Chapter 2
Preoperative Assessment and Intervention: Optimizing Outcomes for Early Return of Urinary Continence

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Introduction

The introduction of robotic surgery for the treatment of prostate cancer has allowed for the collection of more accurate anatomical information on adjacent prostatic structures and has facilitated innovative techniques aimed at enhancing postoperative functional results without compromising oncological prognosis. However, despite improved surgical technique and expertise, urinary incontinence still occurs in the early postoperative setting with an incidence varying between 6 and 20 % [1, 2]. Spontaneous recovery of urinary incontinence is generally to be expected within 3–24 months after surgery but is variable among patients even when a standard approach is applied by the same surgeon [3]. These findings highlight the importance of underlying preoperative factors influencing continence recovery and the timing of recovery. Preoperative evaluation of these factors can provide precious information about postoperative continence. This may help surgeons to individually tailor their approach in accordance with tumor- and patient-related factors to accelerate continence recovery and give patients better preoperative counseling and more legitimate expectations. Herein, we analyzed significant preoperative factors and their assessment techniques that are predictors of early return of urinary continence. Preoperative intervention for modifiable factors and individualized treatment based on preoperative factors in order to achieve early urinary continence were also summarized.

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Preoperative Factors Predictive of Continence Recovery After Radical Prostatectomy

Several patient- and tumor-related preoperative predictors of early return of urinary continence following radical prostatectomy have been evaluated in various publications. Patient's age at surgery is the most reported preoperative nonmodifiable factor compromising the continence status. In a population-based longitudinal cohort study, men aged <60 years were significantly less likely to have postoperative incontinence than older men [4]. Men aged 75–79 years experienced the highest level of incontinence compared to younger patients. In a prospective study, Talcott et al. reported that the continence rate at 12 months was 91 % among patients aged <65 years and 85 % among those aged ≥65 years at surgery [5]. In a recent study, a significant correlation between age and immediate continence after catheter removal was detected [6]. Similarly, Compodonico et al. showed that younger age <65 years was independently associated with immediate continence (OR = 2.63, 95 % CI 1.13–5.88, $p = 0.02$) on multivariate logistic analysis [7]. However, in other studies, the age at surgery had no significant effect on early return of urinary continence but these series either included few elderly patients or observed low rates of incontinence rendering identification of significant risk factors unlikely [8, 9]. Performance status in the preoperative setting was also demonstrated to correlate with early achievement of continence. A favorable Eastern Cooperation Oncology Group (ECOG) of 0 performance score was found as an independent predictor factor for immediate continence in the study of Hatiboglu et al. [6]. Preoperative potency represents also a positive predictor factor of early return of urinary continence in patients treated with bilateral nerve sparing radical prostatectomy. Severe preoperative erectile dysfunction had been demonstrated to be associated with less nerve sparing procedure and thus, worse urinary continence outcome [6, 10, 11]. In addition, several studies have suggested that body mass index (BMI) and baseline physical activity play an important role in regaining postprostatectomy continence levels. Men who were not obese and were active were 26 % less likely to be incontinent than men who were obese and inactive in a study published by Wolin et al. [12]. However, it seems that BMI is not a prognostic factor for immediate continence as evidenced in the study of Hatiboglu et al. [6]. In the CaPSURE national disease registry of men with prostate cancer, preoperative prostate volume was a predictor of recovery of urinary function after radical prostatectomy. Men with prostate volume greater than 50 cc had lower rates of continence, as assessed by urinary function scores 6 months and 1 year after radical prostatectomy, but scores equalized across all volume ranges by 2 years after radical prostatectomy. The individual domains most significantly affected were urinary control, urine leakage, frequency and urine leakage during sexual activity [13]. A potential reason could be subclinical bladder dysfunction related to benign prostatic hyperplasia that is unmasked by surgery. In fact, bladder dysfunction was also demonstrated as a rare cause of incontinence in some patients [14]. Moreover, preoperative bladder dysfunction mainly overactive bladder is a common problem encountered in 40–50 % of patients [15, 16].

