Post-prostatectomy Incontinence Initial Evaluation

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Post-prostatectomy Incontinence: Introduction

Incidence

Urinary incontinence is a relatively common complication following radical prostatectomy (RP) with a wide range of reportedincidence, from 2 to 87 % [1]. Some of this variability may be attributable to differences between clinicians in defining and classifying post-prostatectomy incontinence (PPI) [2]. A group that examined patient-reported outcomes found 33 % of men had urinary incontinence requiring the use of protective devices such as pads, diapers, rubber pants and clamps [3]. Severe incontinence, as defined by either total incontinence or frequent urinary leakage, has been reported to be as high as 8.4 % [2].

It has been well recognized that there is a time-dependent relationship to return of continence after prostatectomy. Incontinence rates decline over time, and generally patients establish their continence baseline status 1–2 years following surgery [4]. Early incontinence is common, while return to continence at 1 year has been reported to be greater than 90 % [5, 6]. Thus it is generally recommended that patients not undergo an invasive anti-incontinence therapy until 6–12 months after surgery to allow for a baseline status to be achieved prior to intervention. Some groups recommend a trial of conservative therapy including pelvic floor physiotherapy first [4]. However, many groups have shown that the majority of patients will have reached baseline continence by 6 months [7]. Penson et al. followed 1213 patients who underwent RP and found that rates of severe urinary incontinence (frequent urinary leakage or no control) peaked at 6 months and steadily declined at 2 years following surgery to 10 % [8]. Goluboff et al. determined that 92 % of their patients reached their final continence status at 6 months [9] and Smither et al. demonstrated that the majority of patients who achieved continence did so as early as 18 weeks postoperatively, with little significant change in functional status until 54 weeks [10].

Another caveat to early observation is that patients with severe early urinary incontinence are more likely to have long-term incontinence. Vickers et al. examined patients who underwent a radical prostatectomy and evaluated the number of pads required at 3, 6, 9, and 12 months, and then reevaluated urinary continence status at 2 years. They found that patients requiring one or two pads at 6 months had a low probability of

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being pad free at 2 years (50 and 36 %, respectively) [11]. This group suggests that severe urinary incontinence even within the first year of surgery is a predictor for poor long-term function, and should be considered for earlier identification and possible intervention.

The benefit of early intervention has been studied. Schneider et al. compared PPI patients with SUI who underwent early periurethral bulking procedure at a mean time of 23 days postoperatively with patients treated at 26 months postoperatively. They found that short-term continence results were higher in the early intervention group, however long-term results were similar [12]. Jones et al. found similar results when comparing intervention with the urethral sling, in that early intervention provided improved short-term but equivalent long-term results [13].

Based on the available clinical data and or own experience, we generally wait about 12 months prior to evaluation and surgical treatment for patients with mild to moderate incontinence, especially if they are noting continued improvement. If a patient is still improving at 12 months, it may be prudent to delay surgical therapy a bit longer. For patients with severe incontinence that is not improving, evaluation and surgical intervention is considered at 6 months. This is dependent of course on the degree of bother to the patient and his willingness to undergo a surgical procedure.

Pathophysiology

The internal urethral sphincter (IUS)lies at the bladder base and is composed of smooth muscle, while the external urethral sphincter (EUS) is composed of skeletal muscle and is under volitional control. The IUS has both longitudinal and circular muscular layers, where continence is mediated by noradrenaline from sympathetic fibers acting on a1-adrenoceptors to cause contraction of the circular smooth muscle and relaxation of the longitudinal smooth muscle via B3-adrenergic receptors. During voiding, the longitudinal smooth muscle contracts while the circular smooth muscle relaxes via nitric oxide and acetylcholine release from parasympathetic fibers, allowing for bladder emptying. The EUS is composed of striated muscle, where contraction and relaxation is mediated via the pudendal nerve [4].

The urinary sphincteric mechanism can also be divided into proximal and distal sphincter. The proximal urinary sphincter is formed by the bladder neck, prostate, and prostatic urethra to the verumontanum, under both parasympathetic and sympathetic control. During a radical prostatectomy, the proximal urinary sphincter is effectively removed. Continence is therefore dependent upon the distal urethral sphincter. This is comprised of the distal EUS, the prostatomembranous urethra, and the supporting musculature and fascia of the pelvis [14]. Therefore, incontinence following radical prostatectomy is most often attributable to dysfunction of the distal urethral sphincter. This can occur as a result of direct injury to the DUS, damage to its nerve supply or supporting structures, or preexisting dysfunction. Intraoperative preservation of this tissue is important to preserve continence [15].

