

Faculty Disclosure

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Dr. Khandalavala has listed no financial interest/arrangement that would be considered a conflict of interest.

Female Stress Incontinence

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Objectives

- Understand the impact incontinence has on women
- Understand the different types of urinary incontinence
- Describe the treatments available to treat incontinence
- Understand the surgical treatment and outcomes of therapy with all the alternative surgical procedures available at this time.

Urinary Incontinence

Defined by International Continence Society as the Involuntary Loss of Urine that represents a hygiene or social problem to the individual.

Presentations

- Symptom reported by the patient.
- Sign that is demonstrable at exam.

- Not a Disease - as no specific etiology exists and most individual cases are multi-factorial in nature.

Historical Context

- Not a recent social or medical problem.
- Women are more willing to talk openly about it, as less social stigmas and embarrassment associated with the diagnosis.
- Larger number of women affected by the problem as the population ages.
- Interest within the medical community has been surging – subspecialty certifications in OB-GYN and Urology
- Incontinence research funding has increased in the last decade resulting in a better understanding of the structure and functioning of the lower urinary tract as well as the neurophysiology of the bladder, urethra and pelvic floor.

Urinary Incontinence

- Affects at least 13 million Americans of all ages
- 85% are women
- Recent Gallup survey indicates that ~70% of these women have symptoms of stress incontinence
- 50% - 70% of women with this problem fail to seek medical evaluation because of a social stigma; coping 6 – 9 years with the problem before seeking medical therapy.
- 2009 survey of women in a managed care population found prevalence of undiagnosed urinary incontinence 53% in the preceding year.
- Psychosocial Impact on at-home caregivers; spouses or family members is rarely considered.

Urinary Incontinence

- 2005-2006 National Health and Nutrition Examination Survey (NHANES) – prevalence of UI : 6.9% ages 20 – 39; 17.2% in ages 40 – 59; 23.3% in ages 60 -79; and 31.7% when aged > 80.
- Stress incontinence is more common in women age < 65 and urge and mixed incontinence in women age > 65.
- A major cause of institutionalization of elderly
- Diminished quality of life
- 15% to 35% of elderly living at home
- ~50% of 1.5 million U.S. nursing home residents

Source: AHCPR publication 96-0682; 1996.

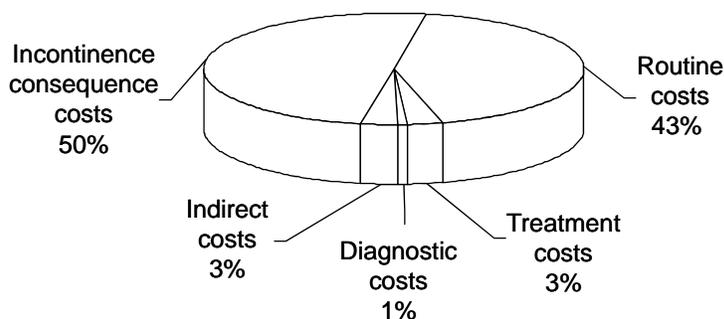
Urinary Incontinence

- Urethral Catherization and Diapering in upto 60% of Nursing Home Residents to manage urinary incontinence. (Complications)
- 1990 – RRC mandated training in the diagnosis and treatment of these problems as part of the curriculum in all OB-GYN residency programs.

Costs of Urinary Incontinence

Total Cost in 1995 > \$26 Billion U.S.

\$3,600 annually per person aged ≥ 65 years



Source: Wagner TH, Hu TW. *Urology*. 1998;51:355-361.