These dysfunctions are, in the majority of cases, compensated and/or subclinical. They tend to deteriorate after surgery and may exacerbate incontinence associated with sphincteric insufficiency [17]. Higher preoperative maximal urethral closure pressure (MUCP) was demonstrated in men regaining continence at 6 months postoperatively compared with incontinent patients and poor preoperative MUCP was independently correlated with persistent incontinence postoperatively [18]. Functional urethral length is another urodynamic parameter that significantly decreases after radical prostatectomy [19]. However, its role as a diagnostic preoperative tool is controversial and more well-designed studies are needed to support its use as a preoperative predictor of postoperative risk of urinary incontinence. Similarly, detrusor function and pressure flow parameters were not predictors of early regain of continence but further prospective diagnostic accuracy studies are still needed to elucidate the role of these studies in the preoperative period [18]. Finally, baseline incontinence is understandably associated with higher rates of incontinence postoperatively [20].

Effect of Anatomical Interindividual Variations on Early Return of Urinary Continence

The preprostatectomy surgical anatomy of the male pelvic floor and perineal anatomy is complex and varies substantially. The external urethral sphincter is a complex structure surrounding the membranous urethra from the apex of the prostate to the penile bulb, in the shape of an inverted horseshoe. It is in close anatomic and functional relationship to the pelvic floor, and its fragile innervation is in close association to the prostate apex. Thus, the shape and size of the prostate can significantly modify the anatomy of the NVB and the urethral sphincter [21, 22]. Muscle fibers and/or nerve supply injury during dissection may result in urethral sphincter insufficiency and cause postoperative urinary incontinence. Understandably, the shape of the prostate at the apex influences the length of the membranous urethra [23]. The external urethral sphincter could in some cases be surrounded by the apex circumferentially making its preservation difficult particularly if the tumor is located at the apex. A long urethral stump is a well-known predictor factor of postoperative immediate continence [24, 25]. Therefore, a preoperative long membranous urethral length and the absence of overlapping between the prostatic apex and the membranous urethra should correlate with higher rates of recovery of urinary continence after radical prostatectomy. Interestingly, Paparel et al. confirmed this hypothesis by demonstrating that time to recovery of urinary incontinence was strongly associated with preoperative membranous urethral length [26]. In fact, a postoperative length >13 mm guaranty immediate continence whereas 70 % of patients had immediate continence when membranous urethral length <13 mm. Lee et al. demonstrated that a prostatic apex overlapping the membranous urethra had a higher risk of excessive shortening of the urethra after the intervention and therefore accounting for a delay in return of urinary continence [27]. A Korean study described the same findings [23]; patients without an anterior or posterior overlying apical pattern had greater chance of early return of continence and higher rates of continence at 1 year of follow-up. However, Mendoza et al. did not find a cutoff value for urethral length [28]. The length of the prostate was also evoked as another anatomical factor that influences urinary recovery after the intervention. Arguably, longer prostates are associated with a greater damage to the NVBs; however, there are some data showing no significant correlation between the prostate length and the early return to continence in the postoperative period [23, 26]. Levator ani thickness at the height of apical dissection, urethral volume, recto-urethralis muscles, puboprostatic ligaments, outer and inner levator distance had been also studied but results are contradictory [18]. All these anatomical variations can be detected and measured in the preoperative period and analyzed and compared to the postoperative setting. Sphincter electromyography and perfusion sphincterometry did not prove their utility for preoperative evaluation of urethral sphincter function for patients awaiting radical prostatectomy [29, 30]. This stems mainly from the normal sphincter function in the majority of patients. Comparison between preoperative and postoperative patterns failed to categorize a subgroup of patients at increased risk for delayed return of continence [31, 32]. On the other hand, membranous urethral length is best assessed by endorectal MRI and several studies investigated its role in augmenting the prediction of continence recovery. Coakley et al. examined 211 patients by MRI before radical prostatectomy and demonstrated the rapid return of urinary continence after the procedure [33]. Von Bodman et al. obtained the same results in a retrospective series of 600 patients [34]. Lim et al. suggested, in their studies, that assessing apical shape on a preoperative mid-sagittal MRI was as much important as measuring the urethral length in predicting early return to continence [23]. However, the absence of a standardized method for measuring anatomical interindividual variability, the retrospective design of the studies, and the low predictive accuracy of these tests limit their reproducibility and their routine use in everyday practice.

