The Standardisation of Terminology and Assessment of Functional Characteristics of Intestinal Urinary Reservoirs

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1. Introduction

In 1993, the International Continence Society (ICS) established a committee for standardisation of terminology and assessment of functional characteristics of intestinal urinary reservoirs in order to allow reporting of results in a uniform fashion so that different series and different surgical techniques can be compared.

This report is consistent with earlier reports of the International Continence Society Committee on Standardisation of Terminology with special reference to the collated ICS report from 1988 (see Appendix 1, Part 2).

As the present knowledge about physiological characteristics of intestinal urinary reservoirs is rather limited in regard to normal and abnormal reservoir sensation, compliance, activity, continence, and other specifications, some of the definitions are necessarily imprecise and vague. However, it was felt that this report still would be capable of stipulating the standardised assessment of intestinal urinary reservoirs and reporting of the results in order to accumulate more information about physiological characteristics of intestinal urinary reservoirs and to establish precise definitions of normal and abnormal conditions. With increased knowledge and better understanding of intestinal urinary reservoirs, this report will have to be updated to become more specific.

It is suggested that in written publications, the acknowledgement of these standards is indicated by a footnote to the section Methods and Materials or its equivalent: “Methods, definitions and units conform to the standards recommended by the International Continence Society, except where specifically noted.”

2. Terminology of Surgical Procedures

Up to now, when different surgical procedures for constructing an intestinal urinary reservoir are described, conflicting terminology is often used. This section defines the terminology of surgical procedures used throughout the report. These definitions may not be universally applicable to the published scientific literature to date, viewed in retrospect, but represent a standardised terminology for surgical procedures for the future.

Definitions

Bladder augmentation is a surgical procedure for increasing bladder capacity. This may be accomplished without other tissues (e.g., autoaugmentation) or with incorporation of other tissues such as intestine (enterocystoplasty, intestinocystoplasty), with or without changing the shape of such intestine (i.e., detubularisation and reconfiguration), and with or without resection of a portion of the original bladder.

Bladder replacement – see “Bladder Substitution.”

Bladder substitution (Bladder Replacement) is a surgical procedure for in situ (orthotopic) total substitution/replacement of the bladder by other tissues such as isolated intestine. After subtotal excision of the original bladder (e.g., in interstitial cystitis) the intestinal urinary reservoir may be connected to the bladder neck (bladder substitution to bladder neck) and after complete excision of the original bladder (radical cystoprostatectomy), the reservoir may be connected to the urethra as a continent outlet (bladder substitution to urethra). If indicated, the urethral closure function may be surgically

supported in addition (e.g., sling procedure, prosthetic sphincter, periurethral injections). Alternatively, an orthotopically placed urethral substitute/replacement, e.g., from intestine may be used as a continent outlet for a complete substitution of the lower urinary tract.

Continent anal urinary diversion is a surgical procedure for continent urinary diversion utilising bowel in continuity or isolated bowel as a reservoir and the anus as a continent outlet.
Continent cutaneous urinary diversion is a surgical procedure for continent urinary diversion providing an urinary reservoir, e.g., from intestine and a continence mechanism, e.g., from intestine for formation of a continent heterotopically placed (e.g., cutaneous) outlet (stoma).

Enterocystoplasty (bladder augmentation with intestine) – see “Bladder Augmentation”.

Intestinocystoplasty (bladder augmentation with intestine) – see “Bladder Augmentation”.

3. Assessment

3.1. Experimental Assessment

For reporting animal studies, the principles and standards for experimental scientific publications should be followed. Species, sex, weight, and age of the animals must be stated, as well as type of anesthesia. If chronic experiments are performed, the type of treatment between the initial experiment and the evaluation experiment should be stated. Raw data should be presented and, when applicable, the type of statistical analysis must be stated. For standardisation of urodynamic evaluation see 4 and 5.

3.2. Patient Assessment

The assessment of patients with intestinal urinary reservoirs should include history, frequency/volume chart, physical examination, and evaluation of the upper urinary tract.