Medical Sequelae of Incontinence

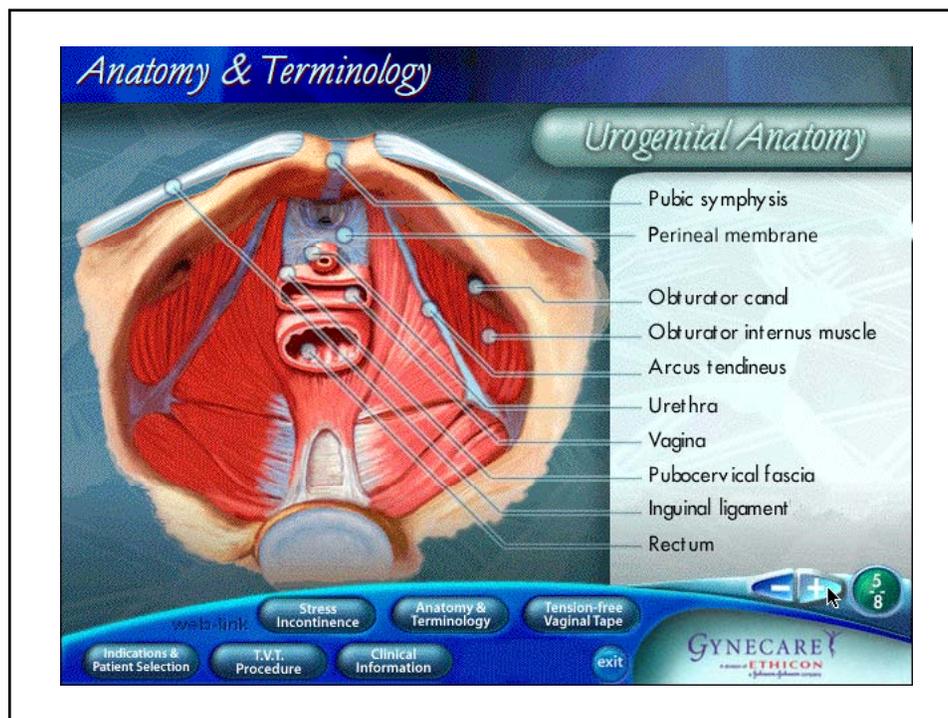
- Increased risk of slips and falls
 - Prevalence: 20-40% with 90% causing fx, in women over 65
- Incontinence, significant risk factor for hip fracture
- Infection, local or systemic
- Skin irritation or breakdown
- Dehydration

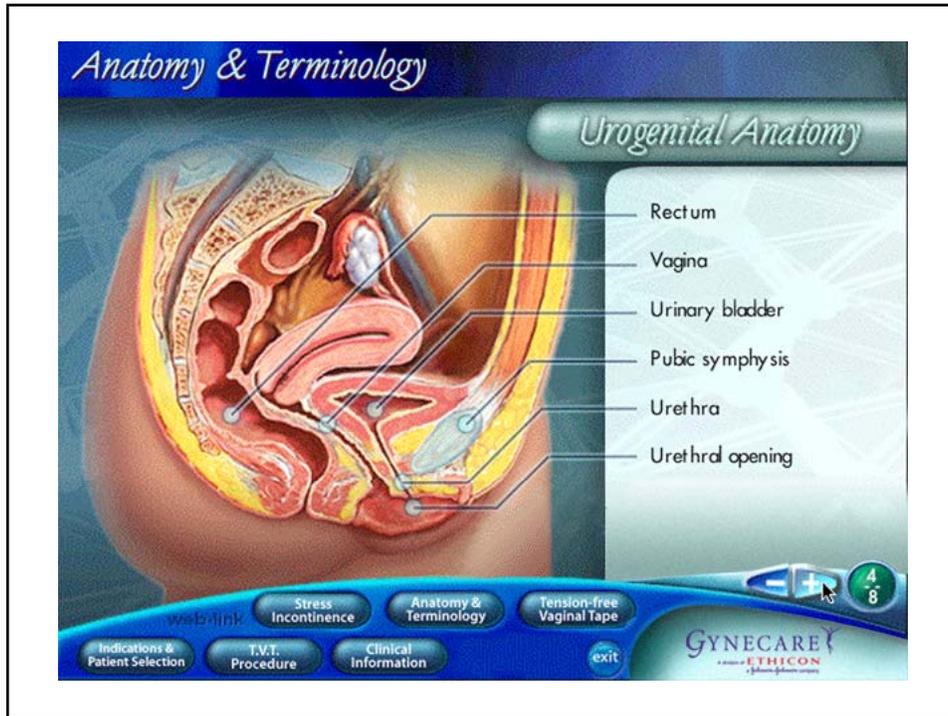
Epidemiology

- Neurologic
- Trauma
- Hormonal changes
- Anatomical weakness of the support structures
- Pharmacologic

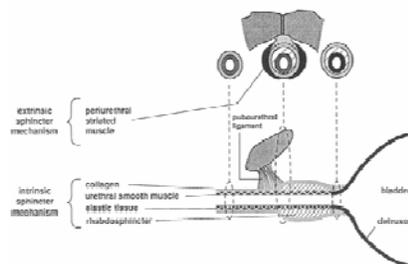
Normal Anatomy of the Bladder and Urethra

