Introduction

Urinary incontinence is a distressing symptom that has a major impact on the women quality of life with significant medical, social and psychological ramification. It includes many types as urodynamic stress incontinence, detrousor instability, mixed incontinence, overflow incontinence, functional incontinence. urodynamic stress incontinence proved to be the predominant type with prevelance rate 20-40%for middle aged women, even the most conservative studies estimate that one in ten women will suffer from urodynamic stress incontinence at sometime ***(Abrams et al., 1990).***

Genuine (urodynamic) stress incontince is involuntary urine loss in absence of detrusor contraction, intravesical pressure exceeds the maximal urethral, pressure and urine is lost. Major causes of Genuine stress incontinence is loss of anatomic support of the urethra and bladder and urethrovesical junction, so that increase in the intraabdominal pressure will be then fully transmitted to the bladder but to a lesser extent to the urethra and urine flow occur. Another cause is despite support of the urethra it fails to act as an effective sphincter ***(American College of Obstyetricians and Gynecologists 1995).***

In the recent years, new types of surgical techniques are being developed which to offer long term results, with reduced hospital stay and quicker return to normal activity and with lower incidence of complications than those associated wiyh the traditional techniques.

Of these new techniques is what is called tape procedures urinary incontinence results from failure of the pubourethral ligaments in the midurethra, which led to the proposal of the integral theory for the maintenance of female stress continence. So in this model, continence is maintained at the mid-urethra and not the bladder neck.

First tape procedure to develop was (T.V.T) tension free vaginal tape, where a prolene mesh tape is placed at midurethra using special trocar where the tape will be lying free at rest and to only exert sufficient pressure on the urethra during cough to prevent leakage of urine ***(Merlin and Ulmsten, 2001)***.

Despite of high cure rate associated with these procedures, they carried a number of serious complications bladder injury 8%, urethral injury, bowel injury, vaginal perforation, post-operative voiding difficulty retro-pubic haematoma and sepsis ***(Dargent et al., 2002).***

This leads to the development of a new mini-invasive procedure, which is Trans-obturator tape (T.O.T), this tape is non woven polypropylene structure.Transmuscular insertion through the obturator and puborectalis muscles reproduce the natural suspension fascia of the urethra while preserving the retropubic space. it produces the same high cure as the above operation but with no risk of bladder injury with very low risk of other complications as sepsis and post –operative urinary retention.

However because some cases of T.O.T were associated with local irritation or foreign body reaction, this led to the development of Obtape LG which consists of a knitted mono-filament polypropylene with clean–cut edge which supposed to cause no reaction ***(Delorime, 2001).***

Aim of the Work

The aim of the study is to compare 2 different materials used in the transobturator technique for the treatment of stress urinary incontinence which are:

- Obtape LG

- Polypropylene mesh.

As regard the efficacy and rate of complications.

Anatomy and Physiology of the Female Urinaty Tract

In order to understand the pathophysiology of stress incontinence it is essential to understand the anatomy of the lower urinary tract which has been traditionally classified by clinicians into:

1. Bladder

2. Bladder neck

3. Urethra.

These structures will be discussed and their role in the female continent system.

Bladder:

The bladder in a distended state is a hollow spherical, muscular organ that displays almost equal internal and external surface. In the empty or the contracted state, the bladder is usually described as a three-sided pyramid, which is placed at one of its angles. It has four surfaces, superior surface, posterior surface (fundus or base) and two inferiolateral surfaces. The angles of the pyramid are formed by the uretrovesical, urachovesical and urethrovesical junctions. The section of the urachus and the bladder is called apex and the junction between the urethra is called the neck. The apex reaches a short distance above the pubic bone and ends as a fibrous cord derivative of the urachus. The superior surface is the only surface covered by peritoneum ***(Redman, 1993).***

The Mucosa of the Bladder:

The mucosa of the bladder is composed of two zones the urothelium which is composed of transitional cells and the lamina propria. The transitional cells are specialized epithelial layer whose structure allows the cells to unfold and expand their size as the bladder fills. The lamina propria contains loose extracellular matrix component fibroblasts and smooth muscle cells that permit considerable stretching of the mucosa. For that reason, the mucosal lining is wrinkled when the bladder is empty but quite smooth and flat when it is distended ***(Hinan, 1993).***

The Musculature of the Bladder:

1. Detrusor muscle:

The detrusor muscle forms the bladder and portion of the bladder base and vesical neck. Its muscle fibers are arranged in relatively large bundles and form an interwined mass. Although the bladder wall is not strictly arranged into layers, its fibers do have some characteristic organization ***(Gosling, 1985).***

In general, it consists of three layers of smooth muscular fibers, external and internal longitudinal fibers and middle circular fibers. There is much intermingling of the muscle fibers forming a complex meshwork which contract as a single unit causing retraction in all dimensions of the bladder ***(Redman, 1993).***

Thus, one can consider the entire musculature of the bladder as a single bundle weaning its way in and out, changing planes, directions and levels but still as a directly continuous filament ***(Tanagho, 1992).***

There are dorsolateral bundles which pass in either side of the caudal detrusor to form a loop anterior to the internal urinary meatus called the detrusor loop or Heiss’s loop. The anterior group of the detrusor group is attached by fibrous band called the transverse precervical arc, which surrounds the anterior third of the bladder neck ***(Redman, 1993).***

So in the region of the vesical neck, there are two "U" shaped bands of fibers (with each "U" opening in opposite direction). The prominent Heiss's loop (detrusor loop) passes anterior to the internal meatus and opens posteriorly. The second which consists of that portion of the intermediate circular layer of the detrusor that lies under the trigone opens anteriorly. The urethral lumen passes through opening in these muscular loops. This arrangement may provide sphincter action when the two straps of the muscle pull in opposite directions to close the urethral lumen ***(Tangho and Smith, 1992).***

2. <u>Trigonal muscle:</u>

There is separate trigonal primordium within the fetus. It leads to a specialized smooth muscles body that exists in the base of the bladder and also extends down into the urethra. It consists of three portions, the urinary bladder trigone, the trigonal ring and the trigonal plate. The urinary trigone is a triangular shaped body of smooth muscles that has its apices at the internal urinary meatus and the two ureteral orifices. It is slightly elevated above the rest of the detrusor musculature and can be seen cystoscopically a fact that aids in locating the internal orifices. At the level of the internal urinary meatus, this trigonal musculature spread out to form a ring at the level of the internal urinary meatus. This ring can be seen surrounding the urethral lumen in the area of vesical neck ***(Delancy, 1986).***

The Urethra

Anatomy of the Female Urethra:

It is about 4 cm long and 6 mm in diameter. It begins at the internal urethral orifice of the bladder approximately opposite the middle of the symphysis pubis and runs antero-inferiorly behind it embedded in the anterior wall of the vagina. It traverses the perineal membrane and ends at the external urethral orifice, which is situated directly anterior to the opening of the vagina and about 2.5 cm behind the glans clitoris ***(Tanagho, 1986).***

Structure of the Female Urethra:

The wall of the female urethra comprises an outer muscle coat and an inner mucous membrane that lines the lumen and is continuous externally with that of the vulva and internally with that of the bladder. Near the bladder it consists of transitional epithelium grading more distally into non-keratinizing stratified squamous epithelium. The female urethra is much more readily dilatable than that of the male ***(Warwich and Bannestan, 1989).***

The muscle coat consists of an outer sleeve of striated muscle (rhabdosphincter) or striated urogenital sphincter together with an inner coat of smooth muscle fiber bands.