3.2.1. History

The history must include etiology of the underlying disease (i.e., congenital anomaly, neurogenic bladder dysfunction, lower urinary tract trauma, radiation damage, bladder cancer or other tumours of the true pelvis) and indication for constructing an intestinal urinary reservoir (e.g., radical surgery for malignancy in the true pelvis, low bladder capacity/compliance, upper tract deterioration due to vesicoureteral obstruction or reflux, urinary incontinence). Information must be available on the duration of previous history of the underlying disease, previous urinary tract infections, and relevant surgery.

The history should also provide information on dexterity and ambulatory status of the patient (i.e., wheelchair bound, paraplegia, or tetraplegia).

Information on sexual and bowel function must be reported in respect to the status prior to applying an intestinal urinary reservoir.

The urinary history must report symptoms related to both the storage and evacuation functions of the lower urinary tract with special reference to the technique of evacuation (i.e., spontaneous voiding with or without abdominal straining, Valsalva or Crede manoeuvres, intermittent catheterisation). Problems of evacuation due to mucus production or difficulty with catheterisation must be reported. Incidence of urinary infections must be reported in respect to the incidence prior to construction of an intestinal urinary reservoir.

3.2.2. Specification of Surgical Technique

The surgical technique must be specified stating the applied type of urinary reservoir and origin of gastrointestinal segments used (e.g., stomach, ileum, cecum, transverse colon, sigmoid colon, rectum), length and shape (e.g., tubular, detubularised) of bowel segments, the technique of urethral implantation (when applicable) and the type of the continent outlet (i.e., original urethra, functionally supported urethra, anal sphincter, catheterisable continent cutaneous outlet). If an intussusception nipple valve is applied, technique of fixation of the intussusception (i.e., sutures, staples) should be stated.

Additional and combined surgical procedures in the true pelvis must be reported, such as hysterectomy, colposuspension, excision of vaginal or rectal urinary fistulae, or resection of rectum. Information of adjuvant treatment, such as pharmacotherapy, physiotherapy, or electrical stimulation, must be available.

3.2.3. Frequency/Volume Chart

On the frequency/volume chart the time and volume of each micturition are reported along with quantities of fluid intake. It must be stated if evacuation was prompted by the clock or by sensation. In addition, episodes of urgency and incontinence have to be reported. The frequency/volume chart can be used for the primary assessment of symptoms of urgency, frequency, and incontinence and for followup studies.

3.2.4. Physical Examination

Besides general, urological, and, when appropriate, gynecological examination, the neurological status should be assessed with special attention to sensitivity of the sacral dermatomes, sacral reflex activity (anal reflex, bulbocavernosus reflex), and anal sphincter tone and control.

3.2.5. Evaluation of the Upper Urinary Tract

Evaluation of renal function and morphology must be related to the status prior to constructing an intestinal urinary reservoir. Studies of renal morphology can be based on renal ultrasound, intravenous pyelography, and radioisotope studies. Quantification of findings should be recorded by using accepted classifications of upper tract dilatation [Emmett and Witten, 1971], renal scarring [Smellie et al., 1975], and urethral reflux [Heikel and Parkkulainen, 1966]. Renal function should be assessed by measuring the serum concentration of creatinine and, if indicated, by creatinine clearance and radioisotope clearance studies.

3.2.6. Other Relevant Studies

Reported complications of urinary diversion into an intestinal reservoir include electrolyte and blood-gas imbalance, malabsorption syndromes, urolithiasis,

urinary tract infection, and development of a secondary malignancy. Follow-up evaluation should include relevant tests when applicable and indicated, and reports should state the results of such studies as serum electrolyte concentrations, analysis of blood gases, serum levels of vitamins A, B12, D, E, K, and folic acid, serum levels of bile acids, urine osmolality and pH, urine excretion of calcium, phosphate, oxalate, and citrate, colonisation of urine, and findings on endoscopy and biopsy of the urinary reservoir.