- Bladder
- Urethra
- Urethral sphincter
- Neuroanatomy





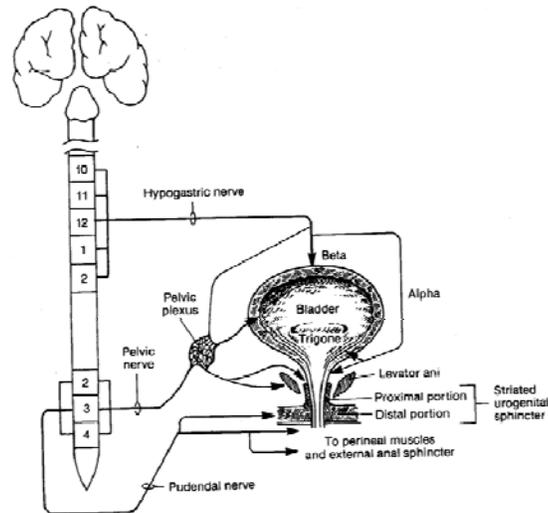
Urethral Sphincter



- Cardoza
- Intrinsic sphincter
- Extrinsic sphincter
- Pubourethral ligaments

Cardoza, Urogynecology, 1997

Neuroanatomy



Urinary Incontinence: Types

- Stress Incontinence (SUI)
- Urge Incontinence
- Mixed Incontinence
- Overflow Incontinence
- Total Incontinence
- Functional Incontinence

Stress Incontinence

- Leakage that is caused by increased intra-abdominal pressure pushing on the bladder
- Leakage usually occurs with exercise, cough, sneeze, lift
- If severe can occur with just positional changes, i.e., gravity

Potential Etiologic Factors for SUI

- Anatomic factors following childbirth
- Thinning of the pelvic floor musculature
- Decreased collagen synthesis in urethra
- Previous pelvic surgery
- Smoking, chronic constipation
- Aging, estrogen deficiency

Urge Incontinence

- Urge incontinence is uncontrolled urine loss associated with a strong desire to void
- Often very sudden, without warning
- May be precipitated by the sound of running water, cold, “key in the door”
- Often will lose large amount of urine

Mixed Incontinence

- Mixture of urge and stress incontinence
- Bladder is overactive and the urethra is underactive
- Urge incontinence may improve with treatment of the SUI
 - Approximately 50-60% in most studies

Diagnosis of Incontinence

- History
- Physical examination
- Pelvic examination
 - Assess for concurrent prolapse
- Focused neurologic examination
- Post-void residual urine
- Urinalysis
- Urodynamic testing

Clinical History

- Frequency of Episodes, Severity and Quantity of urine leak.
- Duration and progression of symptoms.
- Associated Frequency; Dysuria; Hematuria.
- Concomitant fecal incontinence or pelvic organ prolapse.
- Comorbidities.
- Obstetric and Surgical history
- Lifestyle and social history
- Medications.

Physical Examination

- General physical.
- Focused pelvic exam.
- Neurologic exam.
- Voided volume and post-void residual.
- Urine microscopy, culture and cytology.
- Q- Tip Test. (0 – 30 degrees)

Voiding Log

- Recorded over 24 – 72 hours.
- Records all fluid intake and urine output.
- All episodes of urine loss with severity graded and presence or absence of associated urgency.
- Valuable tool prior to Urodynamic testing as well as to objectively follow post therapy results.

Pad Test

- Used to confirm urinary incontinence.
- Helps quantify amount of urine loss with each episode of incontinence as well as over 24 hours.
- Short term (15 minutes to 2 hours) and Long term tests (24 – 48 hours) – pros and cons.
- 1 gm increase in weight = 1 ml of urine lost. International Continence Society considers weight change of < 1gm in 1 hour of the standardized test as a negative result.