The etiology of post-prostatectomy incontinence (PPI) is most often attributable to sphincteric incompetence (SI) that exists with or without bladder dysfunction in about 95 % of cases [1, 16–19]. Isolated bladder dysfunction, such as detrusor overactivity or decreased bladder compliance is a rare cause of post-prostatectomy incontinence. Groutz et al. performed urodynamic evaluation of 83 men with PPI and found 33 % had bladder dysfunction; however, only 7 % had bladder dysfunction as an isolated cause for PPI [16]. Some groups have reported rates of bladder dysfunction as a sole cause for PPI as low as 3 % [20], while concomitant sphincter and bladder dysfunction accounts for 34–45 % of patients with PPI [4]. De novo bladder dysfunction may be due to intraoperative bladder denervation or outlet obstruction. Giannantoni et al. found that de novo decreased bladder compliance and detrusor underactivity shown on urodynamics 1 month after radical prostatectomy had improved and resolved at 8 months in the majority of patients [21]. Sphincteric incompetence overall remains the primary cause of PPI, believed due to direct damage and manipulation intraoperatively [4].

When patients have combined urinary incontinence and a decreased force of stream, scarring leading to urethral stricture disease should be the suspected cause [22].

Following a radical prostatectomy, urinary continence is dependent upon on the distal urethral sphincter. Sphincteric incompetence accounts for approximately 95 % of post-prostatectomy incontinence, though concurrent bladder dysfunction may be present in 30 % of cases. Isolated bladder dysfunction is a rare cause of PPI. Urethral or anastomotic stricture should be suspected in patients with obstruction voiding patterns or a decreased force of stream.

Factors That Drive Treatment

With the wide range in degree and type of incontinence that occurs following a radical prostatectomy, several factors may influence a patient's desire to undergo either conservative or invasive treatment. For some patients, PPI can have a significant effect on quality of life (QoL). Fowler et al. published results from a Medicare survey and found that leakage of urine requiring use of protective pads had a more significant effect on patient's quality of life than sexual dysfunction, and patients were significantly less likely to report satisfaction with surgical treatment [23]. Greater degree of incontinence not only worsens patient reported QoL; it also influences the degree of bother they experience, which then influences their desire for further intervention [4]. Overall, studies suggest that while mild incontinence can be acceptable to patients in exchange for cancer control, requiring regular use of protective devices or pads has a significant influence on patient QoL and may influence desire for further treatment [7, 23].

The type of incontinence also influences patient decision to undergo intervention. Stress urinary incontinence is most common in the early postoperative period and has been well demonstrated to improve over time. This may guide clinicians to counsel patients to continue conservative measures prior to pursuing more invasive options [4].

Patient's desire for cure can also influence counseling and treatment options. There are no curative medical interventions, though medications such asduloxetine have been shown to improve mild to moderate incontinence [24]. A cure for PPI can be achieved with more invasive measures such as surgical interventions; however, these interventions have their own risks and potential effects on symptoms and quality of life.

All of the above factors are important in determining evaluation and intervention for PPI. But in reality it is always an individual patient's decision based on the personal degree of bother. While the degree of incontinence will influence the type of treatment recommended, it is the degree of bother that drives the decision to intervene at all. There are general trends, but the bottom line is that some men are highly bothered by relatively mild incontinence, while others who have severe incontinence may not be "bothered" at all. It is also important that patients have reasonable expectations from treatments, especially those who are highly bothered by mild incontinence.

Patient Risk Factors for PPI

There are a number of recognized preoperative risk factors that increase the rate of PPI. By identifying those patients at increased risk for PPI, preoperative counseling and postoperative management can be better tailored to the individual patient.

Wallerstedt et al. evaluated 1529 patients who underwent a radical prostatectomy for clinically localized prostate cancer with questionnaires 3 months prior to surgery and 12 months after surgery. Incontinence was defined as requiring more than one pad daily to control urination. This group found that age and presence of preoperative urinary leakage were significant predictors of PPI. Prior transurethral resection of prostate for obstructive symptoms was not significantly associated with PPI [25]. Kim et al. also found that age was a significant predictor of PPI, where younger patients tended to have higher rates of early continence recovery [26], and Novara et al.

found that younger age was an independent predictor of continence at 12 months [27]. Catalona's group examined influence of age on return of continence in 1325 men 18 months postoperatively and found that men younger than 70 had continence rates of 92–97 %, while men in their 70s had a significantly lower continence rate of 87 % [28].

Evidence of sphincteric incompetence preoperatively has been demonstrated to increase the risk of postoperative urinary incontinence, primarily resulting in stress urinary incontinence (SUI). Preoperative bladder dysfunction such as detrusor overactivity or an acontractile bladder has also been shown to be a risk factor for PPI [15].

Song et al. performed pelvic MRI imaging on 94 patients prior to undergoing a radical prostatectomy and evaluated the association between the integrity of the pelvic floor muscles, measured by thickness of the pelvic diaphragm as well as ratio of levator ani thickness to prostate volume, and urinary continence. They defined incontinence as any unwanted leakage of urine and found that these measures of pelvic floor integrity were associated with earlier recovery of continence after surgery [29]. Prostate size has not been clearly shown in the literature to influence continence status after prostatectomy, and this group suggests that the presence of pelvic support is more significant than the absolute size of the prostate.

