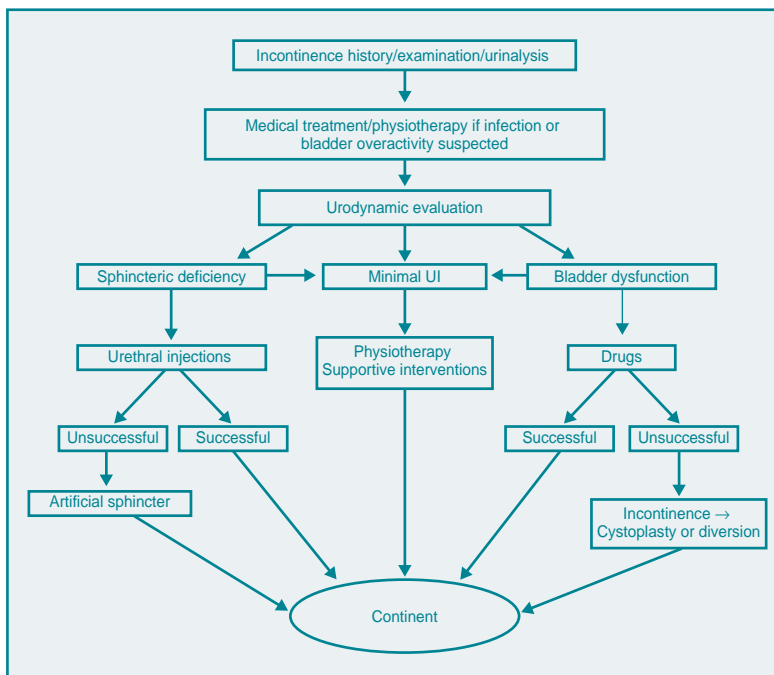
Medications, physiotherapy, and behavioral interventions are the most common first-line treatments and are often used in conjunction with each other (Figure). Surgical treatments are usually reserved for patients who have persistent UI that fails to respond to conservative management and who have had a period of time to appreciate potential benefit. Therapies for sphincter deficiency aim to increase bladder outlet resistance. The two major alternatives are injection of endo-urethral bulking agents and artificial urinary sphincter implantation. Although much less frequent, surgery on the bladder reservoir may be indicated.

### Medications

For a patient with urge incontinence, drugs with mixed anticholinergic and musculotropic action on the bladder should be prescribed. Examples of such drugs are oxybutynin and tolterodine. Recent pharmacologic advancements have produced anticholinergic drugs that have an increased duration of action and fewer side effects such as dry mouth, constipation, and blurred vision. For stress incontinence, potential toxic cardiovascular effects limit the use of drugs with predominantly alpha-adrenergic action. This class of drugs can potentially help by increasing sphincter strength. In some cases, imipramine may provide some clinical improvement in moderate stress UI but rarely produces total dryness. Imipramine has central and peripheral alpha-adrenergic action.

### Diet and Fluid Intake

Patients are counseled about specific guidelines with regard to diet and fluid intake. Excess fluid intake should be limited, potential bladder irritants (eg, coffee, tea, acid juices) should be avoided, and constipation should be treated as it may exacerbate urge incontinence and postvoid residual volume.



Algorithm of management for urinary incontinence (UI) following treatment for localized prostate cancer.

## *Physiotherapy Techniques*

Physiotherapy may benefit patients with stress or mixed postprostatectomy incontinence.<sup>44</sup> Biofeedback is often used to develop control and strength of the levator ani muscle. This induces an associated synergistic action between the striated external urethral sphincter and an indirect retrograde neurogenic control on bladder hyperactivity. Additional self-assessment techniques include stopping and starting the stream when urinating and feeling of tightening-ascension of the anal sphincter during a voluntary contraction. With urge incontinence, the emphasis is placed on bladder training. Patients are instructed to keep a bladder diary in order to help increase the interval between micturition and delay the desire to void. Electrical stimulation may also increase contractility of the levator ani muscle and inhibit bladder overactivity. Electrical stimuli are delivered via a rectal probe or perineal surface electrodes. This method of treatment specifically benefits patients who cannot actively contract their pelvic floor muscles or can generate only weak contractions. Theoretically, electrical stimulation can teach patients how to contract their pelvic floor muscles. Physiotherapy may be performed at home, but the in-office setting with a specialized nurse, physical therapist, or physician is recommended at least for the initial learning period.

Protocols vary in terms of different exercises and duration of treatment; therefore, accurate analysis of the literature on overall success rate of biofeedback is difficult. A randomized study conducted by von Kampen and colleagues<sup>45</sup> on 102 patients suffering from incontinence following radical prostatectomy demonstrated a better continence rate in the pelvic floor re-education program than in the control group. Continence was achieved after 3 months in 88% of the re-education group vs 56% of the placebo group. The difference at 1 year was 14% better for the re-education group compared with the placebo group, and the degree of incontinence was lower. Beneficial effects in the short-term have been confirmed by others studies<sup>46,47</sup> but results on the long-term effect of biofeedback are more equivocal.