4. Procedures Related to the Evaluation of Urine Storage in an Intestinal Urinary Reservoir

4.1. Enterocystometry

Enterocystometry is the method by which the pressure/volume relationship of the intestinal urinary reservoir is measured. All systems are zeroed at atmospheric pressure. For external transducers the reference point is the superior edge of the symphysis pubis for bladder augmentation, bladder substitution or continent anal urinary diversion, and the level of the stoma for continent cutaneous urinary diversion. Enterocystometry is used to assess reservoir sensation, compliance, capacity, and activity. Before filling is started, residual urine must be evacuated and measured. Enterocystometry is performed with the patient awake and unsedated, not taking drugs that may affect reservoir characteristics. In a urodynamic follow-up study for evaluation of adjutant treatment (e.g., pharmacological therapy) of an intestinal urinary reservoir, mode of action, dosage, and route of administration (enteral, parenteral, topical) of the medication have to be specified.

As an intestinal urinary reservoir starts to expand when permitted to store urine, time intervals between surgery for construction of the intestinal urinary reservoir, its first functional use for storage of urine and urodynamic testing must be stated. For reporting of functional characteristics of an intestinal urinary reservoir, the time interval between surgery and enterocystometric assessment must be stated to account for postoperative expansion of the reservoir. As several intestinal segments used in urinary reservoirs react to gastric stimuli, time interval between food ingestion and the urodynamic evaluation should be stated. Reporting of pressure/volume relationships of an intestinal urinary reservoir should be obtained at standardised filling volumes or standardised pressures, which must be stated in absolute numbers.

Specify

a) Access (transurethral, transanal, transstomal, percutaneous);
b) Fluid medium;
c) Temperature of fluid (state in degrees Celsius);
d) Position of patient (supine, sitting or standing);
e) Filling may be by diuresis or catheter. Filling by catheter may be continuous or stepwise: the precise filling rate should be stated. When the stepwise filling is used, the volume increment should be stated. For general discussion, the following terms for the range of filling rate should be used:

i) up to 10 ml per minute is slow fill enterocystometry (“physiological” filling);
ii) 10-100 ml per minute is medium fill enterocystometry;
iii) over 100 ml per minute is rapid fill enterocystometry.

Technique

a) Fluid-filled catheter – specify number of catheters, single or multiple lumens, type of catheter (manufacturer), size of catheter, type (manufacturer), and specifications of external pressure transducer; b) Catheter mounted microtransducer – list specifications; c) Other catheters – list specifications; d) Measuring equipment.

Definitions

Total reservoir pressure is the pressure within the reservoir.

Abdominal pressure is taken to be the pressure surrounding the reservoir. In current practice it is estimated from rectal or, less commonly, intraperitoneal or intragastric pressures.

Subtracted reservoir pressure is estimated by subtracting abdominal pressure from total reservoir pressure. The simultaneous recording of the abdominal pressure trace is essential for the interpretation of the subtracted reservoir pressure trace as artefacts of the subtracted reservoir pressure may be produced by intrinsic rectal contractions or relaxations.

Contraction pressure (amplitude) is the difference between maximum reservoir pressure during a contraction of an intestinal urinary reservoir and baseline reservoir pressure before onset of this contraction. Contraction pressures may be determined from the pressure curves of total reservoir pressure or subtracted reservoir pressure. For assessment of functional significance of such activity of an intestinal urinary reservoir, pressure and volume must be stated for the first, a typical, and the maximum contraction. The frequency of contractions should be stated at a specified volume.

Leak point pressure is the total reservoir pressure at which leakage occurs in the absence of sphincter relaxation. Leakage occurs whenever total reservoir pressure exceeds maximum outlet pressure so that a negative outlet closure pressure results.

Reservoir sensation is difficult to assess because of the subjective nature of interpreting fullness or “flatulence” from the bowel segments of the intestinal urinary reservoir. It is usually assessed by questioning the patient in relation to the sensation of fullness of the intestinal urinary reservoir during enterocystometry.

Commonly used descriptive terms are similar to conventional cystometry:

First desire to empty

Normal desire to empty (this is defined as the feeling that leads the patient to empty at the next convenient moment, but emptying can be delayed if necessary);

Strong desire to empty (this is defined as a persistent desire to empty without the fear of leakage);

Urgency (this is defined as a strong desire to empty accompanied by fear of leakage or fear of pain);

Pain (the site and character of which should be specified).