Stress Test

- Retrograde fill bladder with sterile Saline 200 – 250 cc.
- Remove catheter.
- Have patient cough / Valsalva in the supine position and watch for 1) Hypermobility, 2) Loss of fluid from the urethra, and 3) Timing of the loss from the peak of intraabdominal pressure (Stress Induced Detrusor Instability)
- If no loss supine – repeat in sitting and standing positions.
- Marshall - Bonney Test

Pessary Test

- Reduce concomitant Pelvic Organ Prolapse.
- Uncover “ Occult Urinary Incontinence “ .
- Evaluate effect of supporting the bladder neck on the symptoms of stress incontinence.

Further Testing

- History (Stress Incontinence): Sensitivity 91%; Specificity 51%. (PPV 0.75 – 0.87).
- If PVR < 50 ml; Positive Stress test present; Functional Bladder Capacity at 350 – 400 ml, Complex Urodynamics confirmed the diagnosis 97 % . Fifteen percent had concomitant Detrusor Instability.

Urodynamic Testing

- Urodynamic testing pinpoints the site(s) of the problem by assessing the bladder, urethra, and sphincter
- Goal is to **reproduce** the leakage to better assess the cause

Urodynamics

- Simple cystometrogram (CMG)
 - Assesses the bladder during filling and the post void residual (PVR)
- Complex CMG
 - A filling study that also assesses the sphincter
- Videofluorourodynamics
 - The “Cadillac” of urodynamics
 - Radiographic monitoring while assessing pressure, etc.

Simple Cystometrogram

- Voided volume.
- Straight Catheter – PVR.
- Bladder filling with open syringe or IV bag gravity and Saline manometer readings.
- Assessment of bladder capacity and stress test.
- Automated systems available.

Complex CystoMetrogram

- Voiding profile.
- Urethral catheter with vesical and urethral transducers – Urethral Pressure Profile.
- Vaginal or Rectal catheter with transducer : Intra-abdominal pressure.
- Perineal electrode patches – EMG.
- Continuous recording of subtracted Detrusor pressure and urethral pressure during filling and voiding.
- Ability to detect subtle Detrusor dysfunction

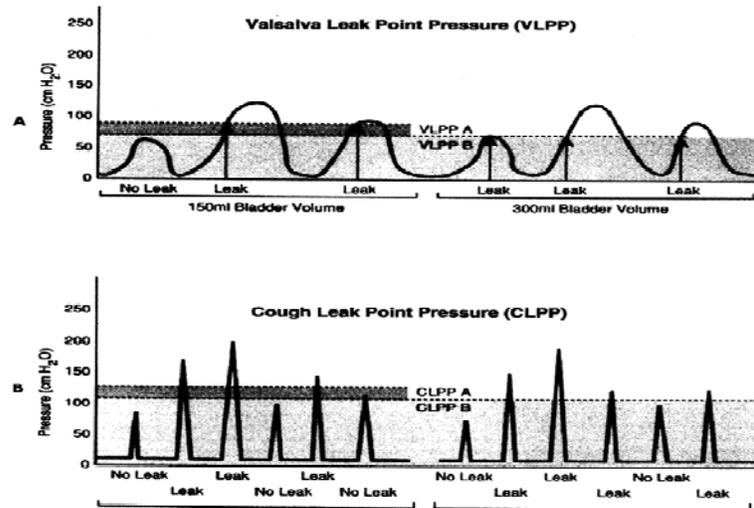
Post void residual (PVR)

- Volume of urine left in the bladder after voiding
- Can be measured by catheter or by bladder ultrasound
- Post void residual < 50 cc normal
- Consistently elevated PVR > 100 cc is abnormal

Valsalva Leak Point Pressure (LPP)

- An abdominal or Valsalva LPP
 - A measure of the stress competence of the urethra or a measure of the ability of the urethra to resist the expulsive forces of abdominal pressure
 - The amount of abdominal pressure required to overcome urethral resistance and produce leakage

Valsalva LPP



Walters, Karram, 1999

Leak Point Pressures

- SUI and hypermobile urethra
 - Type I-II incontinence
 - LPP = 65-120 cm H₂O
- Intrinsic sphincteric deficiency (ISD)
 - Type III incontinence
 - < 65 cm H₂O @ 150-200 cc

Q-tip Test

- Measures amount of mobility of the urethra with Valsalva
- Q-tip test does not change significantly after TVT

Ultrasound

- Evaluate urethra .
- Bladder calculi or Space occupying lesions.
- Bladder diverticulum.
- Proximal tract obstruction with severe Pelvic Organ Prolapse.
- Pelvic organ pathology resulting in incontinence.

