Diagnosis and classification of pelvic girdle pain disorders, Part 2: Illustration of the utility of a classification system via case studies

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Abstract

Pelvic girdle pain (PGP) disorders are complex and multi-factorial and are likely to be represented by a series of sub-groups with different underlying pain drivers. Both the central and peripheral nervous systems have the potential to mediate PGP disorders. Even in the case of a peripheral pain disorder, the central nervous system can modulate (to promote or diminish) the pain via the forebrain (cognitive factors).

It is hypothesised that the motor control system can become dysfunctional in different ways. A change in motor control may simply be a response to a pain disorder (adaptive), or it may in itself promote abnormal tissue strain and therefore be 'mal-adaptive' or provocative of a pain disorder. Where a deficit in motor control is 'mal-adaptive' it is proposed that it could result in reduced force closure (deficit in motor control) or excessive force closure (increased motor activation) resulting in a mechanism for ongoing peripheral pain sensitisation. Three cases are presented which highlight the multi-dimensional nature of PGP. These cases studies outline the practical clinical application of a classification model for PGP and the underlying clinical reasoning processes inherent to the application of this model. The case studies demonstrate the importance of appropriate classification of PGP disorders in determining targeted intervention directed at the underlying pain mechanism of the disorder.

Keywords: Pelvic girdle pain; Sacroiliac joint; Classification; Pain mechanisms; Motor control; Case studies

1. Introduction

Pelvic girdle pain (PGP) of musculoskeletal origin has become recognised as a clinical entity distinct from that of low back pain. Not unlike low back pain though, clarity in the classification of PGP disorders is regularly lacking in both research and clinical settings. Failure to effectively classify these disorders in a meaningful manner has resulted in confusion about PGP disorders in the same way that a lack of classification of back pain has contributed to the problems surrounding the diagnostic label of 'non-specific' low back pain. The failure to meaningfully classify PGP disorders based on their underlying pain mechanism ultimately leads to difficulties in providing appropriate care for the patient, as the treatment may not be directed at the mechanism/s that drive the pain disorder.

In the accompanying article to this paper, a non-exclusive classification system based on a biopsychosocial approach has been presented (O'Sullivan and Beales, 2007a). The underlying basis of this model is one of understanding the mechanism/s involved in the development and maintenance of PGP disorders. It recognises the multi-faceted nature and complex interaction of these mechanisms. This mechanism-based approach directly leads to and facilitates the uptake of appropriate management strategies.

To demonstrate the utility of this classification system three case studies are presented. Note: Where not else stated, subjective data presented in the case studies (fear, beliefs, anxiety, depression scales, etc.) represent a 10-point numerical rating score from data collected from the Orebro Musculoskeletal Pain Questionnaire (Linton, 2005).
2. Case studies

2.1. Case 1: Centrally mediated PGP

2.1.1. Subjective examination findings

39-year-old female; married; two children

Work: home duties

History: 5 year history of chronic PGP that began during her second pregnancy and did not resolve. She reported that after the birth of her second child she became disabled and sought various treatments to manage her disorder. These interventions included manipulation, stabilisation exercises and a pelvic belt. She reported little benefit from these treatments over a period of 2 years. Over this time she had become inactive and very disabled. She was then referred to a clinic that specialised in PGP disorders. As she had great difficulty performing the active straight leg raise (ASLR) test, and pelvic compression did not reduce the pain and heaviness, she was advised that her pelvis was ‘very unstable’ and that she required surgical fusion. Initially she underwent fusion of the symphysis pubis and when this was not successful, she also underwent fusion of both sacroiliac joints (SIs) (Fig. 1). When this did not benefit her she was referred to a multi-disciplinary pain management clinic for psychological, medical and physical management. She was still disabled with PGP and was attending active rehabilitation sessions three times per week.

