Urinary incontinence after radical prostatectomy – experience of the last 100 cases

Roman Sosnowski[1], Michał Szymański[1], Jan Karol Wolski[1], Tomasz Nadolski[1], Tomasz Kalinowski[1], Tomasz Demkow[1], Piotr Peczkowski[2], Małgorzata Pilichowska[2], Marcin Ligaj[3], Wojciech Michalski[4]

[1]Urooncology Department, Maria Skłodowska Curie, Memorial Cancer Hospital, Warsaw, Poland
[2]Radiotherapy Department, Maria Sklodowska Curie, Memorial Cancer Hospital, Warsaw, Poland
[3]Pathology Department, Maria Sklodowska Curie, Memorial Cancer Hospital, Warsaw, Poland
[4]Biostatistic Department, Maria Sklodowska Curie, Memorial Cancer Hospital, Warsaw, Poland

KEY WORDS

prostate cancer ◗ radical prostatectomy ◗ incontinence ◗ Quality of Life (QL)

ABSTRACT

Radical prostatectomy (RP) is a recognized treatment method of organ-confined prostate cancer. Among post-surgery complications, urinary incontinence is a major one. The aim of this study was to determine the incontinence rate after RP and to analyze factors that might affect it. Between March 2007 and December 2008, 132 RP's were performed at Warsaw Cancer Center. A questionnaire to assess the condition before and after RP was developed by the authors and sent to all treated patients. The questionnaire focused on health status information, function in urinary domain, rate of returning to "normal" activity level as before RP and satisfaction from the treatment. The median age of patients was 62 years. Out of 132 patients 102 subjects (77.2%) responded to the questionnaire. Of all responders, 35 patients (34.3%) reported total urinary continence after RP. After RP 35(34.3%) patients reported total urinary continence and in 55(53.9%) patients urinary incontinence of medium degree was present. In 12 (11.8%) patients significant urinary incontinence developed. The most common cause of urine dripping (82% of patients with any degree of urinary incontinence) was associated with abdominal muscle pressure. No statistically significant association between urinary incontinence and adjuvant radiotherapy after RP or the surgeon performing the RP was found (>0.79, >0.803). Radical prostatectomy carries a certain risk of complications. We observed an 88.2% rate of significant (total and moderate degree) urinary continence. The adjuvant radiotherapy and surgeons, who performed the RP, did not affect the rate of incontinence.

INTRODUCTION

Prostate cancer (PCa) is the third most common male malignancy in Poland with respect to incidence and mortality [1]. Taking into account the increasing health awareness in the population, the common availability of diagnostic tests for prostatic diseases, among others prostate specific antigen (PSA), during the so-called "PSA era" has increased the percentage of diagnosing prostatic cancer still confined to the gland (<T3) in recent years. In this connection the percentage of patients subjected to radical treatment increases. The choice of the method of management made by the patient depends not only on the oncologic efficacy, but also on the intensity of adverse effects and expected quality of life (QL).

The patient in cooperation with the doctor, before making the decision about the choice of treatment method, should consider the pros and cons concerning a given therapeutic option, both in the oncologic aspect and in the sphere of the QL. The physical, mental, and social status of a man and his QL play a significant role during the assessment of treatment satisfaction [2].

The aim of this study was to determine the continent rate after RP and to analyze the factors that could play role in this subject.

MATERIAL AND METHODS

Between March 2007 and December 2008, nine experienced surgeons performed 132 radical prostatectomies for prostate cancer. The median age of patients was 62 years (range 52-69), the median of preoperative PSA level was 4.2 ng/ml (range 2.0 – 18 ng/ml). The median duration of RP was two hours (range 1.15 – 4). The mean time to remove the catheter after RP was seven days (range 6-45). Most patients (73%) had the catheter removed within nine days after the RP. The prolonged duration of keeping the catheter in the bladder was associated with abnormal cystographic results (incomplete anastomosis). In one case, catheter repositioning under endoscopic control was required. Table 1 lists the pathological stage and Gleason score of the surgical specimens.

