

Lower Urinary Tract Rehabilitation Techniques: Seventh Report on the Standardization of Terminology of Lower Urinary Tract Function

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International Continence Society Committee on Standardization of Terminology

Contents

1. Introduction	594
2. Pelvic Floor Training	594
2.1. Definition	594
2.2. Techniques	594
2.3. Applications	595
3. Biofeedback	595
3.1. Definition	595
3.2. Techniques	596
3.3. Applications	596
4. Behavioral Modification	596
4.1. Definition	596
4.2. Techniques	596
4.3. Applications	597
5. Electrical Stimulation	598
5.1. Definition	598
5.2. Techniques	598
5.3. Units of measurement/symbols	599
5.4. Applications	599
6. Voiding Maneuvers	601
6.1. Catheterization	601
6.2. Bladder Reflex Triggering	603
6.3. Bladder Expression	603

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1. INTRODUCTION

Lower urinary tract rehabilitation comprises non-surgical, non-pharmacological treatment for lower urinary tract dysfunction. The specific techniques defined in this report are listed in the contents above.

Most of the conditions for which rehabilitation techniques are employed have both a subjective and an objective component. In many instances, treatment is only capable of relieving symptoms, not curing the underlying disease. Therefore, symptoms should be quantified before and after treatment, and the means by which the physiology is altered should be clearly stated.

The applications of the individual types of treatment cited here are taken from the scientific literature and from current clinical practice. It is not within the scope of this committee to endorse specific recommendations for treatment, nor to restrict the use of these treatments to the examples given.

The standards set in this report are recommended to ensure the reproducibility of methods of treatment and to facilitate the comparison of results obtained by different investigators and therapists. It is suggested that acknowledgement of these standards, in written publications, should be indicated by a footnote to the section 'Methods and Materials' or its equivalent, to read as follows:

'Methods, definitions and units conform to the standards recommended by the International Continence Society, except where specifically noted.'

2. PELVIC FLOOR TRAINING

2.1 Definition

Pelvic floor training is defined as repetitive selective voluntary contraction and relaxation of specific pelvic floor muscles. This necessitates muscle awareness in order to be sure that the correct muscles are being utilized, and to avoid unwanted contractions of adjacent muscle groups.

2.2 Techniques

2.2.1 Standard of diagnosis and implementation. The professional status of the individual who establishes the diagnosis must be stated as well as the diagnostic techniques employed. Also the professional status of the person who institutes, supervises and assesses treatment must be specified.

2.2.2 Muscle awareness. The technique used for obtaining selective pelvic floor contractions and relaxations should be stated. Registration of electromyographic (EMG) activity in the muscles of the pelvic floor, urethral or anal sphincter, or the anterior abdominal wall, may be necessary to obtain this muscle awareness. Alternatively or additionally, registration of abdominal, vaginal, urethral or anal pressure may be used for the same purpose.

2.2.3 Muscle training. It should be specified as to whether treatment is given on an inpatient or outpatient basis. Specific details of training must be stated:

1. Patient position
2. Duration of each contraction
3. Interval between contractions

4. Number of contractions per exercise
5. Number of exercises per day
6. Length of treatment program (weeks, months)

2.2.4 Adjunctive equipment. Adjunctive equipment may be employed to enhance muscle awareness or muscle training. The following should be specified:

1. Type of equipment
2. Mechanism of action
3. Duration of use
4. Therapeutic goals

Examples of equipment in current use are:

Perineometers and other pressure-recording devices
 EMG equipment
 Ultrasound equipment
 Faradic stimulators
 Interferential current equipment
 Vaginal cones

2.2.5 Compliance. Patient compliance has three major components:

1. Appropriate comprehension of the instructions and the technique
2. Ability to perform the exercises
3. Completion of the training program

Objective documentation of both the patient's ability to perform the exercises and the result of the training programme is mandatory. The parameters employed for objective documentation during training should be the same as those used for teaching muscle awareness.