The striated urogenital sphincter has two different portions: an upper sphincter portion and a lower arch like pair of muscular bands. Fibers in the sphincteric portion are circular in orientation and occupy the upper two thirds of the body of this muscle, surrounding the urethral lumen in the region from approximately 20% to 60% of its length. This portion is called the sphincter urethrae and corresponds to the rhabdosphincter described by previous authors ***(Delancy, 1986).***

Fibers in this region do not form a complete circle and the gap between its two ends is bridged by the trigonal plate *(column of trigonal tissue extending along the length of the urethra in its dorsal aspect).* The defect in the muscular ring does not impair contraction because the trigonal ring functions as a tendon ***(Delancy, 1986).***

The second portion of the striated urogenital sphincter occupies its distal one third lying adjacent to the urethral lumen.

It consists of two strip-like bands of striated muscle, which arch over the ventral surface of the urethra. One of these bands originates in the vaginal wall and is called the urethrovaginal sphincter muscle. The other band of muscle which originates near the ischiopubic ramus is called the compressor urethra. These two bands overlap around the ventral surface of the urethra and are separated only in their more lateral projections. All three portions of the striated urogenital sphincter muscle are part of the same muscle group and function as a unit. Their innervation is complex. Contraction of the striated sphincter would constrict the lumen of the urethra in its upper portion and compress its ventral wall in the lower one third ***(Delancy, 1986).***

The smooth muscle coat extends throughout the length of the urethra and consists of muscle bundles, the majority of which are oriented longitudinally. The submucosa of the urethra consists largely of a rich vascular sponge surrounded by a coat of smooth muscle and fibroelastic tissue. Functionally, the surrounding smooth muscle coat maintains the mucosal seal mechanism by directing submucosal expansible pressure inwards towards the lumen. This highly efficient *"mucosal seal"* is a major contributor to the closure mechanism of the urethra and is such an important aspect of the normal urinary continence mechanism ***(Klutke et al., 1990).*** This *"mucosal sphincter"* is under hormonal control and lack of estrogen (menopause) leads to atrophy and substitution of the vascular supply by fibrous tissue. Multiple surgery, trauma, radiation and neurogenic disease also can affect the ability to achieve a perfect seal ***(Klutke et al., 1990).***

Normal urethral function depends upon normal support of the urethra as well as its intrinsic sphincter mechanism. As with vaginal support, dynamic interaction between the levator ani muscle complex and the connective tissue supports of the urethra is essential. The urethra lies on a hammock-like supportive layer composed of periurethral endopelvic fascia and anterior vaginal wall. Increased intra-abdominal pressure, as with a cough or sneeze, causes compression of the urethra against this hammock-like layer, thereby compressing the urethral lumen closed. The stability of the suburethral layer depends on the intact connection of the anterior vaginal wall and its connective tissue attachments to the levator ani muscles. These attachments allow the pelvic floor muscle’s normal resting tone to maintain the position of the urethra and bladder neck. They are also responsible for the posterior movement of the vesical neck seen at the onset of micturition (when the pelvic floor relaxes) and for the elevation noted when a patient is instructed to arrest her urinary stream ***(Schafer, 2001).***

Bladder Neck

The Anatomy of Bladder Neck Support:

The bladder neck should be considered as a separate functional unit. However, unlike the circularly oriented pre-prostatic smooth muscle of the male, most of the muscle bundles in the female bladder neck extend obliquely or longitudinally into the urethral wall. Thus, the female does not posses a smooth muscle sphincter at the bladder neck and it is unlikely that active contraction of this region plays a significant part in the maintenance of female urinary continence. However, despite the lack of morphological sphincter the bladder neck behaves like a sphincter as it never opens in normal female until the detrusor contracts ***(Gosling et al., 1977).***

Studies of patients with stress incontinence reveal that the lower urinary tract cannot function optimally unless it is supported by the pelvic floor. The muscles and connective tissue of the pelvic floor must create an environment in which the urethra, vesical neck, and bladder can function effectively. Conversely normal support alone is not enough to ensure continence. A woman's ability to remain continent, therefore, results from a combination of normal activity of the vesical neck and urethra and normal function of the pelvic floor. Neither of these two components alone can maintain continence. It has been shown that there is one to one relationship between urethral support and stress continence and that a patient with a poorly functioning vesical neck may have stress incontinence despite normal urethral support. Thus, urethral support is not the only factor involved in continence ***(Fantl et al., 1996).*** So pelvic floor will be discussed below.

