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Treatment of Urinary Incontinence in Females: A Physical Therapist's Guide

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Treatment of Urinary Incontinence in Females: A Physical Therapist's Guide

by

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This Independent Study, submitted by Natalie R. Wells in partial fulfillment of the requirements for the Degree of Master of Physical Therapy from the University of North Dakota, has been read by the Faculty Preceptor, Advisor, and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.

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ABSTRACT

Urinary incontinence is a common problem for many females in the United States. Most people with this problem believe that their main options for treatment are surgery or medications. People with incontinence, along with their attending physician, often do not realize the types of conservative therapy that are available for the treatment of urinary incontinence in females. As the understanding of urinary incontinence has increased, there has also been an increased awareness of the role of physical therapy in the conservative treatment of the problem.

The purpose of this paper is to review the literature regarding the assessment and treatment of urinary incontinence in females. Background information on the anatomy and physiology of the intact urinary system in females, description of the most common types of incontinence, and a discussion of some assessment techniques for the physical therapist will be presented. The study also will provide information on some of the assessment techniques that other health care professionals are involved in. In addition, the most commonly utilized treatment techniques available to physical therapists will be reviewed and treatment guidelines will be outlined.

CHAPTER ONE
INTRODUCTION

Urinary incontinence has been defined by the International Continence Society as "involuntary urine loss that results in a social or hygienic problem, and which is objectively demonstratable."[1] Urinary incontinence is a problem for many women in the United States. Estimates of the magnitude of the problem vary widely with different definitions of disease, different populations studied and different survey methods.[2] Despite its high prevalence, urinary incontinence is underrecognized and undertreated in the U.S.[3] One reason for the underrecognition of the problem is that women are embarrassed by their incontinence and fail to seek medical attention. Another reason women do not seek medical attention is that symptoms of incontinence are often perceived as being normal. Many health care providers do not encourage women to seek the evaluation and treatment of their symptoms, thereby promoting the problem.[4] These attitudes and beliefs held by the general public and health care providers are counter productive, as early recognition and treatment could prevent acceleration of the problem and may eliminate the need for surgery in later years. It is imperative that health care providers become more aware of the problem and begin addressing it in a more

appropriate manner.

The purpose of this paper is to review the literature regarding incontinence in females and to give physical therapists a guide for the assessment and treatment of this problem. An overview of the anatomy and physiology of the functioning bladder will be provided, followed by a description of assessment tools and techniques which will help the therapist identify the type and severity of incontinence affecting patients. Examples of treatment techniques designed as conservative intervention for incontinence will be presented.

The following research questions will be answered throughout the body of the text:

1.) Why should a physical therapist be interested in the treatment of urinary incontinence in females?
2.) What are the most common theories regarding muscles and nerves involved in the intact micturition process?
3.) What are the different types of incontinence?
4.) What are the most common theories of causality?
5.) What are the most common assessment tools used in identifying the type of incontinence affecting females?
6.) What are some techniques that can be used by physical therapists in the treatment of urinary incontinence in females?

7.) When should physical therapy treatment techniques be administered?

CHAPTER TWO
ANATOMY AND PHYSIOLOGY OF THE FUNCTIONING FEMALE BLADDER

Anatomy

Although the terminology is far from universal, [5-7] there are five major muscles or groups of muscles that play a role in the functioning bladder. The first muscle is the detrusor muscle. The detrusor muscle forms the bladder wall and is made up of three layers of interlacing smooth muscle fibers[4,6] that are controlled by the parasympathetic nervous system.[8-11] The function of the detrusor muscle is to act as a storage reservoir during bladder filling and to actively contract during urination.[4]

At the base of the bladder, the trigone, a second muscle involved in micturition, forms a firm triangular shaped area.[6] The trigone can be identified by the fact that the mucosa is very smooth, in contrast to the remainder of the bladder mucosa, which is folded to form rugae.[12] At the upper corners of the trigone, the ureters enter the bladder and at the lower corner the urethra exits. One study showed that the flat trigone was transformed into an open funnel leading to the urethra during voiding.[9]

The internal sphincter is the third muscle involved in the micturition process. This muscle is formed by the

continuation of the outer layer of the bladder wall that loops around the proximal urethra, in the area of the bladder neck, forming a circular muscle layer.[10] Like the bladder wall, this muscle is believed to be controlled by the parasympathetic nervous system.[9,10] Its natural tone normally keeps the bladder neck and urethra empty of urine until the pressure in the bladder rises above a critical threshold.[12]

In addition to the internal sphincter, a second sphincter, the external sphincter, contributes to the micturition process. The external sphincter is formed by a group of muscle fibers built up around the middle one-third of the urethra.[9,10] Important to some of the treatment theories is the belief that these muscle fibers also contribute to the vaginal and anal sphincters.[10] Some disagreement exists about the innervations of these muscle fibers. Most researchers believe that this sphincter is striated and under voluntary control.[8,10,11] In contrast, Mandelstem believes that the external sphincter is under parasympathetic control.[9] Mandelsem also stated that the exernal sphincter is made up of slow twitch fibers.

The fifth and final group of muscles involved in the continence of females is the pelvic floor musculature. The muscles contributing to the pelvic floor are some of the most frequently discussed muscles in the literature on physical therapy treatment of incontinence. The pelvic

floor is made up of several layers and several muscles. The literature on incontinence is consistent in that most authors believe the pelvic floor muscles to be important in the treatment of incontinence. It is also generally accepted that the pelvic floor is under voluntary control and is supplied by the pudendal nerve. However, confusion may arise when studying the pelvic floor because of the multiplicity of names used for muscles in this area.[7] In addition, authors disagree on which muscle or muscles should be the focus of physical therapy treatment. Chiarelli[13] proposed that it is impossible to separate the different muscles of the pelvic floor and almost impossible to contract them individually. Chiarelli also concluded that the muscles are meant to function as a complete unit. Because this paper is clinically oriented, Chairellis's view on the involvement of the pelvic floor will be used. It is beyond the scope of this paper to determine the exact location and function of each muscle of the pelvic floor. Instead, the following anatomy and physiology sections focus on familiarizing the reader with the most common terminology found in discussions of the pelvic floor and the functions of the pelvic floor as a unit.

The pelvic floor is made up of at least three layers consisting of the following, listed from deep to superficial: (1) the levator ani muscle group, (2) the urogenital diaphragm, and (3) the superficial muscles at the

outlets. The deepest layer, the levator ani group, is the most muscular layers and is often the focus of physical therapy treatments. It originates on the posterior aspect of the pubic bone, sweeps back to skirt the urethra, loops around the vagina and anus and inserts some of its fibers on the coccyx.[14] It is believed that the levator ani complex contains two distinct fiber types.[13] Some fibers are slow twitch and are able to maintain a constant state of tension. These fibers promote continence by continuously pressing the urethra against the pelvic bone. Fast twitch fibers are the other type of fibers located in the levator ani complex. These fibers react quickly and strongly to tightly close the urethra, preventing urine flow when any increases in abdominal pressure occurs. The process through which this occurs is explained in more detail in the physiology section of this paper. The pubococcygeus is thought to be the most important of the levator ani muscles and is sometimes called the PC muscle.[7,15] The iliococcygeus, ischiococcygeus and the puborectalis are other muscles that contribute to the functional levator ani group and have been discussed in the literature on incontinence.[7,15,16] Again, it is clinically important to remember that whatever the specific origin and insertion of each muscle, the pelvic floor muscles function as one unit.[13]

The middle layer of the pelvic floor, the urogenital diaphragm, is a layer of fascia containing the deep

transverse perineal muscles.[17,18] This fascia is pierced by the urethra and vagina. The urogenital diaphragm should not be confused with the pelvic diaphragm, which is another name for the levator ani complex.[19] Because this layer is mainly fascia, it was not usually discussed in detail in the literature reviewed for this paper.

The superficial layer, sometimes called the outlet group, is another layer that was generally only discussed briefly in the literature reviewed for this paper.[7,17] Authors disagree on how the outlet group in controlled. It may be voluntary or it may contain both voluntary and autonomic fibers.

