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## Female Urinary Incontinence

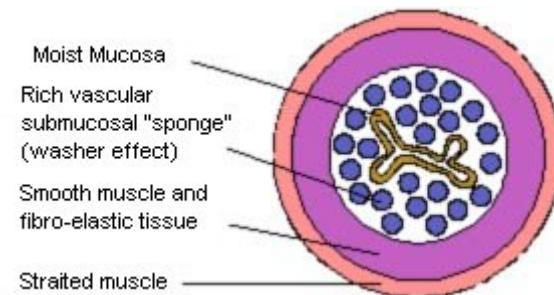
### Incidence

At least ten million Americans suffer from urinary incontinence. It affects 15 to 50 % of elderly individuals in the community. The annual cost spent on incontinence in America is \$10 billion (this figure exceeds the annual cost of dialysis and coronary artery bypass surgery combined)<sup>(1)</sup>.

In New Zealand, approximately 200,000 people suffer from urinary incontinence, of which, about 80% are women <sup>(2)</sup>.

### Factors Involved in Maintaining Urethral Closure and Continence

#### Intrinsic Urethral Mechanism



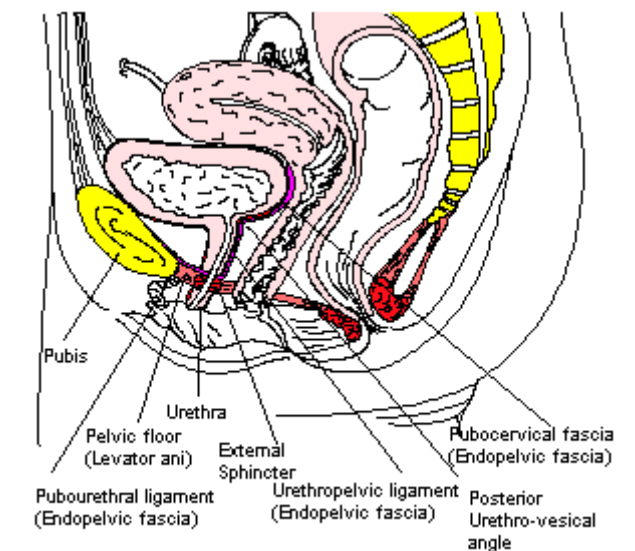
The urethra consists largely of a rich vascular "sponge", lined by a moist mucosal layer and surrounded by a coat of smooth muscle, fibro-elastic tissue and striated muscle. The mucosa provides coaptation. The vascular submucosa creates the "washer effect" for the continence mechanism. Functionally, the surrounding smooth muscle coat contains this mechanism by directing submucosal expansile pressures inward towards the mucosa. Muscle tone is mediated by alpha-adreno receptors in the sympathetic nervous system. All three layers are under estrogen control.<sup>(3, 4)</sup>

