Physical Therapy: Pelvic Muscle Health and Function in Menopause

Denise Hartzell Leggin, MBA, PT, WCS
President, Elite Rehabilitation Solutions
Per Diem Physical Therapist, Einstein and Jefferson Health System

Overview: Menopause

• Normal Physiological Process
  – Natural/spontaneous: final menstrual period (12 months)
  – 40-58 yo (average 52)
  – CDC and 2016 US Census
    • 2012: 41% women older than 45
    • 2015: 8.5% women older than 65
    • 2030: 13.4% women older than 65
  – Potential for 1/3 of women life span

• CLOSER Survey
  – Night sweats/ Vasomotor
  – Weight Gain
  – Sleep Disturbance

• Vaginal/Urinary Symptoms

History

• APTA- Section Obstetrics and Gynecology
  – 1977 – Elizabeth Noble
  – Purpose: Resource for Physical Therapists for healthcare delivery for women before, during and post pregnancy

• APTA – Section on Women’s Health
  – 1995
  – Scope: Incontinence, Pelvic/Vaginal Pain, Pregnancy-MSK dysfunction, Lymphedema, Breast Ca and post surgical, Osteoporosis
  – Across life span
  – 2011 – Mission includes males

Genitourinary Syndrome of Menopause (GSM)

• 2014- ISSWSH and NAMS
  – Inclusive of genital, sexual, urinary symptoms

• Urogenital Consequences of Aging  (2013, Doumouchtsis, SK et al)
  – Pelvic Floor Dysfunction likely to coexist
  – Pathophysiology and mechanism not always clear
    • Aging affects on pelvic floor muscle
    • Women’s Lifespan and interaction of anatomy, lifestyle, genetic, reproductive factors
    • Other: cognition, mobility etc
    • Multidisciplinary approach to treatment
      – Symptom relief
      – Improved function
      – Decision of treatment outweigh risk of complications
### What is PFD?

- **Pelvic Floor Dysfunction** (1998, Bump)
  - Variety of clinical conditions including
    - Urinary Incontinence
    - Anal Incontinence (bowel/gas)
    - Constipation
    - Pelvic Organ Prolapse
    - Sensory and Emptying Abnormalities of LUT
    - Pain Syndromes
    - Sexual Dysfunction

- **Inc HC Resources** (2013, Doumouchtsis, SK et al)
  - 30% consultations for PFD by 2030
  - SUI – surgery 47%
  - POP – surgery by 2050 47%

### Urogenital Consequences of Aging

#### Pelvic Organ Prolapse

- **Risk factors:**
  - Age, BMI, Parity – vaginal, occupational/recreational/heavy lifting, chronic cough, genetics

- **50% Vaginal Delivery- some degree of asym or symp** (Hagen/Stark 2011 Cochrane Review)

- **Surgery for POP**
  - 40-60% re-occurrence (Whiteshed 2004; Unger et al 2016)
  - 30% within 2 years of surgery (Salvatore et al 2010)

#### Urinary Incontinence

  - 51% women 20+ years
  - 32% women 60+ years
  - 17% women 40-59 years
  - Risk Factor- Obesity >30kg/m2
  - Risk Factor- Diabetes

- **Pathogenesis**
  - Urologic
  - Gynecologic
  - Functional

#### Bowel Dysfunction

- **Fecal Incontinence**
  - Decrease PF strength
  - Pelvic Floor muscle defects

- **Constipation**
  - 2-3x more women than male
  - Change in colonic transit
  - Dysnergia of pelvic floor
  - Medications
  - Diet changes/ Dehydration
  - Decrease mobility
### Urogenital Consequences of Aging

- **Sexual Dysfunction**
  - **Classification:**
    - Low desire
    - Decrease arousal
    - Decrease orgasmic
    - Pain
  - **Clinical Exam**
    - Mucosal atrophy, vaginal dryness
    - Scars – surgical, birthing history
    - Shortened pelvic floor
    - Vaginal narrowing/shortness
    - Sensory, central/peripheral nerve changes
    - Hypo versus hypertonicity of pelvic floor muscles
    - Other - medical history, medications, relational/social (interpersonal/partner sexual dysfunction)