Cystoscopy

- Persistent Irritative Voiding Symptoms.
- Post-operative Incontinence.
- Hematuria.
- Urinary fistulas /urethral and bladder diverticulae.

Treatment for Stress Incontinence

- Behavioral
 - Biofeedback
 - Pelvic muscle exercises
- Pharmacotherapy
 - Alpha agonists, increase urethral smooth muscle tone, estrogen
 - Clinical trials ongoing
- Surgical
 - Retropubic procedures
 - Vaginal plications
 - Needle suspensions
 - Bladder neck and sub-urethral slings

Behavioral

- BioFeedback.
- Pelvic Floor Therapy.

Pharmacologic

- Alpha Agonists.
- Tri-Cyclic Antidepressant Medications.
- Estrogen.

Treatment for Urge Incontinence

- Behavioral therapy
 - Avoid dietary irritants, biofeedback, timed voiding
- Pharmacotherapy
 - Anticholinergics, antispasmodics
- Surgical therapy
 - Interstim
 - Bladder surgery
 - Botox

Pharmacotherapy for Urge Incontinence and Overactive Bladder

- Anticholinergics (AntiMuscarinic – Detrusor relaxation)
 - Tolterodine (Detrol LA) 2mg to 4mg Qday
 - Trospium (Sanctura) 20 mg QHS to BID
 - Oxybutynin (Ditropan XL) 5mg to 30mg Qday
 - Darifenacin (Enablex) 7.5mg to 15mg Qday
 - Solifenacin (VESIcare) 5mg to 10mg Qday
 - Fesoterodine Fumarate (Toviaz) 4 – 8 mg Qday.
- Tricyclics (alpha-adrenergic agonists – Increase outlet resistance)
- Estrogen

Surgical Therapies for SUI

- Abdominal retropubic urethropexy
- Needle urethropexy
- Pubovaginal sling
- Paravaginal repair
- Anterior colporrhapy or repair
- Urethral Bulking with Collagen, Hydroxyapatite, Microspheres

Abdominal Retropubic Urethropexy

- MMK - 50% Dry at 5 years
- BURCH - >80% dry at 5 years; 60% dry at 8 years
- Paravaginal Repair
- L-scope RPU - 60% dry at 3 years

Misc.

- Anterior Colporhaphy
- Kelly-Kennedy plication
- Vaginal anterior colpopexy to Coopers ligament
- Collagen
- Microspheres

Pubovaginal Slings

- First sling operation reported in 1907 using gracilis muscle flap by von Giordano
- Multiple materials used
 - All same concept of supporting the urethra and bladder neck in a hammock that provides static stabilization at rest and dynamic compression with cough

Pubovaginal Slings

- Classically were used in patients who failed a primary incontinence procedure
- Classically used for Type III SUI or intrinsic sphincteric incontinence
- Overall success rates good, but complications prevented from becoming first line therapy

Suburethral Sling Procedures

- Giordiano (1907) gracilis muscle
- Goebel (1910) pyramidalis muscle
- Modification with Frangenheim & Stoekel
- Price (1933) use of fascia lata
- Aldridge (1942), Millin, Studdiford use of rectus Abdominis fascia
- McGuire (1970's, 1980's)
- Designed to augment closure of the urethral sphincter mechanism

Pubovaginal Slings

- AUA and ACOG Surgical Guidelines clearly demonstrated long term results were best with pubovaginal slings or abdominal suspensions
- Needle suspensions, anterior repair overall poor long term results
- Laparoscopic, not enough data

Pubovaginal Slings

- Gained popularity among Urologists
- Many modifications seen
 - Anchoring devices
 - Different sling materials
 - All trying to decrease overall complications, especially retention and detrusor instability

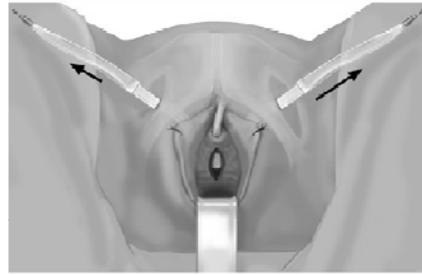
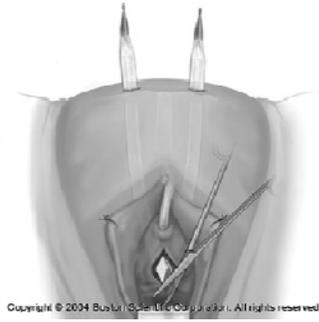
Suburethral Sling Materials