Cancer staging was performed in accordance with 1997 American Joint Committee on Cancer recommendations [3]. Diagnosis of pT3 and pT2 were present in 15 and 87 patients respectively, and no patients with pT4 were present. Positive surgical margins were found in 17 patients. In 15 patients, adjuvant hypofractionated conformal radiotherapy (3D-CRT) was applied

Table 1. Pathological characteristics

Gleason score	Number of patient (%)
4	1
5–6	58
7	37
8	1
Pathological stage	
pT0	5
pT2a	11
pT2b	5
pT2c	66
pT3a	13
pT3b	2

from external fields to a total dose 54.6 Gy in 2.6 Gy fractions. The RT was started on average after three months following the RP procedure due to confirmed positive surgical margins and/or pT3 stage. Arterial hypertension, under medical control, was the most common coexisting condition and was observed in 40% of the patients.

All subjects underwent open anatomical radical retropubic prostatectomy, the technique that was described previously [4]. The nerve sparing technique was not performed and one of the surgeons used magnifying glasses. Two to four weeks before the planned RP, a routine informational meeting with an experienced nurse and the patient took place and it concerned the hospital stay and the planned surgery as well as its possible adverse effects and methods of their management. The patient was discharged home on the day after cystography visualizing the correct cystourethral anastomosis. One experienced pathologist performed histopathological examination. Four weeks following the RP, the patients started rehabilitation – exercises, which included Kegel exercises in cooperation with a physiotherapist.

Not earlier than three months after the RP, a questionnaire, which assessed the condition before and after RP (appendix 1), was developed by the authors and sent to all patients operated on. It included a part concerning health status information – question 1, function in urinary domain – questions 2-5, rate of returning to "normal" activity level from before RP – question 6, and satisfaction from the treatment – question 7. The authors assigned the results of the questionnaire to three groups: full urinary continence, medium (slight) degree urinary incontinence, and significant urinary incontinence according to the key provided in Table 2.

Statistical Analysis Standard methods for descriptive statistics: frequency and cross tabulations and Chi-2 test for rate comparisons were used.

RESULTS

Out of 132 patients to whom the questionnaire was sent, answers were obtained from 102 subjects (77.2%) who were then subjected to analysis. The time elapsing from RP to filling-in of the questionnaire was three to six months in 13 patients, seven to twelve months in 50 patients, and over thirteen months in 39 cases. Before RP, urinary incontinence of significant and medium degrees was present in three (2.9%) and eight (7.8%) patients, respectively. After RP, 35 (34.3%) patients reported total urinary continence. In 12b(11.8%) patients, significant urinary incontinence developed. In the remaining 55 (53.9%) patients, urinary incontinence of medium degree was present. The most common situation when urine dripping took place was associated with abdominal muscle pressure and it occurred in 55 out of 67 patients with any degree of urinary incontinence.

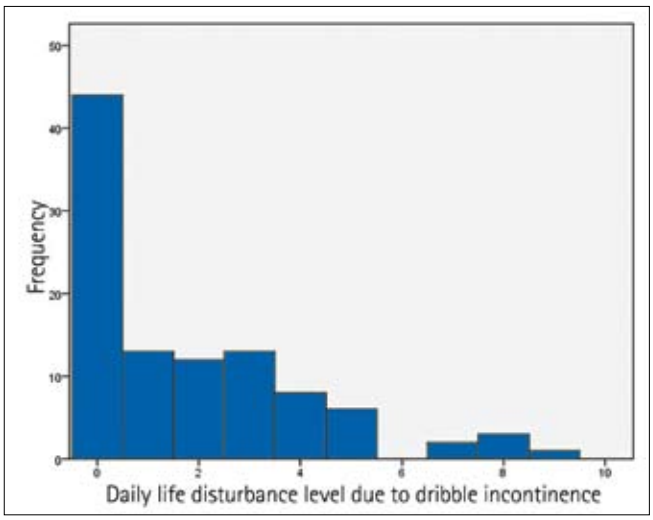

Fig. 1. The distribution on the daily life distrubance level due to dribble incontinence.

The forth question of the questionnaire: Generally speaking, how urine dribbling disturbs your everyday life? was answered by 44% of the patients that the QL was very good (Fig. 1).