#### Extrinsic Factors

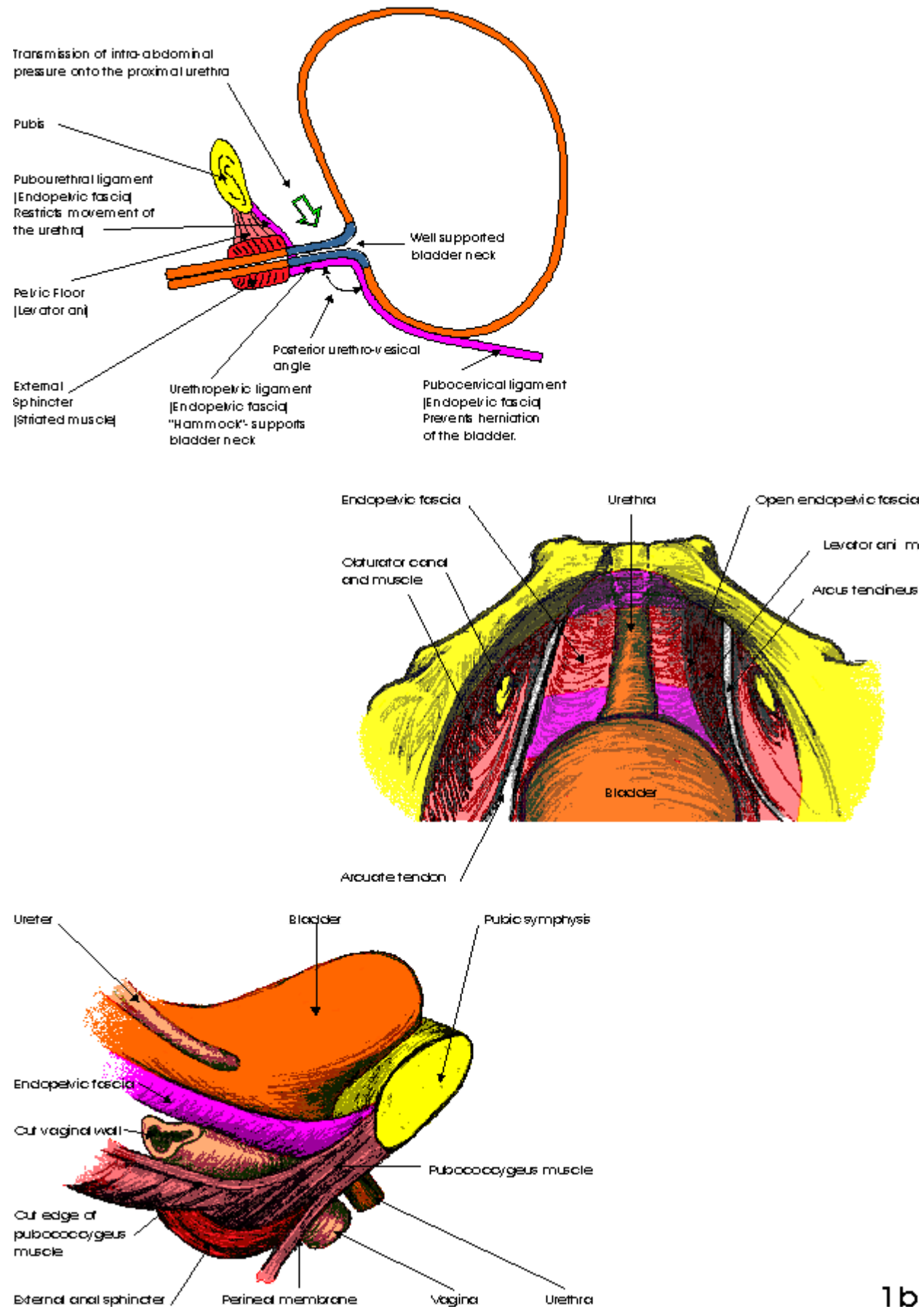
1. Levator Ani muscles (pelvic diaphragm) support all of the pelvic organs and the pubourethralis portion form the "external sphincter".
2. The endopelvic fascia condenses to form three distinct ligaments:<sup>(3)</sup>
  - a. pubourethral ligament - stabilises the urethra
  - b. urethropelvic ligament - supports the bladder neck and the urethra
  - c. pubocervical fascia - supports the bladder

Their attachments to the side wall of the urethra and pelvic wall (arcuate tendons) form a "hammock" behind the urethra. When intra-abdominal pressure increases, (for example, when coughing, sneezing and during exercise), the urethra is forced closed against the posterior "hammock".<sup>(5)</sup>

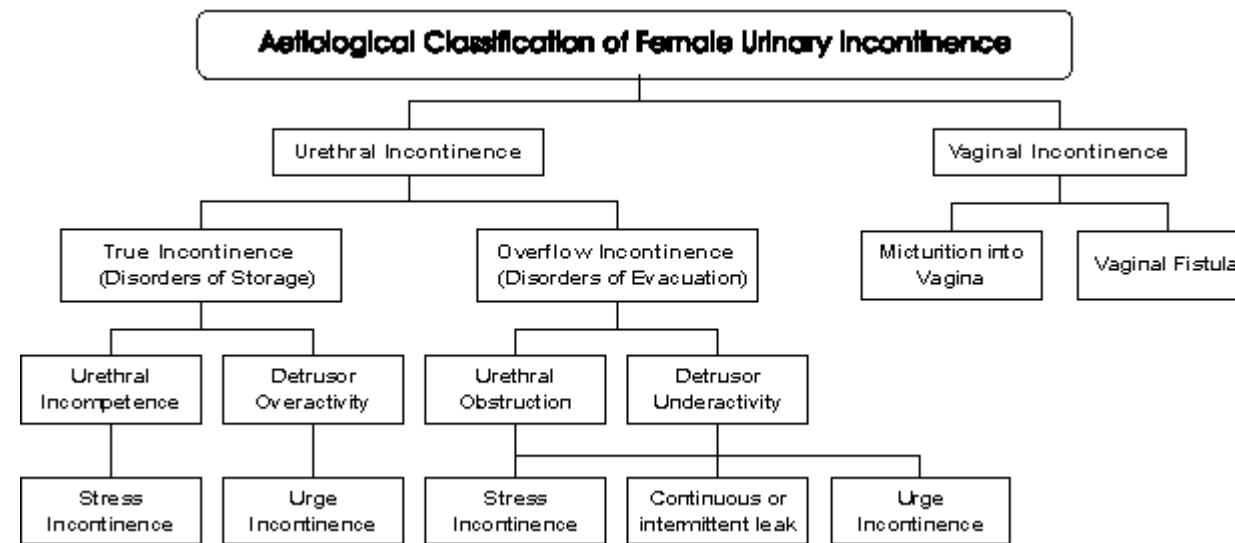
3. Urogenital diaphragm (perineal muscles and fascia).
4. Uterus and cervix. The cardinal ligaments laterally, and the utero-sacral ligaments posteriorly provide direct and indirect support of the bladder as the endopelvic fascia (pubocervical fascia), is fixed to the cervix. <sup>(3, 4, 5)</sup>