Family history: nil

Pain: constant pain over the posterior pelvis as well as pubic area (left side bias)

Aggravating postures: all postures—sitting, standing, lying

Aggravating activities: all activities—walking, lifting, bending, activities of daily living

Easing postures/activities: no symptom relief during weight bearing or non-weight bearing

Activity levels: low

Coping strategies: rest, spends much of the day lying down

Beliefs:

1. Back pain likely to become persistent 10/10
2. Activity aggravates back pain 10/10
3. Activities that aggravate back pain are likely to be damaging 10/10
4. Work likely to aggravate back pain 10/10
5. Basis of the pain—not known

Pain-intensity (VAS): 8/10 (day intake examination); 8/10 (average pain week); 8/10 pain (average over 3 months)

Disability scale score: revised-Oswestry (Fairbank et al., 1980): 50%

Fear avoidance: high levels of fear avoidance behaviour

Psycho-social risk factors (‘yellow’ flags):

1. Stress levels (7/10)
2. Depression (7/10)

Medical imaging: X-rays—successful fusion of the pelvis

Medication: Strong analgesics, pain modulation medication

2.1.2. Key subjective features

- Widespread symptoms
- Constant pain
- Pain is of a high level and non-mechanical in nature
- High levels of disability
- High levels of stress and anxiety
- High levels of fear avoidance behaviour
- Belief that something is damaged and disorder is unlikely to resolve
- Fused pelvis

2.1.3. Plan for physical examination

- Examine for the presence of consistent clinical patterns—organic vs non-organic signs
- Investigate relationship between movement behaviour and pain behaviours

2.1.4. Physical examination findings

Posture and movement analysis

- Standing: patient constantly moved—shifting weight from side to side. There was no consistency with this behaviour. She presented with poor control of standing balance.
- Forward bending and return: full range of motion (ROM)

Fig. 1. X-ray of subject in Case 1 depicting surgical fusion of both sacroiliac joints and the symphysis pubis.
Backwards bending: full ROM
Single leg standing: gross generalised shaking and loss of control on left leg
Gait: inconsistent gait pattern—ataxic in nature
Squat: unable to perform a squat due to loss of control of left leg
Sitting posture: during interview and examination the patient constantly moved, changing position, bracing and unloading spine with arms. There was no consistent pattern with this behaviour.
Sit to stand: use of hands and breath holding

Specific movement tests (O’Sullivan, 2005)

Unable to normalise movement behaviours in sitting, standing, single leg standing, squat
No change in pain with attempts to change movement behaviours
No clear relationship between pain and movement behaviours

Specific muscle testing (O’Sullivan, 2005)

Weakness in her left leg—strength was inconsistent depending on position tested
ASLR—prone/supine (Mens et al., 1999)

Gross weakness and loss of control, not influenced by pelvic compression

Neurological screening examination (Hall and Elvey, 1999)

Absence of neurological findings (normal neural provocation testing, reflexes, sensation and manual muscle tests)

Passive physiological motion segment testing (Maitland, 1986)

No spinal movement impairment

SIJ provocation tests (Laslett et al., 2003)

All highly pain sensitive

Lumbar spine palpation (Maitland, 1986)

Hyperalgesia across lumbosacral, sacroiliac, buttock and pubic symphysis regions (left bias)

2.1.5. Key features of physical examination findings

Presence of abnormal pain behaviours without a clear, consistent clinical pattern to them

Generalised gross motor disruptions of left leg
Inconsistent motor performance
No clear relationship between abnormal pain and movement behaviours—pain was not altered with attempts to normalise movement behaviours
Widespread pain and hypersensitivity
No clear consistent pain pattern to suggest an organic basis to disorder

2.1.6. Diagnosis

Non-specific PGP

2.1.7. Classification

Central nervous system driven pain disorder with central pain sensitisation and abnormal pain and movement behaviours (Fig. 2). Presence of abnormal pain behaviours without a clear, consistent clinical pattern to them

Psycho-social pain drivers:
- High levels of disability, functional impairment and inability to work
- Passive coping strategies for pain management—abnormal illness behaviour, relief with rest, avoidance of provoking activities, medication
- High levels of stress and depression

Case 1: Centrally mediated pelvic girdle pain

Nature of the disorder:
- Widespread pain +/- referral
- Pain constant, severe and debilitating
- All activity and movement provoke pain
- Absence of consistent mechanical pattern of provocation
- Minimal relieving factors (medication only)
- Pain at rest
- Disrupted sleep
- +ve sacroiliac joint pain provocation tests
- Active straight leg raise test – inability to lift leg but not relieved with pelvic compression
- Widespread changes in motor system
- High levels of disability
- Widespread allodynia

Result:
Centrally mediated pelvic girdle pain

Management:
- Medical: Central nervous system modulation
- Psychological: Pain management coping strategies
- Physical: Maintain functional capacity

Fig. 2. The nature and management of centrally mediated pelvic girdle pain.
2.1.8. Stage

- Chronic, stable.

