Incontinence: Definition and Classification

3

Giovanni Bodo and Enrico Ammirati

3.1 Definition

Urinary incontinence (UI) is a "storage symptom." The most recommended definition of incontinence in men, as well as in women, is that of the fifth International Consultation on Incontinence (ICS): "the complaint of any involuntary loss of urine" [1]. This definition is suitable for epidemiological studies of male incontinence, but in clinical practice it must be emphasized that: the loss of urine should be objectively demonstrable, it should happen in socially unaccepted time and place ("social or hygienic problem"), and it should be expelled from an orthotopic anatomically intact urinary system (e.g., urinary leakage from a ureteroileocutaneous urinary diversion is not considered a form of incontinence).

Urinary incontinence is further classified with regard to the specific circumstance in which urinary leakage occurs. Stress urinary incontinence (SUI), in particular, is considered the complaint of involuntary loss of urine on effort or physical exertion (e.g., sporting activities), or on sneezing or coughing. In case the patient complains of involuntary loss of urine on effort or physical exertion, or on sneezing or coughing associated with urgency, it is better to refer as to mixed incontinence with a prevalent stress incontinence component.

Data found in medical literature show that the prevalence of urinary incontinence in men ranges from 1 to 39 % of the population; the wide variability of data can be explained by the heterogeneity in the population studied, by the different definitions

G. Bodo (✉)
Department of Neurourology, Azienda Ospedaliera Universitaria Città della Salute e della Scienza, Torino, Italy
e-mail: giannibodo@libero.it

E. Ammirati
Department of Urology, Azienda Ospedaliera Universitaria Città della Salute e della Scienza, Torino, Italy

G. Del Popolo et al. (eds.), *Male Stress Urinary Incontinence*,
Urodynamics, Neurourology and Pelvic Floor Dysfunctions,
DOI 10.1007/978-3-319-19252-9_3

of incontinence and by the different methods of data collection [2]. Urgency incontinence is the prevalent complaint in the male incontinent population with predominant prevalence of 40–80 %, followed by mixed forms of urinary incontinence ranging between 10 and 30 % and stress incontinence <10 % [3]. The higher percentages of urgency and mixed types of incontinence are more significant in studies involving older people. In fact, the increasing prevalence of UI in men with age is largely due to the contribution of urgency incontinence rather than stress incontinence. One study demonstrated an increasing rate of urgency UI from 0.7 % between age 50 and 59 to 2.7 % between 60 and 69 and 3.4 % for 70 years and older population; stress UI was steady at 0.5 %, 0.5 % and 0.1 % for the above groups, respectively [4]. On the other hand, Maral and coworkers reported the increasing prevalence also of SUI with age: from 0.9 % between age 35 and 44 to 1.2 % between 45 and 54, 3.8 % between 55 and 64, and 4.9 % for 65 years and older respondents [5]. Multivariate analysis in several studies has shown that age is an important risk factor for incontinence. Compared to women, however, there seems to be a more steady increase in prevalence of urinary incontinence in men with increasing age [6–10].

3.2 Etiologic Classification

As it was exhaustively explained in the previous chapter, the anatomical and functional integrity of the urinary sphincter is crucial in the maintenance of continence. Any cause that directly injures the urinary sphincter or that reduces its capacity of maintaining adequate resistance may result in stress urinary incontinence [11].

Thus we can classify stress urinary incontinence into three main etiologic categories:

1. Neurologic stress urinary incontinence (neurogenic bladder)
2. Stress urinary incontinence associated with prostate cancer (PC) and BPH treatment
3. Post-traumatic stress urinary incontinence

3.2.1 Neurologic Stress Urinary Incontinence (Neurogenic Bladder)

“Neurogenic bladder” is a generic term as it can be applied to a broad spectrum of clinical conditions. The neurogenic conditions that can provoke stress urinary incontinence are sacral spinal cord lesions (spinal dysraphism, sacral agenesis, anorectal anomalies, conus injuries) and subsacral lesions (sacral dysraphism, familiar dysautonomies, cauda equina injuries, pelvic nerve injuries) (Fig. 3.1).