# Anatomy of the Female Pelvis



1b



### Incidence of Subtypes of Urinary Incontinence in Women (5)

1. Stress Incontinence 50%
2. Urge Incontinence 20%
3. Mixed 30%

### Genuine Stress Incontinence

Definition:

*The involuntary loss of urine when the intravesical pressure, as a result of an increase of intra-abdominal pressure, exceeds the resistance produced by the urethral closure mechanisms, in the absence of bladder activity (unassociated with the desire to void).*

### Pathophysiology of Stress Incontinence

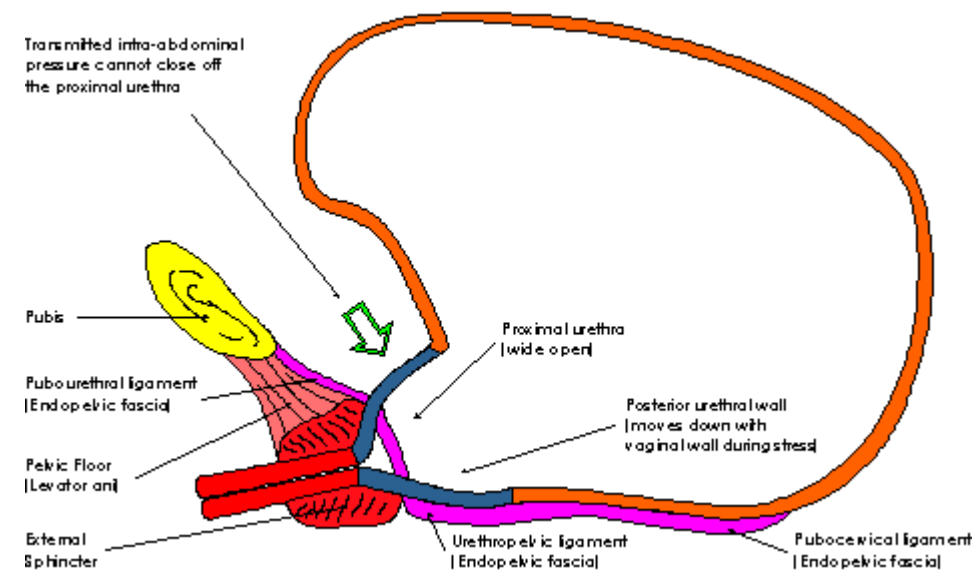
The basic pathology is urethral incompetence. This can be either due to:

A). Urethral hypermobility (80 - 90% of patients)

This results from loss of the normal pelvic support mechanism of the bladder and urethra due to:

- Trauma and stretching of vaginal delivery
- Hysterectomy
- Hormonal changes ( Menopause)
- Pelvic denervation
- Congenital weakness

As the bladder neck support is weakened, the increase in intra-abdominal pressure is no longer transmitted equally to the bladder outlet, and therefore instantaneous leakage occurs.



### B). Intrinsic Sphincter Dysfunction (10 - 20% of patients)

This results from damage to the sphincter due to:

- Multiple prior operations
- Trauma
- Radiation
- Neurogenic disorders including Diabetes Mellitus
- Atrophic changes: lack of estrogen.

## Evaluation of Urinary Incontinence

### History

#### 1. Type of incontinence (Urge or Stress)

Immediate leak after coughing or standing up is stress incontinence.  
Leaking after a few seconds is a detrusor contraction.

2. Straining to void/incomplete emptying (?overflow)
3. Medications (Alpha-blockers)
4. Frequency (> 7 - 8 Diurnal voids)
5. Pattern (Diurnal, nocturnal, after taking medications)
6. Associated symptoms (Dysuria, haematuria, suprapubic or perineal discomfort) - Bladder Carcinoma, Bladder Stone or infection.
7. Alteration in bowel habits / sexual function
8. Other diseases (cancer, diabetes, neurologic disease)

### Voiding Record

A diary kept over a 24 or 48 hour period which records the times and volumes that the patient voids will give an idea of the largest single voided volume but also of frequency and polyuria and severity of incontinence problems.

| Date | Time | Volume voided (mL) | Wet or Dry | Volume of Incontinence | Comments<br>cough, sneeze, running water on way to toilet, volume tea coffee, alcohol, etc. |
|------|------|--------------------|------------|------------------------|---|
|      |      |                    |            |                        |   |
|      |      |                    |            |                        |   |