A number of groups have evaluated the influence of obesity on PPI. Xu et al. performed a meta-analysis of 13 observational studies and found that obese patients were significantly more likely to have PPI [30]. They hypothesize that this may be due to intraoperative factors, such as excessive peri-prostatic fat limiting visualization and manipulation of urethra and neurovascular bundle, as well as postoperative factors such as increased pressure on the bladder and pelvic floor.

Stage of disease has not been conclusively related to rates of PPI, though a more advanced stage of disease may affect the surgical technique and make the dissection more difficult. Incontinence rates may therefore be higher; however, this is likely due to the surgery rather than the influence of advanced disease itself [31].

Table 2.1 Patient risk factors for post-prostatectomy incontinence

Increase risk	Decrease risk
Obesity	Strong pelvic support
Older age	
Preoperative urinary incontinence	
Prior radiation therapy	

There are mixed findings on the influence of radiation therapy on incontinence in post-prostatectomy patients. Some groups report equivalent continence rates between patients who underwent adjuvant radiotherapy and those who did not [32]. However, patients who underwent a salvage prostatectomy following external beam radiotherapy have been shown to have significantly higher rates of incontinence [33], which some suggest may be related to external sphincter fibrosis secondary to radiation therapy. Table 2.1 lists patient risk factors for PPI.

While preoperative risk factors may be important in counseling patients prior to radical prostatectomy, they actually play little role the evaluation and management of PPI, with the exception of prior radiation therapy. Radiation can influence the type of evaluation done and the type of treatment recommended.

Influence of Surgical Techniques

The surgical technique utilized to perform a prostatectomy has been evaluated with respect to effect on rates of incontinence. Factors such as perineal vs. retropubic surgical approach [34–36], robot-assisted laparoscopic prostatectomy (RALP) vs. open retropubic [37–41], bladder neck preservation [42, 43], and nerve sparing [44–50] have been reported by some to improve continence, while others have found no difference. Table 2.1 summarizes some of the risk factors for PPI.

As with preoperative risk factors, surgical technique of radical prostatectomy plays little

role the evaluation and management of PPI once it is established that the patient has incontinence and is seeking intervention.

Evaluation of Post-prostatectomy Incontinence

The approach to the initial evaluation of a patient with PPI is similar to that of any patient with incontinence, in that a careful evaluation of the quality and quantity of the incontinence should be determined, along with the effect on quality of life for the individual patient.

General Medical History

Age, as mentioned previously, should frame the clinician's understanding of the individual patient's problems and likelihood of long-term continence [51]. The time interval since RP should also be determined, given the time-dependent nature of return to continence (see Incidence).

Additional interventions for treatment of prostate cancer should also be determined. A history of radiation therapy, or current or future treatment of metastatic or locally recurrent disease may influence evaluation, timing, or type of treatment [51]. Prior surgeries, especially involving the pelvis, and radiation therapy for purposes other than treatment of prostate cancer should be determined. The current stage and status of prostate cancer should be elicited.

Other medical conditions should be evaluated. For example, a neurogenic bladder can result from a history of trauma or surgery, and should be on the differential, if present [4].

Medications should be reviewed. Certain medications act directly on the GU tract and affect continence, for example alpha-adrenergic blockers can decrease urethral tone and can contribute to urinary incontinence, and anticholinergics may inhibit detrusor contractility. Other medications may indirectly contribute to UI, such as angiotensin-converting enzymes that can cause a chronic cough (exacerbation of SUI) and diuretics that increase voided volumes, which can exacerbate symptoms of urgency and frequency [4].

Finally, an evaluation of the patient's overall health and performance status is important when considering therapy. Elderly patients are more likely to be on multiple medications, and so careful assessment of potential drug interactions is important when initiating new drug therapy aimed to treat UI. In addition, anticholinergic medications can have significant effects on cognition in the elderly patient, and decision to treat with this medication should be made based on a risk–benefit assessment. There are limited studies evaluating the success or complication rates following operative intervention, however it is generally recommended to ensure that the benefit outweighs any operative risk and to ensure patients have sufficient performance status to recover well from a surgical intervention [4]. For an artificial urinary sphincter (AUS), for example, a patient must have sufficient hand dexterity and strength to use the device.

The evaluation of a patient with post-prostatectomy incontinence should begin with an assessment of the patient's general medical history. This includes age, time interval since prostatectomy, additional prior interventions for treatment of prostate cancer, other medical problems, and medication history. Importantly, the patient's performance status and overall health should frame clinician counseling on intervention options.

Characterization of Incontinence and Other Lower Urinary Tract Symptoms

Characterization of the quantity and type of the UI and the circumstances under which it occurs are important to help elucidate the cause and the severity of the symptoms.