Spinal cord injury (SCI) can be a dramatic consequence of car accidents, sports injuries, spinal vascular events, violence, infection, disc prolapsed or spinal surgery. The male-to-female ratio is around 4:1 and in a published epidemiological study in 2000–2003, the mean age at the time of the injury was 37 ± 17.5 years [12]. SCI is classified by the neurological level of the motor and sensory function on the American Spinal Injury Association (ASIA) Impairment Scale [13]. Bladder and

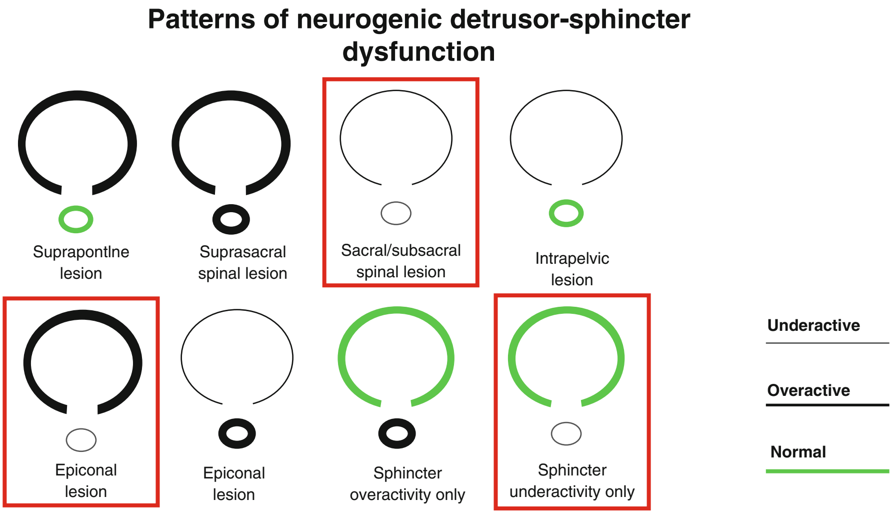

Fig. 3.1 Patterns of neurogenic detrusorsphincter dysfunction (Adapted from The European Association of Urology (EAU)–Madersbacher classification system [14, 15]). *Red squares* – evidence conditions potentially causing SUI

pelvic dysfunction after SCI can be divided into two different phases: acute and chronic. The acute phase, also called "spinal shock," covers the first few weeks or months after the injury and is generally represented by the loss of muscle tone and spinal reflexes caudal to the level of the segmental spinal lesion: detrusor and sphincter are in most cases areflexic; however in this phase, SUI is not typically yet present, surprisingly. SUI is typical of the chronic phase of sacral (conus injuries) and subsacral (cauda equina injuries and pelvic nerve injuries) lesions due to sphincter weakness, sometimes associated also with neurogenic detrusoral overactivity.

3.2.2 Stress Urinary Incontinence Associated with Prostate Cancer and BPH Treatment

Another well-known cause of stress urinary incontinence, and perhaps the most frequent cause of SUI in male, is represented by radical prostatectomy. In a Norwegian survey of elderly men with UI, 28 % of men complaining of UI had undergone prostatectomy [16].