No statistically significant effect of the adjuvant radiotherapy after RP was found on urinary continence ($p > 0.79$) (Table 3). No effect of the surgeon performing the RP was found on urinary incontinence after the procedure ($p > 0.803$). In 52% of the patients, the return to „normal" activity (e.g. return to work, family life, or household activities) occurred after a time period longer than four weeks following RP, in 36% after 2-4 weeks, and in 12% after less than two weeks.

The answer to the question about possibly choosing the same method again for PCa treatment revealed that 18 (15%) patients would have not chosen the same method, looking for an alternative therapy, even at the expense of a higher risk of oncologic inefficacy, while the remaining 85% of subjects would have chosen the same method of treatment.

DISCUSSION

Among various methods of radical treatment of organ confined PCa, radical prostatectomy is a recognized and effective way of treatment. This operation could be associated with urinary incontinence, leading to significant physical and psychological distress for patients with prostate cancer [5, 6]. After Walsh et al.

Table 2. Incontinence score.

	Question	Answer
Total urinary continence	How often do you drip urine?	Never
	What amount of urine do you usually drip?	Not at all
	When do you drip urine?	Never – I do not drip urine
Medium degree urinary incontinence	How often do you drip urine?	Two or three times weekly, About once daily
	What amount of urine do you usually drip?	Small amount, Medium amount
Significant degree urinary incontinence	How often do you drip urine?	Several times a day, All the time
	What amount of urine do you usually drip?	Large amount
	When do you drip urine?	I drip urine all the time

carefully described the anatomy of the male pelvis, radical prostatectomy could be performed with a lower risk of urinary impairment [7]. Reported rates of incontinence following radical prostatectomy in the contemporary literature are 2.5% to 87% [8]. Factors likely accounting for this broad range of continence rates include: patient selection, the surgeon's experience, technique and methodology of assessing continence, and the definition of continence [9].

The exact mechanism of incontinence after prostatectomy has been debated. It is well accepted that two anatomical structures are independently involved, including the distal or external sphincter complex surrounding the membranous urethra and the proximal or internal sphincter located at the bladder neck. The etiology of incontinence has been attributed mainly to sphincteric deficiency and/or bladder abnormalities [10].

Talcott et al. recently presented a survey indicating that pretreatment incontinence was reported by less than 5% of similar patients [11]. The percentage was also similar, being 2.9% and 7.8% for urinary incontinence of significant and medium degrees, respectively.

The effectiveness of the assessment of radical prostatectomy results based on patient self-reported questionnaires seems to be more reliable than an interview or data collection by phone [12]. Calais da Silva and Fossa et al. confirmed that patient assessment of the side effects of PCa treatment and QL impact are generally more accurate than physician evaluation [13, 14]. Therefore, the use of validated self-reporting questionnaires is the optimal method for evaluating continence following radical prostatectomy. These questionnaires should capture various outcomes, such as incontinence frequency, pad requirements, and problems due to incontinence. Continence rates ultimately depend on how these responses are interpreted [15].

In order to assess urinary continence after RP the authors developed their own questionnaire. It consisted of questions about urinary continence before and after RP and a subjective assessment of the effect of RP on the patient's life (appendix 1). In order to facilitate the interpretation of the results, the authors, based on the answers in the questionnaire, assigned one of three combined results: total urinary continence, urinary incontinence of medium degree, urinary incontinence of significant degree, according to the key included in Table 1. The questionnaire built in this way enabled obtaining simultaneous answers concerning time periods before and after RP. The authors understood the drawback of a retrospective assessment, but, in the authors' opinion, this properly developed questionnaire made obtaining reliable results possible. Some authors have used the number of incontinence pads (pampers), large or small, used by the patients for the assessment of urinary continence. Kielb et al. believe that patients who report using one pad daily often do so for "security" purposes rather than significant urinary incontinence [16]. In their study, none of the men using one pad daily had frequent dribbling or a total lack of urinary control. More importantly, 83% of men using one pad daily had no problem or only a small one with urinary function. The use of a single pad daily describes a range of individuals from those who simply use a liner for reassurance to those who use a single absorbent garment to absorb several ounces of urine. The use of pads is also influenced by the surgeon's efforts to discourage their use. Lepor et al. have found that the majority of men who wore a single pad considered themselves continent, suggesting that most were wearing the pad for reassurance [17]. In their study, three months following RP 80% of men who wore a single pad considered themselves continent. By 24 months 100% of men who wore a single pad considered themselves continent.