- Native materials
 - Dura mata, fascia lata
 - Levator ani, bulbocavernous muscle
 - Vaginal mucosa
- Autologous
- Cadaveric
- Dermal allografts
- Collagen matrix
- Porcine collagen
- Synthetic materials
 - GORE-TEX®
 - MARLEX®
 - SILASTIC®
 - MERSILENE®
 - POLYPROPYLENE
- Increased infection, rejection, erosion, urinary retention

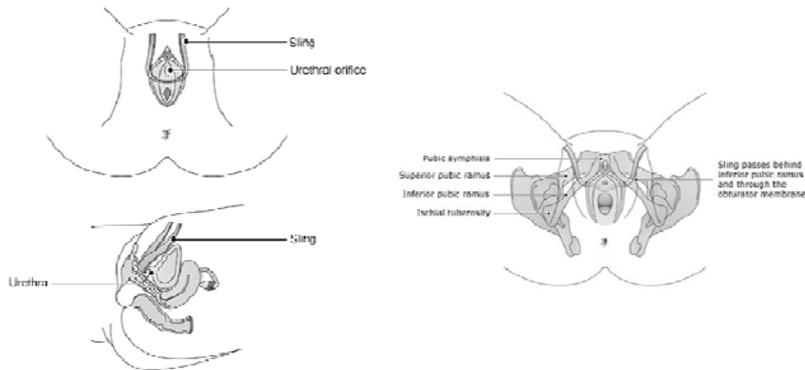
Urethral Slings

- Retropubic.
- Obturator.
- Single Incision Slings.
- Adjustable Slings.

Sub-urethral Slings

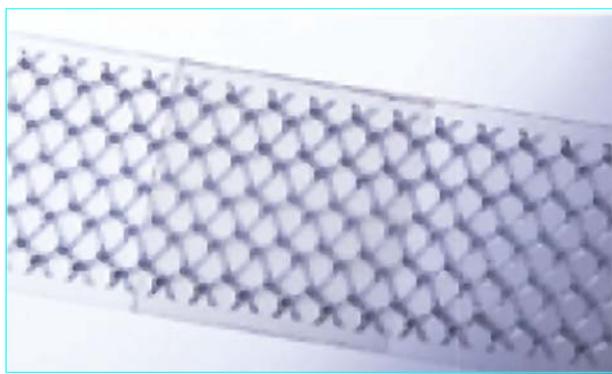


Suburethral Slings

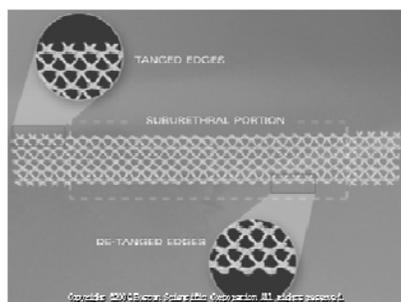


Wide Weave Polypropylene Sling

Description: Unique PROLENE polypropylene mesh covered by a translucent polyethylene sheath.



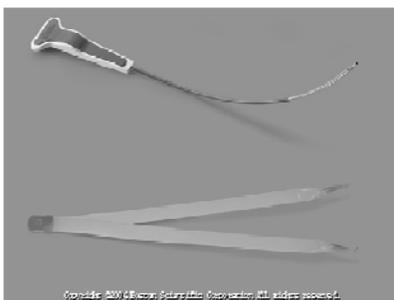
Suburethral Slings



Polypropylene Suburethral Sling



Suburethral Slings



Suburethral Sling

- Traditional indications
 - Failed anterior repair or retropubic urethropexy (RPU)
 - “Stove-pipe” urethra / Type III SUI
 - Low maximum urethral closure pressure (MUCP), Valsalva leak point pressure (VLLP) or open bladder neck
- Current indications include the above plus
 - SUI with hypermobility Type II
 - Primary therapy for all types of SUI

Sling Success Rates

- Overall success rates 70-85%
- Multiple modifications poses difficulty with comparisons of outcomes
- Inconsistent definition of “cure”
- TVT data
 - Thorough evaluation, pad test, QOL, urodynamics