The Value of Preoperative Intervention Aimed to Enhance Early Return of Urinary Continence Following Radical Prostatectomy

Individualization of treatment to reduce therapy-associated early and late functional morbidity is the current trend in cancer surgery. The extent of dissection should be adapted according to patient- and tumor-related factors. Distinguishing patients into different subgroups based on their preoperative risk factors for postoperative delayed recovery of incontinence is an emerging concept in the surgical management of prostate cancer [35]. Patients with idiopathic detrusor overactivity including those with abnormally low bladder compliance are at increased risk for postoperative incontinence. Good urodynamic assessment of these patients and preoperative or simultaneous use of botulinum toxin could decrease incontinence after radical prostatectomy as demonstrated in small series (Abdulhak A, Abst ICS). The effect of botulinum toxin on prostate cancer cells remains to be elucidated [36]. Patients experiencing preoperative urinary incontinence should be informed of their highest risk of incontinence after the intervention. Physical activity and weight loss could play a role in reducing the time to regain continence after radical prostatectomy and are encouraged [12]. Accurate tumor localization is also of paramount importance in tailoring management of prostate cancer. Higher clinical stage, PSA levels, and preoperative Gleason score were shown to predict worse urinary continence outcome [37]. However, tumor stage, PSA, and D'Amico risk groups were not found to be significant predictors of early return of continence in recent series [6]. Understandably, increased tumor aggressiveness is associated with a higher rate of positive surgical margins and biochemical recurrence that might be treated with postoperative radiation therapy with a substantial negative impact on urinary continence outcomes. Morphological alterations in periprostatic tissues due to changes in cancer microenvironment in aggressive tumor need to be confirmed. A short membranous urethral length with an overlapping prostatic apex and an aggressive tumor located at the apex expose the patient to higher risk of positive surgical margins and/or persistent urinary incontinence [38, 39]. Robotic approach could facilitate apical dissection in the confined space particularly if posterior pubic tuberosity is prominent allowing better visualization and access to the limits of dissection but in the absence of oncologic and functional data, many surgeons prefer to offer radiation therapy for these patients to avoid the higher risk of persistent urinary incontinence [40, 41]. Patients with weak pelvic floor muscles or preoperative sphincteric insufficiency could be offered pelvic floor muscle training (PFMT). However, the clinical utility of preoperative PFMT which has been demonstrated for the management of female stress urinary incontinence [42] is more contradictory in men. The principle is based on the assumption that increasing pelvic muscle tone may improve its support to pelvic structures during moments of involuntary increase in intra-abdominal pressure, thus reducing urinary leaking during efforts. In order to ameliorate continence recovery after RALP, investigators have tested the impact of PFMT before the surgical operation. Indeed, it may be thought that a muscular preparation of the pelvic floor prior to the surgical trauma can potentially be beneficial in order to accelerate and improve continence outcomes. Generally, patients start the training 2–4 weeks before surgery and then continue after postoperative catheter retrieval. In addition, the technique may be guided by electromyographic biofeedback or by a physiotherapist; exercise schedule is variable, usually including one weekly encounter with the physiotherapist and daily home contraction exercises. Although theoretically effective in "training" the pelvic floor, multiple RCTs exploring preoperative PFMT have reported variable and contrasting results, and its true clinical impact has yet been elucidated. In summary, current data do not support the use of preoperative PFMT, which does not seem to improve continence outcomes after prostatectomy, neither on the short nor on the long term [43]. However, given the noninvasiveness of PFMT and the high percentage of patient satisfaction, some experts still recommend its use before surgery, particularly in patients at risk but its true impact on quality of life and time to continence requires further investigation.

Conclusion

In the future, the variability in time to regain continence could be predicted in the preoperative setting and thus helps in the patient decision making. Urologist should be aware of the possibilities of these diagnostic tools. A combination of preoperative MRI and urethral pressure profilometry measurements could be used to predict early return of continence. However, more and larger prospective studies with validated and standardized tools are needed to determine the exact role, the clinical utility, and the cost effectiveness of these techniques preoperatively. The next step could be a more individualized approach based on preoperative patient- and tumor-related factors. Tailoring surgery according to these factors could reduce urinary functional complications without compromising oncological outcomes.

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