Physiology

A basic neurophysiological understanding of the micturition process is necessary for the medical professional involved in the assessment and treatment of incontinence. As the bladder fills it distends passively and only small increases in bladder pressure are noted.[10] As the bladder distends, stretch receptors located in the bladder trigger a stretch reflex at the spinal level. The spinal cord automatically returns a message through the autonomic nervous system to the detrusor muscle which causes a contraction lasting long enough for bladder emptying. A nerve pathway connects the detrusor to the internal urethral sphincter to allow for the relaxation of the urethral sphincter in synchrony with the autonomic detrusor

contraction. This coordination allows for the bladder to empty smoothly.

The stimulated stretch receptors also send a message of bladder fullness along the pelvic nerve, through the spinal cord and to the brain cortex.[10,20] The cortex processes the information it receives and makes a volitional decision to urinate or to resist the urge. If it is socially appropriate to urinate, the cortex allows autonomic control, relaxation of the striated sphincter, and ultimate urination. If it is socially inappropriate to void, the cortex sends a message to the striated sphincter to override the autonomic system and contract, resisting voiding.[10] Gartley stated that this message is sent through the pudendal nerve[20] while Fantl stated that it is sent through the pelvic nerve.[8]

There are several reflexes that work to maintain continence in the properly functioning micturition process. One of these reflexes occurs when a sudden increase in intra-abdominal pressure is caused by coughing, sneezing or sudden position changes. The increased pressure is sensed by the stretch receptors in the bladder which trigger a spinal reflex contraction of the levator ani. The levator ani contraction compresses the urethra against the pubic bone in an effort to increase urethral closing pressure and to maintain continence through the coughing or sneezing spell. A second reflex involves the voluntary contraction

of the pelvic floor. It is believed that a healthy pelvic floor contraction will cause reflexive inhibition of the detrusor muscle.[10] The inhibition of a detrusor contraction, in combination with the indirect sphincter mechanism formed by a voluntary reflex contraction of the levator ani, will assist in maintaining continence.

Physical support of the pelvic viscera is also important in maintaining continence. The pelvic floor contributes to the support of the pelvic viscera by forming a supportive layer that closes the bottom of the abdominal pelvic cavity and prevents the organs form falling through the opening within the bony pelvis.[16] Traditionally, the pelvic organs were believed to be supported by ligamentous tissue alone.[19] More recently, researchers have realized that the levator ani complex is the immediate support layer for the pelvic viscera. When the pelvic muscles are functioning normally and offering good support, there is a distribution of forces within the cavity that promotes continence. (See Fig 1) One force is the pressure that is pushing for urine release which is known as bladder pressure. Bladder pressure is determined by several factors including abdominal pressure and the presence of detrusor muscle activity.[21] The opposing force is called urethral pressure, which is the resisting force that is created by the urethral sphincter and pelvic floor muscles working to retain the urine in the bladder. In a correctly functioning

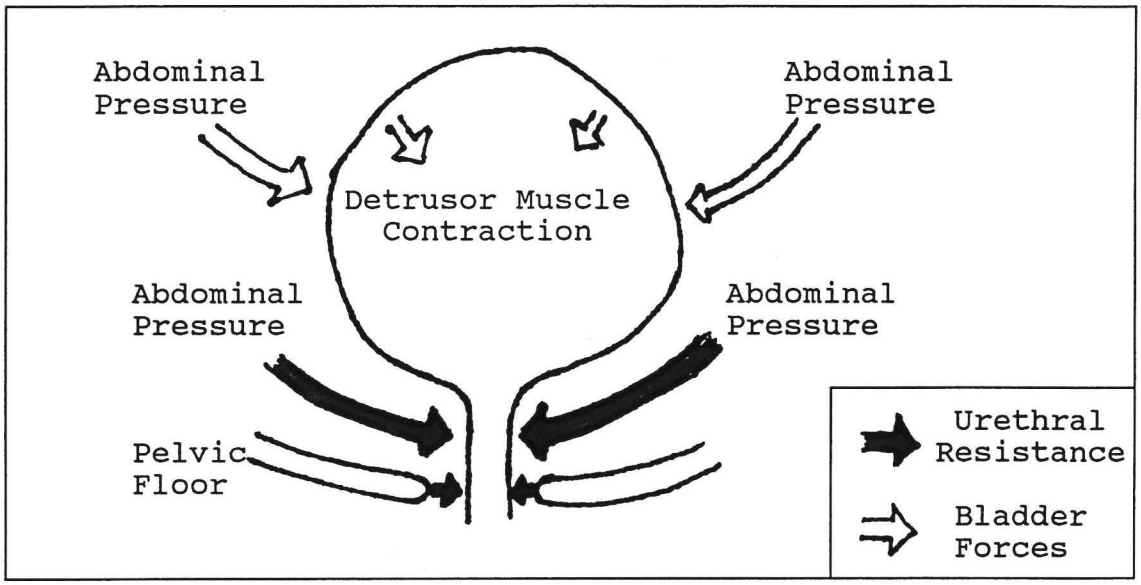


Fig 1. – Bladder forces consisting of abdominal pressure and detrusor muscle contraction work together to empty the bladder. Urethral resistance forces consisting of transmitted abdominal pressure and voluntary pelvic floor and sphincter contraction work together to oppose bladder emptying.

urinary system, increasing abdominal pressure caused by a cough, a sneeze, laughing or physical exertion had an effect on both forces, the bladder pressure and the urethral resistance.[6,8] First, the balloon-like bladder sits within the abdominal cavity so whenever abdominal cavity pressure increases, the pressure pushing in on the outside of the bladder also increases. In addition, the urethral resistance increases because two-thirds of the urethra is located above the pelvic floor, will within the abdominal cavity.[6,8] As abdominal pressure increases, the pressure is transmitted to the proximal urethra providing a passive mechanism of closure.[9] This phenomenon is sometimes

referred to as pressure transmission and is an important part of maintaining continence. [8,16]

While the pelvic floor muscles are important in maintaining continence, they also play a role in micturition. When the pelvic floor muscles relax to allow urination, the pelvic floor drops down, carrying the urethra with it.[10] Descent of the bladder base follows and funneling of the bladder outlet and trigone begins. This causes a subsequent relaxation of the urethra which allows the micturition process to continue.

CHAPTER THREE
ASSESSMENT TO DETERMINE THE TYPE AND SEVERITY OF INCONTINENCE

Types of Incontinence

In order to complete a thorough assessment and to understand the pattern of symptoms that present during the assessment, the therapist will need to have a knowledge of the types of incontinence that exist. It is also important that the evaluator realize that the type of incontinence that affects the patient is generally thought of as a symptom and not a diagnosis.[8,22] The ability of the therapist to correctly identify these symptoms is important because the treatment for each type varies significantly.

Urinary Stress Incontinence

The first and most common type of incontinence in females is urinary stress incontinence(USI), sometimes called stress incontinence.[9,23] Clinically, patients will describe stress incontinence as the loss of small amounts of urine upon coughing, sneezing, laughing, or physical exertion. The Clinical Practice Guidelines developed by the US Department of Health and Human Services described stress incontinence as the inability to generate enough resistance in the sphincter to retain urine in the bladder.[24] The sphincter mechanism may be unable to generate adequate

resistance for three main reasons which will be discussed in the following paragraphs: (1) inadequate pressure transmission,[8,9] (2) weak voluntary muscle contraction,[8,21] and (3) weak reflex contractions.[8]

Chapter 2 described the importance of correctly positioned abdominal organs. When the pelvic floor muscles are functioning properly, the floor maintains as elevated position and the ligaments that connect the pelvic walls to the pelvic viscera are not under tension.[20] When the pelvic floor muscles are damaged, the pelvic floor descends and the intraabdominal organs must be supported by the ligaments. If the ligaments are overstressed, they will eventually fail. Multiparous, aged, obese, and post-menopausal women are at risk for pelvic relaxation which results in loss of the anatomic relationships that allow adequate pressure transmission.[21] An examination of a woman with stress incontinence often reveals descent of the bladder base and a functional loss of length of the urethra. This loss of length prevents adequate pressure transmission and results in stress incontinence.[6,22] (See Fig 2)