### Pain: Abdominal / Pelvic Adhesions

- Non anatomic fibrous connections between peritoneal tissue
- Secondary to normal wound healing
  
  *(Zeynep A, 2008; Rice A, 2013; Arung, W 2011)*
- **Risk Factors**
  - Infection or inflammation
  - Tissue ischemia/hypoxia
  - Surgical
  - Foreign bodies
  - Physical trauma
  - Patient

### Other: Pain

- **Vulvar Pain**
  - Infection
  - Inflammatory
  - Neoplastic
  - Neurologic (nerve compression)
  - Trauma
  - Hormonal
  - Vulvodynia
- 90% VVS - PF dysfunction- superficial hypertonicity, decrease strength, vaginal opening tightness *(Hassing et al 2005)*
- MSK/PF dysfunction- primary vs secondary
PT role in treating pelvic floor

• Abilities
  - PTs treat musculoskeletal and neuromuscular dysfunctions
  - Pelvic floor dysfunctions can be caused by musculoskeletal dysfunction
  - PT may only be able to treat certain aspects of the dysfunction
• Limitations
  - Need to know when to refer - multidisciplinary
  - Many pelvic floor syndromes present the same - but have very different causes

Pelvic Floor Muscle

• Muscular and fascial sling
  – Base of bony pelvic ring
  – Constant resting tone
  – Integrated system
• Function
  – Voiding/ Sphincteric Function
    • Closure vs Relaxation
  – Supportive Function
    • Resists intra-abdominal pressure (cough, sneeze, laugh)
    • Pelvic organs/ pregnancy
  – Stability
    • Synergistic – abdominals, diaphragm, multifidi
    – Sexual appreciation

Perineum:
• Diamond Shape
  3 Layers of muscle
  • Urogenital Triangle/Anal Triangle
  • Urogenital Diaphragm/Anal
  • Pelvic Diaphragm

Neuroanatomy

• Sacral Plexus (L4-S4)
  Pelvic Floor Innervation layered
  – Superior to pelvic floor – LAN (S3-S5)
  – Inferior to pelvic floor- Pudendal N (S2-S4)
  – 3 Divisions of Pudendal Nerve
    • Inferior rectal nerve – external anal sphincter
    • Perineal nerve – Superficial/ Deep
      • Dorsal nerve – to clitoris /penis
  – Lumbar Plexus (L1-L4)
Lumbar and Sacral Plexus

- Lumbar – Spinal Nerves
- Sacral – Spinal Nerves
- Obturator N (L2-L4)
- Femoral N (L2-L4)
- Lumbosacral Trunk
- Pudendal N (S2-S4)
- Sciatic N (L4-S3)

Cutaneous Innervation
- Femoral b’ – genitofemoral
- Iliohypogastric
- Ilioinguinal
- Iliohypogastric
- Dorsal rami L1-L3
- Dorsal rami S1-S3
- Dorsal rami S4-S5

Muscles:
- Piriformis
- Coccygeus
- Obturator Internus

Function: Voiding

- Conservative treatment such as PF therapy recommended as first line treatment: SUI, MUI, UUI, POP, FI
  - Abrams P et al, 5th International Consultation on Incontinence. ICUD-EAU 2013
- PFM training effective for treatment for stress, urge or mixed UI and better than no treatment or placebo
  - 56-70% improvement rates
  - 2014, Cochrane review
  - Updated to 2010
  - 21 trials (15 prior review)
Function: Voiding

• Treatment
  – Exercise Versus Adjunctive
  – Single blind, randomized controlled trial to pelvic floor exercises, electrical stimulation, vaginal cones, and no treatment in management of genuine stress incontinence in women.
    • 1999, Bo, K et al; BMJ
    • Compliance 93% exercise group
    • Exercise Improvement: Strength, Leakage Index, Subjective
  – PFMT + any another active treatment vs same active tx alone (SUI, UUI, MUI)
    • 2015, Ayleke RO, Cochrane review
    • Result: Insufficient to support or refute PFMT as adjunctive
    • Small N each study, study design

Function: Supportive

Muscular/Ligament/Connective tissue

• Endopelvic Fascia
• Uterovaginal Support
• Anterior Vaginal Support
• Posterior Support
• Levator Ani Muscles
• Interaction between Pelvic muscle and endopelvic fascia