The authors had no experience in the assessment of urinary incontinence based on other criteria, including pad test or urody-

Table 3. Effect of the adjuvant radiotherapy after radical prostatectomy on urinary continence

	Number of patient without adjuvant radiotherapy (%)	Number of patient with adjuvant radiotherapy (%)
Total urinary continence	31 (35.6)	4 (26.7)
Medium degree urinary incontinence	46 (52.9)	9 (60.0)
Significant degree urinary incontinence	10 (11.5)	2 (13.3)

Appendix 1.
Questionnaire

1. 1. I have:
- o Diabetes mellitus
- o Hypertension
- o Ischemic heart disease (coronary artery disease)
- o Discopathy
- o Neurological diseases (e.g. Parkinson's disease)
- o None of the above mentioned disease

2. How often do you drip urine? (please choose one answer)
   1. Never
   2. About once weekly or less frequently
   3. Two or three times a week
   4. About once daily
   5. Several times a day
   6. All the time

3. What amount of urine do you usually drip (independently of precautions, used or not)?
   1. Not at all
   2. Small amount
   3. Medium amount
   4. Large amount

4. Generally speaking, how the urine dripping disturbs your everyday life? Please make a circle around a number from 0 (not at all) to 10 (to a very high degree)

0 1 2 3 4 5 6 7 8 9 10
Not at all To a very high degree

5. When do you drip urine? (Please mark all the possibilities concerning your situation)
   1. Never – I do not drip urine
   2. I drip urine before I get to the toilet
   3. I drip urine when I cough or sneeze
   4. I drip urine during sleep
   5. I drip urine during physical activity/exercise
   6. I drip urine after miction termination
   7. I drip urine without any evident cause
   8. I drip urine all the time

6. Please tell after how long time period following discharge from hospital have you returned to „normal" activity (e.g. return to work, duties)

o Within two weeks
o From two to four weeks
o Time period longer than four weeks

7. If I could choose again the method of prostatic cancer treatment:
   1. I would choose the same surgical procedure
   2. I would choose a less mutilating treatment with the possibility of retaining greater fitness, however with the risk of ineffective oncologic treatment

namic examinations, therefore they limited the evaluation to the self-assessment questionnaire, accepting it as the most reliable tool for real assessment of urinary continence.

Many technical modifications have been proposed for improving incontinence rates after prostatectomy by preserving or reconstructing sphincters. The anatomical dissection of the apical region of the prostate described by Myers as well as Walsh allows the preservation of the striated and smooth muscle components of the external sphincter complex [18, 19]. Some have suggested a more limited distal apical dissection with preservation of the puboprostatic ligaments to spare the external sphincter [20]. Others have attempted to preserve the external sphincter by meticulous dissection of the urethra and preserving functional urethra length by performing an individualized apical preparation strictly along anatomic landmarks [21]. Still others have proposed a tubularized bladder neck reconstruction, maintaining that continence is related to the length of the urethra [22]. Malizia et al. reported that the internal and external sphincters can be spared during radical prostatectomy without compromising cancer control and recommended that the bladder neck be preserved to improve urinary continence [23]. The authors performed radical prostatectomy according to the technique described by Walsh [24]. No nerve sparing technique was applied. One of the surgeons used magnifying glasses during RP but, in view of a too small number of patients, the analysis of the effect of such management on urinary incontinence after RP was not possible.

Many authors report, that the recovery of complete urinary continence is time-dependent [25, 26]. Sosnowski et al. found a linear relationship (decrease in consecutive measurements after three, six and twelve months) between the value of the sum of items in the ICI-Q questionnaire that suggested a significant improvement in the assessment of urinary continence in consecutive measurements ($p < 0.001$) [27]. The percentage of men who are completely continent at three months in the literature is 47% to 81% [28]. Most patients (87%) in the present study answered the questions in the questionnaire after more than six months following the RP. The authors believe that in that situation, a single assessment of urinary continence is a reliable method of evaluation of the influence of RP on urinary continence functions, and in an overwhelming majority of cases it will not be worse.