Post-prostatectomy incontinence (PPI) and erectile dysfunction are common problems following surgery for prostate cancer. Open radical prostatectomy (RP) is a common treatment for patients with clinically localized prostate cancer (cT1–cT2) and life expectancy over 10 years, with laparoscopic radical prostatectomy (LRP) and robot-assisted radical prostatectomy (RARP) becoming the most up-to-date techniques. Evaluating the major surgical series coming from referral centers, functional results were overlapping between RP and LRP, with 12-month continence rates ranging from 60 to 93 % after RP and from 66 to 95 % after LRP [17]. Data variability in published studies depends on many factors such as different patient selection, study designs, continence definitions and surgical techniques. A recent systematic review of literature by Ficarra et al. found that the 12-month PPI rates after RARP ranged from 4 to 31 % (mean value 16 %) of cases using a "no pad" definition and from 8 to 11 % (mean value 9 %) when also including as successful for those patients using a safety pad. Age, body mass index, comorbidity index, lower urinary tract symptoms (LUTS) and prostate volume were the most relevant preoperative predictors of urinary incontinence after RARP. A cumulative analysis showed a better 12-month urinary continence recovery after RARP in comparison with RP [18]. Another predictor of urinary incontinence has been identified by Thompson in the surgeon expertise using the RARP technique. Early urinary incontinence scores for RARP surpassed open RP after 182 RARPs, plateauing around 700–800 RARPs [19].

Also another therapeutic option for the treatment of prostate cancer, radiotherapy, is a possible cause of stress urinary incontinence. A recent work compared long-term urinary function after radical prostatectomy or external-beam radiation therapy in a population of 1,665 men with diagnosis of localized PC. Men in the prostatectomy group were significantly more likely than those in the radiotherapy group to report urinary leakage at 2 and 5 years. However, despite absolute differences in the prevalence of urinary incontinence between the two study groups at 15 years (18.3 % and 9.4 %, respectively), they observed no significant difference in the adjusted odds of urinary incontinence (odds ratio, 2.34; 95 % CI, 0.88–6.23) [20].

Surgical treatment for BPH is a rare cause of stress urinary incontinence. Surgical retropubic and soprapubic prostatectomy, in experienced hands, have a low overall rate of morbidity. Stress incontinence and total incontinence are rare often self-limiting, but possible complications [21, 22]. With a precise enucleation of the prostatic adenoma, the risk of injury to the external sphincter mechanism is minimal. Endoscopic treatment is considered a safe procedure with concern to the preservation of the urinary sphincter mechanism. In a large cohort of 3,589 TURP procedures done by a single-surgeon, there were no cases of iatrogenic stress urinary incontinence [23]. Laser technologies are developing and their use is becoming a feasible option to traditional TURP. There are only a few studies analyzing the long-term results of Laser-based procedures for treatment of BPH with small study populations; however, no stress urinary incontinence cases have been yet evidenced [24]. The standard technique of transurethral incision of the prostate (TUIP), if correctly applied, should not be considered a cause of stress urinary incontinence if the operator ends the incision just proximal to the verumontanum. The incidence of urinary incontinence after prostatectomy for benign disease has been reviewed and described in the AHCPR "Benign Prostatic Hyperplasia" Clinical Practice Guidelines [25]. The following percentages for stress incontinence and total incontinence, respectively, were reported: open surgery (retropubic or transvesical prostatectomy): 1.9 and 0.5 %, transurethral incision of the prostate (TUIP): 1.8 and 0.1 % and transurethral resection of the prostate (TURP): 2.2 and 1.0 % [1].

3.2.3 Post-traumatic Stress Urinary Incontinence

The injuries of the urinary tract are the most typical complications of pelvic fractures with disturbance of integrity of the pelvic ring. The close anatomical relationships between the skeletal and connective systems, neurological and vascular structures, and pelvic organs are the predisposing factors for structural and functional damages of the urogenital system. According to the literature, almost 25 % of patients with pelvic ring trauma have any type of urinary tract lesion. Male patients are more susceptible to have urogenital lesions than females: 66 % versus 34 % [26]. The increasing number of injuries to the urogenital tract associated with permanent sequelae is caused by a growing number of pelvic ring fractures as well as, and this is more important, by decreasing mortality in patients with severe trauma to the pelvic ring. The extent of urogenital injury is related to the degree of dislocation of the pelvic skeleton. Injury to the male urethra is the most frequent urogenital trauma because of the male anatomy. It occurs most often in unstable C type fractures when the pelvic ring is disrupted with bone displacement due to shear force at the site of urethra attachment [27]. Incontinence following posterior urethral injuries occurs in 0–20 % of patients and is thought to be due to the extent of injury rather than to the method of management. The data on surgical treatment are mostly retrospective case series and the most commonly published therapy is the artificial urethral sphincter. Bladder neck reconstruction by excising the scar and narrowing the caliber was reported by Iselin and Webster in six patients who had incontinence with an open bladder neck on cistourethrography, following urethroplasty for traumatic strictures [28].

