34 Pelvic Floor Rehabilitation

Silvana Uchôa, Bary Berghmans, and Maura R. Seleme

Introduction

Disorders of the gynecological, urinary, and gastrointestinal systems are often treated by medical and surgical options. However, physiotherapeutic procedures have become increasingly helpful in the rehabilitation of patients with such disorders, due to the optimal outcomes achieved [1]. The rehabilitation of the pelvic floor comprises a group of techniques used to aid the reacquisition of the sphincter control. Among these, there are the so-called behavioral therapies and pelvic physiotherapeutic procedures. Behavioral therapy is defined as a group of specific, low-cost interventions performed to alter the relationship between the patient's signs and symptoms and their environment. This goal can be achieved by modifying the behavior and/or the environment in which it is found. Behavioral techniques help the patient learn ways to control the urethral and anal sphincters (especially of the bladder and bowel control muscles). These techniques are safe and have no side effects.

S. Uchôa (✉)
Universidade Catolica de Pernambuco, Recife, Brazil

B. Berghmans
Pelvic Care Center Maastricht, Maastricht University Medical Centre, Maastricht, The Netherlands

M. R. Seleme
Faculdade Inspirar, Department of Pelvic Physiotherapy, Curitiba, Brazil

Table 34.1 Types of therapeutic modes

Biofeedback
Electrostimulation
Electroanalgesia
Kinesiotherapy or pelvic floor muscle training (PFMT)
Vaginal cones
Rectal balloon training (RBT)

The physiotherapist must first obtain basic knowledge about the anatomy and physiology of the pelvic floor muscles (PFM) to better understand the objectives and effects of the therapeutic modalities used in the rehabilitation of the pelvic floor, as well as the biophysical and biological properties of electrical stimulation, with its indications and contraindications, and also the choice of the correct exercise modality, emphasizing that all therapeutic planning should only be elaborated through careful evaluation and physiotherapeutic diagnosis.

With regard to the rehabilitation of the PFM, biofeedback plays an important role and can be assisted by electrostimulation, either excitatory or analgesic. Similarly, a pelvic floor rehabilitation program includes different types of therapeutic modalities (Table 34.1), emphasizing the kinesiotherapy or pelvic floor muscle training (PFMT), vaginal cones, and also the use of a technique very important for sensorimotor training, which is rectal balloon training (RBT) [2, 3].

L. C. C. Oliveira (ed.), *Anorectal Physiology*, https://doi.org/10.1007/978-3-030-43811-1_34

Pelvic floor dysfunction can cause poor quality of life, especially among women, and the aforementioned physiotherapeutic procedures can act in a curative manner or promote a marked improvement in the function, symptomatology, and quality of life of patients. The different disorders that may benefit from the rehabilitation of the pelvic floor are listed below:

- Urinary incontinence: physiotherapy treatment is most effective in stress, urgency, and mixed incontinence.
- Anal incontinence: postsurgical (as in hemorrhoidectomies, fistulectomies, etc.), underactivity of the external sphincter of the anus, or traumatic origin (obstetrics, accidents, impalation).
- Constipation: by outlet obstruction, anismus or paradoxical contraction of the puborectal muscle, or spastic pelvic floor syndrome.
- Anorectal pain: as in proctalgia fugax and levator ani syndrome, among others.
- Posterior vaginal wall prolapse (rectocele).
- Anterior vaginal prolapse (cystocele).
- Chronic pelvic pain.
- Descending perineum syndrome.
- Sexual dysfunctions.

Pelvic Floor Muscles (PFM)

The pelvic floor covers the base of the abdominopelvic cavity and closes the cavity below the pelvic bone, provides support for the pelvic viscera, and actively participates in maintaining the normal function of these organs. It consists of three layers: endopelvic fascia, pelvic diaphragm, and urogenital diaphragm (Fig. 34.1).

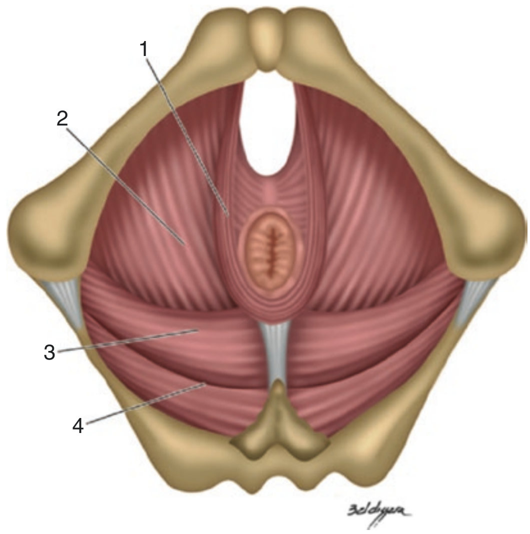

Fig. 34.1 Pelvic floor muscles: (1) puborectal muscle; (2) pubococcygeus or pubovisceral; (3) iliococcygeus; (4) Ischiococcygeus

The endopelvic fascia, also known as visceral pelvic fascia, has an important role to suspend the viscera mechanically and to provide support for pelvic structures [4].

The pelvic diaphragm is formed by layers of muscle and fascia within the pelvis, which are supported as a mesh extending from the pubis to the coccyx. The pelvic diaphragm muscles surround the openings of the urethra, vagina, and rectum. They are constituted by the elevators of the anus (formed by the pubococcygeal, puborectal, and iliococcygeus) and ischiococcygeus muscles. The urogenital diaphragm is formed by the deep transverse muscle of the perineum, the urethral sphincter, and the superficial perineal muscles, which include the bulbospongiosus, the ischiocavernosus, the superficial transverse muscle of the perineum, and the external anal sphincter. The perineum is the set of soft tissues that close the pelvis and hold the viscera in upright position. It is delimited by osteofibrous structures, containing in the anterior portion the pubic symphysis and the ischiopubial branches and, in the posterior portion, the sacrum, the coccyx, and the great sacroischial ligament [2].