Maximum enterocystometric capacity is the volume at strong desire to empty. In the absence of sensation, maximum enterocystometric capacity is defined by the onset of leakage. If the closure mechanism of the outlet is incompetent, maximum enterocystometric capacity can be determined by occlusion of the outlet, e.g., by a Foley catheter. In the absence of both sensation and leakage, maximum enterocystometric capacity cannot be defined in the same terms and is the volume at which the clinician decides to terminate filling, e.g., because of a risk of over-distension.

Functional reservoir capacity or evacuated volume is assessed from a frequency/volume chart (urinary diary). If a patient empties the urinary reservoir by intermittent catheterisation, functional reservoir capacity will be dependent on presence or absence of sensation and/or leakage. Thus, when reporting functional reservoir capacity the following should be stated:

a) Mode of evacuation (e.g., spontaneous voiding, intermittent catheterisation);
b) Presence/absence of sensation of fullness;
c) Presence/absence of leakage;
d) Timing of evacuation (e.g., by sensation, by the clock, by leakage).

Maximum (anaesthetic) anatomical reservoir capacity is the volume measured after filling during a deep general or spinal/epidural anaesthetic, specifying fluid temperature, filling pressure and filling rate.

Compliance describes the change in volume over a related change in reservoir pressure. Compliance (*C*) is calculated by dividing the volume change (<DELTA>*V*) by the change in subtracted reservoir pressure (<DELTA>P_S) during that change in reservoir volume (C = A <DELTA>*V*/<DELTA>P_S). Compliance is expressed as ml per cmH2O.

4.2. Outlet Pressure Measurement

It should be noted that even under physiological conditions the evaluation of the competence of the closure mechanism of a continent outlet by measuring intraluminal pressures under various conditions is regarded as an idealized concept. Moreover, measurements of intraluminal pressures for functional evaluation of a continent outlet do not allow comparison of results between different closure mechanisms, which are in use with different types of intestinal urinary reservoirs. In addition, similar closure mechanisms may behave differently when used in different types of intestinal urinary reservoirs.

Therefore, urodynamic measurements of a continent outlet always have to be related to symptoms of the patient as assessed by history, frequency/volume chart, and, when applicable, measurement of urine loss.

The rationale of performing outlet pressure measurements is not to verify continence or degree of incontinence but to understand how different closure mechanisms work, which urodynamic parameters reflect their competence or

dysfunction, and how their function is related to the characteristics of a reservoir.

In current urodynamic practice, intraluminal outlet pressure measurements are performed by a number of different techniques which do not always yield consistent values. Not only do the values differ with the method of measurement but there is often a lack of consistency for a single method – for example, the effect of catheter rotation when outlet pressure is measured by a catheter mounted microtransducer.

Measurements can be made at one point in the outlet (stationary) over a period of time, or at several points along the outlet consecutively during continuous or intermittent catheter withdrawal forming an outlet pressure profile (OPP). OPPs should be obtained at significant filling volumes of an intestinal urinary reservoir, which must be standardised and stated.

Two types of OPP can be measured:

a) Resting outlet pressure profile – with the urinary reservoir and the subject at rest;
b) Stress outlet pressure profile – with a defined applied stress (e.g., cough, strain, Valsalva manoeuvre).

The outlet pressure profile denotes the intraluminal pressure along the length of the closure mechanism. All systems are zeroed at atmospheric pressure. For external transducers the reference point is the level of the continence mechanism. For catheter mounted transducers the reference point is the transducer itself. Intrareservoir pressure should be measured to exclude a simultaneous reservoir contraction. The subtraction of total reservoir pressures from intraluminal outlet pressures produces the outlet closure pressure profile.

Specify

a) Infusion medium; b) Rate of infusion;
c) Stationary, continuous or intermittent catheter withdrawal; d) Rate of withdrawal;
e) Reservoir volume;
f) Position of patient (supine, sitting or standing); g) Technique (catheters, transducers, measurement technique and recording apparatus are to be specified according to the 1988 ICS report; see Appendix 1, Part 2).

Definitions

Maximum outlet pressure is the maximum pressure of the measured profile.

Maximum outlet closure pressure is the difference between maximum outlet pressure and total reservoir pressure.