In a smaller patient self-reported survey of radical prostatectomy at one hospital, Moul et al. noted that operation time, blood loss, pretreatment PSA, and tumor volume did not predict incontinence [29]. In the present study the mean duration of RP (including bilateral obturatory lymphadenectomy) was two hours. In the authors' ward over the past 10 years 810 of RP procedures were performed. The 102 operations analyzed were performed by experienced surgeons (the number of RPs performed by a given surgeon ranged from 20 to 100). The authors found an absence of effect of RP duration on urinary incontinence in the analysis.

In the present study, in 35 (34.3%) patients total urinary continence was present after RP what meant that those patients reported no signs of urinary incontinence (were never drip urine!). In 55(54%) patients a medium-degree urinary incontinence was present and meant that situations occurred when the patients reported a slight urinary incontinence (question: How frequently do you drip urine? Answer: Two or three times weekly or about once daily; question: What amount of urine do you usually drip? Answer: Small amount or medium amount). Significant-degree urinary incontinence occurred in 12 (11.8%) patients – that condition was described if the patient answered even only one of the questions: How frequently do you drip urine? Answer: several times a day or all the time, or the question: What amount of urine do you usually drip? Answer: significant amount, or the question: When do you drip urine? Answer: I drip urine all the time.

In a population-based longitudinal cohort follow-up study up to 24 months, Stanford at al. reported the proportion of men reporting total urinary control increased after surgery from 20.5% at 6 months to 31.9% by 24 months [30]. Overall, 40.2% of the patients reported occasional urinary leaking, 6.8% frequent urinary leaking, and 1.6% no urinary control 24 months after the diagnosis.

Flower et al. analyzed 1,013 questionnaires of patients who had undergone radical prostatectomy and showed that incontinence was present in 65.6% (any urinary leakage that warranted protection) and had significant impact on the QL (818 patients evaluated). Thirty two percent of the patients reported to wear pads or clamps to control dripping urine. However, only 23% reported dripping or leaking as a medium or big problem [31].

Braslis et al. evaluated 51 patients who have had a radical prostatectomy at least 12 months before [32]. Sixty one percent of patients stated that they had no problem with incontinence, but 39% regarded incontinence as a problem. In the present study the significant percentage of major urinary incontinence is most probably associated with the absence of routinely performed nerve sparing technique. In spite of that, the obtained results of total urinary continence or medium urinary incontinence reaching 88.3% are comparable with the results available in the literature. Of interest is the fact that in most patients no significant influence was found of urine dripping on everyday life. An evident majority of patients (85%), knowing the consequences connected with RP, would choose that therapeutic option again. In contrast, Walsh et al. presented in their paper the results showing that 93% of the patients who underwent RP were wearing no pads at 1 year, and 98% stated that they had no significant urinary problem [33]. Attention should be paid, however, to the vast experience of the above-mentioned center in performing RPs.

In the present study the fact is interesting that in five patients (4.9%) no malignant cells were found in the specimen material. The frequency of such a situation ranged from 0.07% to 4.2% in the literature. Recently, Trpkov et al. found an incidence of no residual cancer on prostatectomy of 0.67% after ten-core positive biopsy [34]. The increasing proportion of pT0 is connected with the so-called "PSA era" which caused an increasing proportion of detection of minimal cancer (lower stage disease). A significant percentage of the 102 analyzed patients had their diagnosis made based on TRUCUT done beyond the hospital of the authors. A repeated examination of the TRUCUT specimens revealed erroneous diagnosis in two cases. After the above-mentioned analysis the authors changed the schema of qualification procedure for RP – at present an examination of TRUCUT is performed by an experienced pathologist on a routine basis.

Van Cangh et al. in their prospective randomized study, where they evaluated 60 Gy external radiation therapy administered between 3 and 4 months after radical prostatectomy for pathologically locally advanced prostate cancer, have found that the adjuvant radiotherapy had no significant influence on urinary continence [35]. Hofmann et al. in their non-randomized study reported that moderate dose of adjuvant RT (median dose 54 Gy) after RP had a temporary effect on subjective urinary continence at four months but not at eight and twelve months [36]. Similarly, the authors of the present study found in their observation that no statistically significant effect of the adjuvant radiotherapy was found on urinary continence.