In women, the perineum is crossed by the urethra, vagina, and anus; it is considered a passage zone, as well as a zone that supports part of the lower trunk. As these two functions are very different, they also require two distinct properties: great sensory and motor coordination, acting intermittently to allow the outputs with great flexibility, and great strength, to ensure firm submission during the remaining time.

These muscles are innervated by the pudendal nerve and by direct branches of the motor roots of S3 and S4 and are composed of type I (slow) and type II (fast) fibers and play an important role in maintaining continence. The muscle levator ani or levators are the most important and essential musculature for the therapist's approach, since it is through it that the muscular qualities of the pelvic floor are developed [2, 5]. The levators, by means of their ramifications, wrapped the proximal urethra and may therefore represent a second sphincter.

Levator Ani Functions

During labor, the levator ani muscles play an essential role in position changes, particularly in the rotation and orientation of the fetal head, which comes into contact with the homolateral levator which, by its tonicity and direction of the passage, places it in contact with the opposite levator. The tonicity of the two bundles, in turn, causes the head to advance forward and downward. On the other hand, the levator represents the last obstacle to presentation, since overcoming this muscular ring requires maximum relaxation of these muscles, which are heavily distended [2]. The physiotherapist aims at the entire postpartum approach to increase awareness of this musculature, contributing to the prevention of perineal complications of childbirth. For sexual function the levator muscles are responsible for vaginal dynamics involving the vagina and favoring the container/content adaptation. Strengthening of these muscles can improve the quality of sexual intercourse.

Use of Physiotherapeutical Modalities

A positive attitude is an essential component of any medical treatment program, especially in the case of pelvic floor rehabilitation. It is essential that the patient takes part in the rehabilitation process and that the patient is motivated to participate in the sessions.

A record of emptying the bladder or the use of bowel and urinary diaries should be performed for at least 2 weeks before starting a behavioral program. The International Continence Society (ICS) recommends completing a diary for three consecutive days. It should include the number of incontinence accidents, activities associated with accidents, sensation during involuntary loss (urgency, level of perceived sensation), periods of regular micturition, and also defecation as well as fluid intake.

The initial assessment of the patient has been addressed already in previous chapters and should include detailed medical history as well as a rectal or vaginal examination for evaluation of bladder, urethra, and rectum prolapses, as well as muscle strength and the patient's ability to control pelvic muscles [6]. Next, the physiotherapeutic modalities used in the rehabilitation of the pelvic floor will be described.

Biofeedback Therapy

Biofeedback is a process of guiding patients so that they can learn to control some of the physiological events that are not under their control. One of the great difficulties in muscle training, especially in the PFM, is to make the individual perceive if he is contracting and/or relaxing the correct muscles and with sufficient strength, either in magnitude or duration, and with coordination and adequate relaxation. Basmajian defines biofeedback as:

"A technique that uses equipment, usually electronic, to reveal to humans beings continuously and instantaneously some of their normal and abnormal internal physiological events in the form of visual and/or auditory signals in order to teach them to manipulate these events (involuntary or unconscious) through the manipulation of the signs represented." [7]

Biofeedback devices monitor and demonstrate muscle activity on the monitor (screen). Special electrodes are adhered to the perineum, around the anus, or to intracavitary regions (vaginal or anal sensors) to measure PFM activity through the capture of electrical signals from muscular activity that, when processed by a computer, show the motor unit recruitment in a graph, which can be compared to the magnitude and the contraction strength duration performed, but *biofeedback* does not measure strength directly, only motor unit recruitment (Fig. 34.2). An audible signal can also be listened when, for example, the amplitude of the contraction reaches the levels or goals desired during the training.

Methods of using anal biofeedback are described in Chap. 35, biofeedback therapy. In general, it can be performed by electromyography (EMG) or manometry. In both cases, the introduction of an intra-anal probe or intrarectal balloon, respectively, is required. In the case of EMG – biofeedback – three sensors are also used on the abdomen (right lateral oblique muscle). This helps to confirm that the activity of the abdominal muscle is not interfering with the PFM, i.e., biofeedback allows the person to learn to perform a selective contraction of these muscles. This type of training allows greater control of muscle contraction and its duration, as well as the training of relaxation of these muscles. Muscle activity, that is, its relaxation and contraction, can be seen by the EMG tracings (Fig. 34.3).

Therefore, the purpose of biofeedback is to modify an inadequate physiological response or to provide the acquisition of a new physiological response. With the aid of biofeedback, learning will be done in three stages. The first step represents the detection and amplification of a function by the apparatus and translation into a visual and/or sound signal immediately available to the patient. The second step is to show the patient that he is able, by a voluntary act, to strengthen, attenuate, or maintain the function that is shown by the visual or auditory signals. This function, of which he has no knowledge (pelvic floor), is shown to him by signals that he can manipulate. It is the stage of awareness, an essential and even exclusive biofeedback role. The third step is the automation of this function, obtained by the manual work of perineal blockage under stress. In this phase, biofeedback, in particular the wireless device, will promote the integration of the PFM function into the patient's body image. This operant conditioning is a closed loop learning, and the feedback is permanent. At any time during the course of action, the patient can act in one direction or the other. In human learning the information represents the ideal reinforcement [2].

