Pelvic Floor Anatomy and Female Lower Urinary Tract Dysfunction

Hann-Chorng Kuo
Department of Urology
Buddhist Tzu Chi General Hospital
Abdomino-pelvic cavity

- Respiratory diaphragm
- Vertebral column
- Abdominal muscles
- Pelvic floor
- Intra-abdominal pressure
- Visceral weight & Gravity in erect body
- Maintain visceral function
Genital Support

- Pelvic floor- Pelvic visceral attachment to pelvic walls through endopelvic fascia
- Levator ani muscles- a pelvic diaphragm with a cleft in anterior portion
- Urogenital diaphragm connects perineal body to ischiopubic rami
- Bulocavernous, ischiocavernous, sup.transverse perineal, anal sphincter m.
Endopelvic fascia
Levator ani muscles

- Pelvic diaphragm composed of levator ani, coccygeus, obturator internus, and piriformis muscles
- Levator ani consists of medial pubococcygeus and lateral iliococcygeus muscles
- Pelvic diaphragm composed of levator ani, coccygeus, obturator
The Pelvic Diaphragm
The Pelvic Floor Muscles

- Obturator internus muscle
- Ischial spine
- Tendinous arch of levator ani muscles
- Priiiformis muscle
- Coccygeus muscle
- Iliococcygeus muscle
- Pubococcygeus muscle
The Pelvic Floor Muscles
The puborectalis muscle
(Inferior fibers of pubococcygeus)
The Puborectalis muscle
The Urogenital Diaphragm
Female Perineum
The Function of Pelvic Floor

- Support pelvic and abdominal organs during stress of increased abdominal pressure
- Allow for opening of the pelvic floor to accommodate excretory functions and parturition
- Endopelvic fascia and visceral ligaments contains smooth muscles
The Pelvic Floor Attachments

- Pelvic floor support depends on its connection to the pelvic bones
- An evolutionary solution for support of visceral organs
- Pelvic floor muscles oppose gravity and increased abdominal pressures
Prevention of Prolapse

- **Constriction** – levator ani muscles constrict lumen of vagina
- **Suspension** – cardinal ligaments & uterosacral ligaments, pubocervical fascia act to suspend cervix and vagina
- **Flap valve mechanism** – anterior traction of levator ani m. and suspension of vagina in posterior pelvis
Prevention of Prolapse
Attachments of Pelvic Floor

- Tendinous arch of pelvic fascia - pubocervical fascia arises
- Tendinous arch of levator ani - levator ani muscles arise
- Pubourethral ligaments
- Pubovesical ligaments
Attachments of Pelvic Floor
Pelvic Floor Dysfunction

- A variety of fascial and anatomic defects
- Cystocele, rectocele, uterine prolapse, enterocele, vault prolapse
- Adequate diagnosis and staging of pelvic floor dysfunction is essential
Diagnosis of Pelvic Floor Dysfunction

- Detailed physical examination
- Pelvic ultrasound
- Fluoroscopy of rectum & bladder
- Magnetic resonance imaging (MRI)
Image Study of Pelvic Floor
The Urethropelvic Ligaments

- Bladder
- Smooth muscle
- Striated
- Symphysis pubis
- Striated muscle
- Smooth muscle
- Urethropelvic ligament
- Smooth muscle
Descent of Bladder during Stress
Cystocele

- Most Gr 1 and 2 cystoceles are asymptomatic
- High grade cystoceles are associated with vaginal bulging, vaginal pressure, dyspareunia, UTI, obstructive voiding, urinary retention
- A high grade cystocele may mask urethral hypermobility and stress incontinence
Physical examination of Cystocele
MRI of Cystocele
Enterocele

- Simple enterocele
- Complex enterocele - associated with vault prolapse and anterior or posterior vaginal prolapse
- Cause vaginal pressure, dyspareunia, low back pain, constipation, symptoms of bowel obstruction
Physical examination of Vaginal Cuff Prolapse
MRI of Enterocele
Rectocele