It is important to determine whether the patient considers the incontinence to be stress-related (involuntary loss of urine with activity, cough, or other event that increases intra-abdominal pressure) urgency-related (involuntary loss of associated with urgency), or a combination of both [52]. If both are present it is important to try to determine which is more predominant and more bothersome. Sometimes patients are unable to express if urine loss is caused by activity or urgency. Incontinence can be insensible (occurring without stress or urgency) or may require more pointed questions as to when incontinence occurs (exactly what the patient is doing during incontinence episodes). In addition, a gravitational component to UI can increase suspicion for sphincteric incompetence as the underlying cause if UI worsens with sitting to standing or while standing, as compared to UI while lying down. Focusing on specific activities that cause or increase incontinence can be especially helpful for the patient with rare UI, where it is difficult to characterize the incontinence in great detail. A study by Mungovan et al. found that the activities that most commonly provoke urinary leakage in post-prostatectomy patients were walking at a comfortable speed and drinking fluids while seated [53]. Identifying the precipitating factors in an individual patient can help the clinician determine the type of incontinence present, and ultimately the intervention that would be most beneficial. Also, some patients will complain that incontinence worsens towards the late afternoon or evening hours. When not associated with urgency, this is thought to occur as a result of "sphincter fatigue" in patients with underlying sphincteric dysfunction. Some patients will experience incontinence due to sexual arousal or orgasm. We believe this is mostly due to sphincteric insufficiency. It can be difficult to manage when it is the only time that a man experiences incontinence.

It is also very important to determine the severity of the incontinence. This is commonly done on an objective basis by assessing pad usage (see below). For patients with more severe incontinence, we find it useful to ask if they are able to voluntarily void at all when they are active. If the answer is no, it is usually a sign of severe sphincteric insufficiency.

With respect to other LUTS, we find it helpful to determine the presence of any overactive bladder symptoms (urinary frequency and urgency not related to incontinence) and nocturia. This knowledge can help to set reasonable expectations from treatment. Also the force of the urinary stream and subjective voiding pattern can be helpful to know. When decreased or abnormal, it may raise the suspicion of a stricture. However, some men who are totally incontinent will report very poor stream because they actually never void significant amounts. For these patients, it can be useful to ask about voiding when they get up from bed with a relatively "full" bladder.

Overall, the patient's degree of bother related to urinary incontinence should be determined, as this will ultimately influence the patient's decision on pursuing further treatment or continuing conservative management. Relevant questions pertaining to the patient's history are summarized in Table 2.2.

Characterization of the subjective type and degree of incontinence as well as any other LUTS is important as it may prompt further testing prior to intervention and can sometimes have a profound effect of the type of treatment offered.

Physical Exam

The physical examination in the man with PPI should include several facets. The abdominal exam should include evaluation of the surgical scar. Palpation of the bladder in the lower abdomen should be performed to rule out a distended bladder to point towards an obstructive process. A digital rectal examination (DRE) will aid in assessment of rectal tone to help evaluate for neurologic factors, as well as a neurological examination of the perineum and lower extremities [4]. The most important part of the exam is the evaluation of the perineum, genitalia and stress testing for incontinence. A full genital examination should be performed. The quality if the skin of the scrotum and perineum should be evaluated. The patient should be observed for gravitational incontinence and then asked to cough or bear down to evaluate for stress urinary incontinence [4]. If the patient admits it incontinence with

Table 2.2 Patient history questions

Patient characteristics
Age
Weight
Mobility and activity?
Surgical characteristics
Time since surgery
Type of surgery
Interventions following surgery (medical or surgical)
Prior abdominal or pelvic surgery
Radiation therapy
Medical history
Other medical problems?
Neurologic problems?
Medication list?
Constipation or fecal incontinence?
Characteristics of controlled voiding
Force of stream
Emptying bladder to completion
Split stream
Characteristics of incontinence
Stress and/or urgency
Awareness of leakage (insensible)
Gravitational
Frequency of leakage
Degree or volume of leakage (number, size, wetness of pads)
Precipitating events or activities
Pattern of incontinence (day versus night)
Degree of bother

certain maneuvers (e.g., bending) he should be asked to perform such maneuvers especially if stress incontinence is not otherwise demonstrated. If the patient is wearing a protective pad, the wetness and size of the pad can be assessed during the physical exam. Though rare, meatal stenosis and phimosis can occur after prostatectomy, and should be ruled out as a cause of obstruction on examination [51].

The physical exam should include an abdominal exam and a full genital exam. In addition, assessment for stress urinary incontinence, including provocative maneuvers that cause incontinence elicited from the patient history, should be performed.

Voiding Diaries and Questionnaires

A voiding and intake diary (bladder diary) is an objective way for patients to describe both frequency and volume of voids, and is designed to include a description of episodes of urinary leakage, fluid intake, and the presence and degree of urgency associated with leakage over a 3–7 day period [4]. The use of bladder diaries in the context of PPI is primarily of use when patients have significant urge UI, and are an inexpensive way to objectify the symptoms for the clinician to interpret [54]. It provides information on the patient's voiding patterns and can shed light on bladder capacity. It can also identify excessive fluid intake [29]. Bladder diaries can be used to monitor changes in urge-related incontinence symptoms, whether over time or following an intervention, and for this reason are useful for measuring outcome [55].