Functional outlet profile length is the length of the closure mechanism along which the outlet pressure exceeds total reservoir pressure.

Functional outletprofile length (on stress) is the length over which the outlet pressure exceeds total reservoir pressure on stress.

Pressure "transmission" ratio[1] is the increment in outlet pressure on stress as a percentage of the simultaneously recorded increment in the total reservoir pressure. For stress profiles obtained during coughing, pressure "transmission" ratios can be obtained at any point along the closure mechanism. If single values are given, the position in the closure mechanism should be stated. If several transmission ratios are defined at different points along the closure mechanism, a pressure "transmission" profile is obtained. During "cough profiles" the amplitude of the cough should be stated if possible.

4.3. Quantification of Urine Loss

On a frequency/volume chart, incontinence can be qualified (with/without urge or stress) and quantified by the number, type, and dampness (damp/wet/soaked) of pads used each day. However, subjective grading of incontinence may not completely disclose the degree of abnormality. It is important to relate the complaints of each patient to the individual urinary regimen and personal circumstances, as well as to the results of objective measurement.

In order to assess and compare results of different series and different surgical techniques, a simple standard test can be used to measure urine loss objectively in any subject. In order to obtain a representative result, especially in subjects with variable or intermittent urinary incontinence, the test should occupy as long a period as possible; yet it must be practical. The circumstances should approximate to those of everyday life, yet be similar for al1 subjects to allow meaningful comparison.

The total amount of urine lost during the test period is determined by weighing a collecting device such as a nappy, absorbent pad, or condom appliance. A nappy or pad should be worn inside waterproof underpants or should have a waterproof backing if worn over a continent stoma. Care should be taken to use a collecting device of adequate capacity.

Immediately before the test begins the collecting device is weighed to the nearest gram.

In the 1988 collated report on "Standardisation of Terminology of Lower Urinary Tract Function" (see Appendix 1, Part 2), the ICS has offered the choices to conduct a pad test either with the patient drinking 500 ml sodium-free liquid within a short period (max. 15 min) without the patient voiding before the test or after having the bladder filled to a defined volume. Because there is a great variation in the functional capacity of different types of intestinal urinary reservoirs and since some types of closure mechanism of the outlet physiologically have a leak point and others have no leak point, it is recommended that the reservoir is emptied by catheterisation immediately before the test and refilled with a reasonable volume of saline, which must be standardised and be stated in absolute numbers. A typical test schedule and additional procedures are described in the 1988 ICS report (Appendix 1, Part

2). Specifications for presentation of results, findings, and statistics from the 1988 ICS report are applicable (Appendix 1, Part 2).

5. Procedures Related to the Evaluation of Evacuation of an Intestinal Urinary Reservoir

5.1. Mode of Evacuation

The mode of evacuation of an intestinal urinary reservoir varies as some patients may have a surgically constructed closure mechanism requiring catheterisation (e.g., continent cutaneous urinary diversion) and sorne patients may have a reservoir with a physiological sphincter mechanism (e.g., bladder augmentation, bladder substitution to bladder neck or to urethra, continent anal urinary diversion), through which they may be able to evacuate urine spontaneously. However, as catheterisation may also be required after bladder augmentation or bladder substitution to bladder neck or to urethra, it must be stated by what means the reservoir is emptied (e.g., spontaneous evacuation with or without Valsalva or Crede manoeuvres and/or intermittent catheterisation).

If intermittent catheterisation is necessary, whether it is performed on a regular basis or only periodically, the intervals between catheterisations must be stated.

Measurements of urinary flow, reservoir pressures during micturition and residual urine apply only to patients with bladder augmentation or bladder substitution to bladder neck or to urethra who void spontaneously. However, as there is no volitional initiation of contraction of an intestinal urinary reservoir, spontaneous evacuation is different from voiding by a detrusor contraction.

In patients with an intestinal urinary reservoir, evacuation is initiated by relaxation of the urethral sphincteric mechanisms and/or passive expression of the reservoir by abdominal straining or Valsalva or Crede manoeuvres. Therefore, measurements of flow and micturition pressures must be interpreted with great caution in respect of the diagnosis of an outlet obstruction.

