Sacroiliac Joint dysfunction, Coccydynia, and altered Pelvic Floor function: is there a link?

Presented by
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Dynamic stability of the lumbo-pelvic region

Stability of inter-segmental lumbar motion is reliant on appropriate control of muscle activation by the central nervous system.

- TrA, lower transverse fibres
- Internal oblique (OI), deep lumbar multifidus & pelvic floor activate prior to motion
- Co-contract to increase segmental stiffness and limit inter-segmental motion in lumbar spine (Hodges & Richardson, 1997; Moseley et al, 2002; O'Sullivan et al, 1997)

Low back pain

- Delayed recruitment of deep local muscles
  - Lumbar multifidus
  - Transversus abdominis
  - Pelvic floor
- Increased activity of superficial global muscles
  - EO / IO
  - Erector spinae
  - Iliopsoas
  - Biceps femoris
- Compensation due to decreased segmental stability

Lumbo-pelvic Stability and optimal load transfer

- Lumbo-pelvic region is always interacting with gravity
- 65% body weight transferred across L5/S1 in standing
- Pelvis is the stable platform or hub of the skeleton

Anatomy of the pubic symphysis

- Fibrocartilaginous joint
- Interposed by fibrocartilaginous disc
- Most stable joint in pelvis

Factors assisting articular stability at the SIJ

- Wedge shape of the sacrum
- Shape of articular surface: planar & L-shaped
- Collagen structure of iliac articular cartilage: increased friction coefficient
- Complimentary ridges & grooves
- Passive constraints of surrounding ligaments
- SIJ is susceptible to vertical shear loads

Developmental changes of the SIJ articular surface & joint cartilage occurs by the 2nd decade (i.e ridges & grooves) (Vleeming et al, 1990)

Stability of the Pelvic articulations

- Pelvic symphysis has strong ligamentous support
- L-shaped articular surfaces of SIJ
- SIJ is susceptible to vertical shear loads


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Stability of the Pelvic Articulations

TrA and pubococcygeus assist stability of pubic symphysis
TrA activation increases stiffness across SIJ (Richardson et al. 2002)

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TrA activation increases stiffness across SIJ (Richardson et al. 2002)
Lumbosacral multifidus crosses from L5 to PSIS and sacrum, and attaches into posterior SI ligaments (Willard, 2007)
Gluteus maximus increases tension across SIJ via attachments into sacrotuberous ligament and posterior layer of thoraco-lumbar fascia (Barker et al., 2004)

Tonic co-contraction of TrA, pubococcygeus and lumbosacral multifidus therefore assists stabilisation of intra-pelvic motion for load transfer during weight bearing movements

Pelvic Girdle Dysfunction

1. Articular dysfunction: at the pubic symphysis or sacroiliac joint (SIJ) causes altered joint glide, inability to maintain closed pack position of SIJ, & altered motor control (Hungerford et al. 2003, 2004)
2. Ligament injury at either pubic symphysis or SIJ causes true instability

Pelvic Girdle Dysfunction

3. Myo-fascial dysfunction: Loss of functional stability to maintain pubic symphysis & SIJ alignment during weight bearing due to altered motor control
4. Internal derangement of pelvic fascia and organs alters ability to activate pelvic floor muscles

Effect of Articular Dysfunction at SIJ

1. Delay in recruitment of TrA and lumbosacral multifidus (Hungerford et al., 2003)
2. Bracing of EO/IO associated with descent of pelvic floor (O’Sullivan et al., 2002)
   - Increases IAP
   - Increased pressure onto the bladder makes it more difficult for pubococcygeus to create the lift required to close the bladder neck

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What do we see clinically with articular dysfunction?

- Decreased ability to activate TrA, lumbosacral multifidus with substitution of global muscles such as external oblique, piriformis, iliopsoas, hamstrings
- Inability to activate pubococcygeus/suburethral slings with resultant effect on ability to create a lift of the pelvic floor under the bladder
- Over activation of Ischiococcygeus, tonically, is one possible compensation strategy

WHY???

Pelvic Girdle Dysfunction

<table>
<thead>
<tr>
<th>Ischiococcygeus activity</th>
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<tbody>
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<td>Articular dysfunction at the sacroiliac joint (SIJ)</td>
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<td>Ligament injury at either public symphysis or SIJ</td>
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<td>Loss of functional stability</td>
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<tr>
<td>Augments compression inferior to SIJ to limit vertical shear forces on SIJ &amp; substitution pattern for normal PF activity</td>
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<td>Tonic activity to compress SIJ inferiorly and try to limit shearing forces across joints</td>
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<tr>
<td>Substitution pattern for normal activity of pubococcygeus?</td>
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Ischiococcygeus

- Arises from ischial spine and anterior aspect of sacrospinous ligament, and is directly connected to the ligament.
- Inserts into the apex of the sacrum between S4 & S5, and the lateral border of the coccyx.
- Forms the deep posterior wall of the pelvis, in conjunction with piriformis.

Ischiococcygeus

- Supplied by ventral rami of the sacral plexus, S3 & S4.
- Nerve supply to levator ani (pubococcygeus, puborectalis, and iliococcygeus) is perineal branch of pudendal nerve arising from S2-4.
- Posterolateral portion of levator ani may take some somatic supply from S3 & S4 sacral nerve plexus.

Optimal pelvic floor contraction:

- Ischiococcygeus lies in a different plane to levator ani.
- Activation with piriformis may create an interface that impede pudendal nerve mobility through the pudendal canal.
- Pain referred to labia, internal vaginal walls, base of scrotum and penis.

Effect of tonic Ischiococcygeus activity

- Sacral apex is drawn into counternutation.
- Coccyx flexed.
- Flattened lumbar spine.
- Counternutated sacrum.

Effect of coccygeus activity on Pelvic Biomechanics

Effect of ischiococcygeus overactivity
<table>
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<td>Bone stress = &quot;coccyx pain&quot;</td>
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<td>Often associated with trauma such as a fall, or MVA</td>
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<td>2nd most common cause is childbirth, rarely related to coccyx fracture (Maigne et al., 1996; Peyton, 1988)</td>
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<td>May also occur after lumbar disc prolapse, or following spinal surgery (Eckert, 1990)</td>
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<td>Pts usually describe sacrococcygeal pain that gets worse with sitting, sit to stand, and prolonged standing or bending</td>
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<td>Specificity in assessment of pelvic floor muscle activation will assist diagnosis of an over active ischiococcygeus</td>
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<td>An articular dysfunction of the SIJ may create tonic activity of ischiococcygeus that is recalcitrant to muscle re-education. Manual Therapy to regain normal articular glide at the SIJ is required prior to retraining motor control.</td>
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<td>Be careful of images for pelvic floor that enhance butt gripping</td>
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<td>Instead, consider imagery to assist activation of pubococcygeus without ischiococcygeus e.g.</td>
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<td>- &quot;Melt your bottom&quot;</td>
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<td>- &quot;Imagine a triangle from pubic symphysis to ischial tuberosities that stays wide as you draw up the front part of the pelvic floor&quot;</td>
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**Thank you to**
Stephanie Tang, Peta Grosbee, and Shreya Ranganathan
Sydney Spine & Pelvis Physiotherapy Centre,
Dr James Linklater
Orthopedic & Sports Medicine Centre, Crows Nest
Illumination!