The Effect of Thoracic and Cervical Stiffness on Lumbopelvic/Pelvic Floor Dysfunction

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Disclosure

Susan C. Clinton provides continuing educational courses in this subject matter and receives honorariums for her presentations.

Session Learning Objectives

At the end of the presentation, the learner will be able to:

1) Understand the anatomy and physiology of the cervico/thoracic region including the airway, glottis, tongue, TMJ and trigeminal/vagal system
2) Define normal abdominal and thoracic pressures and how these pressures are increased with normal postures, positions and activities
3) Discuss the relevance of the literature on fatigability of the pelvic floor muscles and training
4) Outline and demonstrate various changes in intervention techniques (including manual therapy) to reduce the effects of increased abdominal pressures on the pelvic floor, including the use of breathing from low level to high level activity.

Introduction

The case for looking above the pelvic floor

Course Outline

I. Introduction and review of the literature on cervical/thoracic postural positions and intra-abdominal pressure
II. Presentation of the effects of increased intra-abdominal pressure on the performance of the pelvic floor
III. Intervention—linking the evidence to practice—
   • Manual therapy interventions for cervical/thoracic postural considerations
   • Cervical and Cervicothoracic and TMJ interventions
   • Dynamic breathing
   • Submaximal and eccentric training of postural and pelvic floor muscles

Introduction

The Dynamic Respiratory system
   Role of the diaphragm
   Role of the glottis
   System coordination with postural mm
   Dysfunction and the impact on the pelvic floor
Diaphragm
• Primary respiratory mm
  • Increase the negative pressures in the chest to draw air in
  • Return air flow
  • Clear the airways
  • Controlled inspiration / expiration
    • To match to the demands of the activity
      – Exertions such as lifting
      – Phonation – quiet talking to yelling
    • Primary mover of the internal organs

Costal angle
• Wide or narrow?
  • What does this mean:
    – Flat diaphragm
    – Overuse of obliques
    – Overuse of rectus abdominus
    – Underuse of transversus
    – Overuse of breathing and upper respiratory mm
    – Flattened T-spine upper and/or lower
    – Upper thoracic kyphosis
    – Mid/lower thoracic kyphosis
  • Measurements:
    – Angle and circumference

Glottis/Larynx
• Cartilaginous house for airway protection
  • Control of swallowing
    – Glottis fully closed to protect the respiratory system
  • Control of phonation
    – Glottis partially closed for phonation
  • Control of breathing
    – Glottis fully opened
    – Reflexive opening for coughing and airway clearance
  • Requires coordination with diaphragm
    – Diaphragm has to halt activity for the epiglottis to work

Trigeminal and Vagal System
Trigeminal Alarm system

‘CRAZY’ SYMPTOMS
• HEADACHES
• JAW PAIN
• RETRO-ORBITAL PAIN
• TOOTHACHE
• EARACHE
• TINGLING in the FACE
• TINGLING IN THE TONGUE

• TINNITUS
• DIZZINESS
• NAUSEA
• CONJUNCTIVAL PAIN
• VISION PROBLEMS
• TASTE PROBLEMS
• ‘PANIC ATTACKS’
• ‘A FEELING of a ‘LUMP’ in the THROAT’

Referred Nocioception-
Central Sensitization
• ‘Convergence of afferents from one region of the body onto neurons in the CNS that also receive afferents from topographically separate regions’
Referred noioception - Central Sensitization

- Trauma to upper cervical spine
- CONVERGENCE at 'trigemino-cervical nucleus'
- TRIGEMINAL symptoms
- Other cranial nerve symptoms through interconnecting synapses

Trigeminal Symptoms

- Eye
  - Orbit and sclera — retro-orbital pain
  - Conjunctivea — itchy or burning sensation (conjunctivitis without 'red eye') — unsolicited tearing
  - Cornea and iris — 'murky' or dull vision

- Posture and Balance (through convergence)
  - 3 main systems:
    - Inner ear (vestibular)
    - Eyes
    - Upper cervical spine
  - All systems connected via the eyes with 'convergence' at the cerebellum

- Trigemino-cardiac reflex
  - Parasympathetic cardiac dysrythmia
  - Sympathetic hypotonia (hypotension)
  - Apnea
  - Gastric hypermotility ('churning of the stomach')
  - Can occur from central excitation of ANY trigeminal nucleus but MOST likely via the cervical trigeminal nucleus
  - Anxiety? Or maybe 'panic disorder/attack

- Other symptoms
  - Migranes
  - Sleep disorders
  - Dyscoordination (cerebellar)
    - Changes in recruitment patterns
  - Trigeminal/valgal connections

IAP

Normal and abnormal intra-abdominal pressure
(measured by urinary bladder pressure)

- Normal can vary from -1 to 7mmHg in supine
- Large increases with closing glottis, valsalva, standing valsalva, stairs and abdominal crunches
- Increases significantly with coughing and jumping (Cobb et al, 2005)