5.2. Measurements of Urinary Flow, Micturition Pressure, Residual Urine

For specifications of measurements of urinary flow, reservoir pressures during micturition and residual urine the 1988 ICS report is applicable (Appendix 1, Part 2). The specifications of patient position, access for pressure measurement, catheter type, and measuring equipment are as for enterocystometry (see 4.1).

6. Classification of Storage Dysfunction of an Intestinal Urinary Reservoir

Dysfunction of an intestinal urinary reservoir has to be defined in respect to indications and functional intentions of incorporating bowel into the urinary tract. The rationale of using an intestinal urinary reservoir is to improve or provide storage function by:

a) Reducing bladder hypersensitivity;
b) Providing/enlarging reservoir capacity;
c) Providing/improving reservoir compliance;
d) Lowering bladder pressures/providing low reservoir pressures;
e) Improving/providing the closure function of the outlet.

It is not a primary goal of surgery to maintain or provide the capability of spontaneous voiding; intermittent catheterisation is required for evacuation of the reservoir in all cases of continent cutaneous diversion and in many other situations. The need to evacuate a urinary reservoir by intermittent catheterisation is not regarded as a failure in bladder augmentation and bladder substitution to bladder neck or to urethra, even though the majority of patients may evacuate urine spontaneously.

Consequently, the classification of dysfunctions of an intestinal urinary reservoir relates to the storage phase only. Problems of storing urine in an intestinal urinary reservoir may be related to dysfunction of the reservoir or dysfunction of the outlet. The classification is based on the pathophysiology of dysfunction as assessed by various urodynamic investigations. The urodynamic findings must be related to the patient's symptoms and signs. For example, the presence of reservoir contractions in an asymptomatic patient with normal upper tract drainage does not warrant a diagnosis of reservoir overactivity unless the contractions cause urine leakage or other problems defined below.

6.1. Reservoir Dysfunction

The symptoms of frequency, urgency, nocturia, and/or incontinence may relate to dysfunction of an intestinal urinary reservoir and should be assessed by enterocystometry, which is an adequate test for evaluation of the pathophysiology of a reservoir dysfunction (see 4.1). Abnormal findings may relate to sensation, compliance, capacity, and/or activity of an intestinal urinary reservoir.

6. 1.1. Sensation

Sensations from an intestinal urinary reservoir as assessed by questioning the patient during enterocystometry can be classified in qualitative terms. Often these symptoms are associated with contractions of the reservoir as shown by enterocystometry or fluoroscopy. However, up to now there is insufficient information about an isolated hypersensitive state of the bowel of an intestinal urinary reservoir. If symptoms such as frequency, urgency, and nocturia are persisting after bladder augmentation or bladder substitution to bladder neck (e.g., in interstitial cystitis), they are likely to derive from

remnants of the original lower urinary tract, which have not been replaced by intestine, if enterocystometry is otherwise normal.

6.1.2. Capacity/Compliance

Capacity of an intestinal urinary reservoir is determined by sensation and/or compliance. For definitions of reservoir capacity and compliance (AV/AP), see 4.1. Compliance describing the change in volume over a related change in reservoir pressure is likely to reflect a different physiology when determined in an intestinal urinary reservoir as compared to the urinary bladder. The calculation of compliance will reflect wall characteristics of an intestinal urinary reservoir such as distensibility only after a process of “unfolding” of an empty intestinal urinary reservoir has been completed and stretching of the walls begins to take place, which is different in the normal urinary bladder. Compliance may change during the enterocystometric examination and is variably dependent upon a number of factors including:

a) Rate of filling;
b) The part of the enterocystometrogram curve used for compliance evaluation;
c) The volume interval over which compliance is calculated;
d) The distensibility of the urinary reservoir as determined by mechanical and contractile properties of the walls of the reservoir.

During normal filling of an intestinal urinary reservoir little or no pressure changes occur and this is termed “normal compliance.” However, at the present time there is insufficient data to define normal, high, and low compliance. When reporting compliance, specify:

a) The rate of filling;
b) The volume at which compliance is calculated;
c) The volume increment over which compliance is calculated;
d) The part of the enterocystometrogram curve used for the calculation of compliance.