## Physical Examination

1. Abdominal examination - distended bladder, abdominal mass
2. Pelvic Examination - atrophic vaginitis/urethritis, pelvic muscle laxity, bladder neck descent, cystocele, rectocele, uterine/vault prolapse, pelvic mass
3. Stress test - leakage with a full bladder after coughing - immediate (stress incontinence) or delayed (? Detrusor contraction). Bilateral elevation of the vaginal wall, lateral to the bladder neck, will stop leakage in patients with hypermobility of the urethra, but not in patients with intrinsic sphincter dysfunction.
4. Rectal examination - skin irritation, anal sphincter control, faecal impaction
5. Neurologic examination - mental status, sacral reflexes, perineal sensation (S2,3,4)
6. Other medical conditions - congestive heart failure, peripheral oedema

## Post Void Residual Urine

This test is essential in all incontinent women and distinguishes between true incontinence (residual urine <50 mL) and overflow incontinence (residual urine >100 mL)

## Laboratory Investigation

Creatinine and Electrolytes, fasting Glucose and Calcium (for patients with Polyuria).  
Renal Ultrasound in patients with incomplete emptying.  
Urine Culture.

## A. Non-Surgical Treatment

1. **General** - Fluid intake, weight loss, smoking, cough. Distance to toilet - bedside urinal, underwear with Velcro, pads.
2. **Estrogen** - stimulates mucosal proliferation, improving mucosal coaptation and enhancing urethral smooth muscle response to alpha-adrenergic stimulation. It widens the vascular lumen up to fourfold and increases the vascular pulsations in the urethral bed. The decline in estrogen is associated with relative decline in volume of striated muscle and blood vessels and an increase of connective tissue of the urethra. These translate clinically, into a decrease in the urethral closure mechanism leading to urethral problems, particularly incontinence. Estrogen supplements in post-menopausal women could improve urethral closure and outlet resistance.<sup>(3,4,5)</sup>
3. **Stop Alpha Blockers** (Cardoxan) - this relaxes urethral smooth muscle.
4. **Alpha-adrenergic agonists**. For example, Sudomy (pseudoephedrine). Alpha stimulants have a direct stimulatory action on the alpha receptors in the bladder neck and could be used to treat mild degrees of stress urinary incontinence. These agents could be considered in conjunction with other non-surgical modalities. One should however, be aware of the side-effects such as hypertension, tachycardia, arrhythmia and insomnia, and they should be used with great caution in elderly patients.
5. **Bladder relaxants** - e.g. [Detrusitol](#) (Tolterodine), Ditropan (Oxybutynin), Imipramin (Imipramine). These drugs should be considered only in the presence of urgency and urge incontinence.
6. **Physiotherapy** - Pelvic Floor Muscle exercises, Bio-feedback and electro stimulation. Patients should perform these exercises for 8 - 12 weeks before they may experience benefit.

**If the above treatments do not solve the problem, they should be referred to a Specialist for further evaluation and treatment.**

## Urodynamic Evaluation of Urinary Incontinence<sup>7, 8, 9</sup>

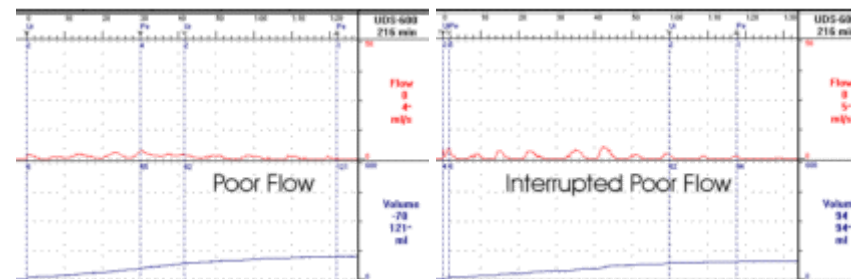
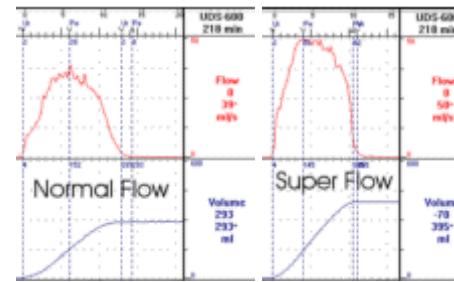
In approximately 10 - 15% of women with symptoms that appear to indicate stress incontinence, their condition is actually due to detrusor instability (coughing can stimulate a detrusor contraction)<sup>(5)</sup> Urodynamic testing reveals that approximately 20% of women with symptoms of urge, frequency, and overactive urge incontinence actually have underlying genuine stress incontinence, rather than detrusor overactivity (This is called "sensory urgency"). Urgency is absent in 20% of patients with detrusor overactivity.<sup>(5)</sup>

### 1. Residual Urine

This test is essential in all incontinent women and distinguishes between True Incontinence (Residual urine < 50 mL), and Overflow Incontinence (Residual urine >100 mL).