## *Supportive Interventions*

Common recommendations during the evaluation period of postoperative UI and trials of therapy include good skin care (washing and drying if maceration is present) and the use of absorbent pads. A great variety of drip collectors and condom catheters are available and are recommended for severe incontinence. Penile compression devices can be helpful in selected temporary circumstances (workouts, swimming, social occa-

sions). The clamp should be released every 3 hours and minimal pressure should be applied to the penile shaft.

## *Surgical Interventions*

Endo-urethral injection of bulking agents is one mode of surgical management. Bulking agents are injected in an endoscopic outpatient procedure. The material is injected into the submucosa at the level of external sphincter and induces luminal narrowing and urethral wall coaptation at the injection sites. Bovine collagen does not induce foreign body reaction and thus has replaced Teflon. Solid particles of pyrolytic carbon (Durasphere) or silicone (Macroplastic, not available in United States) have recently become available for injection. Theoretically, they have a better effect due to the solid nondissolving particles and could potentially lessen the number of reinjections.

Dramatic improvement may be seen in a small number of cases, but often an incomplete transitory improvement is the rule. In one study, social continence (dry or one pad a day) was reported in more than 50% of patients at 3 months.<sup>48</sup> However, it is the duration of the continent interval that is the major issue. At a follow-up of 2 years, the continent rate has dropped to 30% and the new solid particles<sup>49</sup> have not significantly improved long-term results. Repeated injections may be proposed, but it is impossible to predict if continence could be attained. Moreover, injections may temporarily worsen leakage. Results are better among patients with mild to moderate stress incontinence than in those with severe incontinence and postoperative radiation therapy.

The artificial urinary sphincter (AUS) was introduced in 1973 for UI and has been used for more than 15 years in its present form. A periurethral cuff, inserted around the bulbar urethra, maintains a constant predetermined pressure during the continence period. When the patient desires to void, he presses on a pump placed in the scrotum to shift the fluid out of the cuff toward a balloon reservoir. The cuff remains open 2-3 minutes to allow voiding, and then the fluid re-enters, closing the cuff. The components and connecting tubes are inserted through perineal and inguinal incisions. Continence is achieved in approximately 90% of cases.<sup>50,51</sup> Some patients reported leakage of a teaspoon of urine occurring on a daily basis (sometimes induced by sitting on the edge of a chair at the cuff level). Despite this minor leakage, 90% of patients reported satisfaction in performance of the artificial sphincter. The revision rate is close to one third, and the risk of infection or erosion requiring prosthesis removal is 4.5%-23% at 10 years.<sup>52</sup> The artificial sphincter in postprostatectomy incontinence currently provides the best results for mild to severe incontinence. Never-

theless, due to its high cost and surgical placement, most patients are offered a trial of bulking agent injection before placement of an artificial sphincter.

Gomes et al<sup>53</sup> reported in study of 30 patients that prior collagen therapy did not compromise effectiveness of the AUS. However, patients with a Valsalva leak point pressure of less than 60 cm of water have a low rate of success with injection therapy and could benefit from a more timely and cost-effective primary placement of an AUS.

Following radiotherapy to the prostate, placement of the cuff around the bulbar urethra is still possible because this area is not irradiated and men can achieve satisfactory results if the bladder does not present any urodynamic abnormality. However, the continence rate is less (66%)<sup>54</sup> and reoperations are more common. In rare but difficult cases, urethral deficiency can be associated with recurrent bladder neck contracture. A combined urethral stent and AUS has been successfully reported as an alternative to urinary diversion or chronic indwelling catheter drainage.<sup>55</sup>

The male bulbourethral sling was originally proposed by Clemens and colleagues.<sup>56</sup> Through a perineal incision, three synthetic bolster-shaped tubes are passed to a suprapubic incision and tied across the rectus fascia. Sling tension is controlled by intraoperative measurement of urethral pressure and leak point pressure. The short-term success rate was 41%, but a persistent perineal discomfort was common, and for irradiated patients, the incontinence persisted.

Surgery on the bladder reservoir may be indicated in cases of symptomatic drug-resistant bladder instability or in low bladder compliance. A bladder enterocystoplasty may decrease hyperpressure and the onset of uninhibited bladder contraction. Nevertheless, the importance of irradiated tissue in the bladder and ileum must be considered before any surgical decision is made.

## Conclusions

UI is a common adverse effect of localized prostate cancer treatment, potentially leading to a significantly diminished quality of life. Studies with patient questionnaires demonstrated that men undergoing radical prostatectomy had more leakage due to sphincter deficiency than those undergoing radiation. Radiated patients experienced more frequency and urgency in the acute inflammatory period. With the support of medical treatment and physiotherapy, UI tends to diminish during the first year. Surgery is indicated for the few patients reporting severe incontinence. Accu-

rate patient information and explanation of treatment options with their potential risks and benefits can help the patient make an informed rational decision regarding treatment of prostate cancer. Good patient communication can also help to improve the quality of life in the early posttreatment period.

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