2.3 Applications

Pelvic floor training can be used as treatment on its own, or as an adjunctive therapy, or for prophylaxis. The indications, mode of action and the therapeutic goals must be specified. Examples of indications for therapeutic pelvic floor training are incontinence and descent of the pelvic viscera (prolapse). Examples of indications for prophylactic pelvic floor training are postpartum and following pelvic surgery.

3. BIOFEEDBACK

3.1 Definition

Biofeedback is a technique by which information about a normally unconscious physiological process is presented to the patient and the therapist as a visual, auditory or tactile signal. The signal is derived from a measurable physiological parameter, which is subsequently used in an educational process to accomplish a specific therapeutic result. The signal is displayed in a quantitative way and the patient is taught how to alter it and thus control the basic physiological process.

3.2 Techniques

The physiological parameter (e.g. pressure, flow, EMG) which is being monitored, the method of measurement and the mode by which it is displayed as a signal (e.g. light, sound, electric stimulus) should all be specified. Further, the specific instructions to the patient by which he/she is to alter the signal must be stated. The following details of biofeedback treatment must also be stated:

1. Patient position
2. Duration of each session
3. Interval between sessions
4. Number of sessions per day/week/month and intervals between
5. Length of treatment program (weeks, months)

3.3 Applications

The indications, the intended mode of action and the therapeutic goals must be specified. The aim of biofeedback is to improve a specific lower urinary tract dysfunction by increasing patient awareness, and by alteration of a measurable physiological parameter. Biofeedback can be applied in functional voiding disorders where the underlying pathophysiology can be monitored and subsequently altered by the patient. The following are examples of indications and techniques for biofeedback treatment:

Motor urgency and urge incontinence: display of detrusor pressure and control of detrusor contractions

Dysfunctional voiding: display of sphincter EMG and relaxation of the external sphincter

Pelvic floor relaxation: display of pelvic floor EMG and pelvic floor training

4. BEHAVIORAL MODIFICATION

4.1 Definition

Behavioral modification comprises analysis and alteration of the relationship between the patient's symptoms and his/her environment for the treatment of maladaptive voiding patterns. This may be achieved by modification of the behaviour and/or environment of the patient.

4.2 Techniques

When behavioral modification is considered, a thorough analysis of possible interactions between the patient's symptoms, his general condition and his environment is essential. The following should be specified:

1. Micturition complaints; assessment and quantification:
 - Symptom analysis
 - Visual analogue score

- Fluid intake chart
- Frequency/volume chart (voiding diary)
- Pad-weighing test
- Urodynamic studies (when applicable)
- 2. General patient assessment:
 - General performance status (e.g. Kurtzke disability scale [1])
 - Mobility (e.g. chairbound)
 - Concurrent medical disorders (e.g. constipation, congestive heart failure, diabetes mellitus, chronic bronchitis, hemiplegia)
 - Current medication (e.g. diuretics)
 - Psychological state (e.g. psychoanalysis)
 - Psychiatric disorders
 - Mental state (e.g. dementia, confusion)
- 3. Environmental assessment:
 - Toilet facilities (access)
 - Living conditions
 - Working conditions
 - Social relations
 - Availability of suitable incontinence aids
 - Access to health care

For behavioral modification, various therapeutic concepts and techniques may be employed. The following should be specified:

1. Conditioning techniques:
 - Timed voiding (e.g. hyposensitive bladder)
 - Double/triple voiding (e.g. residual urine due to bladder diverticulum)
 - Increase of intervoiding intervals/bladder drill (e.g. sensory urgency)
 - Biofeedback (see above)
 - Enuresis alarm
2. Fluid intake regulation (e.g. restriction)
3. Measures to improve patient mobility (e.g. physiotherapy, wheelchair)
4. Change of medication (e.g. diuretics, anticholinergics)
5. Treatment of concurrent medical/psychiatric disorders
6. Psychoanalysis/hypnotherapy (e.g. idiopathic detrusor instability)
7. Environmental changes (e.g. provision of incontinence pads, condom urinals, commode, furniture protection etc.)