- Defect of prerectal and pararectal fascia, and rectovaginal septum
- Present in 80% asymptomatic patients
- Vaginal mass, vaginal pressure, dyspareunia, constipation
Physical examination of Rectocele
MRI of Rectocele
Uterine Prolapse

- Laxity of uterosacral ligaments
- May present with vaginal mass, dyspareunia, urinary retention, back pain
- Grade 4 prolapse is associated with ureteral obstruction
Physical examination of Uterine Prolapse
MRI of Uterine Prolapse
Complete Eversion of Vaginal Vault
The Continence Mechanism
The Urethral Sphincter and Pelvic Floor
The External Urethral Sphincter
Pelvic Floor Relaxation

- Associated with damage to pubococcygeus muscle
- The muscle is lax, atrophied, poor tone
- Urinary stress incontinence
- Genital prolapse
- Sexual Problem
- Rectal stasis
Muscular Component of Pubococcygeus muscle

- Large diameter slow twitch type I fibers predominant - provide static visceral support
- Fast twitch type II fibers - assists in active closure of pelvic visceral organs
- 40% of women have lost function or coordination of this muscle
The Structures supporting Bladder and Urethra

- Arcus tendineus fascia pelvis
- Levator ani (pubococcygeus muscles)
- Pubovesical muscles or ligaments
- Vaginal muscle attachments to fascia and levator ani
The Structures supporting Bladder and Urethra
The Structures supporting Bladder and Urethra
The Hammock Theory of Extrinsic Continence Mechanism
Increased Abdominal Pressure against Supportive Fascia
The Integral Theory of Extrinsic Continence Theory
Pelvic Floor Relaxation and Abdominal Leak Point Pressure
Pelvic Floor Relaxation
Low LPP without Hypermobility
Pelvic Floor Relaxation
High LPP with hypermobility
Pelvic Floor Relaxation

CLPP > VLPP, mild hypermobility
Physical examination of Pelvic Floor Dysfunction

- General examination - cancer screen, stool OB, urinalysis, physical examination
- Neurological examination - paresthesia of dermatome, bulbocavernous reflex, voluntary contraction of anal sphincter
- Pelvic examination - cystocele, rectocele, uterine prolapse, vault prolapse
- Urinary incontinence by Valsalva maneuver or coughing
Staging of Pelvic Organ Prolapse

- **Stage 0** - no prolapse
- **Stage I** - the most distal portion is >1cm above level of hymen
- **Stage II** - The most distal portion is <1cm proximal or distal to plane of hymen
- **Stage III** - The most distal portion is >1cm below plane of hymen, but < total vaginal length - 2 cm
- **Stage IV** - complete eversion of total length of lower genital tract, the distal portion is > TVL-2 cm, i.e. cervix or vaginal cuff
Evaluation of Pelvic Floor Muscle Function

- Assessing patient’s ability to contract and relax pelvic muscles separately
- Measuring the force of contraction
- Palpation of thickness of pelvic floor musculatures
- Electromyography
- Pressure recording
Measurement of Bladder Base Descent (The Q-tip Test)
Lower Urinary Tract Symptoms caused by Pelvic Organ Prolapse

- Stress incontinence
- Frequency, urgency, urge incontinence
- Hesitancy, weak stream, incomplete empty
- Manual reduction of prolapse for voiding
- Positional change to start or complete voiding
Bowel Symptoms caused by Pelvic Organ Prolapse

- Difficulty with defecation
- Incontinence of flatus
- Incontinence of liquid stool
- Incontinence of solid stool
- Fecal staining of underwear
- Digital manipulation to complete defecation
- Feeling of incomplete evacuation
- Rectal protrusion during or after defecation
Sexual symptoms caused by Pelvic Organ Prolapse

- Vaginal coitus?
- Frequency of vaginal coitus?
- Painful coitus?
- Satisfaction with sexual activity?
- Change in orgasm?
- Incontinence experienced during sexual activity?
Local symptoms caused by Pelvic Organ Prolapse

- Vaginal pressure or heaviness
- Vaginal or perineal pain
- Sensation or awareness of tissue protrusion from vagina
- Low back pain
- Abdominal pressure or pain
- Observation or palpation of a mass