The etiology and examinations of urinary incontinence after radical retropubic prostatectomy

Ph.D. theses

dr. Attila Majoros

Semmelweis University
Clinical Medicine Doctoral School

Thesis Moderator: Prof. Imre Romics MD, Ph.D., D.Sc., university teacher
Opponents: Tibor Flaskó MD, Ph.D., associate professor, head of urological department
Zoltán Szabó MD, Ph.D., head of urological department

The Dean of Closing Examination: Prof. Attila Pajor university teacher
MD, Ph.D., D.Sc

The Members of Examination Board:
Péter Nyirády MD, Ph.D., junior assistant professor
Miklós Merksz MD, Ph.D., head of urological department

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Introduction

The incontinence after radical retropubic prostatectomy might cause a significant decrease on the life quality of patients. In different sources the rate of postoperative urinary incontinence after radical retropubic prostatectomy is: 2.5 – 87 %. The exact reason of incontinence after prostatectomy is not known yet. The studies being engaged with this question on one hand are observing the urodynamic backgrounds, whereas others on the other hand are concentrating on the possible predisposing risk factors. Previously, only bladder dysfunction was considered to be responsible for urinary incontinence following prostatectomy from an urodynamic aspect. In new publications rather sphincter weakness is assumed to be the reason of this incontinent status. Some of the authors have not found any association between preoperative factors and postoperative incontinence, whereas others note elder age, the lack of nerve sparing methods, anastomotic stricture, bladder neck resection and to short urethral stump (proximally from sphincter) might haven important role in developing incontinence or reaching continence later.

Aims

Throughout our study we aimed to clarify the urodynamic backgrounds of incontinence after radical retropubic prostatectomy, to determine the predisposing pre- and perioperative risk factors and being aware of these results we also intended to carry out those less invasive examinations which might provide us help to anticipate the rate of incontinence preoperatively. Furthermore, we also targeted to present through our patients whether the “learning curve” of operation has impact on postoperative continence functions. In the following the details of our aims are shown.

1. The study of urodynamic examinations

We intended to determine the urodynamic causes of incontinence after RRP, the preoperative urodynamic divergences predisposing postoperative incontinence; moreover, we aimed to show the changes of continence and voiding functions after the surgery and to compare the status of postoperatively continent and incontinent patients.

2. The study of pre-, intra- and postoperative risk factors predisposing incontinence
The presentation of risk factors predisposing incontinence or continence later, pre-, intra-, postoperatively (not urodynamic), and the presentation of independent risk factors leading to incontinence

3. The study of the possible use of anal sphincterometry preoperatively in order to predict postoperative urinary incontinence
We wished to examine the effect of radical prostatectomy on anal sphincter function and the differences of anal sphincter pressure parameters within the continent and incontinent patients. We wished to prove our hypothesis that the weakness of pelvic muscles as well as the complete dysfunction might determine incontinence following RRP preoperatively. We were looking for such less invasive examination method that can predict postoperative incontinence before the surgery.

4. The “learning curve” of surgery and the study of its effect on postoperative continence; the postoperative continence status of patients operated on with RRP at Semmelweis University.
The comparison of the results of RRP operations (we compared the surgeries in the first period and the operations of a given surgeon with greater skills) carried out at the Institute by one urologist, as far as the postoperative continence status is concerned. The evaluation of postoperative incontinence status after radical prostatectomy performed at the Department of Urology, Semmelweis University between 1st January 1998 and 31st December 2006.

Methods
In order to incorporate our aims we carried out four clinical examinations, in which the continence and voiding dysfunctions of patients undergoing RRP because of early stage prostate cancer were examined and the parameters were assessed. The surgeries and examinations were performed at Semmelweis University Department of Urology and at Department of Urology St Agnes Hospital Bocholt, Germany between 1st January 1998 and 31st December 2006.

No. 1. clinical examination: A prospective urodynamic examination to assess incontinence after radical retropubic prostatectomy.
From March 2003 to May 2004 68 patients participated in this prospective study. Urodynamic examinations were performed 3-7 days before and 2 months after RRP; moreover continence status was taken by a survey 9 months after the surgery.
We divided the patients into immediate continent, later continent and incontinent groups according to the postoperative continence status.

No.2 clinical examination: the retrospective analysis of risk factors causing incontinence after radical retropubic prostatectomy

Possible predicting factors for permanent incontinence and delaying continence were evaluated in 166 patients after RRP. Patients were asked to fill out the questionnaire about their urinary symptoms and continence status minimum one year after the operation. The criteria to assess the continence status of the patients were the same as in examination No. 1. During cryptography, we evaluated the distance between the bladder and the striated sphincter was measured and represented the length of the urethral stump (USL). The length of the striated sphincter (SL) was obtained by measuring the length of the collapsed urethral segment. The total posterior urethral length (PUL) was obtained by adding the USL to the SL. Uni- and multivariate analyses were carried out to assess the predictors of incontinence and of the delayed recovery of continence. When assessing the statistical data we gained the dependent and independent (free of the influence of other factors) risk factors related to postoperative incontinence.