3.3 Severity Classification

Another different way to classify stress urinary incontinence is the evaluation of its severity. Incontinence is an objective manifestation, but it is associated with an important subjective component. The fear of losing even just a few drops of urine in public may condition one's life, so it is not always true that a low-grade incontinence is a minor problem. On the other hand, some patients feel their incontinence as a physiological consequence of aging, accept it and manage to have a normal life even with the existence of a high-grade incontinence. Classification and grading of incontinence, however, is an important and crucial element in clinical evaluation, decision making for treatment and follow-up of patients. There are several ways to indicate the grade and severity of incontinence: the number of pads used per day, the use of pad test, validated questionnaires and the urodynamic evaluation of Valsalva leak point pressure (VLPP).

It is not reliable to define the degree of incontinence evaluating just the number of pads used per day. Every patient may use pads of different brands, having a different absorbing capacity, different size and may change it after a different leakage amount (e.g., some patients may feel discomfort even with a few drops of urine in their pad, and thus change an almost dry pad many times per day). It may be used to evaluate the clinical amelioration or worsening of incontinence in the same patient, but we should be sure that the patient used always the same type of pad and changes the pad always at the same level of leakage. Thus it is better to apply a much more objective method of evaluation: a 1- or 24-h pad test. For the application of the 1-h test, the patient is asked to pass urine 1 h before the beginning of the evaluation and to postpone micturition until the end of the evaluation. During the test, the patient is asked to do some specific activities: (1) drinking 500 mL of water, while sitting for 15 min; (2) walking on a treadmill at a self-determined comfortable speed for 30 min; (3) standing up and sitting down ten times; (4) coughing ten times in a standing position; (5) running on the spot for 1 min; (6) bending down to pick up a coin from the floor five times and (7) washing hands under running water for 1 min [29]. During each activity, the patient is wearing a pre-weighted pad. The values of the exam consist in the sum of the gain of weight of each pad worn by the patient. The reference values may be considered as indicated: <1 g, continent; 1.1–9.9 g, mild incontinence; 10.0–49.9 g, moderate incontinence and >50.0 g, severe incontinence [30]. The 24-h pad test, instead, consists in wearing pre-weighted pads during a 24-h interval, from the morning after passing urine until the morning of the next day. The values of the exam, as in the previous case, consist in the sum of the gain of weight of each pad worn by the patient. The reference values may be considered as indicated: <4 g, continent; 4.1–19.9 g, mild incontinence; 20.0–74.9 g, moderate incontinence and >75.0 g, severe incontinence [31]. The only standardized data available, as those just reported, refer to female population; there is a lack of studies for standardized values for pad test in male. In our experience, for example, we refer to mild SUI in male with 24-h pad test <200 g, moderate male SUI with values between 200 and 400 g and severe SUI in male with values >400 g.

As previously stated, the subjective perception of incontinence by the patients plays a crucial role in the way the disease limits one's life and becomes a problem needed to be treated. Many patients during an office evaluation complain of urinary leakage, their fear of losing urine, the conditions and activities that are mostly associated with leakage and many other relevant clinical elements. This subjective component of incontinence can be measured with the aid of validated questionnaires. They are composed of specific and targeted questions to evaluate specific aspects of incontinence: the different burden of urgency and stress incontinence components, the limitation in everyday life and the implication in modifying one's quality of life. They are easy to be understood by the patient as they have been translated and validated in many languages, and they are repeatable and costless. Even if there are many questionnaires currently available, the ICI committee developed a complete modular questionnaire (ICIQ) to provide a definitive international review and consultative opinion regarding the recommended measures to assess patient-reported outcomes within the area of urinary incontinence and LUTS. The ICIQ modular questionnaire was developed to meet the need for a universally applicable standard guide for the selection of questionnaires for use in clinical practice and clinical research. Fourteen ICIQ modules/questionnaires are currently available for use, with further modules in development. Clinicians or researchers are able to select module(s) to meet the particular requirements of their study or clinical practice [1].