Treatment is often empirical, and may require a combination of the above-mentioned concepts and techniques. The results of treatment should be objectively documented using the same techniques as used for the initial assessment of micturition complaints.

4.3 Applications

Behavioral modification may be used for the treatment of maladaptive voiding patterns in patients when:

The etiology and pathophysiology of their symptoms cannot be identified (e.g. sensory urgency)

The symptoms are caused by a psychological problem

The symptoms have failed to respond to conventional therapy

They are unfit for definitive treatment of their condition

Behavioral modification may be employed alone or as an adjunct to any other form of treatment for lower urinary tract dysfunction.

5. ELECTRICAL STIMULATION

5.1 Definition

Electrical stimulation is the application of electrical current to stimulate the pelvic viscera or their nerve supply. The aim of electrical stimulation may be to directly induce a therapeutic response or to modulate lower urinary tract, bowel or sexual dysfunction.

5.2 Techniques

The following should be specified:

1. Access:
 - Surface electrodes (e.g. anal plug, vaginal electrode)
 - Percutaneous electrodes (e.g. needle electrodes, wire electrodes)
 - Implants
2. Approach
 - Temporary stimulation
 - Permanent stimulation
3. Stimulation site
 - Effector organ
 - Peripheral nerves
 - Spinal nerves (intradural or extradural)
 - Spinal cord
4. Stimulation parameters
 - Frequency
 - Voltage
 - Current
 - Pulse width
 - Pulse shape (e.g. rectangular, biphasic, capacitatively coupled)
 - With monopolar stimulation, state whether the active electrode is anodic or cathodic
 - Duration of pulse trains
 - Shape of pulse trains (e.g. surging trains)
5. Mode of stimulation
 - Continuous
 - Phasic (regular automatic on/off)

- Intermittent (variable duration and time intervals)
- Single sessions: number and duration of, and intervals between, periods of stimulation
- Multiple sessions: number and duration of, and intervals between sessions
- 6. Design of electronic equipment, electrodes and related electrical stimulation characteristics:
 - Electrodes (monopolar or bipolar)
 - Surface area of electrodes
 - Maximum charge density per pulse at active electrode surface
 - Impedance of the implanted system
 - Power source (implants):
 - active, self-powered
 - passive, inductive current
- 7. For transurethral intravesical stimulation
 - Filling medium
 - Filling volume
 - Number of intravesical electrodes

5.3 Units of Measurement and Symbols

Parameters related to electrical stimulation, units of measurement and the corresponding symbols are listed in Table I.

5.4 Applications

The aims of treatment should be clearly stated. These may include control of voiding, continence, defecation, erection, ejaculation or relief of pain. Specify whether electrical stimulation aims at:

A functional result completely dependent on the continuous use of electrical current
 Modulation, reflex facilitation, reflex inhibition, reeducation or conditioning with a sustained functional result even after withdrawal of stimulation

Electrical stimulation is applicable in neurogenic or non-neurogenic lower urinary tract, bowel or sexual dysfunction. Techniques and equipment vary widely with the type of dysfunction and the goal of electrical stimulation. If electrical stimulation is employed for control of a neuropathic dysfunction, and the chosen site of stimulation is the reflex arc (peripheral nerves, spinal nerves or spinal cord), this reflex arc must be intact. Consequently electrical stimulation is not applicable for complete lower motor neuron lesions except when direct stimulation of the effector organ is chosen.

When ablative surgery is performed (e.g. dorsal rhizotomy, ganglionectomy, sphincterotomy or levatorotomy) in conjunction with an implant to achieve the desired functional effect, the following should be specified.