As discussed in chapter 2, there is widespread agreement that the pelvic floor muscles can voluntarily contract to resist urine flow. However, the pelvic floor muscles can become weak, in which case, they can not exert enough pressure to overcome the bladder pressures, resulting in leakage. Incompetence of these muscles is widespread and

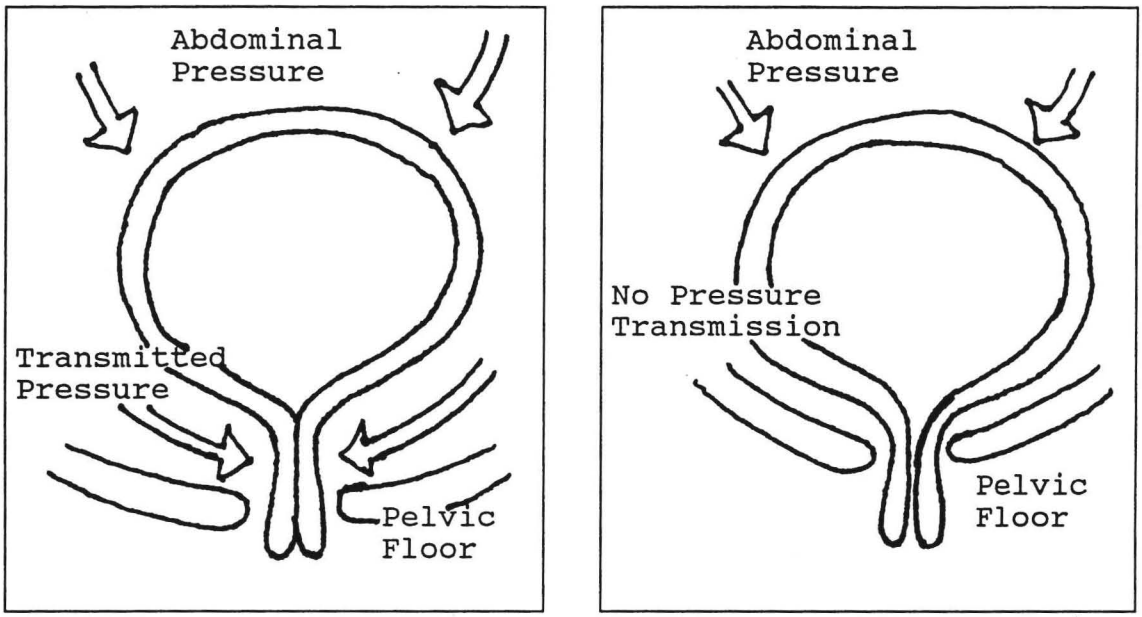


Fig 2. — Left, The bladder is correctly positioned allowing for adequate pressure transmission and ultimate continence; Right, The bladder has descended allowing no pressure transmission and probable incontinence.

can be related to local causes such as the stretching of the urethra and pelvic floor during labor.[6] It has been found that women from cultures that require a squatting position for activities of daily living tend to have stronger pelvic floor muscles.[25] In another study, women from a tribe of native South Africans were found to have relatively strong pelvic floor muscles.[26] These women were taught a form of pelvic floor exercises by their elders after childbirth. These authors suggest that women in Western cultures may have weak pelvic floor muscles because they do not use them regularly as in some other countries.

The third reason for failure of the sphincter mechanism

is weak reflex muscle contractions. Chapter 2 provided an explanation of the neurophysiology of an intact reflex mechanism. It is beyond the scope of this text to discuss all the changes that can occur to make the reflex arc itself function improperly. However, it is important to note that weak pelvic floor muscles can be the point of breakdown of the reflex mechanism even if the reflex arc itself remains intact.

There are several additional factors that may predispose a patient to an increase in the severity of urinary stress incontinence. These factors tend to augment the three main causes of USI that were discussed above. The main factors are obesity, chronic cough, and history of child births. Each of these conditions can cause trauma and decrease the strength of the pelvic floor muscles. [18,27]

Urge Incontinence

The second leading type of incontinence in females is urge incontinence.[28] It has been described as the involuntary loss of urine associated with involuntary detrusor contractions sometimes referred to as detrusor overactivity.[24]

The normally functioning detrusor muscle contracts only when the bladder is full enough to trigger the stretch receptors. It should not contract during the filling phase of micturition.[29] (See chapter 2 for more details on the intact micturition process.) In the case of detrusor

overactivity, the bladder contracts before it is full and causes a sense of urgency that can not be inhibited.[21] In severe cases, the symptoms consist of an inability to get to the bathroom before leakage occurs. Usually, large amounts of urine are leaked and the patient is frustrated with the problem. Many times the frequency of urination will increase because the patient is attempting to empty her bladder before an urge and leakage occurs. It is possible to categorize detrusor overactivity into one of two categories discussed in the following paragraphs.

Detrusor overactivity can be caused by neurologic abnormality, in which case it is called detrusor hyperreflexia.[11] This is a common cause of incontinence in the elderly and may result from upper motor neuron lesions such as stroke, Alzheimer's, Parkinson's or multiple sclerosis.

Detrusor overactivity that is unrelated to neurologic control is called detrusor instability.[3,30] Whiteside[5] showed that 80% of women with urinary urgency symptoms had detrusor instability. For this reason, the assessment and treatment techniques discussed later will focus on detrusor instability rather than on detrusor hyperactivity.

Because the exact cause of detrusor instability is unknown, it is sometimes called idiopathic detrusor instability. One cause can be the patient's dietary intake. Foods such acid foods, spicy foods, milk products and sugar

have been known to cause an increase in incontinence because of bladder irritation.[30] Drugs with diuretic effects, such as alcohol, caffeine or some blood pressure medications, can contribute to urge incontinence by increasing urinary output.[3]

Some experts believe that poor bladder training in childhood can cause detrusor instability.[13,31] Chairelli[13] explained that little girls are encouraged to go to the bathroom when their mothers want them to go (i.e. before an outing) and not when they really need to go. As an alternative, Chairelli recommended that "girls should be encouraged to urinate only when they need to" because "they have the ability to hang on until a suitable place can be found." By encouraging young girls to hold on, mothers could help their daughters develop pelvic floor control.

Mixed Incontinence

Clinically, patients may present with a mixture of stress and urge incontinence, commonly called mixed incontinence.[24] It is important that the clinician realize that a mixture of the two symptoms can occur in the female population so that it can be identified and correctly treated.

Overflow Incontinence

A fourth type of incontinence is overflow or paradoxical incontinence. This type of incontinence is typically observed in middle-aged or elderly men.[9] Because

this type of incontinence is uncommon to females, its treatment is beyond the scope of this text.[11,22,32] However, a knowledge of its existence and its typical symptoms are important to the process of differential diagnosis. The cause of overflow incontinence in females is frequently uncertain or difficult to find.[22,32] In males, incontinence is often caused by a blockage of the urethra as in prostatitis. The patient usually presents with complaints of small amounts of urine during voiding and a feeling that he or she needs to void again shortly after attempting to void. Because the bladder remains full after an attempt to void, the patient may experience small amounts of leakage as the detrusor muscle continues to contract in an effort to expel the remaining urine.[33]

Assessment Techniques for Therapists

Norton[34] explained that a thorough assessment is needed to correctly identify the type of incontinence that exists. The following section of this paper will describe some assessment techniques which aid in diagnosis.

Dorothy Mendelstam,[29] an incontinence advisor, stated that a clear history of the type and degree of incontinence must be obtained from the patient as a first step in the treatment of incontinence. There is some question regarding the accuracy of a subjective history,[4,28,29] but asking the right questions during the history taking can help determine the type of incontinence that is present. Figure 3 lists

the questions that can be helpful in the evaluation of incontinence. The first five questions establish part of a relevant medical history. Questions six and seven attempt to show the signs of stress incontinence while questions eight through ten are aimed at determining urge incontinence. Questions eleven through fourteen are related to voiding dysfunctions. Nocturia, another possible type of detrusor instability is addressed in questions fifteen through seventeen. Questions eighteen and nineteen help define the severity of the problem and questions twenty and twenty-one screen for urinary tract infection. To increase the reliability of the history, a voiding record may be kept.[3,11] A sample daily diary used to identify patterns of incontinence is presented in figure 4. Patients can also use their diary as a place to record the performance of their home exercise program which will be discussed in chapter 4.