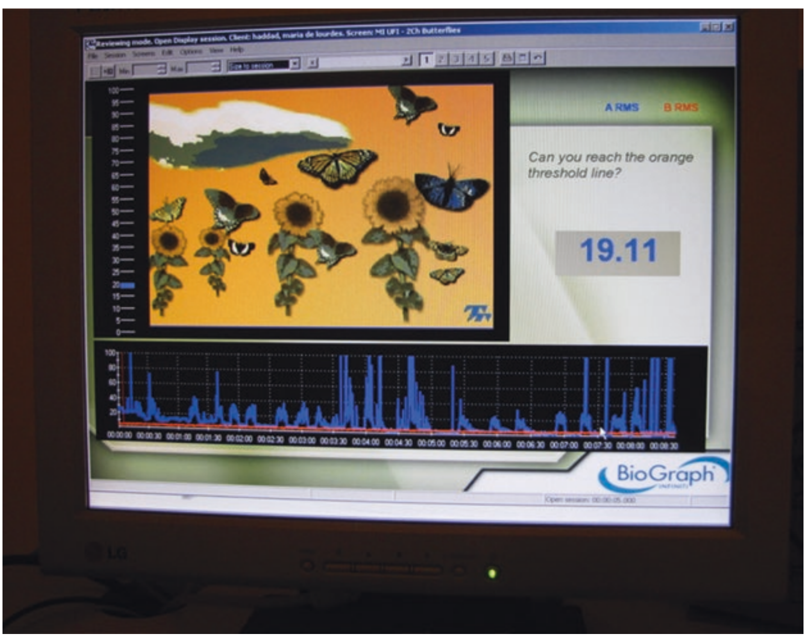

Fig. 34.2 Electromyographic biofeedback screen

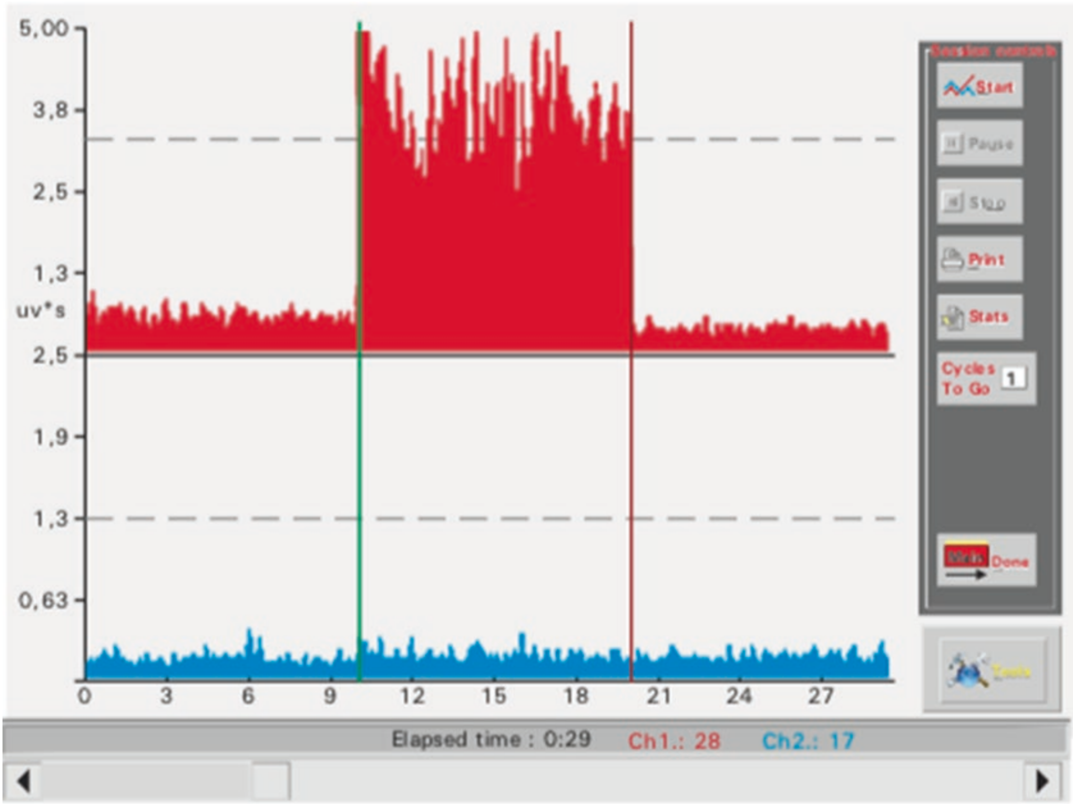

Fig. 34.3 Sustained contraction exercise for 10 seconds

Finally, the goal of using biofeedback as a therapeutic modality is to train the individual first to recognize the sensation of transient relaxation of the internal anal sphincter (IAS) and then to respond to that sensation with the closure of the external anal sphincter (EAS) strong enough to prevent fecal leakage. Some patients recognize the sensation of the IAS, but they are not able to contract the EAS with enough strength to prevent any loss. In such cases, the use of biofeedback should be added with PFMT to help strengthen the EAS response and increase its capacity.

In biofeedback training the skeletal muscles are being trained, mainly the EAS and the puborectalis muscle and the pelvic floor muscles in general. But functional training must be added when the patient has awareness of the right contraction, especially with the wireless device. Functional training of the PFM needs to be incorporated in the treatment by the pelvic physiotherapist to mimic daily life activities and situations in which the patients used to have incontinence, in order to realize fully automatic avoidance of leakage. If successful, the patient will be extremely motivated to adhere and continue the PFMT [8].