Uterosacral ligament
Cardinal ligament (Transverse Cervical)
Pubocervical ligament
Arcus Tendon of Pelvic Floor
Pubovesical ligament
Pubococcygeus
Compressor Urethrae
Pubourethral ligament

• DRA
  – 39% (N=1738) parous women several years postpartum (Ranney, B. 1990)

• Relationship between DRA and PF dysfunction (retrospective review)
  – 66% (N=514) with supportive dysfunction (SUI, FI, POP) (Spinzagl, TM 2007)
Stability (inner core)

- Pelvic floor: tonic hold sitting and standing

- Postural and Respiratory Function
  - Sapsford R. Manual Therapy 2004: 9:3-12
  - Breathing Rest: Inhale- diaphragm - down  Abdominals - out
    Exhale: diaphragm - up  Abdominals -in
  - Progressive increase IAP – blowing nose, coughing, sneezing

- Trunk Stabilization

Function: Sexual

- Superficial Perineal Muscles
  - Anterior attachments to clitoris
    - Imediocavernosus
    - Bulbocavernosus

- Muscle tone
  - Hypertonicity - pain
  - Hypotonicity- dec sensory

- Postmenopausal women
  - Less PF muscle strength

Do stages of menopause affect outcomes of PF muscle training?

Impact of PFM training on pfm strength at different stages of menopause?

- Group 1 >/= 7 days from normal menstrual cycle
- Group 2 > 60 days to 4+ years
- Group 3 >/= 5 years since last menstruation

- Measurements:
  PERFECT, Brink, perineometry, transabdominal US, Stop test, 1 hr pad test

- Treatment:
  - First two weeks- education, motor learning: verbal/tactile cues PF contraction
  - HEP – written instruction based on PERFECT
  - Weekly 1:1 Logging of session
  - position, # reps slow/fast/rest interval and # of reps in day and week
  - 4th, 8th 10th 12th week- Update Program
  - PF pre contraction/ "Knack" (Miller et al)
  - intervention 3x/week – 30 min sessions

- Outcome
  - all groups with statistically increase in strength G 1 and G3 most prevalent (59%/57% respective vs G2 44%)
What should PF Do?

- Change Length
  - Contract - elevate
  - Relax – return to rest position
  - Lengthen – bulge, drop
- Symmetry
  - Sensation – appreciate squeeze and lift
  - Left/right and anterior/posterior
- Strength – endurance and Power
- Motor Control/ Muscle Coordination

Evaluation: Overview

- Subjective History
  - Present complaint/ history
  - Past Medical / Surgical History
  - Gyn/Birthing/Urologic/ GI/ sexual etc
  - Medications
- PT Examination
  - Orthopedic Examination (lumbar, hip, posture)
  - External Pelvic Floor – observation/manual
  - Internal Examination – pelvic floor, accessory/surrounding soft tissue
  - Questionnaire – outcome tools
  - Adjunctive- Diary, Biofeedback, Estim

Pelvic Floor Muscle Assessment

- Overview- Pelvic Floor Assessment
  K Bø, M Sherburn "Evaluation of Female Pelvic-Floor Muscle Function and Strength” Physical Therapy Volume 85 • Number 3 • March 2005
  - Categorized
    - Ability to Contract
      - Observation
      - Vaginal Palpation,
      - US, MRI, EMG
    - Quantify Strength
      - Palpation
      - Manometry
      - Dynamometry
      - Cones

Pelvic Muscle Assessment

- Clinical Recommendations
  - No single measurement tool
  - Subjective influence – skill/ clinical experience
  - Palpation- PT recommended technique to understand, teach, provide feedback
  - Position, instructions, # fingers- must be reported and standardized
  - US – suprapubic and non invasive
  - Vaginal squeeze pressure – affected by intra abdominal pressure
Standardization of Terminology: Pelvic Floor Function & Dysfunction

Messelink, B. et al. 2005. Standardization of Terminology of Pelvic Floor Muscle Function and Dysfunction: Report From the Pelvic Floor Clinical Assessment Group of the International Continence Society