Establishing an absolutely certain diagnosis of urinary incontinence on the basis of a history is not always accurate,[4,28,29] especially when symptoms of both urge and stress are present.[35] According to Cholhan, reliance on patient history alone can result in an incorrect diagnosis in more than 30% of cases.[28] However, in addition to a good history, there are other assessment tools for use by a physical therapist that can be used to gain a more accurate picture of the patient's diagnosis.

PATIENT HISTORY

1.) Have you ever been pregnant?
2.) Have you ever given birth?
How many times?
3.) Have you gone through menopause?
4.) What medications are you currently taking?
5.) Have you had any recent changes in medications?
6.) Do you leak when you cough, sneeze or laugh?
7.) Do you leak upon physical exertion?
8.) Do you ever have an extremely strong urge to urinate that causes you to rush to the bathroom?
9.) If yes, do you ever leak before you reach the toilet?
10.) Do you develop an urgent need to urinate when are nervous, under stress or in a hurry?
11.) Do you find it difficult to initiate urination?
12.) Do you have a slow urinary flow?
13.) Do you have to strain in order to urinate?
14.) After urinating, do you experience dribbling or a feeling that your bladder is still full?
15.) How many times do you urinate during the night after you have gone to bed?
16.) How many times do you urinate during the day?
17.) Have you wet the bed in the past year?
18.) Do you find it necessary to wear a pad because of your leaking?
19.) How often do you leak?
20.) Have you had bladder, urinary or kidney infections?
21.) Do you have pain or discomfort with urination?

Fig 3. — Questions to be included in an accurate history of a patient with complaints of incontinence.

TIME	INTAKE	OUTPUT	SYMPTOMS
6 AM		200 cc	· urge woke me up · small leak
7 AM	8 oz		
9 AM		100 cc	· laughed & had med. leak
10 AM	8 oz		
12 Noon	12 oz		
2 PM		200 cc	· stood up & lg. leak
3 PM	8 oz		
6 PM	8 oz	300 cc	
9 PM	8 oz	100 cc	· TO BED
1 AM		300 cc	· urge woke me · lg. leak
4 AM		100 cc	
6 AM	8 oz	100 cc	

Fig 4. – Sample daily diary for patient recording of any liquid intake or output. Symptom column records if any leakage occurred and what may have caused it.

Musculoskeletal and Digital Exams

First, the physical therapist should perform a musculoskeletal assessment. Muscle weakness or imbalances in the adductors, gluteals, back extensors or abdominals can affect the pelvic floor.[36] Following a screening for weakness in these areas, a more detailed exam of the pelvic floor and sphincter muscles should be conducted. Several authors[14,33,37] have described strength grading scales to be used with the digital exam. Some of those scales will be

discussed in the following section. However, a detailed description of the methods used to perform the digital exam is beyond the scope of this text. There are courses available on the treatment of incontinence that include lab sessions on digital examinations. Information on these courses can be obtained through the OB/GYN section of the APTA.

In a study by Brink, Sampselle, Wells, Dionko and Gillis,[14] the authors chose to use the following strength scale:

0 - No contraction.
.3 - Flick (Barely perceptible)
.5 - Instant mild pressure.
1 - Loose hold for 1-2 seconds.
2 - Firmer hold for 1-2 seconds.
3 - Good squeeze for 3-4 seconds, pulls fingers in and up loosely.
4 - Stronger squeeze for 3-4 seconds, pulls fingers up and in snugly.

The assessment was performed with the patient lying on her back. The examiner used two fingers, first assessing the coronal plane and then the anteroposterior plane. The authors found the digital evaluation to be reliable, valid when compared to vaginal myography, and significant when related to the amount of urine lost during an episode of incontinence. Upon completion of the study, the authors

developed a second scale which had multi-levels and further elaborated on the dimensions of pressure, duration and displacement than were embedded in the original scale.

Chairelli[38] described an additional scale:

0 - No contraction.

1 - Flicker. Only with the muscle put on stretch.

2 - A weak squeeze, two second hold.

3 - A fair squeeze, definite "lift" (where the contraction can be felt to move in an upward and inward motion.)

4 - Good squeeze, good hold with lift. The contraction must be able to be repeated a few times at least. (A single contraction, no matter how strong, could not be graded as a 4 if it were not able to be repeated.)

Another author recommended using the modified Oxford grading scale in which the evaluator records a muscle grade from the following scale:[33]

0 - Nil.

1 - Flicker.

2 - Weak.

3 - Moderate.

4 - Good.

5 - Strong.

When recording the results of the assessment, the muscle grade is listed first, followed be the length of the hold

(up to 10 seconds), the number of repetitions the patient is able to perform, and finally, the number of fast, one second contractions that the patient can perform.

The development of a universal, valid and reliable scale is still in progress. As a clinician, it is important to choose a scale with established validity and reliability, and to use that scale on a consistent basis in the clinic. As with any scaling system, consistency will lead to a uniformity of understanding and will facilitate better communication between physical therapists and other health professionals.

Urine Stream Interruption Test

The physical therapist can also conduct the urine stream interruption test (UST) developed by Sampselle and DeLancey.[19] This test further assesses the effectiveness of the pelvic floor muscles by evaluating the ability to impede urine flow. The patient is asked to sit on a commode when she has an urge to urinate that is strong enough, in her normal experience, to result in toileting. She is then told that she can begin urination but should be prepared to stop when given the signal. The signal is given approximately 3 seconds after the initiation of flow. The length of time between the signal and the complete cessation of urine flow is measured by the examiner. There are no reported norms for the UST but it can be used as a criterion referenced test to monitor patient improvement with treatment. Signs

of hesitancy or weak urine stream may become evident during the observation of voiding. These symptoms indicate a blocked urethra and the need for a referral to a specialist.

Sampselle and DeLancey[19] demonstrated that the results of a correctly performed UST have been correlated with pelvic muscle strength in women. In addition, stopping the urine stream can be used as an awareness technique to help women isolate the correct pelvic muscles to be exercised during treatment. This treatment technique will be discussed further in chapter 4.

Provocative Stress Testing (Direct Visualization)

Several authors have advocated the use of the stress test.[3,4,8,11,24,28] In this test, the patient, while in an upright position and with a full bladder, is asked to give a single vigorous cough or to perform a Valsalva Maneuver.[11,24] The examiner should be able to view any leakage that might occur. If leakage occurs during the cough, the symptom correlates with stress incontinence. However, when leakage is delayed more that 2 seconds the symptom indicates detrusor hyperactivity triggered by the cough.

Perineometer

A perineometer is a biofeedback devise created by Kegal. How this devise relates to the treatment of urinary incontinence will be discussed in detail in chapter 4. However, some authors have recommended its use, along with other instruments, as an assessment tool in measuring the

Strength of the pelvic floor muscles.[36] Norms for the amount of pressure the pelvic floor muscles can exert on the perineometer range form 20 mm Hg to 65 mm Hg, depending on the source. More research is needed to determine a definite standard for evaluation when using this equipment.

Electromyography

Electromyography(EMG) reflects the activity of the urinary outlet by recording pelvic floor muscle activity and external sphincter activity.[39] An increase in EMG activity usually indicates an increase in urethral resistance, while a decrease in EMG activity indicates a decrease in urethral resistance. It has also been suggested that pelvic floor EMG can differentiate between a tetanizing contraction and a non-tetanizing contraction.[17]

There are several commercially available EMG monitors with attached computers and printers. The equipment typically used by physical therapists comes with single-user vaginal surface electrodes. If cost containment is an issue, then the use of EMG must be carefully considered because each patient must purchase her own re-usable electrode. One company listed their 1992 price for electrodes at $99 each.[40]

EMG can also be used as an assessment tool in combination with tests performed by specialists[28,39] or as a treatment technique performed by physical therapists. These uses of EMG will be discussed later in this paper.