2.1.9. Management

The classification of this disorder is based on the high levels of widespread constant pain, generalised hyperalgesia, the non-mechanical nature of the disorder, the absence of a clear organic basis to pain, widespread disruption to the motor system and abnormal pain behaviours, the lack of a clear relationship between the abnormal movement behaviour and pain and resistance to conservative treatments. All these factors support that the pain is centrally mediated (Fig. 2).

These disorders are very complex and highly resistant to change. The management approach for this disorder must be multidisciplinary (Fig. 2):

- Cognitive (psychologist intervention)
- A focus on normalising beliefs and cognitive functioning
- Educate regarding vicious pain cycle (Fig. 3)
- Developing active coping strategies
- Pacing strategies
- Medical pain management: central nervous system inhibitory medication
- Rehabilitation: normalising movement behaviours and restoration of function, no pain focus, graduated functional whole body exercise programs, group exercise

2.1.10. Outcome

In spite of ongoing multi-disciplinary management, 5 years later this patient lives with ongoing chronic PGP. The cognitive components to the intervention provided her with active coping strategies that enabled her to reduce her disability levels, change her beliefs and maintain moderate levels of functional capacity.

2.1.11. Commentary

This case highlights the danger of considering PGP disorders purely from a biomechanical perspective. This patient did not respond to the multiple conservative and invasive interventions directed at her pelvis, based on the premise that her pelvis was ‘unstable’. This in turn promoted fear, passive dependence on health care, passive coping strategies, disability, reinforcing abnormal pain behaviours and providing fuel for a centrally mediated pain disorder to develop (Fig. 3). This patient has all the hall-marks of centrally mediated pain—widespread, severe, constant pain, allodynia, gross and widespread motor disturbances, high levels of disability with peripherally directed interventions exacerbating the disorder. This case highlights the importance of the early classification of PGP disorders and directing management at the mechanism/s that underlie the pain disorder. It highlights the danger of focussing on the signs and symptoms of a disorder (i.e. ASLR test) without consideration for the complex central mechanisms that can drive pain. A one-dimensional view for the classification and management of PGP disorders (in this case assuming the pelvis was ‘unstable’) may in fact amplify pain.

2.2. Case 2: Reduced force closure

2.2.1. Subjective examination findings

36-year-old female; married; two children (2 and 4 years old)

Fig. 3. The vicious cycle of pain for centrally mediated pelvic girdle pain.
Work: physiotherapist (unable to work because of pain)
Home: household activities; picking up and carrying 2-year-old child

History: gradual onset of PGP during second pregnancy. Pain increased following child birth and had not abated. Initial treatment after her child was born was pelvic manipulation which aggravated her pain. The second physiotherapist she saw advised that her pelvis was unstable and that she needed to dynamically stabilise it. She was instructed to perform transverse abdominal wall exercises and was given a series of exercise progressions that involved graduated limb loading in supine. She reported no relief from this treatment. She was then referred to a PGP clinic where she was instructed that she had a hypertonic pelvic floor and she needed to learn to relax it. She was instructed to do relaxation and breathing exercises and gradually increased her cardiovascular fitness. However this resulted in a significant increase in her pain. She took analgesic medication and non-steroidal anti-inflammatory regularly. She reported that she had developed stress incontinence after training her pelvic floor to relax.

Family history: nil

Pain: localised SIJ pain on the right with some gluteal referral. Pain was intermittent in nature.