Bladder Function
- Increase in cholinergic hypersensitivity (Karnak et al, 2007)
IAP
Changes of the head of the bed
> 20 degrees significantly increases the IAP
Clinically significant at 30-45 degrees with decrease of abdominal perfusion
(McBeth et al, 2007) (Yi et al, 2012)
Post C-section
IAP is higher than in general abdominal surgical population
(Abdel-Razeq et al, 2010)

Faulty Breathing Patterns
Changes in respiratory chemistry and pH
- Triggers smooth muscle constriction
- Electrolyte imbalance
- Decreased tissue oxygenation
- Increased excitability of the NS and muscles
(Levitsky, 2007)

Faulty Breathing Patterns
Stronger associations with back pain than obesity and physical activity
(Smith et al, 2000)
Stronger associations with cervical pain
(Perri et al, 2003)

IAP
Cervical and thoracic postural contributions to changing intra-abdominal pressure
- Forward Head posture
- Dysfunctions of the first/second ribs
- Thoracic stiffness
- Seated postures – work/meals
- Sleep dysfunctions
- Trigeminal/vagal connection

Forward Head Posture (FHP)
- Structural changes - spinal
  - Upper thoracic spine flexion
  - Mid thoracic kyphosis or complete flattening
  - T4/5
  - Loss of lumbar lordosis/posterior pelvic tilt
  - Increased lower cervical extension
  - Clavicle stiffness in anterior rotation
- Excessive tension in lower cervical fascia compromising C8 and T1 nerve roots
- Stiffness/Extension C4/5
- Lack of muscular stability and ligamentum nuchae tautness
- Extension pattern of A/0
Forward Head Posture

- Structural Changes – other
  - Relative scapular elevation/shoulder IR
  - Rotational changes
    - Ab/add position
  - Changes in length of levator scapula, semispinalis capitus, omohyoid, scalenes (anterior/posterior), trapezius, rhomboids, serratus anterior, lattisimus, pectoralis
    - Posterior scalenes
    - Sub-occipital mm
    - Longus colli
    - Hyoid mm, tongue and sublingual mm
    - Laryngal mm
  - Cervical rotatores
  - Suboccipitum
  - Pelvic floor
  - Psoas
  - TMD

Cervical MM

- More than simply support and/or control movement of the neck
- Important role in maintaining equilibrium
  - Cervico-vestibular reflex and influence the vestibular-ocular reflex
  - Anticipatory function involved with scanning
  - Strongly influenced by the limbic system and impaired function in this system can cause changes in muscle tone
  - Triggered by breathing changes, acidosis response to threat, increased sympathetic response
  - When under stress increased activity of certain cervical muscles
  - Shoulder and neck muscles are involved in defense mechanisms and are activated by stress and fear
  - Evolution – individual survival

Dynamic Performance of the Pelvic Floor

Changes in evidence regarding strength training and functional performance of the pelvic floor

- Anal Sphincter Fatigue (Hodges et al)
- PFM submax training (Junginer et al, 2013)

Dynamic Performance of the Pelvic Floor

Effects of chronic changes in intra-abdominal pressures on the long term performance of the pelvic floor/TA/Diaphragm

- Loss of eccentric control

Interventions

Manual therapy interventions
- Cervical/thoracic postural considerations (FHP)
- Thorax:
  - Segmental traction/distraction
  - Rotational quadrant movements
  - Head rotation for rib mobility with breath
  - Restore diaphragm

Cervical Region:
(Previous focus – retraction and longus colli)

Paradigm shift
- Mechanical change in cervicothoracic region
- Mobilization/manipulation of the stiff segments (home ex with towel roll/theraband)
- Posterior glides of stiff A/O region
- Segmental upper cervical rotation/extension facilitation
- Target the suboccipital mm
- Hyoid mobilization
- Retraining of lingual and sublingual mm in lengthened postures
Interventions

Restoration of tongue and glottis position
Retrain swallowing/cough
Intonation training
Coordination

Interventions

Dynamic breathing
Static Training
Postures (muscle strategies?) CO2 measures, RR rates
(dynamic training)
Dynamic Coordination
Vertical chest lift, abdominal timing
(postural strategies) (Perri et al., 2003)
Intonation (Massery)

Interventions

Submaximal and eccentric training of postural and pelvic floor muscles in functional context with the upper quarter

Questions?

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Making Sense of the Evidence - Neil O’Connell, PhD, MSc

Managing CrossFit Athletes – Common Musculoskeletal and Pelvic Floor Problems and Solutions
- Antony Lo “The Physio Detective”, B. App. Sc (Physio), MMT, MsK Physio

Pelvic Nerves: Manual Therapy and Neurodynamics & Treating Pelvic Pain – A New Model of Care
- Sandra Hilton, PT, DPT, MS and
- Carolyn Vandyken, PT, Cred MDT, CCMA (cup)

Dynamic Core for Kids
- Julie Wiebe, PT, MPT, BSc & Shelley Mannell, PT, C/NDT

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