Reeducation may be useful in cases of sphincter incontinence, as well as when there is a change in the perception of defecating desire. There are no clinical, manometric, defecographic, or electromyographic predictive factors [8]. However, the presence of total denervation of the pudendal nerve with absence of objective sphincter contraction contraindicates reeducation by this technique [9–12].

Reeducation may be useful in cases of small sphincter injury (maximum 1 quadrant or 25% of the sphincter) [11] and particularly as a complement to repair surgery (sphincteroplasty). The reeducation involves 1–3 weekly individual sessions, lasting 20–30 minutes each.

Electrical Stimulation

Electrical stimulation has been used for a long time in the rehabilitation of the PFM and restoration of the neuromuscular reflex mechanism. The first studies were initiated in 1952 by Huffman, Osborne, and Sokol [13], and electrical stimulation was used in the treatment of a hypo- and hyper-reflexive bladder and in conditions of myogenic incontinence, such as sphincter weakness and surgical sphincter injury. The electric current is used with various frequencies, pulse widths, and intensities, either transcutaneous or intracavitary, in order to promote some form of muscle contraction, improve circulation, increase muscle contraction secondary to atrophy or neuromuscular dysfunction, as well as decrease pain and improve tissue healing. The isolated use of electrostimulation does not directly cause the strengthening of PFM.

To obtain more muscle strength, it is critical to combine electrical stimulation with PFMT during the treatment session. Electrotherapy is useful in cases where the patient has a weak PFM or has no or insufficient awareness of this contraction, which in clinical practice is rather frequent and a common finding. In such cases, in order to improve or restore awareness of PFM activity, electrotherapy can play an important role in neuromuscular information.

It is through direct stimulation of the pudendal nerves that the electrical stimulation of the pelvic floor produces contraction of the levator muscle and the urethral and anal sphincters, causing concomitantly an inhibitory reflex of the detrusor contraction. There are virtually no side effects, other than local discomfort. Contraindications to the procedure include patients with demand pacemakers, pregnancy, menstruation, neoplastic lesions, infections, and exposed metal implants.

Electrical stimulation is usually performed on a daily basis, three times a week, or at least two sessions per week. The session time varies from 15 to 30 minutes, depending on the type of fiber to be stimulated, with treatment duration of 4–20 weeks. The techniques most used are:

- Bipolar, with one electrode on each side of the anus
- Bipolar, with one electrode on each side of the gluteal cleft, next to the anus
- Bipolar, with one electrode above the anus and another on the surface of the perineum
- Quadripolar, with two electrodes placed below or into the sciatic tuberosity and two placed anteriorly on the perineum or on the obturator fossa
- Monopolar, with intra-anal or intravaginal probes [14]

Numerous stimulation sites are described in the literature, varying from posterior tibial stimulation to perineal and parasacral transcutaneous stimulation with electrodes around the perineum fibrous center and sacral (S2, S3, S4), respectively. However, intracavitary vaginal or anal stimulation is considered to be more effective and has become widely used (Fig. 34.4a, b).

In general, surface stimulation is reserved for cases where it is impossible to use intracavitary probes, such as fistulas, fissures, or hemorrhoids [12, 15–17]. The relative efficacy of vaginal and anal stimulation has led to numerous controversies [12, 18, 19]. However, some studies have shown that, from a theoretical point of view, anal stimulation is more effective than vaginal stimulation. The explanation is justified by the difference in impedance because, in the anal canal, there is a greater density of the nervous afferents, as well as the smaller distance between the electrodes and the pudendal nerve [19].

It is worth mentioning that, in order to use electrical stimulation as therapy, parameters such as frequency, pulse width, intensity, and working time-rest time are fundamental for effective application. The intensity of the current may vary between 2 and 80 mA, but it should be used with sufficient intensity to produce at least 65% of the maximum voluntary contraction, in order to result in increased muscle strength, i.e., motor level stimulation.