Our study also has several limitations. Overall, 77% of eligible, sampled men participated in the survey. It is possible that nonparticipants experienced different levels of urinary incontinence than were reported by the participants. The conduction of a retrospec-

tive analysis renders a precise assessment of the initial condition impossible. The assessment of urinary continence based on answer to one questionnaire does not allow follow-up of the effect of time after RP on urinary continence.

CONCLUSIONS

We believe that the assessment of RP results in the aspect of incontinence rate, incontinence frequency, and patient global self-assessment makes possible a reliable presentation of the therapeutic option, i.e. RP for prostatic cancer confined to the organ.

Radical prostatectomy carries a certain risk of complications. We observed a 88.2% rate of significant (total and moderate degree) urinary continence after this operation. The adjuvant radiotherapy and surgeons who performed RP did not affect the rate of incontinence. In order to obtain more detailed data it is recommended to conduct further studies on this topic.

REFERENCES

1. Didkowski J, Wojciechowska U, Zatoński W: *Nowotwory złośliwe w Polsce w 2007 roku* [*Malignant neoplasms in Poland in 2007*]. Warszawa 2009, pp. 43-113
2. Bland KI: *Quality-of-life management for cancer patients*. CA Cancer J Clin 1997; 47 (4): 94-97.
3. Fleming JD, Cooper JS, Henson DE, et al: *AJCC Cancer Staging Manual*, Lippincott- Raven, Philadelphia 1997, pp. 219-222.
4. Walsh PC: *Radical prostatectomy in locally confined prostatic carcinoma*. Prog Clin Biol Res 1990; 359: 199-207.
5. Fowler FJ, Jr, Barry MJ, Lu-Yao G, et al: *Patient-reported complications and follow-up treatment after radical prostatectomy. The National Medicare Experience:1988-1990*. Urology 1993; 42 (6): 622-269
6. Gliniewicz B, Sikorski A: *Quality of life after radical prostatectomy*. Urol Pol 2005; 58 (1): 55-59
7. Walsh PC, Lepor H, Eggleston JC: *Radical prostatectomy with preservation of sexual function: anatomical and pathological considerations*. Prostate 1983; 4 (5): 473-485.
8. Carlson KV, Nitti VW: *Prevention and management of incontinence following radical prostatectomy*. 2001; 28 (3): 595-612.
9. Eastham JA, Kattan MW, Rogers E, et al: *Risk factors for urinary incontinence after radical prostatectomy*. J Urol 1996; 156 (5): 1707-1713.
10. Litwin MS, Hays R D, et al*: Quality-of-life outcomes in men treated for localized prostate cancer*. JAMA 1995; 273 (2): 129-135.
11. Talcott JA, Rieker P, Propert K J, et al: *Patient-reported impotence and incontinence after nerve-sparing radical prostatectomy*. J Natl Cancer Inst 1997; 6; 89 (15): 1117-11123.
12. Kao TC, Cruess DF, Garner D, et al: *Multicenter patient self-reporting questionnaire on impotence, incontinence and stricture after radical prostatectomy*. J Urol 2000; 163 (3): 858-864.
13. Calais da Silva F: *Quality of life in prostatic carcinoma*. Eur Urol 1993; 24 Suppl 2: 113-117.
14. Fossa SD, Aaronson NK, Newling D, et al: *Quality of life and treatment of hormone resistant metastatic prostatic cancer. The EORTC Genito-Urinary Group*. Eur J Cancer 1990; 26 (11-12): 1133-1136.
15. Wei JT, Dunn RL, Marcovich R, al: *Prospective assessment of patient reported urinary continence after radical prostatectomy*. J Urol 2000; 164 (3 Pt 1): 744-748.
16. K0ielb S, Dunn RL, Rashid MG, et al: *Assessment of early continence recovery after radical prostatectomy: patient reported symptoms and impairment*. J Urol 2001; 166 (3): 958-961.