Drawbacks to the use of diaries include patient difficulty in completing them accurately and in a timely manner, which increases as the number of days recorded increase. Also, urinary leakage that occurs less than once daily will have a limited ability to be represented. The Fifth International Consultation on Incontinence (ICUD) provided recommendations in their *Incontinence* text in 2013 in which they give a grade C recommendation (based on expert opinion) for the use of bladder diaries in the initial evaluation of patients with PPI to help communicate voiding patterns [4].

Questionnaires are another useful tool to objectively measure symptoms and their influence on quality of life, and are a more commonly utilized tool in patients with PPI. There are many available questionnaires that can be focused on symptoms, measures of patient-reported outcomes, or influence on quality of life. Patients with obstructive symptoms can have their symptoms characterized by questionnaires such as the American Urological Association score for BPH (AUA-7) [56], and the International Prostate Symptom Score (IPSS) [57]. Patients with urgency symptoms can be better assessed with the International Consultation on Incontinence Modular Questionnaire (ICIQ) [58]. The European Association of Urology published guidelines on management of urinary incontinence in 2014 where they provided a grade B recommendation (based on well-conducted clinical nonrandomized trials) on the use of questionnaires as a way to provide a standardized assessment of voiding symptoms [55].

For the patient with PPI, voiding and intake diaries and questionnaires are not an essential part of the evaluation in routine clinical practice for all patients. Diaries are most useful when there are complaints of overactive bladder symptoms, nocturia or nocturnal enuresis as a predominant complaint (especially if daytime incontinence is minimal). Diaries may also be useful in cases where excessive fluid intake is suspected. Questionnaires are most beneficial in the research setting, but can be useful when trying to differentiate stress for urgency incontinence in cases where direct questioning is less conclusive (**e.g.,** ***the MESA questionnaire)***[59]**.**

Pad Usage and Pad Tests

Determining the number of pads a patient with PPI requires has been shown to affect patient's perception of degree of severity of incontinence. Fowlers et al. found that patients who wore pads were more likely to report urinary leakage as a medium or big problem than those who did not require pads but still reported urinary leakage [23]. The number of pads required also influences patient perception of continence. Sacco et al. showed that patients requiring one pad daily consider themselves continent and have good perception of health-related QoL (HRQoL), while requirement of two or pads daily had worse HRQoL outcomes, and patients were less likely to consider themselves continent [60].

Pad tests are often used to help evaluate the relationship between the patient's sensation of urinary leakage and the actual volume of urine leaked. Several studies have shown that quantifying incontinence by pad weights or pad number can predict outcomes of certain interventions [4]. We believe that a 24-h pad test is the gold standard objective measurement of PPI. The number of pads is not a perfect measure of leakage, as some patients will tolerate a saturated pad prior to changing, while others may change pads frequently with even mild leakage. In addition, there is variability in the size and type of pad [4]. Tsui et al. showed that the severity of incontinence was not related to the number of pads used, but better correlated to the pad weight, and recommends that pad weight be used rather than pad count alone [61]. However, there is evidence that a pad test may not be absolutely necessary to quantify the degree incontinence, provided that patients can accurately express the size, number and wetness of the pads that they use. In a prospective study conducted by the SUFU foundation, patient perception of number of pads required on a daily basis correlated well with actual number of pads collected during pad testing over a 24-h period. When patients were asked, "to what extent does urine loss affect your quality of life?" with options not at all, small amount, moderate amount and significant amount, they were stratified into four groups which were shown to be different in the number of pads required [2]. The study concluded that a pad test might not necessary to accurately determine the severity of PPI, if carefully collected prospective information about incontinence is obtained.

We believe that an accurate assessment of the degree of incontinence is important before recommending certain interventions. The literature would support the premise that sling procedures are less effective in cases of severe incontinence. How one assesses the degree of incontinence will vary depending on the clinical scenario. If a patient wears multiple extra large pads/day (**i.e.,** ***diapers) and admits that they are always wet to soaked, that may enough to conclude that incontinence is severe. Conversely if the patient is wearing one extra small or small pad per day incontinence is likely mild (or moderate at the worst). However the majority of patient fall between these two extremes. In such cases formal pad testing, or a least an accurate assessment of pad number, size and wetness is recommended.***

Simple Diagnostic Studies

A urinalysis is generally recommended as an initial diagnostic study for patients with urinary incontinence to rule out an infectious cause, along with a urine culture [15]. In addition, older men are at risk of diseases of the bladder such as bladder cancer, carcinoma in situ, bladder stones, and urethral strictures, often presenting with overactive bladder symptoms, which can be reflected in hematuria or pyuria. Performing a urinalysis can help rule out some of these causes of UI [4]. The EAU provides a grade A recommendation (based on clinical studies of good quality) for routinely performing a urinalysis [55].