No.3 clinical examination: anal sphincterometry (pilot study) performed by a prospective method preoperatively in order predict urinary incontinence after radical prostatectomy

Throughout a prospective pilot study we carried out anal sphincterometry at 27 patients 1-7 days before and two months after RRP. Patients were divided into three groups according to postoperative urinary continence status two months after the surgery: continent patients, slightly incontinent patients; moderate or severe incontinent patients.

No.4 clinical examination: retrospective examination on presenting RRP “learning curve” and its effects on continence of patients operated on at Semmelweis University Urology Department in the past nine years.

177 RRP were carried out between 1st January 1998 and 31st December 2006. The average follow-up time was 27.1 +/- 25 (2-105) months. As far as continence status is concerned, we compared the surgeries in the first period and the operations of a given surgeon with greater skills.
Results

No. 1. clinical examination: A prospective urodynamic examination to assess incontinence after radical retropubic prostatectomy.

There was no significant difference in age between continent and incontinent patients (p > 0.05). However, a significant difference could be noted between those who were continent immediately following catheter removal and those who became continent later on, but within two months (59.2 +/- 5.6 years vs. 62.6 +/- 7.2 years, p < 0.05).

Two months after surgery, 43 patients (68.2%) became completely continent. Ten of them (15.9%) were continent immediately following catheter withdrawal and 33 (52.3%) did so within 2 months. Urodynamic stress incontinence was diagnosed in 18 cases (28.6%) and urge incontinence alone in 2 cases. The continence rate was 84.1% (53/63 patients) 9 months following RRP.

The postoperative continence rate among those who had no preoperative lower urinary tract symptoms was 71% (27/38 patients) and 64% (16/25 patients) among those with preoperative symptoms. The patients who became continent immediately after the catheter withdrawal had no preoperative symptoms, while of those who became dry later had previous voiding difficulties and urge incontinence (p < 0.03). The most frequent postoperative symptom mentioned by the patients was incontinence (20 patients – 31.7%).

Preoperative urodynamic abnormality was detected in 26 (41.3%) patients (only one case in the immediate continent group). Detrusor overactivity was the most frequent (23.8%), whereas the most frequent urodynamic abnormality in the incontinent group was sphincter weakness (90%). There was a significant decrease in the parameters of residual urine (p<0.0001), bladder capacity (p<0.0001), detrusor pressure during voiding (p<0.0001), maximal rest urethral closure pressure (p<0.0001) and maximal voluntary sphincter constriction (p<0.0001). Comparing urodynamic parameters of postoperatively continent and incontinent patients, we found significant differences in postoperative maximal rest urethral closure pressure (p<0.0005) as well as in the preoperative and postoperative maximum voluntary urethral closure pressure (p<0.0001) to the benefit of the continent group.

There was no significant difference in preoperative maximum urethral closure pressure at rest between patients who remained continent and those who became incontinent following surgery (68.6 +/- 13.2 vs. 67.5 +/- 11.3 cmH2O, p>0.05). However, considering immediately continent patients and those who became continent later, there was a significant difference in both closure pressures (rest and voluntary), to the benefit of those who reached immediate continence pre- and postoperatively.
No.2 clinical examination: the retrospective analysis of risk factors causing incontinence after radical retropubic prostatectomy

At least one year after surgery 145 (87.4%) patients became perfectly continent; out of these patients 34 (20.5%) were continent immediately after the removal of the catheter, whereas 111 (66.9%) gained continence later; 21 (12.6%) patients remained incontinent more then one year after RRP. Univariate analysis of the differences in the possible predictor variables among the three groups showed eight factors related to incontinence: age, preoperative and postoperative voiding difficulty, volume of the prostate, presence of anastomotic stricture, USL, SL and PUL. The rate of anastomotic stricture was the highest (42.9%) in the incontinent group. Because both the USL and the SL correlated with the PUL (but not USL with SL), only PUL remained in the multivariate logistic regression. Between the continent and incontinent patients there were no differences in pathological tumor stage, the status of lymphatic nodes, the parameters of Gleason score and the rate of positive margin. There was no significant association between the stricture and the SL, however, there was a significant difference between the patients with anastomotic stricture (n=26) where we observed shorter urethral stump and thus the shorter posterior urethra and those without stricture (n=40). USL in patients with and without stricture were 8,8 ± 4,2 mm and 11,1 ± 2,9 mm, respectively (p=0,003). Based on the previous data and the multivariate logistic regression, it was proved that only PUL was the independent risk factor predisposing for incontinence (p<0.0001). The older age of the patients (above 65 years, p=0.034) and the postoperative PUL (p=0.001) were found to be a predisposing independent risk factor for delayed continence.