Another way to define the severity of stress incontinence is the urodynamic evaluation of leak point pressure (LPP). The detrusor pressure or the intravesical pressure or the abdominal pressure (pdet or pves or pabd) at which involuntary expulsion of urine from the urethral meatus is observed is the LPP. The rise in bladder pressure causing leakage may originate either from the detrusor (caused for example by the filling of a low-compliance bladder) or from an increase in the abdominal pressure. Thus there are two different leak point pressures – the detrusor LPP (DLPP) and the abdominal LPP (ALPP). The abdominal pressure increase during the latter is produced voluntarily by coughing leak point pressure (CLPP) or by Valsalva maneuver (VLPP). Based on a study of 29 men with incontinence after radical prostatectomy, it was concluded the ALPP is a relatively poor predictor of incontinence severity and, therefore, has limited clinical value in the urodynamic evaluation of post-prostatectomy incontinence. The ALPP can be also measured with the recording of the abdominal pressure only (without simultaneous urethral catheter positioned) and it seems to be more concordant to the clinical severity of incontinence. The urodynamic assessment of these patients should focus on the presence or absence of stress incontinence and on the presence of associated bladder dysfunction [32].

Alternatively the severity of impairment of the urinary sphincter function can be evidenced with a video urodynamic technique for the evaluation of VLPP in men (video-Valsalva leak point pressure/VLPP) [33]. The length of the urethra and the entrapment of urine in the bulbar urethra may render less synchronous measurement of the bladder pressure at the moment of leakage; in our opinion and clinical practice, it may be better to evaluate the bladder pressure at the passage of urine through the proximal urethra seen on fluoroscopy (Fig. 3.2).

LPP, otherwise, can be measured in a retrograde fashion (RLPP). There are two main techniques: (1) by retrograde infusion of the distal urethra while simultaneously recording intraurethral pressure and (2) by the application of a Foley catheter cuffed in the navicular fossa connected to a water infusion system, usually a saline solution bag, dropping into the catheter; the height of the water level in the bag expressed in centimeters at the moment the fluid stops to drop, equals the urethral opening pressure expressed in cmH_2O. Craig et al. demonstrated that RLPP measurements are reproducible and simple to perform and that RLPP correlates significantly with the lowest of multiple ALPP measurements in men with SUI [34].

We need further studies to investigate whether RLPP measurement can definitively replace V-VLPP, especially for keeping sanitary expenses low; on the other hand, video urodynamic testing may allow evaluation of the anatomical integrity of the urethra, thus eliminating the need for further urethrographic scans or urethroscopies.