Screening for Post Residual Volume

An estimate of the post residual volume (PRV) is recommended for patients with urinary incontinence. [3,24] Estimations can be made with abdominal palpation but some authorities believe that more accurate measures of PRV volume are necessary. However, it was stated in Clinical Practice Guidelines[24] that clinical judgement must be included in interpreting the significance of PVR volume.

Most physical therapists are limited to abdominal palpation for estimating the PVR volume. However, there are other more specific evaluation tools available to specialists. For example, there is a portable bladder scanner available on the market that uses ultrasonography to measure PRV.[41] If the therapist suspects an excessive PRV volume, indicating possible urinary outlet obstruction, then the patient should be referred to a specialist for further evaluation.

Assessment Techniques for Specialists

If the therapist is uncertain of the type and severity of incontinence that exists or if the therapist suspects a pathological process other that those the therapist is educated to treat, the patient should be referred to a specialist for further testing. Some of the more common evaluation techniques that physical therapists should be aware of will be covered on the following section.

Laboratory Testing

According to one source, urinary tract infection is the most common cause of urinary bladder symptoms.[42] Infections should be addressed while taking the patient's history. If the possibility of urinary infection exists, the patient should be refereed to a laboratory specialist for urinalysis and appropriate cultures.

Urodynamic Testing

Urodynamic tests are designed to determine the functional status of urinary bladder and the urethra.[24] By measuring the pressure and flow relationship throughout the micturition cycle, urodynamic tests can indicate which part of the cycle is malfunctioning.[29] The components of a urodynamic study will be discussed individually here but the reader should realize that many times the tests are performed simultaneously or in series. Tests involving filling will be discussed first, followed by tests of voiding.

Cystometrogram

The filling cystometrogram is an assessment of intravesical or bladder pressures during filling.[35] In other words, this procedure tests detrusor function.[28,43] It is mainly used to identify detrusor instability or urge incontinence. The simple cystometrogram involves measuring the intravesical pressure with a single pressure monitoring

catheter while filling the bladder to capacity or until involuntary detrusor contraction occurs.[24] (See Fig. 5) One way to identify an involuntary detrusor contraction is to watch the water level in the syringe as it is filling the bladder because any rise in the column of water can be secondary to a detrusor contraction.[3] Because only one pressure sensor is used on the simple cystometrogram, results must be interpreted with caution.[24] A potential problem with using only one sensor is that an increase in intraabdominal pressure will increase the intravesical pressure, and might be misinterpreted as inhibited bladder activity.[28] To eliminate this problem, two sensors can be used.

When using two sensors, the intravesical pressure is still measured with the pressure monitoring catheter in the bladder but the intraabdominal pressure is measured by a second pressure monitor in the rectum.[4] The true detrusor pressure, that is, the actual pressure generated by the bladder muscle, is determined by subtracting the intraabdominal pressure from the intravesical pressure.[4,28,29] During the filling phase, detrusor pressure normally remains below 15 mm H_2O until voiding is performed.[9](See Fig 6) Normally, there is no evidence of detrusor contraction during filling. Occasionally, however, vacillating detrusor pressures have been observed to coincide with the patient's report of a sense of urgency. A

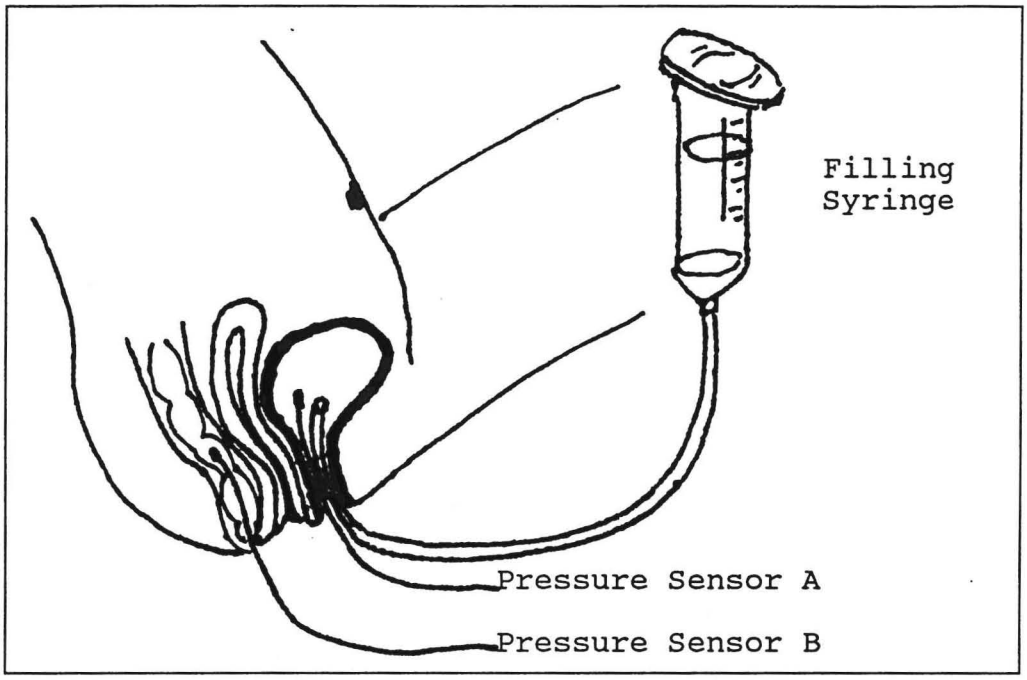


Fig 5. – Cystometrogram. The syringe is used to fill the bladder with saline solution while monitoring how much solution has entered the bladder. Pressure sensor A is used alone in a simple cystometrogram. Pressure sensors A and B are used together in a dual channel cystometrogram.

patient can be asked to cough once the bladder has been bladder which is shown to contract when the patient is attempting to inhibit micturition is termed unstable.[9] The filled. This is known as provocative testing.[35] Further, the patient should be asked during filling of the bladder to report the initial desire to micturate and when a sensation of fullness is first experienced.[9] Normally, the first desire to micturate occurs at 150 - 200 ml and the sensation of fullness occurs at 350 -500 ml.

Voiding Cystometrogram

The voiding cystometrogram, like the filling

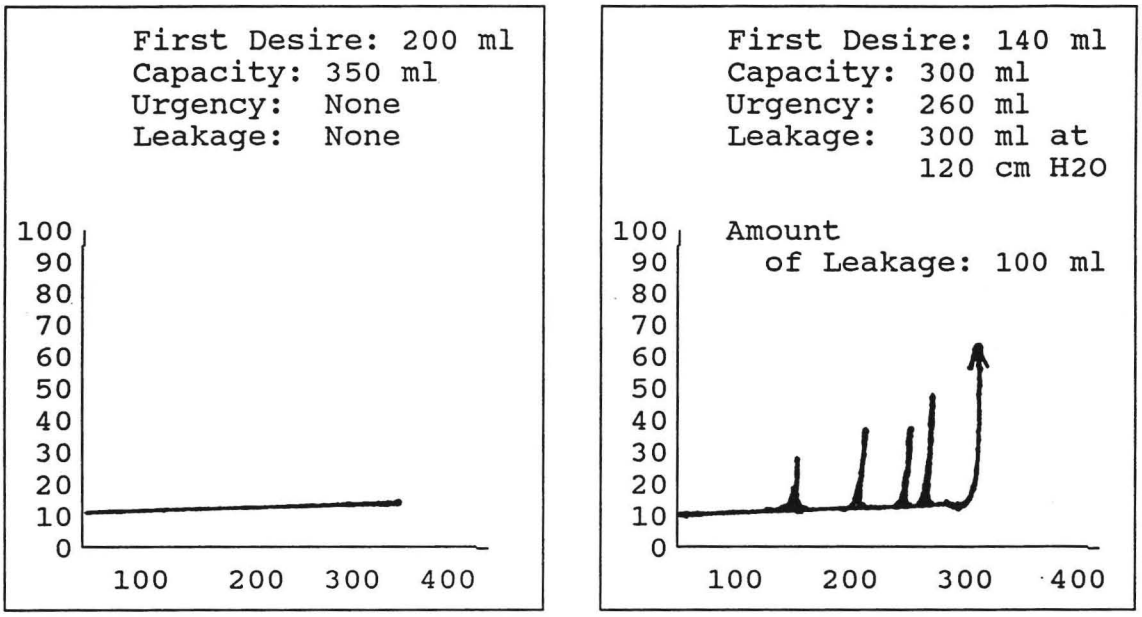


Fig 6. – Filling cystometrogram report. Right, Report indicating a normal bladder; Left, Report indicating an unstable bladder.

cystometrogram, assesses the actual bladder pressure. However, the voiding cystometrogram is performed duringurination.[9] Detrusor pressure recorded during voiding normally rises to about 30 - 50 cm H_2O in women. When used in combination with uroflowmetry, which will be discussed next, a more definite diagnosis can be made.