Aggravating postures: sitting, standing (loading right leg)

Aggravating activities: walking (>10 min), lifting and carrying child; previous treatment stabilising exercises; fit-ball, limb loading, stretching exercises for the hip

Easing postures/activities: relief during unloading of right leg and non-weight bearing, rest eases pain

Coping strategies: rest, avoiding provoking activities

Beliefs:

1. Back pain likely to become persistent (5/10)
2. Activity aggravates back pain (10/10)
3. Activities that aggravate back pain are likely to be damaging (7/10)
4. No idea as to the basis of the pain or what is required to manage it

Pain-intensity (VAS): 6/10 (day intake examination); 5/10 (average pain week); 5/10 pain (average for 3 months)

Disability scale score: Revised-Oswestry (Fairbank et al., 1980): 38%

Fear avoidance: Tampa Scale of Kinesiophobia (French et al., 2007): 38/68

Psycho-social risk factors ('yellow' flags):

1. Stress levels (4/10)—pain and disability results in stress
2. Depression (7/10)—gets down because of pain disorder

Medical imaging: X-rays and CT-imaging—no abnormalities detected

Blood tests: −ve

2.2.2. Key subjective features

- Localised SIJ pain
- Loading pain disorder
- No awareness of pain disorder—conflicting advice regarding management and underlying pain mechanism
- Passive coping strategies
- High levels of pain, disability and movement-based fear
- Absence of pathoanatomical disorder on radiology

2.2.3. Plan for physical examination

- Identify symptomatic structure
- Investigate provoking postures and activities to determine whether control or movement impairments are linked to pain disorder
- Investigate motor control of lumbar spine and pelvis—especially regarding right limb loading
- Investigate whether enhancing control over painful structure/s reduces pain in provocative postures and activities
- Determine if beliefs regarding movement-based fear are real or perceived

Physical examination findings

2.2.4. Posture and movement analysis

- Standing: sway posture standing (Fig. 4a) (pelvis anterior to thorax) with avoidance of loading right leg. Reduction in tone in the transverse abdominal wall, lumbar multifidus and right gluteal muscles
- Forward bending: full ROM (no pain)
- Return from forward bending: poor control of posterior pelvic rotation via hips
- Backwards bending: full ROM (no pain)
- Side bending (R/L): full ROM
- Single leg standing: right—increased sway of pelvis anterior to thorax and Trendelenburg pattern of right hip (with pain)
- Sitting posture: slumped sitting with weight shift to left buttock
- Sit to stand: tendency to laterally shift load to left leg
- Single leg sit to stand on right leg: inability to transfer load on right leg
Specific movement tests (O’Sullivan, 2005)

- Attempts to elevate pelvic floor were associated with bracing of the abdominal wall, breath holding and depression of the pelvic floor
- Attempts to activate the lower transverse abdominal wall (transverse fibres of internal oblique and lower transversus abdominis) in side lying and supine were associated with bracing and breath holding
- Inability to initiate isometric contraction of right gluteal muscles
- Marked weakness of right gluteal muscle on testing

ASLR—prone/supine (Mens et al., 1999)

- Marked ‘heaviness’ when elevating right leg with breath holding and bracing of the abdominal wall
- Manual pelvic compression across ilium normalised the test

Neurological screening examination (Hall and Elvey, 1999)

- Absence of neurological findings (normal neural provocation testing, reflexes, sensation and manual muscle tests)

SIJ provocation tests (Laslett et al., 2003)

- All tests positive—except she experienced relief with ilium compression

Passive physiological motion segment testing (Maitland, 1986)

- No spinal movement impairment

Lumbar spine palpation (Maitland, 1986)

- Tenderness inferior sulcus of SIJ
- Trigger points and tenderness over gluteal and piriformis muscles

2.2.5. Key features of physical examination findings

- Full ROM of lumbar spine (active and passive)
- Avoidance of loading right lower limb
- Loading pain when weight bearing on right side and was associated with a lack of activation of postural stabilising muscles (right gluteal, transverse abdominal wall, lumbar multifidus, left quadratus lumborum)
- Facilitating optimal loading reduced pelvic pain
- +ve ASLR—normalised with compression
- Inability to isolate activation of local pelvic muscles