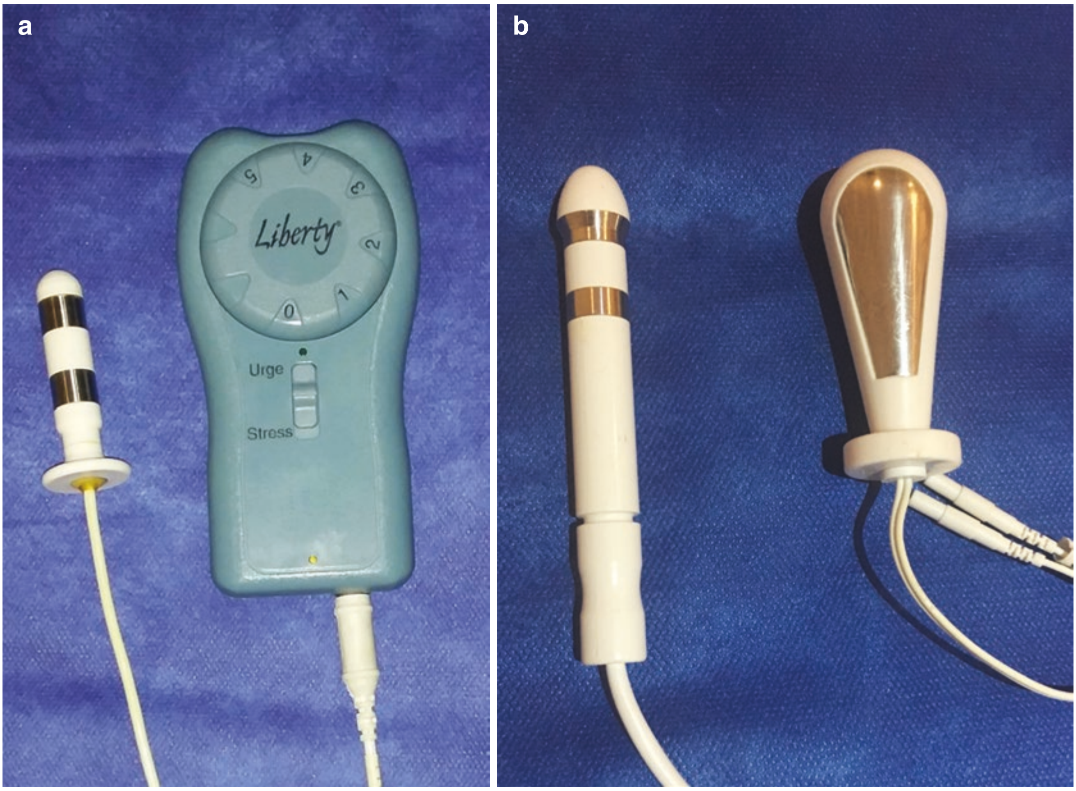

Fig. 34.4 (**a**) Electrostimulation device with a probe. (**b**) Anal and vaginal probes

The choice of electric current frequency is based on the type of muscle. The levator ani and external sphincter muscles consist of motor units of slow and fast fibers, which often respond best to frequencies from 10 to 20 Hz and 30 to 60 Hz, respectively, and pulse duration ranging from 250 μs to 1 ms.

Initially, in the case of a weak muscle, the resting period must be twice the stimulation period, progressively evolving until equal time is reached between the passage of the current and the rest time. Frequency and pulse width are two inseparable parameters in terms of amount of energy, pulse width being the determining factor for the desired type of recruitment. It can be stated that the smaller the pulse width, the greater the intensity of the current for its effectiveness. There is yet no consensus about whether maintenance treatment is necessary, so further studies should be carried out for this purpose, but what is currently used are biphasic, low-frequency currents and also, more recently, interferential current (medium frequency) with a patient-tolerable intensity and a period of treatment for 3–6 months [20, 21].

Recent data show that, in case of underactivity of the EAS leading to incontinence, the frequency of the electric current should be between 50 and 100 Hz, at a current intensity of 65–100 mA. For urgency incontinence, the ideal parameters may be 4 and 10–20 Hz, and current intensity ranges from 35 to 100 mA.

Although there is no agreement among these parameters in the specific literature, most scientific papers and publications consider these as ideal. As the stimulation of the pelvic floor is predominantly indirect, reflex, by the contributions of the internal pudendal nerve, to be effective, the probe should be positioned as close as possible to the afferents of the pudendal nerve [2]. Relevant literature regarding effects of electrical stimulation reports cure or improvement rates from 54%

to 77% of patients, with minimal reported side effects [20, 21].

In a recent systematic review, the authors concluded that there is sufficient evidence showing the efficacy of biofeedback associated with electrical stimulation in the treatment of anal incontinence. They also stated that the interference current associated with biofeedback seems to be the safest and most effective treatment modality [21].

Transcutaneous Electrical Nerve Stimulation (TENS)

Transcutaneous electrical nerve stimulation (TENS), which is used to achieve pain relief through cutaneous electrodes or intracavitary probe, will stimulate small-diameter nerve fibers and release endorphins or act upon the pain gate theory. The two most recognized theories to explain the effects of TENS on pain are:

1. Pain gate control theory proposed by Melzack and Wall [22]
2. The release of endogenous opioids during the application of acupuncture TENS for patients with chronic pain [23, 24]

TENS is a treatment modality with proven efficacy in controlling acute and chronic pain syndromes [16, 23].

Modes of Stimulation

The modes of stimulation are conventional, acupuncture-like, burst and brief-intense TENS, which are combinations of parameters chosen to influence pain relief. They are determined by adjusting the frequency parameters, the pulse width, and the current intensity of the TENS device. There are devices that also allow changes in frequency modulation. The most commonly used modes of stimulation will be described below.

Conventional Mode

It is the most commonly used TENS modality and aims to activate large alpha and beta proprioceptive myelinated nerve fibers. The parameter set for conventional mode consists of frequencies of 50–150 pulses per second (pps) and pulse duration of 20–100 μs, with sufficient intensity for the patient to feel a sensation of "tingling," but without muscle contraction.

Acupuncture-Like TENS

This mode produces muscle contraction in myotomes as a result of descending efferents inhibiting ascending nociceptive pathways in the dorsal horn of the spine at multiple segmental levels and consists of low frequencies, from 1 to 4 pps, with pulse duration of 150 to 250 μs. Intensity is based on patient tolerance.

Burst Mode

TENS burst is similar to *acupuncture-like* TENS, but the accommodation effect is less. This mode combines low-frequency (1–4 Hz) pulse frequency with high internal frequency (70–100 Hz), so that high pulse frequencies are emitted in fixed trains or bursts of 5–7 per pulse between the carrier wave of low frequency. The pulse width is 250 μs, and the intensity of current is high.

Brief-Intense TENS

This mode is the least tolerated by the patient. The parameters set for the brief-intense mode consist of about 100 pps, with a pulse width of 150–250 ms, and at intensity regulated based on patient tolerance, yet strong enough to promote tetanic muscle contraction or muscle fasciculation depending on the location of the electrode. According to Melzack, this mode of brief-intense stimulation can break the memory of pain, being the most effective mode of stimulation to induce short-term electroanalgesia [22].