### 2. Uroflow

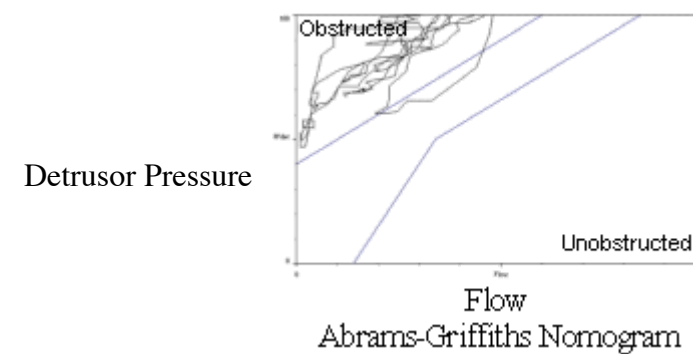
A poor flow could be an indication of urethral obstruction and should be treated during surgery to prevent post-operative retention or difficulty to void.



### 3. Pressure flow study

A small catheter in the bladder measures the pressure during voiding while her flow is also measured. This helps to differentiate true urethral obstruction from underactivity of the Detrusor.

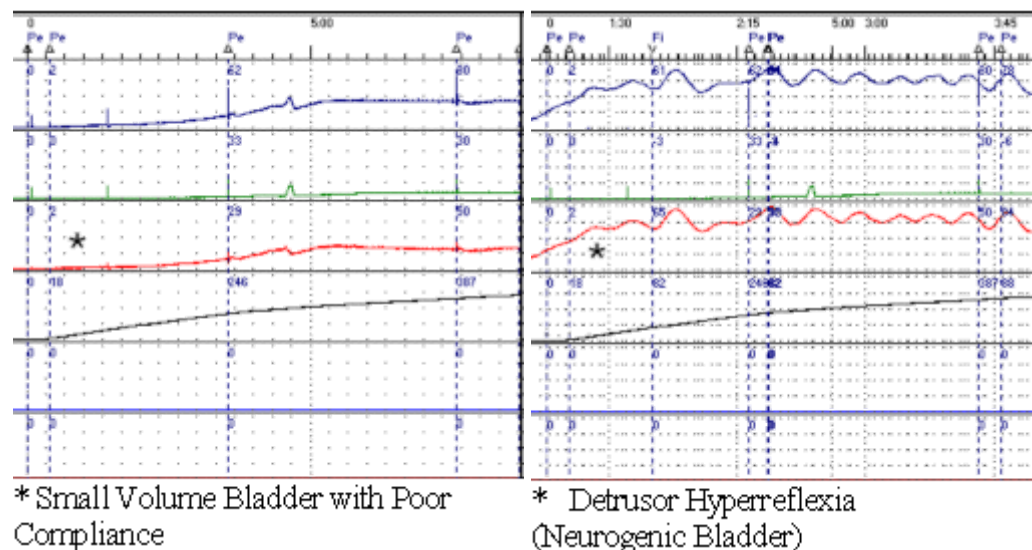
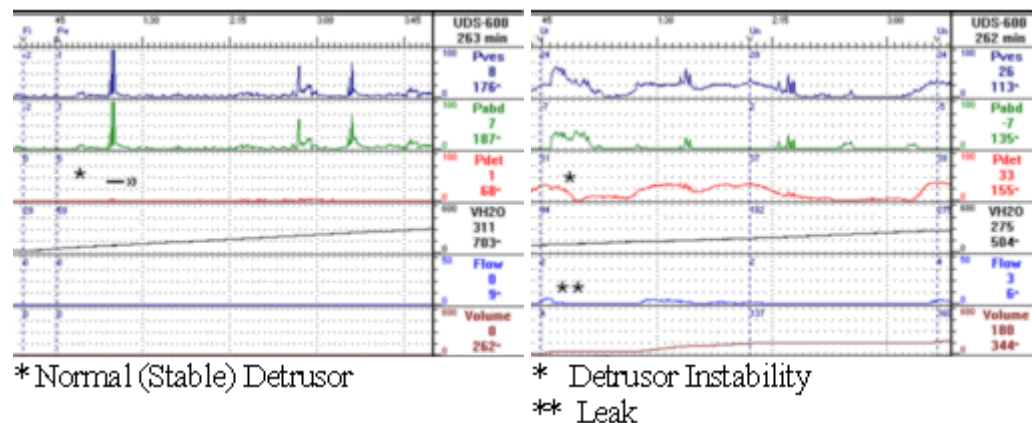
Obstruction = detrusor pressure more than 50 cm water and flow < 15 mL/s.