Fig. 4. (a) Subject in Case 2 with a classification of reduced force closure exhibits a passive sway standing posture as her normal standing posture. This posture is associated with inhibition of the local force closure muscles (transverse abdominal wall, lumbar multifidus, gluteal muscles, pelvic floor). (b) Corrected standing posture facilitates automatic postural activation of local force closure muscles. Assumption of this posture immediately reduced her SIJ pain.
2.2.6. Diagnosis

- Non-specific PGP (post partum PGP)

2.2.7. Classification: mal-adaptive movement disorder

- Peripheral driver: reduced force closure of right SIJ and associated structures (Fig. 5)

<table>
<thead>
<tr>
<th>Case 2: Reduced force closure</th>
<th>Case 3: Excessive force closure</th>
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<tr>
<td>Nature of the disorder:</td>
<td><strong>Nature of the disorder:</strong></td>
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<tr>
<td>- Localised pain +/- referral</td>
<td>- Localised pain +/- referral</td>
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<tr>
<td>- Pain provoked by sustained or repeated loading sitting / standing / walking</td>
<td>- Pain provoked by sustained or repeated loading sitting / standing / walking</td>
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<tr>
<td>- No spinal movement impairment or pain</td>
<td>- No spinal movement impairment or pain</td>
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<tr>
<td>- Pain provoked by long lever exercises, stretching +/- manipulation</td>
<td>- Pain provoked by increased pelvic compression / sacroiliac belt / local muscle activation / optimizing alignment</td>
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<tr>
<td>- Pain relieved by increased pelvic compression / sacroiliac belt / local muscle activation / optimizing alignment</td>
<td>- Pain relieved with relaxation / stretching / massage</td>
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<tr>
<td>+ve sacroiliac joint provocation tests</td>
<td>+ve sacroiliac joint provocation tests</td>
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<tr>
<td>+ve ASLR test (supine +/- prone) normalized by pelvic compression</td>
<td>-ve ASLR test</td>
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<tr>
<td>Passive postures with poor lumbopelvic position sense</td>
<td>Erect active postures</td>
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<tr>
<td>Inability to isolate local pelvic muscle synergies (pelvic floor, lower internal oblique, transverses abdominis, +/- lumbar multifidus, psoas major, gluteal muscles)</td>
<td>High levels of muscle tone and tension of pelvic floor, abdominal wall, adductors, gluteal muscles</td>
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<td>Avoidance of painful activity</td>
<td>Muscle guarding and tension (↑ intra-abdominal pressure) with inability to relax pelvic muscles</td>
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<td>Disability</td>
<td>Disability</td>
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**Result:**
Peripheral pain sensitization due to a loss of local compression within pelvic joints resulting in repeated strain in sacroiliac, joint and surrounding structures

**Reduced force closure classification**

- Anxiety related to chronic disabling pain
- Fear of activity (non-pathological)
- Lack of control and awareness of disorder
- Belief that activity is provocative (non-pathological)

**Result:**
Central amplification of pain due to cognitive components of disorder

**Management:**
Enhancing local force closure via motor learning in conjunction with appropriate cognitive intervention leads to resolution/control of the disorder

**Result:**
Peripheral pain sensitization due to excessive and sustained compression of sacroiliac joints and surrounding pain sensitive structures (increased pelvic compression)

**Excessive force closure classification**

- Associated underlying anxiety
- Active coping, poor pacing,
- Hyper-vigilence

**Result:**
Central amplification of pain due to cognitive components of disorder

**Management:**
Reducing excessive motor activity and facilitating relaxation using both motor learning and appropriate cognitive intervention leads to resolution/control of the disorder

Fig. 5. The nature and management associated with mal-adaptive motor control disorders of the pelvis with; Case 2: Reduced force closure classification and Case 3: Excessive force closure classification. Normal text represent common features of the disorders while *italics* text highlights differences between the disorders (ASLR = active straight leg raise).
Belief that activity is provocative (correct)—reinforcing disability
Avoidance behaviours relating to right leg loading
Deconditioning, high disability levels

