Pelvic Organ Prolapse and Urinary Incontinence

Geoffrey D. Towers, MD, FACOG
Wright State University
School of Medicine
Department of OB/GYN

Introduction

- Anatomy Overview
- Pelvic Organ Prolapse
- Urinary Incontinence
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Anatomy

- General Pelvic Support
- Anterior Compartment
- Posterior Compartment

General Support

[Image of anatomical diagram]

General Support

[Image of anatomical diagram]
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**Endopelvic Fascia: Vaginal Support**
- **Level I:** Upper Vagina & Cervix
  - Cardinal & Utero-Sacral Ligament complex
- **Level II:** Mid-Vagina, Bladder, Rectum
  - Anteriorly: Pubo-cervical fascia
  - Laterally attaches to Arcus Tendineus
  - Posteriorly: Recto-vaginal fascia
- **Level III:** Lower Vagina, Urethra
  - Anteriorly: Perineal Membrane
  - Posteriorly: Perineal Body

**General Support**

**Endopelvic Fascia**
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Retropubic Anatomy

Posterior Compartment

Pelvic Organ Prolapse

- ACOG Practice Bulletin #176 (April 2017)
- Peak sx ages 70-79
- Number of women with sxs expected to increase by 50% by 2050
- 41-50% women have some pelvic relaxation on examination
- 3-6% of these have symptoms
Epidemiology of POP
- 300,000 surgeries in U.S. annually for POP
- Incidence of surgery 1.5-1.8 surgeries per 1,000 women-years
  - 13% lifetime risk.
- Natural hx: 78% stable over 1 year
  - Most will not worsen if don’t want treatment.

Pathophysiology of POP
- Upright position: the Levator Ani muscles form the Pelvic Floor (Horizontal)
- Levator Ani (3 muscles):
  - Pubococcygeus, Ileococcygeus, & Coccygeus
- Attaches to:
  - Pubic symphysis, Arcus tendineus, Ischial spine, & Coccyx
- Urethra, Vagina, & Rectum pass through the Levator Ani

Pathophysiology of POP
- Normal:
  - Levator Ani: **horizontal**
  - Upper 1/3 vagina: **horizontal**
  - With increased abdominal pressure:
    - the rectum, uterus, & upper vagina are pushed down & backward on top of Levator Ani
- Prolapse:
  - Levator Ani: **oblique or vertical**
  - Upper 1/3 vagina: **oblique or vertical**
  - With increased abdominal pressure:
    - the rectum, uterus, & upper vagina fall through the genital hiatus of L.A.
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**P.O.P. – Risk Factors**
- Advancing Age
  - Post-menopausal >> Pre-Menopausal
- Caucasian >> African
- Parity

**Risk Factors for POP**
- Childbirth injury
- Aging
- Denervation
- Genetics / poor collagen
- Constipation
- Prior pelvic surgery
- Chronically increased intra-abdominal pressure
- Occupation
- Congenital factors

**Risk Factors for POP: Childbirth Injury**
- Risk Factors:
  - Routine Episiotomy - Forceps
  - 3rd & 4th degree tears - OP position
  - Prolonged 2nd stage of labor - Macrosomia
- Pudendal nerve Neuropathy (Tetzschner, 1997)
  - Present: SVD & C-sec for 2nd stage arrest of labor, equal occurrence
  - Absent: Elective C-sec
  - Pushing & straining lead to Neuropathy
Risk Factors for POP: Childbirth Injury
- Damage to Internal & External Anal sphincters
  - Anal Ultrasound: assess Int. & Ext. sphincters
  - Primiparous: 35% damaged sphincters, only 3% injuries recognized
  - Multiparous: 40% preexisting defects, 44% after delivery
  - Only 1/3 with defects had anal incontinence
    - other protective mechanism exists

Risk Factors for POP: Aging
- Pelvic muscles weaken with age
  - Kegel exercises strengthen Levator Ani
- Decreased estrogen after menopause
  - ERT: Strengthens vaginal tissues
  - Increases skin collagen content
  - Increases urethral closing pressure
    (Versi, 1998)
- Decreased elastic collagen fibers with age