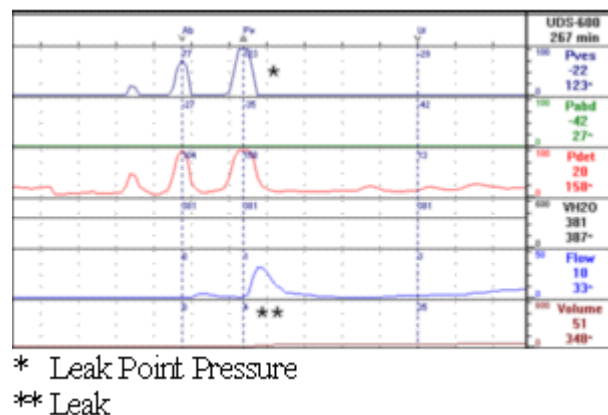
### 4. Cystometrogram

The pressure in the bladder and rectum is measured during bladder filling. Intra-abdominal pressure is subtracted from bladder pressure to give a real indication of Detrusor function.



### 5. Abdominal Leak-Point Pressure (ALPP)

This is the measurement of the total bladder pressure during coughing or valsalva manoeuvre to determine the pressure in the bladder required to induce leakage. In hypermobility of the urethra, the ALPP will be more than 60 cm water, but with Intrinsic Sphincter Dysfunction, the ALPP is less than 60 cm water and often less than 20 cm water.



## 6. Cystoscopy

To evaluate the urethral closing mechanism and to exclude other pathology.

## B. Surgery for Hypermobility of the Urethra

The pathology in these patients is malposition of a normal sphincteric unit and therefore, the goal of surgery is repositioning of the bladder neck and urethra to a high retropubic position (Bladder Neck Suspension).

*Burch Colposuspension* is still one of the operations with the best long-term results. This operation also corrects small to moderate cystocele. It can be done Laparoscopically, or by open surgery, depending on the circumstances. With the Laparoscopic technique, the patient is normally discharged after two nights and could return to work within one to two weeks. *Burch Colposuspension* is carried out through the retropubic space and the vaginal wall and urethropelvic ligament (endopelvic fascia), is elevated and fixed to the lateral pelvic wall by attaching it to Cooper's Ligament with Ethibond Sutures. Because all loose fatty and connective tissue is stripped off the vaginal wall and urethropelvic ligament, it adheres to the pelvic wall and should cause permanent fixation in this position.