Uroflowmetry

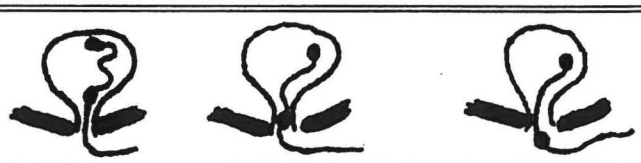
Uroflowmetry, as described in Clinical Practice Guidelines, measured the rate of urine flow visually, electronically, or with the use of a disposable unit.[24] Measurements include volume voided, maximum average flow rates, voiding time and time to maximum flow rate.[28] Some

authorities believe that uroflowmetry is not helpful in establishing the type of incontinence that a patient has.[24]

Profilometry/Sphincterometry

Profilometry is the measurement of urethral sphincter competency, at rest and during activities such as coughing.[28,35] Figure 7 shows examples of profilometry printouts for both resting and active testing. This test can be helpful in the identification of stress incontinence.[35] The usual procedure entails using some of the same equipment that was used in the two-channel cystometrogram.[28] One pressure-sensor is placed in the rectum to monitor the overall inter-abdominal pressure. The second pressure-sensor is a dual-sensored probe that is inserted into the bladder. The distal pressure sensor will measure bladder pressure while the proximal sensor measures urethral pressure.[8] This dual-sensor will be pulled out slowly and at an even rate as the pressure is being monitored as demonstrated at the top of figure 7.

The urethral closure pressure is determined by subtracting the bladder pressure, which is a voiding force, from the urethral pressure, which is a continence force. What remains is the net force for continence. If this net urethral closing pressure stays above zero, as in A and B of figure 7, then continence is maintained. However, if the urethral closure pressure drops below zero, as in C of figure 7, then incontinence will result. It should be

Location of Dual Sensor	

A. - NORMAL (NEGATIVE) RESTING PROFILOMETRY

1) PAB	
2) PBL	
3) PUR	
4) PBL-PAB=PD	
5) PUR-PBL=PUC	

B. - NORMAL (NEGATIVE) ACTIVE PROFILOMETRY

1) PA	
2) PBL	
3) PUR	
4) PBL-PAB=PD	
5) PUR-PBL=PUC	

C. - ABNORMAL (POSITIVE) ACTIVE PROFILOMETRY

1) PA	
2) PBL	
3) PUR	
4) PBL-PAB=PD	
5) PUR-PBL=PUC	

Fig 7. – Profilometry report. PAB=Abdominal Pressure; PBL=Bladder Pressure; PUR=Urethral Pressure; PD=Detrusor Pressure; PUC=Urethral Closure Pressure.

noted that in C, the detrusor pressure remained constant during coughing, showing no signs of detrusor instability. Instead, these results indicate a problem with the urethral closing mechanism which would be diagnosed as stress incontinence.

The combination of an accurate, complete history and properly chosen special tests will result in a clear picture of the patient's incontinence. This information, in combination with an understanding of the anatomy and physiology involved in the micturition process, prepares therapists to treat patients with incontinence. Chapter 4 will describe many of the procedures that therapists can be involved in during the treatment process.

CHAPTER FOUR
CONSERVATIVE TREATMENT FOR FEMALE URINARY INCONTINENCE

Trained physical therapists have much to offer in the treatment of urinary incontinence. Because physical therapists are experts in the areas of muscle function and neurology, they can effectively treat the pelvic floor musculature and associated reflex mechanisms in an effort to restore continence in females. This chapter will focus on some of the treatment techniques that physical therapists can administer. The first section will address the treatment of urinary stress incontinence with pelvic floor strengthening, achieved by exercise alone, exercise with weights, or exercise augmented with biofeedback or electrical stimulation. The second half of the chapter will focus on the treatment of urge incontinence through bladder retraining and the utilization of existing reflexes.

Treatment of Urinary Stress Incontinence

Pelvic Floor Exercises

In the late 1940's, Kegel proposed the use of pelvic muscle exercises to improve the function and tone of the pelvic floor after childbirth.[26,44] Kegel's exercises are still used today and consist of the volitional contraction and relaxation of the levator ani complex, especially the

pubococcygeus portion. The goal of Kegel's exercises, in the treatment of urinary incontinence, is to increase the strength and endurance of these muscles in order to promote urethral closing pressure through the sphincter mechanism.[44] These muscles are particularly important in resisting urine flow during sudden increases in interabdominal pressure as during coughing or sneezing. Strengthening the pelvic floor muscles can also increase urethral resistance through the passive mechanisms discussed in chapter 2. The goal of exercising, in this case, is to restore proper alignment and support of the pelvic viscera to allow for passive pressure transmission.[45]

In the past, there has been a tendency to regard Kegel exercises as "something good to do" rather than as a true therapeutic intervention.[45] Because of this line of thinking, patients were often times told to simply stop and start the flow of urine a few times each day. Studies of the effect of pelvic floor exercises have shown that brief written or verbal instructions such as this are an inadequate means of initiating a Kegel exercise program.[44] Not only is this method of instruction inadequate, it can be harmful.[37] Used excessively, stopping urine flow midstream can lead to detrusor instability or worsen any existing instability.

Physical therapists involved in the treatment of incontinence need to spend time with their patients in order

to educate them on the location and function of the pelvic floor, since many women are unaware of their pelvic muscle function.[44] The therapist must also insure that the patient is indeed contracting the correct muscles because many women incorrectly bear down when asked to contract their pelvic floor.[10,44] Chiarelli suggested that therapists place two examining fingers within the vagina and then ask the woman to squeeze up and in around the therapist's fingers.[37] Chairelli goes on to suggest that the following can help the patient achieve a successful contraction:

1.) Tell the patient to imagine that they have a strong need to pass gas but are in a socially inappropriate situation to do so and must hold it in.

2.) Press your fingers gently in a posterior direction which puts the pubococcygeus muscle on stretch.

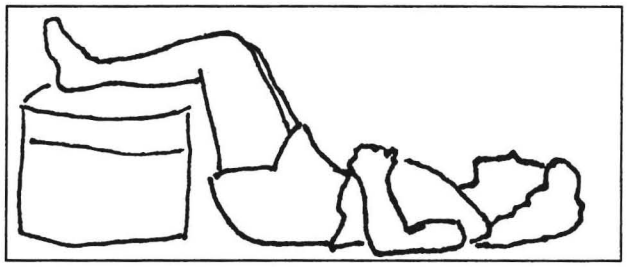
3.) Stretch your fingers apart sideways and then ask the patient to squeeze them together.

Once the patient is able to contract the pelvic floor muscles correctly, a home exercise program should be initiated. Bavendam recommended at least 100 contraction per day.[4] Chiarelli stated that the length of each contraction is the key to the success of the bladder training program.[37] This author also proposed that a "base number" should be established by counting the number of

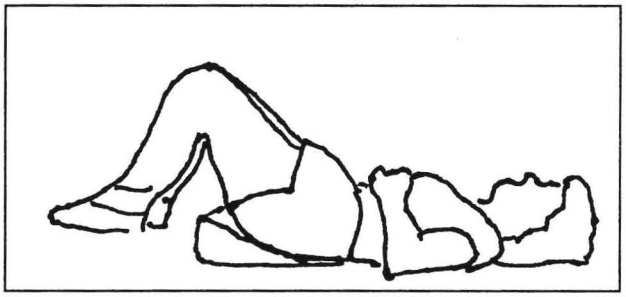
contractions a woman can repeat in series, with a six second rest period between each contraction. When the muscle is digitally felt to be tiring, the base number is established. The home exercise program entails contracting the pelvic floor in at least six separate sessions each day consisting of the base number of repetitions.