Kinesiotherapy (PFMT)

Kinesiotherapy, or PFMT, is one of the treatment modalities most used by the physiotherapist in order to restore and improve the musculoskeletal system. It is important for the therapist to know the exact medical diagnosis so that the pelvic floor reeducation program is fine-tuned on that, indi-

Table 34.2 Oxford grading scale score for assessing muscular strength

0	No muscle activity
1	Minor muscle "flicker"
2	Weak muscle activity without a circular contraction
3	Moderate muscle contraction
4	Good muscle contraction
5	Strong muscle contraction

vidualized, and effective [23]. It is essential that the patient is aware of the PFM, and the physiotherapist should then make a complete functional assessment taking into account the so-called 4F program: this is "find," "feel," "force," and "follow through" so that at the onset of the PFMT all parameters for the training are correct and appropriate. Thus, extensive history taking, documentation of symptoms, identification of etiologic and prognostic factors, internal vaginal and rectal exams, and pressure assessment by manometric or electromyography examination should be performed. In clinical practice, assessment of pelvic floor muscle strength test is often performed using the Oxford scale, which evaluates the presence and intensity of voluntary contraction of the pelvic floor, graduating from 0 to 5 (Table 34.2).

The baseline score obtained by the patient will be recorded and will be used for later evaluations. This score provides information about the amount of lifting (support function) and closure (sphincter function) by the PFM. A good functional assessment of the PFM helps to determine the possible duration of rehabilitation, as well as the potential for rehabilitation. Another important parameter is endurance, 50% of the person's maximal voluntary contraction, which is the ability to maintain a moderate muscle contraction for 30 seconds or more. Therapists also determine how many fast muscle contractions with maximal intensity and complete relaxation can be performed and observe their quality as well as quantity of muscle relaxation, classifying it as delayed, absent, partial, or (in)complete. The resting activity (rest tone) between contractions is also evaluated, specifically looking for deficiencies that occur with an altered activity.

Muscle coordination and contraction of other muscle groups, especially the buttocks, adductors, and abdominals, are also observed and evaluated. There are also other problems, such as the presence of trigger points in the pelvic floor, reduced sensitivity, and myofascial scarring or adhesions, as they may promote an obstacle to muscle strengthening.

PFMT aims to improve urethral resistance through active exercise of the pubococcygeus muscle. These exercises strengthen the voluntary pelvic and periurethral muscles. The contraction exerts a closing force on the urethra and increases the muscular support for the visceral pelvic structures, so that the same occurs when these exercises are done for the anal region.

Some women lose cortical control of the pelvic floor muscles after severe pain in the perineum following delivery, and neuropraxia and even denervation have been observed [24, 25].

Pelvic floor muscle exercises are valuable for their strength properties and pain relief. They also speed up healing, reducing edema and stimulating good circulation. After delivery or surgery, these exercises can begin as early as the doctor allows [26]. Furthermore, they should be performed constantly, since any muscle in the body, without being used, weakens very quickly. For this, it is necessary to use a schedule with home exercises to maintain the strength achieved (Fig. 34.5).

The frequency and amplitude of activity of the motor unit supplying PFMs are increased by changes in posture and increases in intra-abdominal pressure that occur during activities such as coughing or sneezing and decrease during effort in preparing for defecation [27].

Conditions that promote chronic increase of intra-abdominal pressure, such as chronic constipation, chronic cough, and obesity, predispose to all kinds of pelvic floor dysfunctions, especially in already damaged tissues. For anal continence, the anorectal sphincters and pudendal nerves must be intact; the rectum with normal reservoir function and capacity, normal anorectal sensitivity, and anorectal angle should be maintained by tonic contraction of the puborectal muscles; the PFM should function normally. However, the largest contribution is due to the IAS muscle, which is responsible for 50–80% of the anal resting tone. In order to

Fig. 34.5 Kinesiotherapy (PFMT)

obtain increase of PFM activity, PFMT should address both types of muscle fibers (consisting of 70% of type I, slow fibers, and 30% of type II, fast fibers). During PFMT, fast contractions should be alternated with sustained contractions and also ask for fast contractions at the end of sustained contractions. The objectives of PFMT are:

- Improve muscle coordination, strength, and endurance.
- Increase muscle cross-sectional area.
- Increase the closing pressure of the urethra and the anus.
- Increase the patient's ability to contract PFM with sudden increase in intra-abdominal pressure.
- Facilitate inhibition of the detrusor muscle by the pudendal-pelvic reflex.

PFMT should be executed in short sessions of intensive (maximal) contractions, from three times a week to every day. According to Bo [27], PFMT involves series of 8–12 maximal contractions holding for 3–8 seconds, alternated with 15 fast contractions between these series and one sustained contraction as long as the person can perform. They can be performed in any posture but preferably in the posture where loss of urine and/or stool occurs. Mild pain or discomfort in the area can be felt in the first few days, mainly because the individual is not used to train the pelvic floor muscles. These symptoms tend to disappear in the first week with continued training. However, if the pain persists or becomes more severe, the training should be discontinued, and the patient should consult a medical doctor for further advice.

It is important to emphasize that relevant literature shows that preferably PFMT should be guided by a skilled physiotherapist, who is experienced to offer the appropriate intensity and duration of PFMT.