The selection of bowel segments, the size of bowel (diameter, length), and the geometry (shape) of a reservoir after bowel detubularisation and reconfiguration determine capacity of an intestinal urinary reservoir [Hinman, 1988]. For a given length of bowel, reconfiguration into a spherical reservoir provides the largest capacity. The distensibility of bowel wall, as assessed in experimental models, varies between bowel segments (i.e., large bowel, small bowel, stomach) and with orientation (longitudinal, circumferential) of measurement within a bowel segment [Hohenfellner et al., 1993]. However, the relative contributions of wall distensibility (influenced by selection of bowel segments) and of geometric capacity (influenced by size of selected bowel and reservoir shape after detubularisation and reconfiguration) in determining the capacity of an intestinal urinary reservoir are not yet precisely understood. Low capacity of an intestinal urinary reservoir may relate to bowel size (diameter/length) and/or configuration of bowel segments in the reservoir (e.g., tubular, inadequate detubularisation, and reconfiguration).

6.1.3. Activity

In intact bowel segments, peristaltic contractions are elicited at a certain degree of wall distension. As a result of detubularisation and reconfiguration of bowel segments in an intestinal urinary reservoir, such contractions do not encompass the whole circumference of a reservoir. Net pressure changes in the reservoir are determined by the mechanical and muscular properties of both the contracting and the non-contracting segments of the reservoir. Contractions of segments of an intestinal urinary reservoir may be observed by fluoroscopy but may not increase subtracted reservoir pressure if the generated forces are counterbalanced by other segments of a urinary reservoir which relax and distend. Some contractile activity of an intestinal urinary reservoir is a normal finding on enterocystometry or fluoroscopy.

Overactivity of an intestinal urinary reservoir is defined as a degree of activity which causes lower urinary tract symptoms and/or signs of upper tract deterioration in the absence of other causes of upper tract damage such as urethral obstruction or reflux. Symptoms such as abdominal cramping, urgency, frequency, and/or leakage may be related to reservoir activity seen during enterocystometry and thus establish the diagnosis of an unacceptable degree of reservoir activity ("overactivity"). Signs of impaired upper tract drainage may be associated with elevated subtracted reservoir pressures on enterocystometry due to an early onset, high amplitudes, and/or frequency of contractions and thus establish the diagnosis of overactivity even if subjective symptoms are not experienced.

However, since a precise definition of normal and increased activity of a urinary reservoir from intestine is not yet established, the frequency of contractions should be reported at a specified volume and the pressure/volume relationships should be stated for the following defined contractions of the reservoir:

a) First contraction;
b) Contraction with maximum contraction pressure (amplitude);
c) Typical contraction.

The diagnosis of overactivity of an intestinal urinary reservoir should not be made until a reasonable interval – which must be stated – has elapsed after surgery, since an intestinal urinary reservoir expands after surgery, when permitted to store urine, and since some of the reservoir activity subsides with time with an increase of capacity.

6.2. Outlet Dysfunction

The symptoms of incontinence and/or difficulties with catheterisation may relate to dysfunction of the outlet of an intestinal urinary reservoir and should be assessed in terms of pathophysiology. Leakage may occur if total reservoir pressure exceeds outlet pressure so that the result is a negative outlet closure pressure as assessed by outlet pressure profiles (see 4.2). For such

an event, volume and total reservoir pressure at onset of leakage (leak point pressure) must be stated.

Leakage may occur with a functioning closure mechanism because of an excessive reservoir pressure increase due to contractions of the intestinal urinary reservoir (overactivity) or overdistension of the reservoir (overflow).

The definition of incompetence of a closure mechanism is different for a closure mechanism which physiologically has a leak point from that for a closure mechanism without a leak point.

A closure mechanism which physiologically has a leak point (e.g., the urethral sphincter, some types of closure mechanism in continent cutaneous urinary diversion) is incompetent if it allows leakage or urine in the absence of contraction of the intestinal urinary reservoir (overactivity) or overdistension of the reservoir (overflow) as assessed by enterocystometry (see 4.1). A closure mechanism which normally has no leak point (e.g. an intussusception nipple) is incompetent if it permits leakage of urine independent of results of enterocystometry.

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