### Laparoscopic Burch Colposuspension

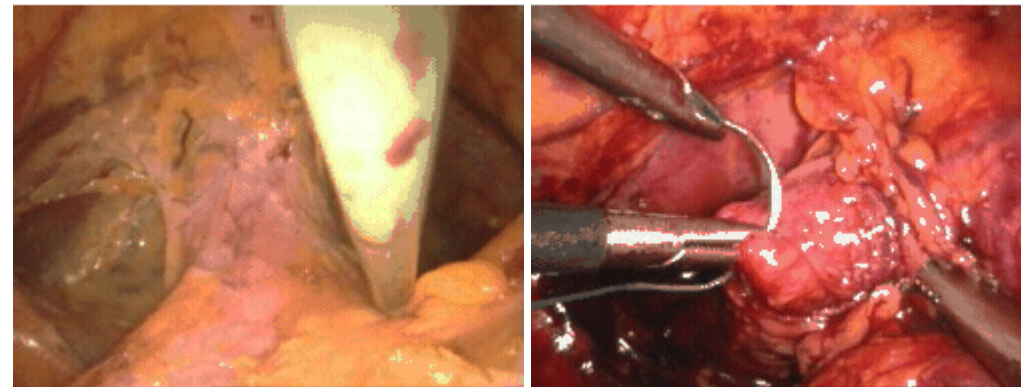


Photo 1 See page 7b "AP View" before

Photo 2 Suture through the left urethropelvic ligament

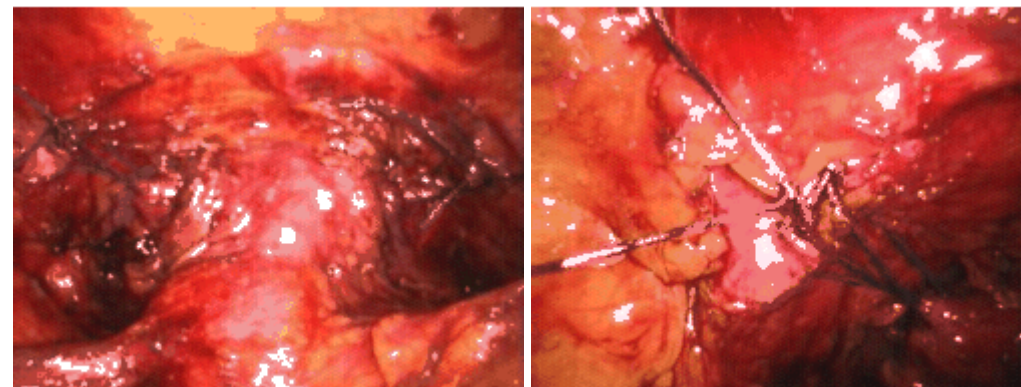


Photo 3 See page 7b "AP View" after surgery

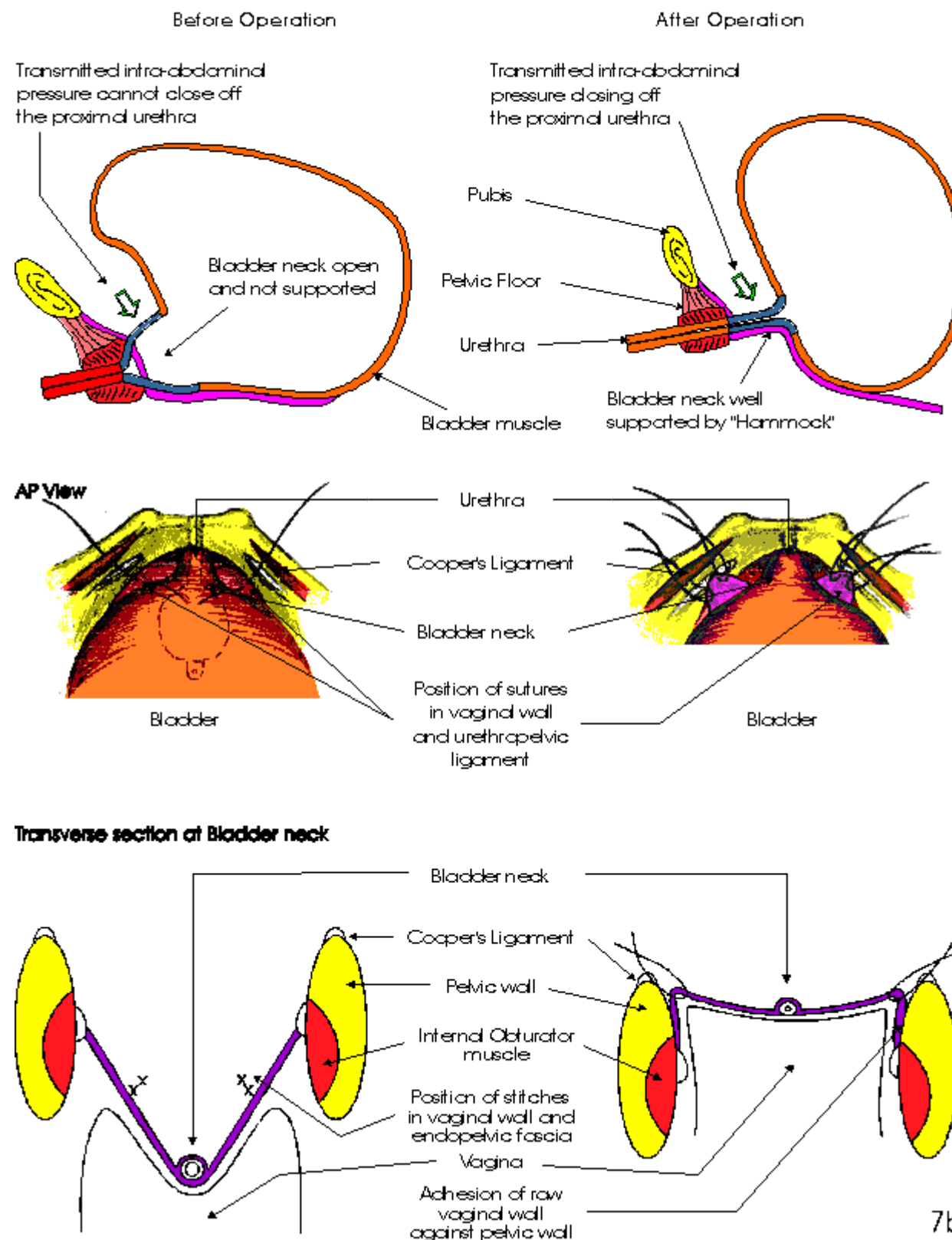
Photo 4 Two elevating sutures fixed to Cooper's ligament (left side)



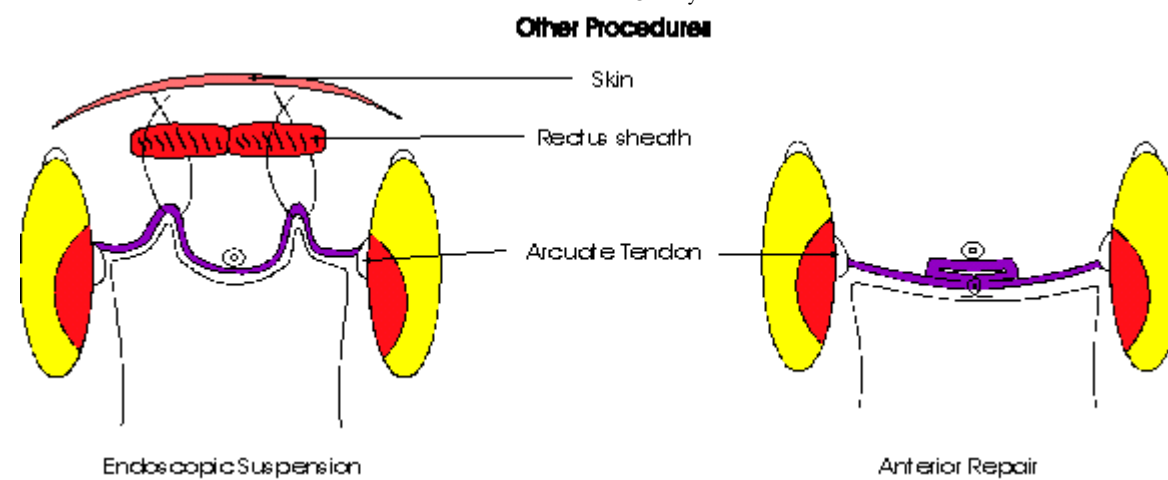
# Surgery for Hypermobility of the Urethra