Suburethral Slings

■ Indications

- Female stress urinary incontinence resulting from urethral hypermobility and/or intrinsic sphincter deficiency (ISD)

■ Contraindications

- Pregnant patients
- Patients with future growth potential
- Women with plans for future pregnancy

Goal of Surgery

- Restore and/or reinforce the pubourethral ligaments at the mid-urethra
- Restore and/or reinforce the suburethral vaginal hammock at the mid-urethra
- Reinforce the paraurethral connective tissue

Complications

- Intra-operative bleeding.
- Early Retention of urine.
- Mesh Exposure.
- Mesh erosion – Vaginal; Urethral.
- Late retention of urine.
- Proximal migration with recurrent symptoms.
- Overactive bladder.

QUESTIONS ?

Pelvic Organ Prolapse

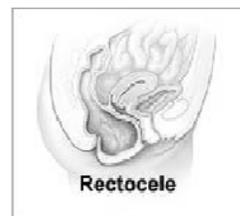
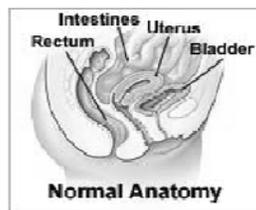
Pelvic Organ Prolapse

- Descent or Herniation of the Uterus into or Beyond the Vagina
- One in Nine women will undergo at least one operation and 30% of these will need more than one procedure (underestimation)
- Prevalence estimated at 14.2%
- Mean age at surgery 54.6 years

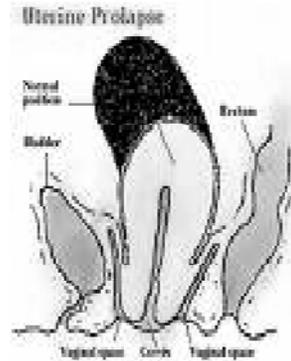
Systems of Pelvic Organ Prolapse

- Grade 1 to 4
- Mild / Moderate / Severe
- Pelvic Organ Prolapse – Quantified (POP-Q)
- Descriptive –
 - Cystocele
 - Rectocele
 - Enterocele

Descriptive - POP



Uterine Prolapse



Etiology of Prolapse

- Trauma – Obstetric
- Age
- Diminished Estrogen
- > 50% incidence in Multiparous Postmenopausal women
- <2% in Nulliparous women

Etiology of Prolapse

- Increase in Intra-abdominal Pressure
 - Asthma
 - COPD
 - Constipation
 - Lifting – job related
 - Intra-abdominal Mass

Etiology of Prolapse

- Collagen :
 - Marfans
 - Ehlers-Danlos
 - 30% reduction in collagen content found in women with major POP under 40 years age (Genetic)
- Neonatal
 - neurologic
 - Spina Bifida

Symptoms of POP

- Pelvic Pressure
- Protrusion
- Pain
- Dyspareunia
- Retention of Urine
- Bleeding
- Ulceration with Discharge
- Incarceration
- Hydronephrosis

Proctidentia with Hydronephrosis



Physical Examination

- Complete Physical
- Rectovaginal
- Supine, Sitting and Standing
- Urinary and Defecatory Dysfunction
- Urinalysis / Culture
- PAP smear
- Chemistry

Imaging

- Ultrasound
- VideoFluoroscopic Defegram
- MRI
- Video-urodynamics

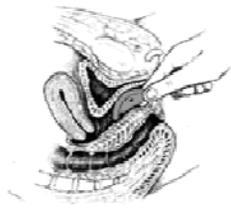
MRI - dynamic



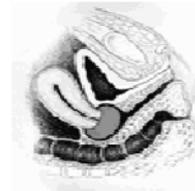
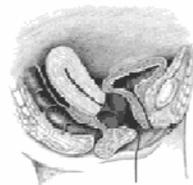
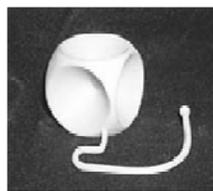
Management Options

- Expectant
- Pessaries
- Surgical

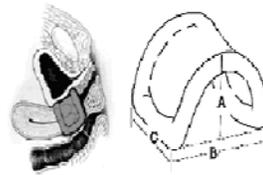
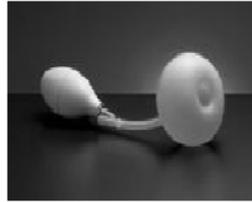
Pessaries – mild to moderate POP