Exercises with Vaginal Cones

Vaginal cones are a set of small capsules of anatomical shape, made up of inert, resistant, and relatively heavy material that when inserted in the vaginal canal provides the necessary input for the woman to contract the PFM during the exer-

Fig. 34.6 Complete kit of vaginal cones

cises with them. It was Plevnik [28] in 1985, the first to present the cone concept for strengthening the PFM, especially in urinary incontinence. The use of vaginal cones serves as an adjunct to PFMT. The patient uses a kit of cones, which are identical in shape and volume but have increasing weights. A kit is usually composed of five or six cones, with weights varying between 20 and 100 g (Fig. 34.6).

As part of the exercise program, the woman inserts the weighted cone into the vaginal canal with the conical portion resting on the upper surface of the perineal muscle and should seek to retain it by contracting the PFM for a period of 15–20 minutes. This procedure should be done twice a day. The sustained contraction required to retain the cone increases the strength of the pelvic muscles, and the cone weight serves to provide proprioceptive feedback to the contraction of the desired PFM [28–30].

The Swiss ball is used in pelvic floor rehabilitation because it provides proprioception and can be used to help pelvic movement in association with PFM contractions, promoting the perception and increased PFM strength.

Swiss ball exercises improve the sensory perception of PFM with each movement. Thus, spontaneous acceptance of new exercises is promoted, which are also self-motivating [29–34].

Fig. 34.7 Rectal balloon

Rectal Training with Balloon (RTB)

It is reported that rectal sensation may be more important than the sphincter strength in attempts to relieve the symptoms of constipation or anal incontinence. Rectal balloon training (RBT) (Fig. 34.7) is used to improve rectal sensitivity by gradual reductions in distension of the rectal balloon so that the individual can perceive and distinguish smaller rectal volumes or be able to inhibit urgency using progressive distention of the balloon, through a voluntary anal contraction to neutralize the action of the rectoanal inhibitory reflex (RAIR) in response to the rectal filling.

Fig. 34.8 iPelvis app

Since the precise mechanisms responsible for improvement after physiotherapeutic interventions like PFMT or biofeedback remain obscure, some researchers have argued that rectal sensitivity training is the most important element to provide feedback to the individual [35].

Finally, the necessity of prolonged therapy for patients that could be trained and maintained in home training gave impulse for the development of new information technology and apps such as the iPelvis (Fig. 34.8) [36–38]. Therefore, the concept of the "5 F" pelvic floor muscle training focusing on the restoration of continence during sport, work, and daily activities was developed. Motivation, adherence, compliance, and behavioral change are keywords for our clinic- and home-based pelvic floor muscle training. This innovative mApp iPelvis contains very attractive and useful components to realize optimal individual functional training. iPelvis connects the patient and healthcare providers; is easily accessible, funny, and attractive; and supports its users in many ways every day. iPelvis shows the patient's progress in an enthusiastic way, facilitates improvement of patient's quality of life, puts pressure on the patient to adhere and comply in an empathic way, and helps the patient to face health problems such as urinary incontinence, fecal incontinence, pre- and postoperative surgery, prolapses, and sexual dysfunctions, appealing to the patient's own responsibility to keep on training. The iPelvis system, built on behavior change theories, can serve any health professional to focus his patients on behavior change, using easy and ludic strategies to animate the patient, and does so in a controlled and structured way.

Summary

The beneficial effects of physiotherapy modalities to treat pelvic floor disorders have been demonstrated in different studies, with an improvement in up to 70–80% of patients. In addition, satisfaction rates can be achieved in up to 40–50%, resulting in a better quality of life [2, 29–31].

The use of biofeedback in combination with other physiotherapeutic modalities may promote an improvement in 55–87% of cases of anal incontinence. Moreover, electrical stimulation has been reported to cure or improve 54–77% of cases, with minimal side effects [3, 26, 29, 32, 39]. The results reported in the literature are described as successful in 70% of cases in the short term, whereas long-term follow-up shows satisfactory results in 50% of patients [33]. Pelvic floor rehabilitation may be used before or after surgical treatment, in cases of surgical failure, or as prevention for pelvic floor dysfunction Multidisciplinary treatment of pelvic floor disorders is associated with improvement in the expected outcomes. The role of the physiotherapist in rehabilitation of the pelvic floor is to help patients to improve symptoms as well as to improve the pre- and postoperative results. The ultimate goal is improvement in quality of life.