- Objective to facilitate comparison of results and communication by PFM study investigators
- Based on ICS principle –
  - Symptoms- subjective report
  - Signs - objective
  - Conditions
- Symptom Groups (IUAG/ICS Joint Report on the Terminology for Female Pelvic Floor Dysfunction 2010 Neurology and Urodynamics 29:4-10)

Symptom categories

- Urinary Incontinence Symptom
  - Stress, Nocturnal enuresis, Mixed, Continuous, Urgency (replaces urge)
  - New - Insensible, Coital (penetration (sui) versus orgasm (DI)), Postural (new- unclear to link with urgency or stress)
- Bladder Storage Symptoms
  - Increase day frequency, Nocturia –inc night frequency, Urgency, OAB Syndrome – frequency and nocturia
- Sensory
  - Increased bladder sensation- desire can be postponed
  - Reduced sensation
  - Absent sensation

Symptoms

- Voiding and post-micturition
- Hesitancy, slow stream, intermittency, straining, incomplete emptying, need to re-void, post-micturition leakage, dysuria (intrinsic or extrinsic to vulva), position dependent, retention
- Pelvic Organ Prolapse Symptoms
- Sexual Dysfunction Symptoms
  - Dyspareunia, superficial/introital dyspareunia, deep dyspareunia, obstructed intercourse, vaginal laxity, other
- Anorectal dysfunction Symptoms
  - Anal incontinence, fecal / flatal incontinence, Fecal or flatal urgency, straining, constipation, rectal prolapse, rectal bleeding/mucus, decrease sensation
- Pain
  - Infection

Objective measures

- Visual Inspection
- Palpation
- Describe Pelvic Floor
  - Resting position
  - Voluntary Contraction - Absent, weak, normal or strong
  - Voluntary Relaxation – complete, partial, absent
  - Involuntary Contraction — absent or present
  - Involuntary Relaxation — absent or present

Signs

- Visual Inspection
- Palpation
- Describe Pelvic Floor
  - Resting position
  - Voluntary Contraction - Absent, weak, normal or strong
  - Voluntary Relaxation – complete, partial, absent
  - Involuntary Contraction — absent or present
  - Involuntary Relaxation — absent or present
### Brink Scale

**3 Pelvic Floor Variables**

- **Vaginal Pressure**
  - 1 = no response, 2 = weak squeeze, 3 = moderate squeeze, 4 = strong squeeze

- **Vertical Displacement**
  - 1 = none, 2 = finger base moves anteriorly, 3 = whole length finger move anteriorly, 4 = whole finger move anteriorly, gripped, pulled in

- **Duration of Contraction**
  - 1 = none, 2 < 1 sec, 3 = 1-3 sec, 4 > 3 sec

### Pelvic Floor Strength

*(Laycock - Modified Oxford Rating Scale)*

- 0 = no contraction
- 1 = Flicker, only with muscles stretched
- 2 = Weak Squeeze, two second hold
- 3 = Fair/ Moderate squeeze, definite 'lift'
- 4 = Good Squeeze, 'lift', contraction can be repeated
- 5 = Strong Squeeze, good 'lift', repeatable

---

### PERFECT Scale for PFM Assessment

- **Power**—maximum voluntary contraction (MVC)
  - 0-5
- **Endurance**—time MVC sustained
- **Repetitions**—number MVC’s replicated
- **Fast Twitch**—number of quick contractions performed after 2 minutes of rest
- **Every**
- **Contraction**
- **Timed**

### Standardization of Terminology: Conditions

Defined as categories of problems based on symptoms and signs

- Normal Pelvic Floor Muscles
- Overactive Pelvic Floor Muscles
- Underactive Pelvic Floor Muscles
- Non-functioning Pelvic Floor Muscles
Treatment Algorithm

**Hypertonicity**
- Downtraining
- Relaxation
- PFE
- Dilators
- Modalities—estim/EMG/US/ice/heat
- Soft Tissue Mobilization
- Refer to MD—medication/injections

**Hypotonicity**
- Uptraining
- PFE/ vaginal weights/cones
- Estim /EMG- NMRE
- Soft Tissue mobilization
- Pain modalities – ice/heat/estim/TENS

Treatment Algorithm

- Patient Education – posture, movement patterns, ergonomics etc
- Orthopedic- alignment, muscle imbalance
- Core Stabilization
- Neural Tension
- Soft Tissue Restrictions
- Visceral
- HEP
- Behavioral strategies