Risk Factors for POP: Denervation of Pelvic Floor
- EMG studies (Pudendal nerve):
  - Prolonged motor terminal latencies after SVD, not C-sec
  - 5-yr F/U: persistent abnormal EMG’s, parous > nullip
- Increased denervation associated with:
  - Aging, Childbirth (with reinnervation), SUI, POP
- POP & SUI: Prolonged conduction to urethral muscle
- POP, no SUI: Prolonged conduction only to pelvic floor
  (Smith, Br J Ob Gyn, 1989;96:24-32)
Risk Factors for POP: Genetics / Poor Collagen

- Family history: POP or SUI
- Congenital weakness:
  - Nulliparous with POP: Defective utero-sacral & cardinal ligaments
- Poor collagen
  - with POP: more Type III collagen - weaker (Norton, 1992, Neurourol Urodyn; 11:2)
  - with SUI: 30% less total collagen (Falconer, 1994, Ob Gyn; 84:583)

Risk Factors for POP: Constipation

- Excessive straining
- Stretching of pudendal nerve —> damage
- Progressive neuropathy & dysfunction
- Case-control study:
  - with POP: 61% constipated
  - normal: 4%
  - (Spence-Jones, 1994, Br J Ob Gyn, 101:147)

Risk Factors for POP: Prior Pelvic Surgery

- Predisposes to prolapse at a site opposite to the original repair
- Enterocele/ Rectocele after Urethropexy
  - 27% (Wiskind, 1992)
- Cystocele after Sacrospinous Ligament Fixation
  - 15-30% (several studies)
- Neurologic damage from surgery (Benson, 1993; Ob Gyn; 82:387)
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**Risk Factors for POP: Increased Abdominal Pressure**
- Chronic increased intra-abdominal pressure
  - Smoker
  - COPD
  - Obesity
- Gradually damages supporting tissues

**Risk Factors for POP: Occupation**
- Airborne paratroopers
  - Parachute jumps led to paravaginal defects (Davis, 1996)
- Assistant nurses
  - Repetitive heavy lifting
  - Odds ratio of 1.6
  - (Denmark, 1994)

**Risk Factors for POP: Congenital Factors**
- Spinal cord pathway disease:
  - Spina bifida
  - Muscular dystrophy
  - Myelodysplasia
  - Trauma
- All lead to flaccid paralysis of pelvic floor muscles
Types of Prolapse Defects
- Anterior Compartment:
  - Cystocele, Urethrocele
- Upper Compartment:
  - Uterine Prolapse, Vaginal Vault Prolapse, Enterocele
- Posterior Compartment:
  - Rectocele, Perineal Body Defect, Descending Perineal Syndrome, Anal Sphincter Defect, Rectal Prolapse

POP: Associated Findings
- Urinary Disorders
- Fecal Disorders
- Sexual Dysfunction
- Pelvic Pain

POP: Urinary Disorders
- Urinary Incontinence
  - Stress Urinary Incontinence
  - Potential SUI
  - Urge Incontinence
- Detrusor Instability
- Urinary Retention
  - Urethra kinks & obstructs with advancing prolapse
  - 30% with PVR > 100 cc (Coates, 1997)
  - 8% with hydronephrosis (Beverly, 1997)
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## Diagnosis

- **History**
  - Pelvic Pressure/Pain
  - Something Falling Out
  - Incontinence
  - Splinting
- **Physical Examination (complete)**
  - POPQ
  - Baden-Walker
  - Assessment of tone

## POPQ

- Stands for "Pelvic Organ Prolapse Quantification"
- Adapted by the International Continence Society
- Also AUGS, SGS
- Standard System of Terminology
- Objective, Site-Specific, Reproducible
Cystocele

- May involve Urethra
  - Cystourethrocele
- DDX:
  - Diverticulum
  - Skene’s Gland
  - Mass Lesion
- Associated with incontinence
Cystocele
- Can be midline or lateral
- Lateral cystocele requires special attention
  - Lateral attachment to AFP
  - Apical support/suspension is key

Repair of Midline Cystocele

ATFP Detachment (L I/II)
Rectocele
- Look for associated enterocele
- Splinting with Bowel Movements
- Often associated with perineal defect
- Site-specific repair preferred over levator plication
- Suspension (level I) often necessary