Pessaries – severe POP

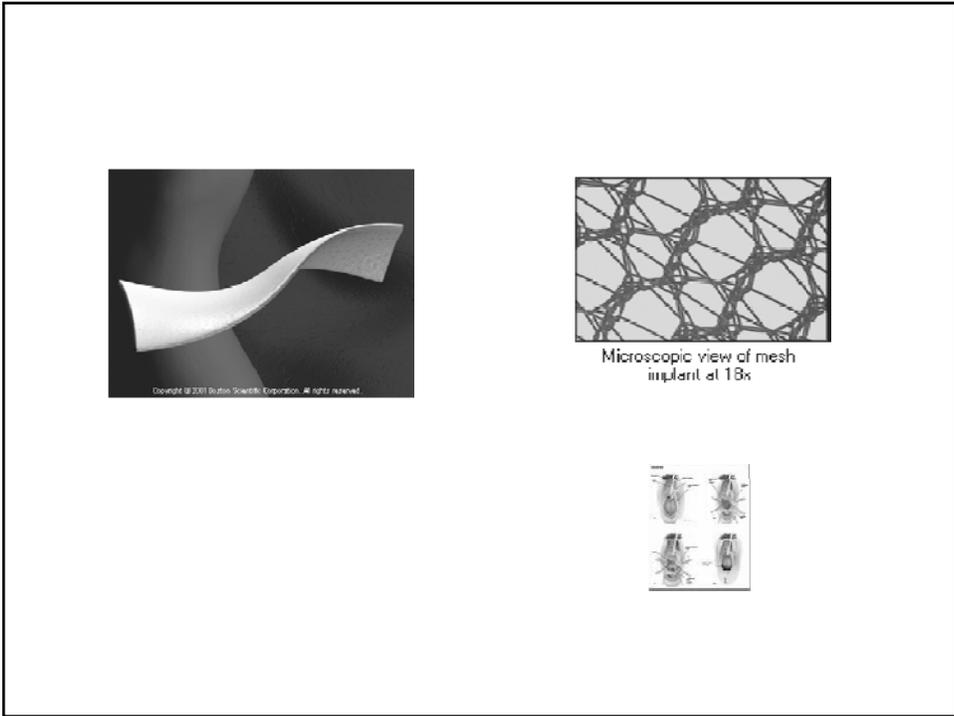


Pessaries – severe POP



Surgical

- Site Specific and Defect Specific Repairs
- Apical Suspensions
 - Vaginal
 - Abdominal
- Mesh Augmented Repairs
 - Polypropylene
 - Biologic – Allograft (Cadaver Dermis) and Xenograft (Porcine Collagen Matrix)



Apical Suspension - vaginal



Figure 3: For proper device placement, the dissection finger is placed adjacent to the suture site



Figure 4: To maintain device position, the dissection finger is placed firmly on the tip of the device



Figure 6: Once suturing is confirmed, the Caspio device is carefully withdrawn and reloaded



Figure 8: The upper vaginal vault is secured to the sacrospinous ligament, restoring vaginal wall support and correcting prolapse

Apical suspension - abdominal

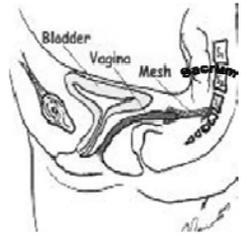
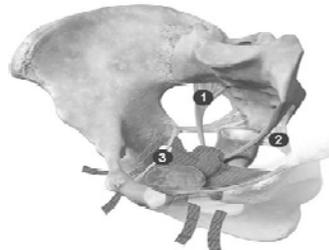
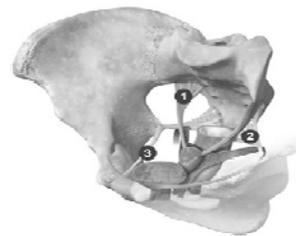
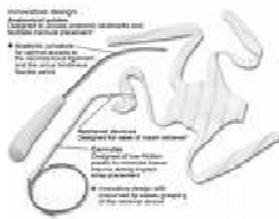


Figure 9 - Posterior mesh attachment Figure 10 -Anterior mesh attached



Evolving Minimally Invasive Systems for Complete Pelvic Floor Repairs



QUESTIONS ??