A post-void residual (PVR) helps assess for incomplete emptying and obstruction as a cause of voiding symptoms. The Canadian Urological Association (CUA) published guidelines on adult UI in 2012 and provides a grade A recommendation (based on clinical studies of good quality) to include a PVR as part of the routine assessment [62]. The American Urological Association also recommend in their guidelines on the surgical management of SUI, updated in 2009, to perform a PVR as an essential part of the patient evaluation [63]. There are not specific values associated with abnormal PVRs [54], however it provides the clinician an understanding of the patient's ability to empty their bladder, which can be related to symptoms. The ICUD recommends that a PVR of greater than 200 mL should be considered a sign of an obstructive urinary problem [4]. Uroflowmetry, similar to assessment of PVR, is useful in assessing for obstructive urinary patterns [15].

Routine assessment of bladder emptying is important in the evaluation of PPI. This is most easily accomplished by determination of a post void residual (or random check of bladder volume in a patient with severe incontinence who does not void). This is most commonly done by a bladder scan ultrasound. Uroflow is generally reserved for patients who complain of some emptying symptoms (incomplete emptying or slow stream).

Imaging for PPI

Differences on imaging have been shown to exist between patients with and without incontinence following a prostatectomy. These studies have been performed to help elucidate causes of PPI, rather than helping evaluate degree or outcomes of urinary incontinence. Tuygun et al. performed pelvic magnetic resonance imaging (MRI) on patients following prostatectomy and found that patients with PPI had a higher incidence of fibrosis, thereby concluding that fibrosis plays a key factor in the pathogenesis of PPI [64].

Paparel et al. studied the change in urethral length on preoperative and postoperative pelvic MRIs in patients undergoing radical prostatectomy and found that membranous urethral length loss was associated with incontinence, and recommend preservation of this length intraoperatively to help improve continence [65].

In clinical practice, imaging does not have a significant role in evaluating PPI and predicting treatment outcomes unless other pathologies are being excluded, for example fistulae or underlying cancerous processes [55]***. The most common form of imaging is the voiding cystourethrogram done as part of videourodynamics. While this can provide a very accurate anatomic assessment of the lower urinary tract, it has not been found to be superior to standard urodynamics in a head to head trial.***

Urodynamics

Urodynamic studies (UDS)remain the gold standard for diagnosing the type of incontinence in patients post-prostatectomy. However, it is not always a requirement to perform in the setting of PPI. Urodynamics can be used to diagnose bladder dysfunction such as detrusor overactivity or decreased compliance and the capacity of the bladder. It can also be used to determine the abdominal leak point pressure (ALPP), which, in men following a prostatectomy, is primarily related to sphincteric incompetence [4].

It is important to note that urodynamics may not serve to predict outcome following intervention, but serve to diagnose the type of incontinence present. Thiel et al. failed to find a urodynamic parameter that would identify those patients who failed artificial urinary sphincter (AUS) placement, with failure defined as requiring one pad or more following placement [66]. Similarly, ALPP may provide an "objective measure" of urethral resistance to an increase in abdominal pressure but fails to predict surgical outcomes [67]. Twiss et al. evaluated 29 patients with SUI following prostatectomy and found that ALPP on UDS failed to correlate with their degree of urinary incontinence, as determined by the 24-h pad test. They concluded that ALPP has limited clinical value in the setting of PPI management, and recommend focusing on the presence or absence of SUI and bladder dysfunction during urodynamics to guide management and diagnosis [20].

Symptoms alone are inferior to urodynamics for diagnostic purposes. Reis et al. evaluated patients with urinary incontinence following radical prostatectomy and compared their responses on the International Consultation on Incontinence Questionnaire-Short Form (ICIQ-UISF) to their findings on urodynamic studies (diagnoses included sphincteric incontinence alone, bladder dysfunction, and a combination of these two). They found that the diagnosis determined by urodynamics were not predicted by the ICIQ-UISF and concluded that urodynamic testing is required for determining the etiology of incontinence [22]. However the routine use of urodynamics has not been shown to result in better treatment outcomes for PPI. It is important to note that treating SUI symptoms in the presence of bladder dysfunction does not alter outcomes in PPI patients. Ballert and Nitti examined 72 PPI men with SUI, of which 30.6 % had concomitant detrusor overactivity, and found that preoperative detrusor overactivity did not result in worse postoperative outcomes. They caution, however, that these patients may require anticholinergic treatment postoperatively to improve symptoms [68]. Other groups have found similar outcomes following placement of an AUS [69, 70].

There are some unique problems encountered in PPI patients when performing UDS. A bladder neck contracture/anastomotic structure can be narrow enough that even the small caliber urethral catheters used for UDS, 7-French, can be sufficient to occlude the urethra and limit the ability to measure VLPP. For patients where sphincteric incompetence is strongly suspected, but no leakage is noted, it is suggested that the study be repeated. Another problem may arise in patients with severe sphincteric insufficiency, where standing upright results in continuous leakage. Methods to help manage this incontinence during urodynamics are use of a penile clamp or having a patient lay supine during filling [71].