Enterocele
- True Hernia
- Contains Bowel/Omentum
- Need to repair if found
- High index of suspicion
Enterocele Repair

Vault/Uterine Prolapse

- Similar sx to other prolapse
  - Obstructive voiding
    - May be severe!
  - Irritation/ulceration
  - Stasis/rubbing
  - Cervical Elongation

Vault prolapse with enterocoele
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Vaginal Vault Prolapse
Stage IVa

Cervical Ulceration
- Stasis
- Rubbing

Hyperkeratosis
Vault Prolapse Management

- Apical support
  - Pessary
    - 4000+ years of experience
    - Excellent for select patients
  - Surgery
    - Abdominal vs. Vaginal Approach
    - Restore “normal” anatomy
    - Suture repair vs. Mesh
    - Mesh “kit”?
  - No treatment

Rectal Prolapse

Rectal prolapse
Rectal Prolapse

Pelvic Organ Prolapse

- All 3 are inter-related:
  1. Pelvic Organ Prolapse
  2. Urinary Incontinence
  3. Anal Incontinence

- History, Exam, and Testing need to address all 3 of these possible diagnoses

Urinary Incontinence

- ACOG/AUGS Practice Bulletin #155 (Dec 2015)
- Good Review
Normal Function

- Storage
  - Keep urine in bladder
- Micturition
  - Let urine OUT of the bladder
- It's all physics!
  - If bladder pressure > urethral pressure, urine flows.

Prevalence of Incontinence

- Young women 25%
- Middle aged/postmenopause 44-57%
- Older Women 75%
- Only 45% of women in U.S. with at least weekly urine leakage seek care.

Urinary Incontinence Definitions

- Urinary Incontinence:
  - Involuntary loss of urine that is a social or hygienic problem. 3 Main Types:
- Stress Urinary Incontinence:
  - Physical exertion: cough, sneeze, laugh, exercise, lifting
- Urge Urinary Incontinence:
  - Assoc. with urge to void, more bothersome than SUI
- Mixed Urinary Incontinence
Costs of Incontinence
- The estimated 2.6 million elderly community dwelling incontinent women spent approximately 4.8 billion dollars on incontinence care.
- 2.2 billion of this was on pads, briefs, other protective garments and supplies.

Anatomy of Stress Incontinence
- Loss of urethral support allows unequal transmission of abdominal pressure with stress events
  - Also loss of posterior urethrovesical angle (PUV)
- Urethra displaced instead of compressed
- IVP>mUCP \rightarrow WET
- "Garden hose in the mud…"
- Position of urethra more important than PUV

Urge Urinary Incontinence
- Frequency/Urgency
- "Can't make it"
- Difficult to hold urine with urge
- "Toilet mapping"
- Physiologic
  - Loss or impairment of normal neurologic feedback pathways
  - "Detrusor-sphincter dyssynergia"
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**Bladder Support**

**Physiology of Micturition**

- **Detrusor Function**
  - Parasympathetic = contraction = micturition
    - Acetylcholine (muscarinic) receptors (M2, M3)
  - Sympathetic = relaxation = Storage
    - Adrenergic (Beta) receptors
Neurotransmitter Receptors of Bladder & Urethra

Rohner, 1983

Neurophysiology

- Four basic autonomic and somatic loops
  - I- Cerebral cortex to brainstem (modifies sensory stimuli from loop II)
  - II- Sacral micturition center (SMC, S2-S4) and detrusor to brainstem (and back, to activate III, if not inhibited by I)
  - III- Bladder wall to SMC, to urethra (relaxation of urethral sphincter as bladder contracts)
  - IV- Cerebral cortex to SMC to urethral striated muscle (voluntary relaxation and initiation of voiding)
Normal Micturition

Diagnosis

Differential Diagnosis

© Genitourinary Etiology
- Filling/Storage disorders
  - Urodynamics SUI
  - Detrusor Overactivity (idiopathic/neurogenic)
  - Mixed
- Fistula
  - Vesical
  - Urethral
  - Ureteral
- Infectious
  - UTI
  - Vaginitis
- Congenital
  - Ectopic ureter
  - Epispadias