17. Lepor H, Kaci L, Xue X: *Continence following radical retropubic prostatectomy using self-reporting instruments*. J Urol 2004; 171 (3): 1212-1215.
18. Walsh PC: *Radical prostatectomy for the treatment of localized prostatic carcinoma*. Urol Clin North Am 1980; 7 (3): 583-591.
19. Myers RP, Goellner JR: *Cahill DR. Prostate shape, external striated urethral sphincter and radical prostatectomy: the apical dissection*. J Urol 1987; 138 (3): 543-550.
20. Poore RE, McCullough DL, Jarow JP: *Puboprostatic ligament sparing improves continence after radical retropubic prostatectomy*. Urology 1998; 51 (1): 67-72.
21. Schlomm T, Heinzer H, Steuber T, et al: *Full Functional-Length Urethral Sphincter Preservation During Radical Prostatectomy*. Eur Urol 2011; 60 (2): 320-329.
22. Seaman EK and Benson MC: *Improved continence with tubularized bladder neck reconstruction following radical retropubic prostatectomy*. Urology 1996; 47 (4): 532-535.
23. Malizia AA, Banks DW, Newton NE, et al: *Modified radical retropubic prostatectomy: double continence technique*. J Urol 1989: 141: 316A: 585.
24. Walsh PC, Quinlan DM, Morton RA, et al: *Radical retropubic prostatectomy: improved anastomosis and urinary continence*. Urol Clin North Am 1990; 17 (3): 679-684.
25. Steiner MS, Morton RA, Walsh PC: *Impact of anatomical radical prostatectomy on urinary continence*. J Urol 1991; 145 (3): 512-514.
26. Eastham JA, Kattan MW, Rogers E, et al: *Risk factors for urinary incontinence after radical prostatectomy*. J Urol 1996; 156 (5): 1707-1713
27. Sosnowski R, Demkow T, Kalinowski T, et al: *Ocena trzymania moczu po prostatektomii radykalnej* [*Continence assesment after radical prostatectomy*]. Urol Pol 2008; 61 (Suppl 1): 73.
28. Ramon J, Leandri, P Rossignol G, et al: *Urinary continence following radical retropubic prostatectomy*. Br J Urol 1993; 71 (1): 47-51.
29. Moul JW, Mooneyhan RM, Kao TC, et al: *Preoperative and operative factors to predict incontinence, impotence and stricture after radical prostatectomy*. Prostate Cancer Prostatic Dis 1998; 1 (5): 242-249.
30. Stanford JL, Feng Z, Hamilton AS, et al: *Urinary and sexual function after radical prostatectomy for clinically localized prostate cancer: The Prostate Cancer Outcomes Study*. JAMA 2000; 283: 354-360.
31. Fowler F, Barry MJ, Lu-Yao G, et al: *Effect of radical prostatectomy for prostate cancer on patient quality of life: results from a medicare survey*. Urology 1995; 45 (6): 1007-1015.
32. Braslis KG, Santa-Cruz C, Brickmann AL, Soloway MS: *Quality of life 12 months after radical prostatectomy*. BJUrol 1995; 75: 48-53.
33. Walsh PC, Marschke P, Ricker D, Burnett AL: *Use of intraoperative video documentation to improve sexual function after radical retropubic prostatectomy*. Urology 2000; 55 (1): 62-67.
34. Trpkov K, Gao Y, Hay R, Yimaz A: *No residual cancer on radical prostatectomy after positive 10-core biopsy: incidence, biopsy findings, and DNA specimen identity analysis*. Arch Pathol Lab Med 2006; 130: 811-816.
35. Van Cangh PJ, Richard F, Lorge F, et al: *Adjuvant radiation therapy does not cause urinary incontinence after radical prostatectomy: results of a prospective randomized study*. J Urol 1998; 159: 164-166.
36. Hofmann T, Gaensheimer S, Buchner A, Rohloff R: *An unrandomized prospective comparison of urinary continence, bowel symptoms and the need for further procedures in patients with and with no adjuvant radiation after radical prostatectomy*. BJU Int 2003; 92 (4): 360-364.

Correspondence

Roman Sosnowski
Urooncology Department
Cancer Memorial Hospital
5, Roentgena Street
02-781 Warsaw, Poland
phone:+48 22 546 20 00
roman.sosnowski@gmail.com