More recently, it has been suggested that pelvic floor exercises be done progressively in gravity assisted, gravity eliminated, and anti-gravity positions.(See Fig 8) Wells reviewed 22 studies on pelvic floor exercises and found that no one training regimen could be recommended because research methods varied so much from study to study.[46] However, she did conclude that the technique, in general, has substantial merit and no side effects.

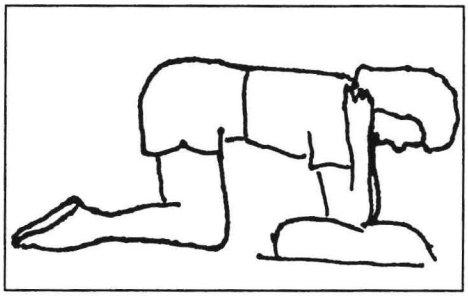
The importance of compliance, as with any home exercise program, is another consistency that has been found in studies of pelvic floor exercises, regardless of the regimen used.[47] Another factor that plays into the success of pelvic floor exercise is patient selection. Most authors agree that pelvic floor exercises consistently benefit women with recent onset of symptoms who receive close follow up and encouragement from an enthusiastic instructor.[34] Many authors also agreed that conservative measures such as pelvic floor exercises, should be tried before surgical interventions because of the absence of known side effects and the relative low cost of the treatment.



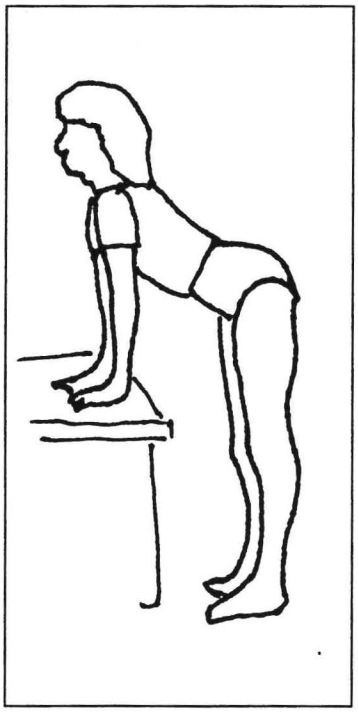
A. Gravity Assisted



B. Gravity Assisted



C. Gravity Eliminated



D. Anti-Gravity

E. Functional

F. Functional

Fig 8. – Example pelvic floor exercises in gravity assisted, gravity eliminated, anti-gravity and functional positions. Used with permission of Melanie Carvell,PT, Bismarck, ND.

Exercise with Resistance

Progressively weighted vaginal cones have been designed by Plevnik as a method of further strengthening the pelvic floor muscles.[48] Cones typically come in a set of 4 to 9, of identical shape and volume, but of increasing weight. Weight limits range from 20g to 100g.[49] Each cone has a nylon thread attached to the narrow end to facilitate removal. The cone is inserted into the vagina, base first with the tapered portion resting on the pelvic floor. A feeling that the cone will "slip out" of the vagina provides the sensory feedback that causes the pelvic floor to contract around the cone.

Moore and Medcalfe found a success rate of 70% in patients with stress urinary incontinence after four months of treatment with cones.[50] Other studies have found similar results in six weeks to two months of treatment.[49,51] Moore and Medcalfe's results documented that some participants found that the cones allowed them to isolate the pelvic floor muscles and correctly perform pelvic floor exercises for the first time.[50] Patients who benefitted most from cone therapy were those with stress urinary incontinence of less than two years duration.

Another benefit of using cones for resistance exercises is that they provide an effective method of treatment for stress urinary incontinence that is not costly, labor intensive or time-consuming.[52] As with exercise alone,

therapy with cones is acceptable to most women and is without side effects.

Exercises with Biofeedback

Kegel designed the first biofeedback tool used to indicate pelvic floor activity.[26,53] The tool was called a perineometer and was an intravaginal pneumatic chamber connected to an external pressure gauge. Many biofeedback devices have been developed since the original perineometer[45] and they vary in design and price.[34] According to one review article,[53] most incontinence specialists are currently using biofeedback instruments that use vaginal or rectal probes or surface electrodes placed around the anus. These methods are designed to pick up pubococcygeus muscle actively. Some EMG type biofeedback units have a computer screen display for easier understanding and recording. Some questions may be raised about EMG reliability because the probe must be removed and replaced each session. As a result, placement may vary slightly at each recording, which could affect the outcome. Therefore, care must be taken when interpreting and comparing EMG recordings from one session to the next. Care must also be taken to avoid a sudden increase in abdominal pressure during recording as these may be interpreted as muscle contractions.[34] To avoid this problem, McDowell, Burgis and Candib,[54] advocated the use of simultaneous feedback of bladder pressure, sphincter activity and

intraabdominal pressure.

Using biofeedback devices can benefit the patient in several ways. First, the biofeedback device can be used as a learning tool. Initially, the feedback allows the patient to locate the pelvic floor muscles by giving them visual or auditory cues that indicate the success of their attempted pelvic floor contraction.[4] Once the correct muscles have been identified, the patient is able to adjust or alter muscle activity in an effort to achieve a better contraction.[45] Successful patients will learn to perform the adjusted contraction automatically.[55]

A biofeedback device can also be used to monitor patient progression, as measured by increases in strength and duration of contractions.[4] Kegel suggested using a chart to document progression.[26] Recording the patient's progression can be motivating for both the patient and the physical therapist. Demonstrating another type of motivation, one study found that women using the device only in the clinical setting frequently remarked on how much harder they could contract their pelvic floor when they could concentrate on the "lights".[50] The authors concluded that biofeedback devices may especially have value as a time saving device in the clinical setting. Castleden stated that the best motivation is successfully decreasing symptoms.[57] Castleden went on to state that home use of a biofeedback unit for motivation is therefore unnecessary for

all patients.

Many studies have been done comparing the use of biofeedback and exercise to exercise alone.[45,53,58] The authors used different indicators of success of biofeedback. Some found better subjective reports from the patients themselves, while others found better objective measures such as higher EMG output or higher pressures on urodynamic studies. One study showed that the success of biofeedback devices depend largely on the quality of moral support the patient is given during treatment.[59] In general, the majority of the studies reviewed concluded that exercise with biofeedback was better that exercise alone.

Biofeedback should not be thought of as a treatment in and of itself. It is a training technique that is one component of a treatment program.[60] Another optional component of a treatment program is electrical stimulation which will be discussed in the following section.

Electrical Stimulation

Electrical stimulation is another technique that can be used to augment exercise in the treatment of urinary stress incontinence. It can be used as an additional method of identifying the pelvic floor musculature[53] or it can be used to augment urethral sphincter function.[61] There are several types of electrical stimulation used in the treatment of incontinence. Some therapists use Faradism, a low frequency current, as a sensory stimulus to enhance the contraction of

weak levator muscles.[17] A vaginal electrode with a large indifferent pad over the sacrum or lower abdominals is generally used with this technique. Some specialists believe that Faradic stimulation can be potentially harmful because it can result in a decrease in maximal tetonic force.[62]

Interferential electrical stimulation, a second type of electrical stimulation, has also been used in the treatment of incontinence. It has the benefit of a decreased level of discomfort at the skin-electrode interface.[34] This type of electrical stimulation is administered with four vacuum suction electrodes, two placed on the lower abdominals and two placed on the adductors.[63] Two medium frequency alternating currents of slightly different frequencies criss-cross in the center of the four electrodes, approximately at the pelvic floor.[17] A beat frequency of 100 Hz is produced in the pelvic floor area,[17] stimulating structures in and around the pelvic floor, such as the bladder neck and pubococcygeus.[63] The placement of the electrodes also can facilitate simultaneous contraction of the hip adductors and lower abdominals.