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Differential Diagnosis

- Nongenitourinary Etiology
  - Functional
    - Neurologic
    - Cognitive
    - Psychologic
    - Physical Impairment
  - Environmental
  - Pharmacologic
  - Metabolic

DIAPPERS

- D Delirium / confusion
- I Infection
- A Atrophic urethritis/ vaginitis
- P Pharmaceuticals
- P Psychological esp depression
- E Endocrine (hypercalcemia, hyperglycemia)
- R Restricted mobility
- S Stool impaction

Basic Office Evaluation

- Thorough history
- Physical examination
- Screening Urinalysis
- Post-void residual volume measurement
- Demonstration of stress incontinence
- Assessment of urethral mobility
**History**

- Most important!!
- Characterization
- Duration
- Precipitating events
- Fluid intake
- Frequency
- Effect on life
- Storage/Micturition
- Treatment goals

**Storage**
- Frequency
- Nocturia
- Urgency
- Incontinence

**Micturition**
- Hesitancy
- Stream abnormality
- Straining
- Retention
- Pain

**History**

- PMHx
  - MS
  - DM
  - CVA
  - Back problems
- PSHx
- Allergies
- Medications

**Voiding diary**
- Include volumes!

**Validated questionnaires**

**Medication Effects**

<table>
<thead>
<tr>
<th>Medication Type</th>
<th>Effect on Urethral Resistance</th>
<th>Effect on Detrusor Contractility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dopaminergic Agonist</td>
<td>↑</td>
<td>▼</td>
</tr>
<tr>
<td>Cholinergic Agonist</td>
<td>↓</td>
<td>▼</td>
</tr>
<tr>
<td>Beta-adrenergic Agonist</td>
<td>▼</td>
<td>▼</td>
</tr>
<tr>
<td>Methyl Xanthine (Caffeine)</td>
<td>▼</td>
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Bladder Diary

Urinalysis
- CC or cath specimen
- Treat any UTI empirically as uncomplicated UTI prior to any further workup
- Send for culture
- If microscopic hematuria (>2 RBC/HPF on microscopy) then cystoscopy and CT

Physical Exam
- Exclude confounding or contributing factors
- Diverticulum
- Fistula
- Prolapse
- Pelvic floor musculature/neurologic exam
- Discharge
- Rectal examination
Demonstration of Stress Incontinence

- Cough stress test
  - Full bladder (or backfill to 300cc)
  - If recumbent negative then test standing
  - If both negative despite SUI complaints then needs multichannel urodynamic testing

Cough Stress Test: Spurt of Urine

Urethral Mobility

- At least 30 degrees from horizontal
- Point Aa
- Q-tip
- Visualization
- Palpation
- Ultrasound
- If absent, 1.9x increase in sling failure
  - Consider bulking or fascial sling
Assessment of Urethral Mobility

- Displacement angle at least 30 degrees from horizontal

Post-void residual volume

- Measure by catheter or ultrasound
- Normal is <150cc
- If elevated, then re-test at different time
- If elevated, consider further testing (voiding pressure-flow study)

Multichannel Urodynamics

- Not required for initial evaluation of uncomplicated SUI
- Indicated for:
  - Unclear diagnosis on basic evaluation
  - Failure to improve with treatment
  - Prior pelvic floor or incontinence surgery
  - Symptoms not correlating with objective findings
  - Based on clinical judgment
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**Multichannel Urodynamics**

**Treatment Strategies**

- **UTI first**
- **Behavior/Lifestyle modification**
  - 50% reduction in incontinence compared with controls in RCT
  - Bladder training
  - Weight Loss (obesity 4.2x risk for SUI)
    - RCT 47% reduction SUI with 8% reduction baseline weight
- **Diet/Fluid Management**
  - Eliminate irritants (coffee, tea, artificial sweeteners)
- **Pelvic muscle exercises/PT**
  - Objective 1-year cure SUI 59% compared to 77% with sling