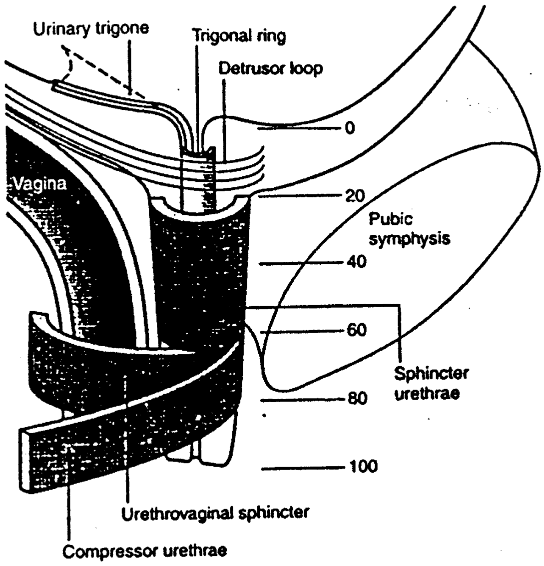

Figure (1): Component parts of the internal and external sphincteric mechanisms and their locations. The sphincter urethrae, urethrovaginal sphincter and compressor urethrae are all parts of the striated urogenital sphincter ***(Delancy, 1986).***

The 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 endopelvic fascia, the pelvic diaphragm and the urogenital diaphragm ***(Carl and Cary, 1995).***

1. Endopelvic Fascia:

This layer represents a continuation of the abdominal transversalis fascia, which extends over the pelvic floor, lying immediately beneath the peritoneum. The endopelvic fascia is a viscerofascial layer, which attaches to and joins the various pelvic organs.

Distinct subdivisions of the fascia of the pelvic floor have surgical and physiological significance ***(Carl and Gary, 1995). It includes:***

A. <u>Cardinal ligaments:</u>

The cardinal ligament is primarily a perivascular connective tissue that runs along the uterine vessels. The cardinal ligaments join the lower uterus, cervix and upper vagina to the pelvic side wall laterally on either side .Cardinal ligaments are the base of a rectangle formed by the periurethral fascia and pubocervical fascia ***(Carl and Gary, 1995).***

They are not important for continence but they do play a role in the support of bladder base and the pathophysiology of cystocele.

B. <u>Uterosacral ligaments:</u>

The uterosacral ligaments are a more medial segment of the endopelvic fascia, at the level of the cervix and upper vagina, and serve to stabilize the visceral structures posteriorly towards the sacrum ***(Carl and Gary, 1995).***

C. *Urethropelvic ligaments:*

Another specialized group of endopelvic fascia fibers, with perhaps greater functional significance for stress urinary incontinence (SUI), are the urethropelvic ligaments. These fibrous attachments head medially to approach the proximal urethra, reaching it at a point slightly upwards to the level of the pubourethral ligaments.

The urethropelvic ligaments pass together with fibers of the pubococcygeus muscle and travel from the anterior aspect of the tendenious arc to the anterior vaginal wall, bladder neck and proximal urethra. This portion of the pelvic floor is the main musclofascial support of the bladder neck and proximal urethra. Magnetic resonance imaging reveals these fibers originating in the area of the tendinous arc and pubis inserting into the proximal urethra. This musclofascial extension appears to envelop the bladder neck and proximal urethra, supporting these structures against downward and outward mobility. Proper intrapelvic support requires an active component of muscular contraction during stress along with the firm strength of the ligament ***(Bent et al., 2001).***

Observations that stress incontinence may be associated with denervation of the pelvic floor are in agreement with this musclofascial concept of bladder neck and proximal urethral support ***(Smith et al., 1989 and Snooks et al, 1985).***