References

1. Shelly B. Assoalho pélvico. In: Hall MC, Brody LT, editors. Exercício terapêutico na busca da função. Rio de Janeiro: Guanabara Koogan; 2001. p. 356–90.
2. Grosse D, Sengler J. Reeducação perineal. 1st ed; 2002. p. 13–33/61–99.
3. Kegel AH. Physiologyc therapy for urinary stress incontinence. JAMA. 1951;146:915–7.
4. Bent AE, Ostergard DR, Cundiff GW, Swift SE. Ostergard's urogynecology and pelvis floor dysfunction. 5th ed: Lippincott Willians & Wilkins; 2003.
5. Calais-Germais B. El periné feminino y el parto. Ed: Los Libros de la Liebre de Margo, SL; 1998.
6. Corços J, Davis MB, Drew S, West L, Incontinência urinária e fecal: o uso do biofeedback eletromiográfico para treinar a musculatura do assoalho pélvico, 1997.
7. Basmajian JV. Biofeedback – principles and practice for clinicians, vol. 1. 3rd ed; 1989. p. 281–5.
8. Berghmans B. Pelvic floor muscle training: what is important? a mini-review. Obstet Gynecil Int J. 2017;6(4):00214.
9. Enck P, Van Der Voort IR, Klosterhalfen S. Biofeedback therapy in fecal incontinence and constipation. Neurogastroenterol Motil. 2009;21:1133–41.
10. Binder-Mcleod AS. Biofeedback eletromiográfico para melhorar o controle motor voluntário. In: Robinson AJ, Snyder-Mackler L, editors. Eletrofisiologia clínica. 2nd ed. Porto Alegre: Artmed; 2001. p. 386–92.
11. Kim YS, Weinstein M, Raizada V, Jiang Y, Bhargava V, Rajasekaran R, et al. Anatomical disruption & length-tension dysfunction of anal sphincter complex muscles in women with fecal incontinence. Dis Colon Rectum. 2013;56(11):1282–9.
12. Scott KM. Pelvic floor rehabilitation in the treatment of fecal incontinence. Clin Colon Rectal Surg. 2014;27:99–105.
13. Huffman JW, Osborne SL, Sokol JK. Electrical stimulation in the treatment of intractable stress incontinence: a preliminary report. Arch Phys Med Rehabil. 1952;33(11):674–6.
14. Pickles B, Compton A, Cott C, Simpson J, Vandervoort A. Fisioterapia na terceira idade. São Paulo: Sartos Livraria editora; 1998. p. 230–54.
15. Uchôa SM. Aplicações da Eletroestimulação nas Disfunções do assoalho Pélvico. In: Agne JE, editor. Eletrotermofototerapia. 1ª edição: Santa Maria; 2013. p. 507–11.
16. Uchôa SM, Matos M. Técnicas de reeducação anorretal. In: Amaro JL, Haddad JM, Trindade JC, Ribeiro R, editors. Reabilitação do assoalho pélvico nas disfunções urinárias e anorretais. ed. São Paulo: Segmento Farma; 2012. p. 311–27.
17. Plevnik S, Vodusek DB, et al. Optimization of pulse duration for electrical stimulation in treatment of urinary incontinence. World J Urol. 1988;4:22–3.
18. Davis HL. Is electrostimulation beneficial to denervated muscle? A review of results from basic research. Physiother Can. 1983:55–66.
19. Martellucci J. Electrical stimulation for pelvic floor disorders. Ed. London: Springer; 2015. p. 89–90.
20. Martins FG. Tratamento conservador da incontinência urinária feminina. Urologia Contemporânea. 2000;6(1):21–6.
21. Vonthein R, Heimerl T, Schwandner T, Ziegler A. Electrical stimulation and biofeedback for the treatment of fecal incontinence: a systematic review. Int J Color Dis. 2013;28:1567–77.
22. Melzack R, Wall PD. Pain mechanisms: a new theory. Science. 1965;150:1971.
23. Schüssler B. Aims of pelvic floor evaluation in: pelvic floor reeducation principles and practice: Springer; 1994. p. 40.
24. Snooks S, Barnes P, et al. Damage to the innervation pf the voluntary anal and periurethral musculature in incontinence: an electrophysiological study. J Neurol Neurosurg Psychiatry. 1984;47:1269–73.
25. Snooks S, Stechell M, et al. Injury to innervation of pelvic floor sphincter musculature in childbirth. Lancet. 1984;324:546–50.

26. Polden M, Mantle J. Fisioterapia em ginecologia e obstetrícia. Rio de Janeiro: Livraria Santos; 2002. p. 235.
27. Jundt K, Peschers U, Kentenich H. The investigation and treatment of female pelvic floor dysfunction. Dtsch Arztebl Int. 2015;112:564–74.
28. Plevnik S. New methods for testing and strengthening the pelvic floor muscles. In: Proceeding of 18o Annual Meeting of ICS. London; 1985. p. 267–8.
29. Carrière B. The Swiss ball. In: Theory, basic exercises and clinical application: Springer; 1998. p. 327–58.
30. Sartori DVB, Gameiro MO, Yamamoto HA, Kawano PR, Guerra R, Padovani CR, et al. Reliability of pelvic floor muscle strength assessment in healthy continent women. BMC Urol. 2015;15:29.
31. Grosse D, Sengler J, et al. Les techniques de stimulation dans la reeducation vesico-sphinctérienne. J Urol. 1993;99(5):229–42.
32. Janez J, Plevnik S, Suhel P. Urethral and bladder responses to anal electrical stimulation. J Urol. 1979;122:192–3.
33. Susset JG, Galea G, Read L. Biofeedback therapy for female incontinence due to low urethral resistance. J Urol. 1990;143:1205–8.
34. Guillemont F. Reeducation perineale et incontinence fecale. Explorations fonctionnelles digestives. 2 Décembre 2000.
35. Roongsirisangrat S, Rangkla S, Manchana T, Tantisiriwat N. Rectal balloon training as an adjunctive method for pelvic floor muscle training in conservative management of stress urinary incontinence: a pilot study. J Med Assoc Thail. 2012 Sep;95(9):1149–55.
36. GFS L, et al. An ideal e-health system for pelvic floor muscle training adherence: systematic review. Neurourol Urodyn. 2019;38(1):63–80.
37. Dumoulin C, Hay-Smith EC, Mac H-SG. Pelvic floor muscle training versus no treatment, or inactive control treatments, for urinary incontinence in women. Cochrane Database Syst Rev. 2014;14:CD005654.
38. Berghmans B. Pelvic floor muscle training: what is important? a mini-review. Obstet Gynecol Int J. 2017;6(4):00214. https://doi.org/10.15406/ogij.2017.06.00214.
39. Bo K. Pelvic floor muscle strength and response to the pelvic floor training for stress urinary incontinence. Neurourol Urolodyn. 2003;22:654–8.