Another type of electrical stimulation used by physical therapists is functional electrical stimulation(FES). It is usually administered with an intravaginal or intraanal electrode connected to an external stimulator. The stimulators found within most physical therapy departments

can be used or the patient can use a battery powered, portable electrical stimulator. FES can vary in frequency from 10 HZ to 50 Hz and is administered intermittently. Some studies have used "on" and "off" intervals as short at .5 seconds on and 1.5 seconds off.[64] Others have experimented with intervals as long as 10 seconds on and 25 seconds off.[65] Intermittent, rather than constant, stimulation circumvents the problem of muscle fatigue without sacrificing effectiveness. Few studies have been done to compare the different techniques used in the application of FES. Standardization of the stimulation parameters is necessary to allow appropriate comparisons before this treatment can be accepted as a routine treatment for urinary incontinence.[53]

Pelvic muscle stimulation is probably achieved by direct stimulation of the afferent fibers in the pudendal nerve.[66] The electrical impulse runs along the afferent limb of the pudendal nerve to the sacral nerve roots and the efferent pathways to the pelvic floor muscles. Pelvic muscle contraction occurs and results in increased urethral closure pressure.

Other Conservative Techniques

Nielsen et al concluded that a new conservative treatment, the urethral plug, is a promising alternative treatment for stress urinary incontinence in women.[67] This treatment consists of inserting a plug with one or two

spheres along the stalk. The plug is worn until voiding, at which time it is removed and replaced by a new one.

Realini and Walters proposed the use of vaginal diaphragms in the treatment of USI.[68] They studied ten women with USI. The subjects wore the ring portion of a diaphragm which they inserted in the morning and removed in the evening. Forty percent of the women studied experienced clinically significant improvement.

These two methods of treatment are far from perfected. More studies need to be done before they should be considered as a treatment technique for most patients.

Pharmaceutical Treatment

Drugs have been used to successfully treat USI. There is no evidence that estrogens alone are helpful in managing incontinence, but a combination of estrogens and alpha adrenergic agonists, such as phenylpropanolamine, can reduce genuine stress incontinence.[31,52] Estrogen strengthens collagen fibers and improves supporting structures and the strength of the pelvic floor contractions. Alpha adrenergic agonists increase the contraction of the smooth muscle of the bladder neck which contracts by alpha adrenergic innervations. Because many patients who are being treated with physical therapy may also be involved in pharmaceutical treatments, therapists should be familiar with the drugs, and associated actions, commonly used to treat urinary incontinence.

Treatment of Urge Incontinence

Behavioral Therapy

As described in chapter 2, there are two main causes of detrusor instability that lead to urge incontinence. The first is detrusor hypersensitivity. Simple measures such as avoidance of caffeine and alcohol may be successful.[52] Other bladder irritants, which can contribute the urge incontinence, are acid foods such as citrus fruits, tomato products, spicy foods, and milk products.[30] Consultation with a nutritionist is the safest way to eliminate these items from the patients diet. Some authors suggested decreasing the patients fluid intake. However, extreme care must be taken when using this technique. Some women may have already attempted to decrease their fluid intake to deal with their problem. Dehydration is always a risk factor when modifying fluid intake.

The second contributing factor is poor bladder training. One method of treating poor bladder habits is behavioral training or bladder retraining.[31] The aim of bladder retraining is to restore the patient with urgency or frequency symptoms to a more normal and convenient pattern of micturition.[32] This method works particularly well for women who have developed the habit of frequency in an attempt to avoid accidents and who have lost confidence in their ability to hold their urine. When using the behavioral technique, the patient is instructed to void each

half hour regardless of a need to void. They should try to never pass urine outside the scheduled times, even if it results in accidents. Over time, the intervals are lengthened until the is three to four hours between voids. This type of treatment is time consuming and requires highly motivated patients.[32]

Strengthening Exercises

Pelvic floor exercises have also been shown to improve urgency symptoms. Many of the strengthening techniques used in the treatment of stress incontinence can also be used in the treatment of urge incontinence. The goal in the treatment of urgency, however, is not to restore visceral alignment or to regain functional pressure transmission, but to reflexively inhibit the contracting detrusor. One theory that explains why patients report a decrease in frequency and urgency with pelvic muscle exercises is that an increase in tone of the pelvic floor is said to raise the micturition threshold.[53] The method through which this may occur is the perineodetrusor reflex which is a reflexive inhibition of the detrusor muscle that is triggered with volitional contractions of the pelvic floor.[10] Women in one study expressed that the ability to contract the pelvic floor muscle was important to them because they could now postpone micturition by suppressing urgency symptoms.[69] This allowed them to regain self confidence and actively contribute to their own improvements.

Vaginal Cones

As in the treatment stress urinary incontinence, weighted cones can be used to supplement pelvic floor exercise. The results of one study showed that two of three women with urge incontinence improved with resisted exercises with cones.[50] It was noted that their rate of improvement was slower than in women with stress incontinence. Patients with urge incontinence not only had to learn to contract their pelvic floor muscles but also had to learn to allow the suppression of uninhibited detrusor contractions.

Electrical Stimulation

Electrical stimulation has been found to be especially successful in the treatment of urge incontinence.[70] There is experimental and clinical evidence that intravaginal electrical stimulation inhibits the detrusor muscle of the bladder. Preliminary studies have also shown that bipolar interferential treatment can be effective for patients with urinary symptoms caused by detrusor instability.[10] Two reflex arcs are activated by stimulation of the pudendal nerve afferents.[61,72] The first involves the hypogastric nerve (sympathetic) that mediates bladder inhibition at low intravesical volumes. The second involves the inhibition of the pelvic nerve (parasympathetic) which reflexively inhibits the detrusor at high intravesical volumes. This creates reflex inhibition of the detrusor muscle, decreasing

the severity of incontinence.

Pharmaceutical Treatment

Drugs are often used in the treatment of urge incontinence.[31] Success has been found using a number of drugs from different drug classes. (See Fig 9) It is important that physical therapists are aware of these drugs, their possible side effects, and their mechanism of action as some patients will be using them while getting physical therapy treatments. A few of the most common drugs will be discussed below.

Anticholinergic Agents
- Atropine
- Propantheline hydrochloride
- Propantheline bromide

Musculotropin Relaxants
- Oxybutynin
- Flavoxate
- Dicyclomine hydrochloride

Calcium Channel Blockers
- Terodiline
- Verapamil
- Nifedipine

Others
- Imipromine
- Desmopressin acetate

Fig 9. — Common drugs used in the treatment of incontinence.

Anticholinergic agents can inhibit detrusor contractions. The most commonly used anticholinergic is

terodiline which also has calcium channel blocking effects. This drug acts directly on the detrusor muscle to inhibit contraction. Propantheline hydrochloride can also be used. This drug works at the ganglionic level as well as at the neuromuscular junction. It is of particular benefit in patients with prominent urinary frequency.[52] Both drugs have the possible side effect of urinary retention which may necessitate self catheterization. Sometimes, detrusor instability and irritable bladder symptoms are due to incomplete emptying of the bladder. Paradoxically, the administration of a cholinergic agent may cure urinary symptoms.

CHAPTER FIVE
CONCLUSION

Physical therapists have a crucial role in the treatment of urinary incontinence in females. Because of the magnitude of the problem, more physical therapists need to study urinary incontinence and become adept at assessing and treating it.

Many women suffer from the symptoms of incontinence but are afraid to seek help because of embarrassment and fear of surgery. Physical therapists must learn to help their potential patients confront these fears before treatment can even begin. Physical therapists interested in the treatment of urinary incontinence in females need to promote their services to potential patients and physicians. Promoting these services to the general public and to potential patients will help to make the topic of incontinence a little easier for patients to talk about. In addition, women with symptoms of incontinence will be more likely to seek treatment if they know there is legitimate treatment, other than surgery or medications, available. Because many gynecologists and urologists tend to see surgery as a primary solution to incontinence symptoms,[45] the development of a non-surgical approach by physical therapists would give these physicians another avenue of

treatment for women who are not surgical candidates. With the correct training, physical therapists could administer treatments that would help the millions of women across the United States who suffer from incontinence.

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