The Dysfunctional Pelvis:
A review of anatomy, biomechanics and management

Presented by: Nichole Hamilton
Will commence LIVE from Sunshine Coast, Australia at 7pm AEDT

Nichole Hamilton
B.App.Sc. (Phty)
Physiotherapist
• Graduated from Sydney University at the end of 1997
• Has a passion for physiotherapy education. She is the Queensland representative for the APA’s Educator Group
• Worked in private practice in London for five years under Danielle Lee and Shirley Sahrmann, and it is here she completed a certificate with Manual Concepts in Spinal Manual Therapy.
• Mitchie has also worked as an assistant teacher on the AMTA courses teaching manual therapy and MET techniques for the lumbar spine and pelvis.
• Started work with orthopaedic hip specialists Dr Michael O’Sullivan in 2005 at North Sydney Orthopaedic and Sports Medicine Centre to develop post-operative protocols for hip arthroscopy.
• Michael and Nichole have lectured together on management of hip pain and hip impingement since 2007.
• Nichole has subsequently worked as an assistant teacher for LJ Low ascher “Discover the Sports Pelvis” course.

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Summary

- Anatomy and Biomechanics
- Function of the pelvic girdle
- Tests of function
- Reasons for dysfunction
- Common consequences of dysfunction
- Management ideas and options

Anatomy and biomechanics

- Innominate and sacrum
- Three vertically aligned joints comprise the pelvic ring: pubic symphysis and SJs
- The SIJ is an L shaped synovial joint with a shorter vertical arm and a longer horizontal arm

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**Anatomy and biomechanics**

- Ventral SI ligament
- Interosseous and Posterior ligaments
- Sacrotuberous ligament
- Sacrospinous ligament
- Iliolumbar ligament
- Long dorsal ligament

**Physiological movements**

- Innominate Anterior and Posterior rotation
- Sacral Nutation and Counternutation

**Stability of the pelvic ring**

- Vertical orientation makes the SIJ’s & PS susceptible to shear forces in the vertical plane (Snijders et al 1993)
- Therefore requires adequate lateral compression to stabilise and transfer load efficiently (Lee 1999)

**Factors optimising SIJ load transfer efficiency**

- Form Closure and the passive system
- Force Closure and the active system
- Optimal neural function and the motor control system
The closed packed position for optimal pelvic stability is a combination of:

- Sacral Nutation
- Innominate Posterior Rotation


'Unlocking' should not occur during activities that increase load through the pelvic girdle.

Reasons for non-optimal load transfer at the pelvis:

- Unlocking at the SIJ during transfer of load is non-optimal. This can be caused by a few factors, which can include:
  - Loss of integrity of the passive system (ligamentous damage through trauma, joint inflammatory conditions)
  - Active or control system impairment (loss of coordinated motor control or strength)

Consequences of non-optimal pelvic function:

- Altered respiratory function (O’Sullivan et al 2002)
- Altered or non-optimal pelvic floor function (O’Sullivan et al 2002, Pool-Goudzwaard 2003)
- Patterns of rigidity or bracing (Lee 2011)
- Altered load through surrounding tissue or joints (lumbar spine, hip)
- Pelvic girdle pain

Tests of load transfer:

- Does the SIJ unlock when loading?

- The pelvic should be able to maintain a closed packed position when transferring load: combined sacral nutation and innominate posterior rotation
- If the pelvic UNLOCKS when transferring load this is a sign of non-optimal load transfer.
- Unlocking of the pelvis occurs with sacral counterrotation and relative innominate anterior rotation

Tests of optimal load transfer:

- Test for SIJ unlocking by palpating the innominate with one hand, and the central sacrum or ILA with the other thumb.
- Can the pelvis maintain CPP in single leg standing? Forward bending? Squat?
- If not, what does this tell us?
Tests for optimal load transfer

**Active Straight Leg Raise**
- Tests ability to maintain LP stability during load transfer
- Patient Supine
- Actively raise one leg off plinth, then repeat on opposite side
- Differences in subjective effort noted and compensation strategies observed


Tests of the passive system

- Passive Joint Glide tests: First proposed by Lee 1992, and fully described in Lee 2011
- Patient supine with legs rested evenly either neutral or on bolster so SIJ is in loose packed position
- Palpate medial PSIS gently, and ASIS/iliac crest with palm and heel of opposite hand
- Apply gently oscillatory AP glide, feeling innominate movement into your fingers relative to sacrum
- When performing joint mobility tests remember there is very little joint play in the SIJ. To detect R1 and R2 only small forces required

Tests of the passive system: Comparison made from left to right: should feel symmetrical joint play in normal healthy subjects

(Buyruk et al 1995, Damen 2002)

Does the joint feel compressed?

If there is joint play available, does a cue to switch on your 'core' reduce this joint motion?

If you take the joint into a closed packed position, is there any slack in the system? What might this indicate?

(Lee 2011)

Assessment & management pathways

**Q:** Is the pelvis contributing to my patients symptoms?
**Test:** Is the pelvis unlocking (showing signs of non-optimal load transfer) during the problem activity?

**NO:**
Pelvis less likely a contributing factor

**YES:**
Pelvis may be a contributor, further tests to determine WHY

**Q:** Why is the pelvis unlocking? Loss of force closure and non-optimal active system?
**Test:** ASLR, if positive does compression help? Anterior? Posterior? Can this be repeated in problem activity?

No, compression not helpful. Do not start treatment with ‘core’ exercises aimed at increasing pelvic compression. What needs decompressing or release work?

Yes, compression helps. Start exercises aimed at improving joint compression. This could include ‘core’ endurance with appropriate cues, postural cues to optimise inner unit function, progress to functional dynamic control tailored to patient goals
Q: Why is the pelvis unlocking?
Loss of symmetry in the passive system? Loss of passive integrity?
Test: Passive Joint glide tests - are they symmetric?
Assessment & management pathways
No:
Asymmetric glide
Yes, joint glide symmetric. Less with compressed feel
What muscles might be contributing to increased motion on the side of unlocking?

Start with ‘release’ based Rx until joint glide symmetric
Is there a loss of passive integrity?
Motor control retraining?

Treatment Options

Education: Includes posture, addressing beliefs, pain education and management ideas, improving a patients understanding whilst minimising fear
Manual therapy/release: Areas of hypertonicity and excessive compression that are contributing to non-optimal load transfer in the pelvis
Functional exercise prescription: Guided by patients capacity and goals. Tailored to the individual with awareness of unique motor control strategies. Progressed with ideas of return to function.

Retraining Movement Patterns


Lee D G, Vleeming A 1998 The active straight leg test test and validity of the pelvic girdle. European Spine 8:468


Coming up next week

Part 4 / 6 in our Hip & Groin Series

“Anterior hip impingement and labral tears: A case of biomechanical overload?”

• To review anatomy and understand the biomechanics of the hip within the pelvis.
• To understand the potential reasons for labral tear, both structural and biomechanical.
• Review postural concepts and motor control around the hip.
• To understand the potential effects of the thorax and lower limb on hip dysfunction.
• Develop clinical reasoning pathway for physiotherapy management for anterior hip pain.

Nichole Hamilton

Live Q & A
With Nichole Hamilton

Thank you
From Nichole Hamilton

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