**Pharmacotherapy**

- **Antimuscarinic**
  - Multiple options
  - Affect M2 and M3 receptors
  - All have antimuscarinic side effects (dry mouth)
- **Beta Agonist**
  - Mirabegron
  - B-3 adrenergic receptor in detrusor
  - Not for patients with severe HTN, renal dx, liver dx
- **Onabotulinumtoxin A (BOTOX)**
  - Injected cystoscopically (100 units)
  - Similar reduction to antimuscarinic
  - Better rate of complete resolution (27% vs. 13%)
  - Higher UTI (33%) and voiding dysfunction (5%)
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**Treatment**
- What type of receptors at urethra?
  - alpha-receptors: contractile
    - alpha agonists (theoretically) treat S.U.I.
- What type of receptors at bladder?
  - beta-receptors: Inhibitory
  - cholinergic: contractile
    - anti-cholinergics treat D.O.
    - Beta agonists treat D.O.
    - BOTOX treats D.O.

**Neurotransmitter Receptors of Bladder & Urethra**
Rohner, 1983

**CONTINENCE AND MICTION**

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Figure 3.2: The innervation of the bladder and urethra. Parasympathetic fibers arising in S2 through S4 herniatory trigonal nerves and pelvic plexus pass to the bladder and urethra. These parasympathetic fibers exert contractile tone. Sympathetic fibers that leave the lumbar plexus form the superior hypogastric plexus, primarily in the bladder and urethra to cause relaxation. (Reprinted and modified with permission from: C.A. Low and N. Winnick, Urology, 1991.)
### Anticholinergic Drugs
- Tolterodine (Detrol)
- Oxybutynin (Ditropan)
- Solifenacin (VESiCare)
- Darifenacin (Enablex)
- Trospium Chloride (Sanctura)
- Fesoterodine Fumarate (Toviaz)
- Imipramine (Tofranil)
- Amytriptyline (Elavil)

### Beta Agonist
- Mirabegron (Myrbetriq)

### Alpha Agonists
- Pseudoephedrine (Sudafed)
- Phenylephrine
- Phenylpropanolamine
- Similar drugs, often found OTC
- Risk – Hypertension!
Treatment Strategies

- Sacral Neuromodulation
  - 62% clinical success rate (26% completely dry, 36% with >50% reduction in episodes)
  - For UUI refractory to first-line treatment/medical management
  - Also indicated for non-obstructive retention and fecal incontinence

Treatment Strategies

- Incontinence pessary
  - May improve sxs of SUI and MUI
  - No objective evidence reported
  - Good option for young women who have not completed childbearing
  - Level B evidence

Treatment Strategies

- Bulking Agents (level B evidence)
  - For ISD, non-mobile urethra, persistent sxs after surgery, women with medical co-morbidities that preclude surgery
  - Generally less effective than other surgical treatment (factor of 1.7-4.8)
  - Prone to need for repeat injections
Surgery
- Aimed at restoring anatomic support to urethra and/or bladder base
  - Midurethral Sling (TVT/TOT or similar)
  - Burch colpourethropexy
  - Suburethral (Bladder Neck) Sling
  - Trans/Peri-urethral injections (adds bulk to urethra, specifically for ISD)

Treatment Strategies
- Surgical Treatment (SUI)
  - Can be first-line for uncomplicated SUI in appropriately counseled patient (better cure rates compared to PT)
  - Midurethral mesh sling is “standard of care”
    - TOT and TVT essentially equal in effectiveness
      - TOT less obstruction, fewer significant injuries, more groin pain
      - TVT more vascular/visceral injury, more blood loss, more obstruction
      - Mesh complications equal (2%)
    - Single incision slings are LESS effective
  - Burch colpourethropexy
  - Fascial sling (fixed urethra, mesh complication)

SUI and Prolapse
- 40% of women without SUI will develop SUI after prolapse surgery (occult SUI)
- Screen for it
- Colpopexy and Urinary Reduction Efforts (CURE) trial
  - Significant reduction in postoperative SUI with Burch at time of ASC in stress-continent patients (24% vs. 44%)
- Vaginal Prolapse Repair and Midurethral Sling trial
  - Similar finding, but with risk of adverse effects from incontinence procedure
Summary

- Pelvic organ prolapse and urinary incontinence closely related and interdependent
- Many risk factors
- Comprehensive evaluation needed
- Understanding the anatomy and physiology is essential for accurate diagnosis and treatment

Questions?