Bladderneck Suspension:

*Burch Colposuspension*



There are more than 100 other operations, but most other suspension operations done trans-vaginal do not create the same raw surface and therefore, do not have the same amount of fixation due to fibrosis, to the pelvic wall. The failure rate is therefore higher. There is also a higher incidence of post operative retention, or difficulty passing urine, where the elevating sutures are very close to the urethra and bladder neck.

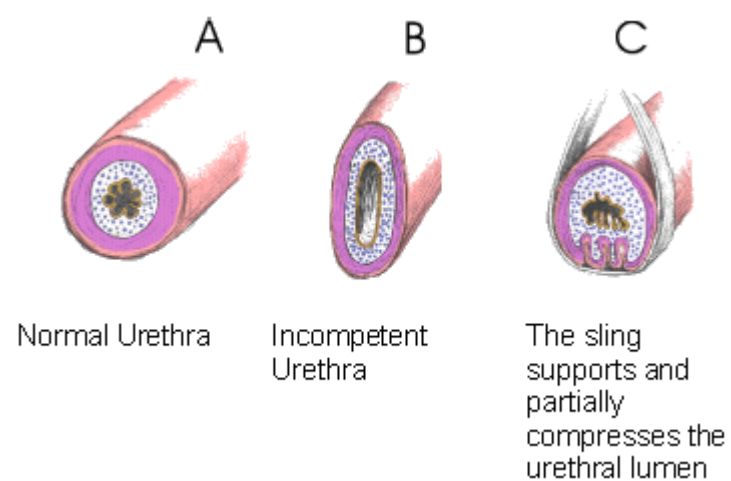


## Treatment of Intrinsic Sphincter Deficiency

### A. Urethral Slings

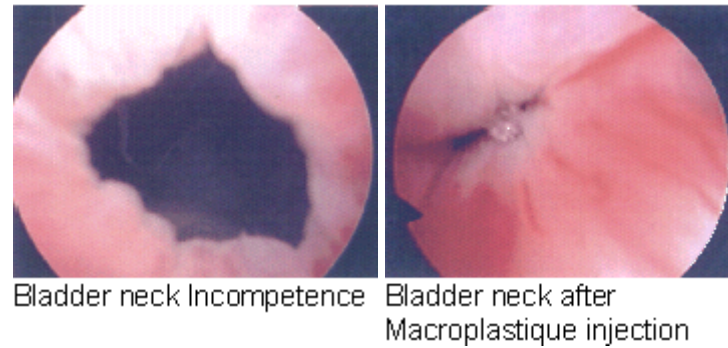
In this condition, there is damage or paralysis of the sphincteric unit which could even be in a normal position. The goal of surgery for Intrinsic Dysfunction is coaptation, support, and compression of the damaged sphincteric unit. Simple suspension of the bladder neck is unlikely to correct the problem. Urethral Sling Procedures are the best to achieve the goal.

A sling is put around the mid-urethra. There are different suburethral slings which include Sparc sling, TVT and IVS.



### B. Periurethral Injections

In patients with good support of the bladder neck, but with Intrinsic Sphincter Deficiency, injections of substances, such as Macroplastique and Collagen, can cause coaptation of the urethral mucosa.



### C. Artificial Sphincter

## Complications of Surgery

1. Detrusor Overactivity, with urgency and even urge incontinence (normally only temporary). Could be treated with muscle relaxants ([Detrusitol](#) (Tolterodine), Ditropan (Oxybutynin), Imipramin (Imipramine))
2. Urinary retention or incomplete bladder emptying: - Treatment options - catheterisation, triple voiding, Alpha Blockers. Anterior bladder neck incision. Ubetrid for detrusor underactivity.
3. Urine prolapse or Vaginal vault prolapse  
- Treated by Laparoscopic Sacrohysteropexy or Sacrocolpopexy.
4. Enterocoele and rectocoele: Could be fixed with sacrocolpopexy or posterior repair.

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9. All pictures of Urodynamic Studies in this article were done on the Urodynamic machine used by the author.

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