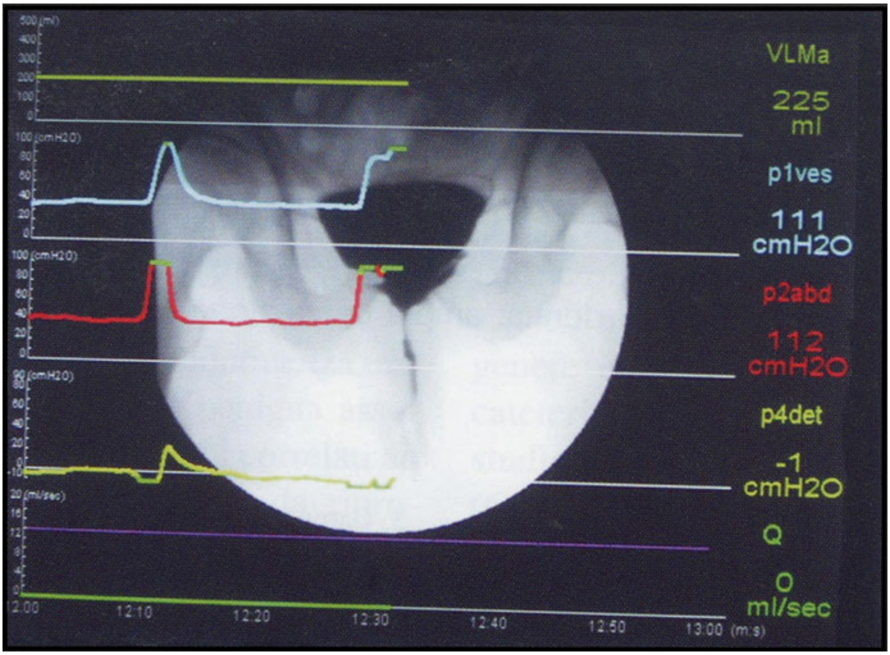

Fig. 3.2 The value of abdominal pressure at the moment of urinary leakage in the posterior urethra at fluoroscopy expresses the video Valsalva leak point pressure. Note that the flowmeter does not record any flow of urine

References

1. Incontinence (2013) 5th international consultation on incontinence, 5th edn. Paris February, 2012
2. Thom D (1998) Variations in estimated of urinary incontinence prevalence in the community: effects of differences in definitions, population characteristics, and study type. J Am Geriatr Soc 46:473
3. Herzog AR, Fultz NH (1990) Epidemiology of urinary incontinence: prevalence, incidence and correlates in community populations. Urology Suppl 36:2
4. Ueda T, Tamaki M, Kageyama S, Yoshimura N, Yoshida O (2000) Urinary incontinence among community dwelling people aged 40 years or older in Japan: prevalence, risk factors, knowledge and self-perception. Int J Urol 7:95
5. Maral I, Ozkardes H, Peskircioglu L, Bumin MA (2001) Prevalence of stress urinary incontinence in both sexes at or after age 15 years: a cross-sectional study. J Urol 165:408
6. Boyle P, Boyle P, Robertson C, Mazzetta C, Keech M, Hobbs FD, Fourcade R, Kiemeney L, Lee C, The UrEpik Study Group (2003) The prevalence of male urinary incontinence in four centres: the UREPIK study. BJU Int 92:943
7. Diokno AC, Estanol MVC, Ibrahim IA, Balasubamanian M (2007) Prevalence of urinary incontiennce in community dwelling men: a cross sectional nationwide epidemiology survey. Int Urol Nephrol 39:129–136
8. Landi F, Cesari M, Russo A, Onder G, Lattansio F, Bernabe R, Silvernet-HC Study group (2003) Potentially reversible risk factors and urinary incontinence in frail older people living in community. Age Ageing 32:194–199