1. Techniques used to reduce pain or mass reflexes during stimulation
 - Number and spinal level of interrupted afferents
 - Site of interruption of afferents

TABLE I. Parameters for Electrical Stimulation

Quantity	Unit	Symbol	Definition
Electric current	Ampere	A	1 A of electric current is the transfer of 1 C of electric charge per second
Direct (D.C.)			Steady unidirectional electric current
Galvanic			Unidirectional electric current derived from a chemical battery
Alternating (A.C.)			Electric current that physically changes direction of flow in a sinusoidal manner
Faradic			Intermittent oscillatory current similar to alternating current (A.C.), e.g. as produced by an induction coil
Voltage (potential difference)	Volt	V	1 V of potential difference between 2 points requires 1 J of energy to transfer 1 C of charge from one point to the other
Resistance	Ohm	Ω	1 Ω of resistance between 2 points allows 1 V of potential difference to cause a flow of 1 A of direct current (D.C.) between them
Impedance (Z)	Ohm	Ω	Analogue of resistance for alternating current (A.C.); vector sum of ohmic resistance and reactance (inductive and/or capacitive resistance)
Charge	Coulomb	C	1 C of electric charge is transferred through a conductor in 1 s by 1 A of electric current
Capacity	Farad	F	A condenser (capacitor) has 1 F of electric capacity (capacitance) if transfer of 1 C of electric charge causes 1 V of potential difference between its elements
Frequency	Hertz	$\text{Hz}(\text{s}^{-1})$	Number of cycles (phases) of a periodically repeating oscillation per second
Pulse width	Time	ms	Duration of 1 pulse (phase) of a phasic electric current or voltage
Electrode surface area	Area	mm^2	Active area of electrode surface
Charge density per pulse	Coulomb/area/time	$\mu\text{C mm}^{-2}\text{ms}^{-1}$	Electric charge delivered to a given electrode surface area in a given time (one pulse width)

Dorsal rhizotomy (intradural or extradural)

Ganglionectomy

2. Techniques to reduce stimulated sphincter dyssynergia:

Pudendal block (unilateral or bilateral)

Pudendal neurectomy (unilateral or bilateral)

Levatorotomy (unilateral or bilateral)

Electrically induced sphincter fatigue

External sphincterotomy

If electrical stimulation is combined with ablative surgery, other functions (e.g. erection or continence) may be impaired.

5.4.1 Voiding When the aim of electrical stimulation is to achieve voiding, state whether this is obtained by:

Stimulation of the afferent fibres to induce bladder sensation and thus facilitate voiding (transurethral intravesical stimulation)

Stimulation of efferent fibres or detrusor muscle to induce a bladder contraction (electromicturition)

5.4.2 Continence. Electrical stimulation may aim to inhibit overactive detrusor function or to improve urethral closure. State whether overactive detrusor function is abolished/reduced by reflex inhibition (pudendal to pelvic nerve) or by blockade of nerve conduction. When electrical stimulation is applied to improve urethral closure, state whether this is by:

A direct effect on the urethra during stimulation

Reeducation and conditioning to restore pelvic floor tone.

5.4.3 Pelvic pain. If electrical stimulation is applied to control pelvic pain, the nature and etiology of the pain should be stated. When pelvic pain is caused by pelvic floor spasticity, electrical stimulation may be effective by relaxing the pelvic floor muscles.

5.4.4 Erection and ejaculation. If electrical stimulation is applied for the treatment of erectile dysfunction or ejaculatory failure, the etiology should be stated. Electrically induced erection requires an intact arterial supply and cavernous tissue, and a competent venous closure mechanism of the corpora cavernosa. Electroejaculation requires an intact reproductive system.

5.4.5 Defecation. Defecation may be obtained by electrical stimulation, either intentionally or as a side-effect of electromicturition.

At present, the mechanism of action of electrically induced control of pelvic pain, erection, ejaculation and defecation are not fully understood. The clinical applications of these techniques have not yet been fully established.

6. VOIDING MANEUVERS

Voiding maneuvers are employed to obtain/facilitate bladder emptying. For lower urinary tract rehabilitation, voiding maneuvers may be used alone or in combination with other techniques such as biofeedback or behavioral modification. The aim is to achieve complete bladder emptying at low intravesical pressures. The techniques employed may be invasive (e.g. catheters) or non-invasive (e.g. triggering reflex detrusor contractions, increasing intra-abdominal pressure).