Urodynamics should be an option in patients who are considering advanced treatment of incontinence (either surgical intervention for stress incontinence or third line therapy for urgency incontinence). Urodynamics is not necessary or practical for patients who have had recent prostatectomy and are still in the recovery phase or for patients considering conservative or medical treatment of incontinence. While some routinely recommend urodynamics prior to a surgical intervention, the utility of this practice has not been proven to affect outcomes [15]. The AUA/SUFU Urodynamics Guideline states that "clinicians should perform repeat stress testing with the urethral catheter removed in patients suspected of having SUI who do not demonstrate this finding with the catheter in place during urodynamic testing" [72]. It is also known that in PPI the urethral catheter can cause obstruction due to the rigidity of the anastomotic area. For this reason we generally subscribe to the urodynamics protocol we published in 2005 for specific use in the post-prostatectomy male with urinary incontinence [71]. As per standard urodynamic protocol, a 7 Fr urethral catheter and a rectal catheter should be used, with pressure sensors to determine the detrusor pressure from their difference. It is recommended to initiate filling at a medium fill rate, starting at 50 mL/min but reduce to 30 mL/min in patients with a history of severe urgency incontinence or a known small functional bladder capacity. As mentioned previously, for patients with severe sphincteric incompetence, a penile clamp can be used to allow bladder filling in the standing position. We recommend filling to 150 mL and then performing straining maneuvers to assess for stress incontinence. If incontinence is detected, an abdominal leak point pressure (ALPP) can be determined. If no stress incontinence is demonstrated, filling is continued and Stress incontinence is assessed at various volumes (usually 50 mL intervals) until demonstrated. If stress incontinence is not demonstrated, it should be reassessed for without a catheter at a volume of at least 50 % of cystometric capacity. At capacity, a pressure-flow study is performed, as is the standard in urodynamics. Video fluoroscopy can be performed to evaluate both the bladder neck as well as the region of the anastomosis to assess for the presence of a narrowing or stricture. In these patients at risk for a scarred urethra, a urethral catheter can occlude the urethra and prevent diagnosis of sphincteric insufficiency (35 % of this study's population), and the ALPP may be falsely elevated [71]. For this reason, Huckabay et al. recommend a second fill phase to 50–70 % of bladder capacity on first fill phase, followed by removal of the catheter and reassess for stress incontinence (and ALPP if desired). A noninvasive uroflow can be obtained and a repeat video fluoroscopy. A urodynamic protocol for PPI evaluation is shown in Fig. 2.1.

Urodynamics can be helpful is assessing the patient with PPI. Controlled studies regarding the value of UDS in PPI have not been done. Practically speaking, clinicians should do UDS prior to advanced therapy if the information provided will help to guide treatment or patient counseling. UDS is also useful in cases when the clinician is not sure of the cause of the problem. Although there is no evidence-base literature to support or refute UDS in patients who have had radiation, at this time we would recommend routine use in such patients who are considering surgical intervention. Finally we also believe that UDS is valuable in men who have PPI with incomplete bladder emptying, not caused by an obvious stricture.

Cystoscopy

In patients who have symptomatic decreased force of stream and incomplete emptying, cystourethroscopy should be performed to rule out abnormalities such as a urethral stricture or bladder neck contracture [15]. It should also be performed if other bladder abnormalities are suspected, such as diverticulum, bladder stones, and presence of staples in the bladder [51]. It is also recommended that cystourethroscopy be performed prior to any surgical intervention, to evaluate for any urethral scarring and to evaluate the status of the bladder [15].

Cystourethroscopy should be preformed routinely before surgical intervention such as artificial urinary sphincter or sling procedure to evaluate the urethra, anastomosis and bladder.

Summary

Post-prostatectomy incontinence most often primarily due to sphincteric incompetence related to the surgical intervention, though bladder dysfunction can be present in isolation or in combination with stress incontinence. An understanding of the risk factors for PPI, including older age and obesity, should be evaluated, and an understanding of the different risks of urinary incontinence can help risk-stratify patients for long term voiding dysfunction. The complexity of the evaluation of PPI is determined by the degree of bother to the patient and his willingness to proceed with treatment. A detailed history and physical (including the use of questionnaires and bladder diaries when indicated) can provide important information in guiding diagnosis of the