9. Muscatello DJ, Rissel C, Szonyi G (2001) Urinary symptoms and incontinence in an urban community prevalence and associated factors in older men and women. Int Med J 31:151–160
10. Nelson RL, Furner SE (2005) Risk factors for the development of fecal and urinary incontinence in Wisconsin nursing home residents. Maturitas 52:26–31
11. Roberto Carone, La teoria "uretro-centrica", alcune riflessioni su un possibile cambiamento di paradigma. http://www.siud.it/altreimg/La_Teoria_Uretro-Centrica.pdf
12. Jackson AB, Dijkers M, Devivo MJ, Poczatek RB (2004) A demographic profile of new traumatic spinal cord injuries: change and stability over 30 years. Arch Phys Med Rehabil 85:1740–1748
13. Ditunno JF Jr, Young W, Donovan WH, Creasey G (1994) The international standards booklet for neurological and functional classification of spinal cord injury. Am Spinal Injury Assoc Paraplegia 32:70–80
14. Madersbacher H (1990) The various types of neurogenic bladder dysfunction: an update of current therapeutic concepts. Paraplegia 28:217–229
15. Stoehrer M, Blok B, Castro-Diaz D, Chartier-Kastler E, Del Popolo G, Kramerf G, Pannek J, Radziszewski P, Wyndaele J-J (2009) EAU guidelines on neurogenic lower urinary tract dysfunction. Eur Urol 56:81–88
16. Hunskaar S (1992) One hundred and fifty men with urinary incontinence. I. Demography and medical history. Scand J Prim Health Care 10(1):21–25
17. Ficarra V et al (2009) Retropubic, laparoscopic, and robot-assisted radical prostatectomy: a systematic review and cumulative analysis of comparative studies. Eur Urol 55:1037–1063
18. Ficarra V, Novara G, Rosen RC et al (2012) Systematic review and meta-analysis of studies reporting urinary continence recovery after robot-assisted radical prostatectomy. Eur Urol 62(3):405–417
19. Thompson JE et al (2014) Superior quality of life and improved surgical margins Are achievable with robotic radical prostatectomy after a long learning curve: a prospective single-surgeon study of 1552 consecutive cases. Eur Urol 65:521–551
20. Resnick MJ et al (2013) Long-term functional outcomes after treatment for localized prostate cancer. N Engl J Med 368(5):436–445
21. Filiadis I, Adamopoulos V, Konstandinidis E (2007) Modification of retropubic adenomectomy: improved hemostasis and outcome. Int Urol Nephrol 39:169–172
22. Desai MM et al (2009) Single-port transvesical enucleation of the prostate: a clinical report of 34 cases. BJU Int 105:1296–1300
23. Tascı AI, Ilbey YO, Tugcu V, Cicekler O, Cevik C, Zoroglu F (2011) Transurethral resection of the prostate with monopolar resectoscope: single-surgeon experience and long-term results of after 3589 procedures. Urology 78(5):1151–1155
24. Pereira-Correia JA et al (2012) GreenLight HPS ™ 120-W laser vaporization vs transurethral resection of the prostate (<60 mL): a 2-year randomized double-blind prospective urodynamic investigation. BJU Int 110:1184–1189
25. McConnell JD, Barry MJ, Bruskewitz RC et al (1994) Benign prostatic hyperplasia: diagnosis and treatment. Clinical practice guidelines, No. 8. Rockville, MD: Agency for Health Care Policy and Research, Public health service, US department of Health and Human Services. Report No.: AHPCR Publication No. 94-0582
26. Ter-Grigorian AA et al (2013) Urogenital disorders after pelvic ring injuries. Cent European J Urol 66:352–356
27. Pavelka T et al (2010) Urogenital trauma associated with pelvic ring fractures. Acta Chir Orthop Traumatol Cech 77(1):18–23
28. Herschorn S et al (2010) Surgical treatment of stress incontinence in Mes. Neurourol Urodyn 29:179–190
29. Abrams P, Blaivas JG, Stanton SL, Andersen JT (1988) The standardisation of terminology of lower urinary tract function. The International Continence Society Committee on Standardisation of Terminology. Scand J Urol Nephrol 114:S5±19
30. Smither AR, Guralnick ML, Davis NB, See WA (2007) Quantifying the natural history of post-radical prostatectomy incontinence using objective pad test data. BMC Urol 7:2

31. O'Sullivan R, Karantanis E, Stevermuer TL, Allen W, Moore KH (2004) Definition of mild, moderate and severe incontinence on the 24-hour pad test. BJOG 111:859–862
32. Twiss C, Fleischmann N, Nitti VW (2005) Correlation of abdominal leak point pressure with objective incontinence severity in men with post-radical prostatectomy stress incontinence. Neurourol Urodyn 24:207–210
33. Carone R, Vercelli D. Urodinamica clinica, vol. 1 Tecniche, Cap. 12 Videourodinamica, Società italiana di Urodinamica
34. Comiter CV, Sullivan MP, Yalla SV (1997) Retrograde leak point pressure for evaluating post-radical prostatectomy incontinence. Urology 49(2):231–236