When reporting on voiding maneuvers, the professional status of the individual(s) who establishes the diagnosis must be stated as well as the diagnostic techniques employed. Also the professional status of the person(s) who institutes, supervises and assesses treatment should be specified.

6.1 Catheterization

6.1.1 Definition. Catheterization is a technique for bladder emptying employing a catheter to drain the bladder or a urinary reservoir. Catheter use may be intermittent or indwelling (temporary or permanent).

6.1.2 Intermittent (in/out) catheterization. Intermittent (in/out) catheterization is defined as drainage or aspiration of the bladder or a urinary reservoir with subsequent removal of the catheter. The following types of intermittent catheterization are defined:

1. Intermittent self-catheterization: performed by the patient himself/herself
2. Intermittent catheterization by an attendant (e.g. doctor, nurse or relative)
3. Clean intermittent catheterization: use of a clean technique. This implies ordinary washing techniques and use of disposable or cleansed reusable catheters.
4. Aseptic intermittent catheterization: use of a sterile technique. This implies genital disinfection and the use of sterile catheters and instruments/gloves.

6.1.2.1 Techniques. The following should be specified:

1. Preparation used for genital disinfection
2. Preparation and volume of lubricant
3. Catheter specifications: type, size, material and surface coating
4. Number of catheterizations per day/week
5. Length of treatment (e.g. weeks, months, permanent)

6.1.2.2 Applications. Specify the indications and the therapeutic goals. Typical examples for the use of intermittent catheterization are: neurogenic bladder with impaired bladder emptying, postoperative urinary retention and transstomal catheterization of continent reservoirs.

6.1.3 Indwelling catheter. An indwelling catheter remains in the bladder, urinary reservoir or urinary conduit for a period of time longer than one emptying. The following routes of access are employed:

Transurethral

Suprapubic

6.1.3.1 Techniques. The following should be specified:

1. Catheter specifications: type, size, material
2. Preparation and volume of lubricant
3. Catheter fixation: e.g. balloon (state filling volume), skin suture
4. Mode of drainage: continuous/intermittent. For intermittent drainage specify clamping periods
5. Intervals between catheter change
6. Duration of catheterization (days, weeks, years)

6.1.3.2 Applications. The indications and the therapeutic goals should be specified. Examples of the use of temporary indwelling catheters are:

Suprapubic catheter: after major pelvic surgery

Transurethral catheter: in order to monitor urine output in a severely ill patient

Examples of the use of permanent indwelling catheters are:

Suprapubic: candidates for urinary diversion unfit for surgery

Transurethral: severe bladder symptoms from untreatable bladder cancer

6.2 Bladder Reflex Triggering

6.2.1 Definition. Bladder reflex triggering comprises various maneuvers performed by the patient or the therapist in order to elicit reflex detrusor contractions by exteroceptive stimuli. The most commonly used maneuvers are: suprapubic tapping, thigh scratching and anal/rectal manipulation.

6.2.2 Techniques. For each maneuver the following should be specified:

1. Details of maneuver.
2. Frequency, intervals and duration (weeks, months, years) of practice

6.2.3 Applications. When using bladder reflex triggering maneuvers, the etiology of the dysfunction and the goals of treatment should be stated. Bladder reflex triggering maneuvers are indicated only in patients with an intact sacral reflex arc (suprasacral spinal cord lesions).

6.3 Bladder Expression

6.3.1 Definition. Bladder expression comprises various maneuvers aimed at increasing intravesical pressure in order to facilitate bladder emptying. The most commonly used maneuvers are abdominal straining, Valsalva's maneuver and Credé's maneuver.

6.3.2 Techniques. For each maneuver, the following should be specified:

Details of the maneuver

Frequency, intervals and duration of practice (weeks, months, years)

6.3.3 Applications. When using bladder expression, the etiology of the underlying disorder and the goals of treatment should be stated. Bladder expression may be used in patients where the urethral closure mechanism can be easily overcome.

REFERENCE

Kurtzke JF (1983): Rating neurological impairment in multiple sclerosis: An expanded disability status scale (EDSS). *Neurology* 33:1444–1452.