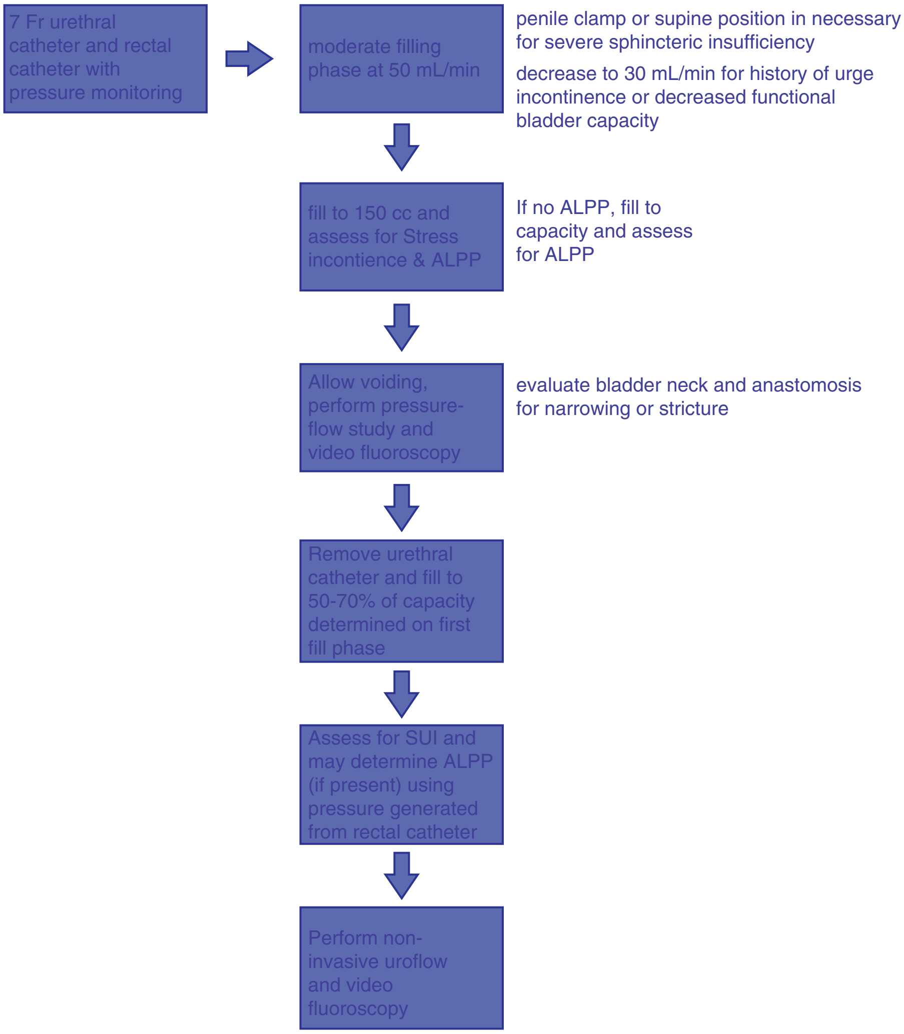

Fig. 2.1 Urodynamics protocol

type of incontinence. An accurate assessment of the degree (quantity) of incontinence is important and this can be aided by pad testing or careful questioning. Imaging has low utility in diagnosis of PPI, unless combined with urodynamics (videourodynamics). Cystourethroscopy has utility in select cases, and is recommended prior to surgical intervention for evaluation of the urethra, anastomosis and bladder. Urodynamics may also be performed prior to surgical intervention if it will influence treatment and/or counseling. This helps guide appropriate intervention and management. A pathway for initial evaluation of PPI Patients is shown in Fig. 2.2.

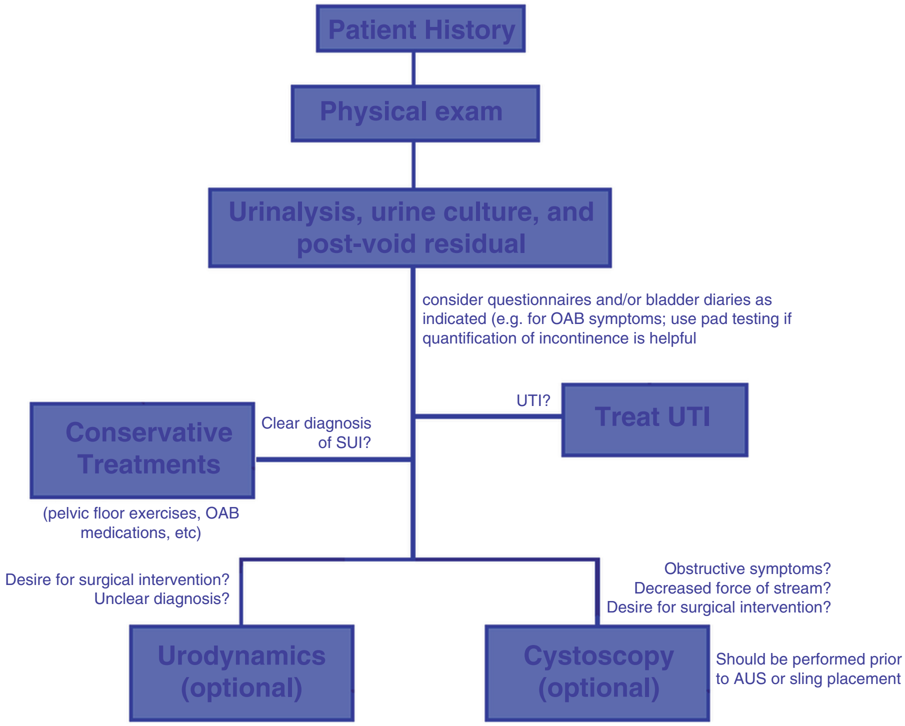

Fig. 2.2 Pathway for initial evaluation of PPI patients

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