2.2.9. Management: cognitive

- Provide an awareness of pain mechanism—educate regarding vicious cycle (Fig. 6)
- Make patient aware of loss of pelvic motor control and how her postural control and avoidance behaviours have reinforced her pain disorder
- Enhance functional capacity in order to develop active coping strategies with pain control

2.2.10. Management: motor learning

- Train ability to elevate pelvic floor muscles and isolate activation of transverse abdominal wall without global abdominal wall activation and breath holding (O’Sullivan and Beales, 2007b)
- Train control of pelvis independent to the thorax (in supine, sitting, and standing)
- Train lumbopelvic sitting and aligned standing postures with equal limb loading (O’Sullivan et al., 2002)
- Train loading of right leg with optimal alignment of the thorax relative to the pelvis and pain control
- Train lifting techniques with equal weight bearing and lumbopelvic control
- Graduated cardiovascular fitness program—progress from exercise bike to walking
- Increase conditioning of lumbopelvic region with whole body exercise and right leg loading exercises—lunges, squats and hand weights

Graduated functional restoration with movement and pain control—specific to patient’s provocative activities
Graduated return to work

2.2.2. Outcome

Twelve months later this patient had returned to work as a physiotherapist with very little pain and had returned to playing handball and other sporting activities. Her bladder control also normalised.

2.2.3. Commentary

These examination findings support the presence of a loading pain disorder of the right SIJ and surrounding structures, associated with a loss of local motor control resulting in a loss of adequate force closure (impaired load transfer) of the SIJ complex. This results in excessive strain being placed through the pain sensitive supporting ligamentous structures of the SIJ, with resultant maintenance of pain during loading (Fig. 6). This loss of control is reinforced by the faulty postural and movement behaviours she had developed. Her avoidance behaviours have developed from an inability to optimally load the right leg without pain.

Management logically focuses on a cognitive based motor control intervention directed at the functional activation of the key force closure muscles of the SIJ to enhance the dynamic stability to the joint. Achieving pain control during loading allows for the restoration of normal movement and coping behaviours, reduced avoidance behaviours, conditioning and the resumption of work and sporting activities. This in turn promotes the resolution of the disorder.

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**Fig. 6. The vicious cycle of pain for pelvic girdle pain with a classification of reduced force closure.**
2.9. Case 3: Excessive force closure

2.9.1. Subjective examination findings

38-year-old female; single

Work: Pilates instructor full time (12 hours per day—6 days per week)

History: Onset of PGP 2 years earlier following heavy Pilates session which focussed on pelvic stabilisation exercises and hip stretching. The disorder progressively deteriorated over time in spite of various treatments. These treatments involved—stabilising exercise training (focussed on the pelvic floor, transverse abdominal wall, lumbar multifidus and gluteal muscles, stretching, muscle energy techniques for the SIJs, trigger point work and massage to the piriformis and quadratus lumborum). In spite of significant treatment the disorder worsened. She had been advised by a physiotherapist and chiropractor that her SIJs were ‘unstable’ and regularly become ‘displaced’, and as the stabilising exercise program has not worked, she required prolotherapy (sclerosing injections to the SIJ ligaments). However following the sclerosing injections, there was no change in her pain. She was finding it increasingly difficult to work and was highly anxious regarding her ‘unstable pelvis’, had high levels of pain, and was disabled. She wore a SIJ belt even though it was provocative. Following advice she was considering SIJ fusion surgery. She also reported developing bladder control problems.

Family history: Nil

Pain: localised to SIJs with spread to buttocks (right > left), also internal pelvic pain across perineum

Aggravating postures: sitting, standing

Aggravating activities: walking, bending, lifting, working, pain worse at end of working day and after exercise (power walking and swimming) and Pilates classes, no symptom relief during weight bearing

Easing postures/activities: rest and relaxation, heat, massage, non-steroidal anti-inflammatories

Coping strategies: Pelvic stabilisation—isometric muscle contractions of the pelvic floor, transverse abdominal wall, lumbar multifidus and gluteal muscles, although these strategies did not reduce the pain. She was reliant on passive treatments 2–3 times per week involving massage of the pelvic muscles. On questioning she very rarely rested and relaxed. After work (12 hours without a break) she would go power walking or swimming where she would focus on gluteal and pelvic floor contractions. She reported that she was constantly focussed on her pain and contracting her pelvic muscles.