No.3 clinical examination: anal sphincterometry (pilot study) performed by a prospective method preoperatively in order predict incontinence after radical prostatectomy

No anal incontinence was observed neither before nor after the surgery. There were no significant differences in anal sphincter pressure between the preoperatively and postoperatively measured parameters. The values of preoperative RASP were not lower at incontinent patients than in the continent group. The preoperative RASP and MACP parameters, however, were significantly lower in the moderately-severe incontinent group than in the continent or slightly incontinent groups.
No.4 clinical examination: retrospective examination on presenting RRP “learning curve” and its effects on continence of patients operated on at Semmelweis University Urology Department in the past nine years.

177 RRP were carried out between 1st January 1998 and 31st December 2006. 124 patients undergoing RRP was minimum one year after the surgery, therefore we considered this number the basis of our study (100%). The rate of immediate continent patients after catheter removal was 25.8% (32 patients), total continence reached within one year after the surgery was 87.9% (109 patients), and only one patient was noted to reach continence within more than a year (13 months). 30 operations in the first period (01.1998-02.2003) and 30 operations in a more experienced period (04.2005-12.2005) of one given operating physician (Imre Romics) were compared. There was no significant difference neither in the immediate continence nor in the final continence status. However, the time to reach continence was 4.1 months in the first group and 2.8 months in the last one; therefore the difference is significant \(p < 0.045\).

Conclusions

RRP does cause a significant urodynamic change in the continence as well as voiding functions. The dysfunction of continence (incontinence) is mainly determined by the sphincter; the divergences of bladder (low bladder capacity, detrusor hyperactivity) are of peripheral importance.

The incontinence after RRP appears mainly in the form of stress incontinence (60%), mixed in a low amount of the cases (30%), and we can mention urge incontinence only in 10%.

The cause of stress incontinence is the decrease of urethral sphincter function due to the operation. The preoperative status of the patient partly determines his capability of postoperative continence.

The exact preoperative status – as a starting point – may be influenced by intro-and postoperative factors. The factors playing role in determining postoperative incontinence can increase or decrease their effects on each other, therefore the factors being independent from other effects could only be determined by a multivariable statistic analysis.

Several differences in preoperative factors can be noticed within the incontinent and continent (here the immediately and later continent) patients. Within the continent group, patients being continent right after catheter removal form a separate entity. These patients are of a younger age, they are without preoperative symptoms, urodynamic differences and have significantly better urethral sphincter function (P. clos. max, P. sphin. max, USL, SL, PUL). The most
important factors to influence continence are the age and the urodynamic status of patients. Elder age will not inhibit continence but retard reaching it.

The most important preoperative urodynamic parameter to reach postoperative continence is maximal urethral closure pressure describing sphincter function. In the sphincter function the maximal voluntary urethral closure pressure besides the maximal rest urethral closure is considered to be very important, since in case the former one is normal, postoperative continence reached by a proper rehabilitation regardless of a preoperatively weaker decreased rest urethral closure pressure. The RRP has no effect on the function of pelvic muscles and anusssphincter, thus its dysfunction is totally independent from the surgery, however it can warn us about the complex weakness of pelvic muscles. The decreased function of pelvic muscles preoperatively might anticipate a severe incontinence after the operation. The anal sphincterometry is appropriate to examine the complex function and weakness of pelvic muscles. The examination is fast, less invasive and capable of predicting serious postoperative incontinence.

The increased volume of prostate, especially in elder patients, could become a passive factor of preoperative continence function. In accordance with it, the preoperative dysuria may also be a predisposing but not independent factor for postoperative incontinence. Preoperative detrusor hyperactivity cannot be regarded as a predisposing risk factor for incontinence; nevertheless, it can delay reaching continence and is based on lower urethral obstruction in 40%. In these cases the hyperactivity is usually ceased after the surgery.

The most important predictive parameter amongst the intraoperative factors is the length of urethral stump above the sphincter. The total length of dorsal urethra is calculated on the length of postoperative urethral stump and the length of outer sphincter (preoperatively given parameter, related to urethral closure pressure), which is an independent predicting factor of incontinence or reaching continence later.

The study period of the surgery proved that different methods of practice of the operation have direct impacts on the immediate or final continence status; however, early continence might be expected in case of an operator having greater practice. Although we are in the lack of experience, relying on study of pathological tumor stages and postoperative continence correlations and being supported by other anatomic results, we do consider that the nerve sparing surgical method has no significant importance in reaching or maintaining continence. Paradoxically, a frequent appearance of urinal incontinence could be noticed in the case of postoperative anastomotic stricture, which might be the consequence of a periurethral scaring that inhibits the active sphincter function. Due to the fact that anastomotic stricture just like
incontinence appears more frequently in the case of shorter urethral stump, we cannot regard it as an independent predisposing factor. Patients under the age of 65 having no symptoms and having a good urethral sphincter function before the surgery do have a promising chance of reaching immediate postoperative continence regardless of the tumor stage. In order to know much more about incontinence after radical retropubic prostatectomy, we need further randomized, prospective examinations involving a large number of patients, in which the success of operations performed with standard surgical methods should be assessed.

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Publications not related to the theses:


