TENSION-FREE VAGINAL TAPE: A NEW SURGICAL
PROCEDURE FOR TREATMENT OF FEMALE
STRESS URINARY INCONTINENCE

Thesis
Submitted for Partial Fulfillment
Of M.D. Degree in Obstetrics and Gynecology

By
Mohamad Ramadan Ibrahim
(M.B., B.Ch., M.Sc.)
Assistant Lecturer of Obstetrics and Gynecology
Benha Faculty of Medicine

Supervised By

PROF. DR. MOHSEN KHAIRY
Prof. And Chairman of Obstetrics and Gynecology Department
Benha Faculty of Medicine

PROF. DR. BADAWY HATHOUT
Prof. of Urology
Benha Faculty of Medicine

PROF. DR. MOHAMAD ABD-ALHADY SAYED
Prof. of Obstetrics and Gynecology
Benha Faculty of Medicine

PROF. DR. NOUR ASHMAWY
Assistant Prof. of Obstetrics and Gynecology
Benha Faculty of Medicine

Benha Faculty of Medicine
Zagazig University
2002
TENSION-FREE VAGINAL TAPE: A NEW SURGICAL PROCEDURE FOR TREATMENT OF FEMALE STRESS URINARY INCONTINENCE

Thesis

Submitted for Partial Fulfillment

Of M.D. Degree in Obstetrics and Gynecology

By

Mohamad Ramadan Ibrahim

(M.B., B. Ch.) (M.Sc.)
Assistant Lecturer of Obstetrics and Gynecology
Benha Faculty of Medicine

Supervised By

PROF. DR. MOHSEN KHairy
Prof. And Chairman of Obstetrics and Gynecology Department
Benha Faculty of Medicine

PROF. DR. BADAWY HATHOUT
Prof. of Urology
Benha Faculty of Medicine

PROF. DR. MOHAMAD ABD- ALHADY SAYED
Prof. of Obstetrics and Gynecology
Benha Faculty of Medicine

PROF. DR. NOUR ASHMAWY
Assistant Prof. of Obstetrics and Gynecology
Benha Faculty of Medicine

Benha Faculty of Medicine
Zagazig University
2002
Chapter I

ANATOMY OF FEMALE URINARY CONTINENCE MECHANISM

In order to comprehend the pathological processes which lead to the development of urinary incontinence, a clear understanding of the normal mechanisms for the maintenance of continence is fundamental, this is in turn must be based on a knowledge of the morphology and physiology of the bladder and urethra, and their supporting structures (Hilton, 1995).

The anatomy of the female continence mechanism will be discussed according to the following scheme:

A- Female pelvis:
1. Bony pelvis.
2. Tendineus arc.
3. The pelvic floor.
   - Levator fascia.
   - Pelvic diaphragm.
   - Urogenital diaphragm.

B- Urinary bladder and bladder neck

C- The urethra

A- Female Pelvis

1. Bony Pelvis:
   A careful examination of the bony pelvis would suggest that it is one intact osseous structure, while, in fact; it is formed of four bones, the
paired coxals (innominates), the sacrum, and the coccyx. The large flared coxals are further divided into three parts which join in the acetabulum: The ilium, the ischiuim and the pubis. The pubic portions of the coxals join in the midline, ventrally separated by cartilage, which is termed the symphysis pubis (Stein et al., 1992).

2. Tendinous Arc:

The obturator internus muscle, similar to the bony pelvis, provides a framework for attachment of the pelvic diaphragm to the pelvic bone. The obturator internus hugs the side wall of the pelvis and travels through the lesser sciatic foramen to insert in the greater trochanter of the femur. From the pubic bone to the ischial spine on either side, it acts as intermediary for the attachment of the pelvic floor muscles to the bone (Delancy, 1997).

The obturator internus fascia is a strong sheet of deep fascia covering the medial surface of the obturator internus muscle. This fascia gives origin to the greater part of the levator ani muscle along a line which is called the white line (arcus tendineus or tendenious arc). This fibrous band or arc traverses the medial aspect of the muscle between the pubic bone and ischial spine bilaterally. This fascial arc flanks the proximal urethra and bladder neck anteriorly and rectum posteriorly as it courses the length of the pelvic outlet to the ischial spine and acts as a fascial ring at the pelvic outlet (Delancy, 1997).

3. Pelvic Floor:

The pelvic floor lies at the bottom of the abdominopelvic cavity and closes the cavity below within the bony pelvis. This not only provides the majority of support for the viscera of the pelvis but actively participates in the maintenance of the normal functions of those organs.
There are three supporting layers comprising the pelvic floor: the pelvic diaphragm, the levator fascia and the urogenital diaphragm (Carl and Cary, 1995).

**a- The pelvic diaphragm:**

The pelvic diaphragm is a group of striated muscles together with their superior and inferior fascial layers that closes the pelvic outlet. This diaphragm is composed of the levator ani and coccygeus muscles (Delancy, 1997).

The levator ani can be considered the true muscular floor of the pelvis and is composed of the pubococcygeus and ischiococcygeus, muscles. Functionally, the pelvic diaphragm can be divided into an anterior muscle group, the “pubovisceral portion”, and a posterior muscle group, the “base plate” (Delancy, 1997).

It is the anterior muscle group of the pelvic diaphragm and most importantly the pubococcygeus muscle with the overlying endopelvic fascia and fascial condensations, that directly, attaches to bladder, urethra, vagina, uterus and rectum and serves an active role in pelvic visceral control. Arising from the pubic bone and anterior tendinous are, the pubococcygeus is a thick U shaped muscle through which the urethra, vagina and rectum traverse. This layer not only helps in supporting the visceral structures at rest but is a backup to the endopelvic fascia and serves as the principal support during periods of suddenly increased intra-abdominal pressure (Delancy, 1997).

The muscles of the pelvic floor maintain constant contractile tone by spinal reflex even at rest. This supports the pelvic floor and maintains
the normal pelvic axis. Furthermore, the rectus abdominis muscle and the pelvic floor contract in synchrony; with contractions of one muscle group, there is reciprocal contractions of the other. At the time of abdominal muscles contractions such as with cough or strain, the pubococcygeus also contracts, further stabilizing and maintaining the bladder neck in a high retropubic position. This synchronous contraction between pubococcygeus and rectus abdominis muscle helps to facilitate equal pressure transmission from the abdominal cavity to the proximal urethra and thereby maintain “stress continence” (Lawson, 1974).

Figure (1): View of the female perineum. Note the relation of the levator ani and perineal muscles (From Raz et al., 1998).

The posterior muscle group of the pelvic diaphragm consists of the posterior levators and the coccygeus muscle. These muscles originate further posterior on the tendinous arc on either side as well as on the ischial spines. The two sides fuse in the midline as a median raphe posterior to the rectum, as well as attach on the coccyx itself.
Occasionally, the posterior group of pelvic floor muscles is visibly separated from the anterior group by connective tissue. This posterior group of pelvic floor muscles is referred to as the base plate, because it provides basal support of the pelvic organs and provides a firm muscular closure of the pelvic outlet (Delancy, 1997).

When this plate is intact, it stretches in a horizontal plane from the rectal hiatus to the coccyx. The upper two thirds of the vagina and uterine cervix lie on a horizontal plane created by the levator plate. The posterior pelvic floor muscles assist in development and maintenance of the normal vaginal and uterine axis within the pelvis. These muscles are active at rest and like the puboccygeus muscle contracts further at the time of rectus abdominis muscle contraction during valsalva to maintain the proper vaginal axis (Delancy, 1997).

Figure (2) : Abdominal view of levator ani and the tendinous arc. Note the relation of the bladder and urethra (From Raz et al., 1998).