Treatment Techniques

**Principles Pelvic Muscle Training**
- Education:
  - Anatomy and Function
  - self awareness
  - Correct PF contraction
- Training:
  - Strength (MVC),
  - Power ( st+ speed)
  - Endurance,
  - Relaxation
  - Specificity/ motor control
- Function: “knack”, ADL, Work, Sports

Teaching Pelvic Floor Exercise


- N = 47 women
- 49% demonstrated effective technique
- 25% demonstrated valsalva and incontinent promoting effort
Teaching Pelvic Floor Exercises
(Crotty K et al 2011)

- Relax
- Draw pelvic floor muscles up and in
- Should feel anal and vaginal openings lift up and close
- Should not use buttocks or adductors
- No one can see you perform a pelvic floor exercise

Sample Biofeedback Units and Sensors

<table>
<thead>
<tr>
<th>Time</th>
<th>Amount Voided</th>
<th>Leak Volume</th>
<th>Activity during leakage</th>
<th>Fluid Intake</th>
</tr>
</thead>
<tbody>
<tr>
<td>6am</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7am</td>
<td></td>
<td></td>
<td></td>
<td>8oz coffee</td>
</tr>
<tr>
<td>8am</td>
<td>5</td>
<td>1</td>
<td>walking</td>
<td>8oz coffee</td>
</tr>
<tr>
<td>10am</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1pm</td>
<td>15</td>
<td>2</td>
<td>stairs</td>
<td>16oz coke</td>
</tr>
<tr>
<td>2pm</td>
<td>5</td>
<td>1</td>
<td>sneeze</td>
<td></td>
</tr>
<tr>
<td>5pm</td>
<td>10</td>
<td></td>
<td></td>
<td>6oz wine</td>
</tr>
</tbody>
</table>

Used for evaluation and progress
Document bladder function, habits, and patterns

Pelvic Floor Distress Inventory
Barber MD 2005, 2011

- PFDI 20 – short form
  - 20 questions - 3 scales
    - UDI – 6; POPDI 6; CRADI- 8
  - Short form
    - Regression analysis to determine questions
    - External validation N = 45, prospective, surgery for incontinence or reconstructive
  - Results
    - ICC .93; each scale ICC .82 to .91
    - R= .86 to .93 for each scale
    - SRM 1.09
  - MCID – 45 points (summary score)
### Questionnaires

**Genitourinary Pain Index (GUPI female/male)**

- Modification of NIH Chronic Prostatitis Symptom Index (NIH-CPSI)
- One tool for quantifying severity of symptom urologic pain conditions
- 3 subscales: Pain (23), Urinary symptoms (10), QOL(12)
- Total points 45
- Demonstrated validity, reliability, responsive to change (7 points)
- Sensitivity 100% and Specificity (76%)  

J. Quentin Clemens, Elizabeth A. Calhoun, Mark S. Litwin, Mary McNaughton-Collins, John W. Kusek, Evelyn M. Crowley, and J. Richard Lands UROLOGY 74 (5), 2009.983-987

### Treatment: Home
Treatment: Home

Conclusion: When to Refer

- Urogenital Consequences of Aging
  - Pathophysiology and mechanism not always clear
  - Pelvic Floor Dysfunction likely to coexist
  - Multidisciplinary approach to treatment

- Medical Management of Menopause
  - Infection
  - Inflammation
  - Vaginal atrophy
  - Hormonal
  - Vasomotor
  - Other

Is there a musculoskeletal component to dysfunction

- Urinary Incontinence
  - Stress, Urgency, Mixed
  - Grade A recommendation (PFMT)

- Fecal Incontinence
  - Grade B and C recommendation
  - Biofeedback and PFMT

- Pelvic Organ Prolapse
  - Grade A and B evidence
  - PFMT symptom improvement

- Pelvic Pain

Case Study Examples

- Patient A
  - 46 year old female
  - Referring Diagnosis:
    - Lumbar Radiculitis
    - Pelvic Pain
    - Left hip pain/ knee pain
    - Constipation

- Patient B
  - 68 year old female
  - Referring Diagnosis:
    - IC
    - Constipation and Irritable Colon
    - PF Dysfunction