Beliefs:

1. Her pelvis was unstable and weak and regularly ‘goes out’
2. The more stable her pelvis is the better she should be
3. The more exercise she does the better she should be
4. Holding erect postures and contracting pelvic muscles is beneficial
5. PGP likely to become persistent (10/10)

Pain-intensity (VAS): 6/10 (day intake examination); 6/10 (average pain week); 6/10 pain (average for 3 months)

Disability scale score: revised-Oswestry (Fairbank et al., 1980): 32%
Fear avoidance: low score
Psycho-social risk factors (‘yellow’ flags):

1. Stress levels (8/10)—highly stressed and anxious person
2. Depression (5/10)—gets down because of pain disorder

Medical imaging: X-rays and CT-imaging—no abnormalities detected; bone scan—mild signs of inflammation of the SIJs (right > left)

Blood tests: —ve

2.9.2. Key subjective features

- Pain localised to SIJs
- Loading provokes pain
- Unloading and relaxation relieves pain
- Belief that pelvis is ‘unstable’ reinforced by treatment providers
- Patient constantly activates pelvic stabilising muscles although this does not relieve pain
- Coping strategies—exercise, muscle contraction, passive treatments (with resultant poor control over pain disorder)
- Lack of pacing, long work hours, lack of relaxation and rest
- Signs of inflammation of SIJ on bone scan (right > left)
- High levels of stress and anxiety and focus on pain
- Absence of any signs suggesting serious underlying pathology

2.9.3. Plan for physical examination

- Identify painful structure/s
- Investigate patient’s movement behaviours
- Investigate provoking postures and activities to determine whether impairments of motor control or excessive motor activity are linked to the pain disorder
- Investigate whether enhancing control over pelvis reduces or increases pain in provocative postures and activities
- Determine whether her current coping strategies are beneficial
Determine if beliefs regarding ‘unstable pelvis’ and ‘weakness’ are valid

2.9.4. Physical examination findings

Posture and movement analysis

- **Standing**: erect thoracolumbar posture; high tone in the abdominal wall, back and gluteal muscles, apical breathing pattern
- **Forward bending**: hands flat on the floor with no increase in pain
- **Backwards bending**: hyperextension of the spine without pain
- **Side bending (R/L)**: full ROM
- **Single leg standing**: erect standing with gluteal activation
- **Sitting posture**: erect active sitting (Fig. 7a) with forward incline, extended thoracolumbar spine, apical breathing pattern
- **Sit to stand**: initiated with hip flexion and thoracolumbar spine maintained in extension
- **Squat**: full movement with ease
- **Gait**: rigid erect thoracolumbar spine (minimal rotation) with accentuated hip extension

Specific movement tests (O’Sullivan, 2005)

- Relaxation of sitting posture via thorax (Fig. 7b) and abdominal wall reduced pelvic pain
- Relaxation of gluteal, back and abdominal wall muscles with reduced lumbar lordosis and increased thoracic flexion in standing reduced pelvic pain

Specific muscle testing (O’Sullivan, 2005)

- Ability to co-activate the pelvic floor, lower transverse abdominal wall (transverse fibres of internal oblique and lower transversus abdominis) and lumbar multifidus at L5/S1 in side lying and supine without breath holding
- High levels of strength of hip flexors and extensors
- Difficulty relaxing gluteals, lumbar multifidus and lower abdominal wall
- Rapid, apical breathing in all postures including supine
- Difficulty belly breathing in supine
- High levels of flexibility of trunk and hip muscles
- Internal pelvic floor examination (by womens health physiotherapist) confirmed the ability to contract and elevate the pelvic floor, but difficulty relaxing it. Strength grade 5+ Oxford scale, very strong contraction on Peritron.

ASLR—prone/supine (Mens et al., 1999)

- –ve
- Ability to lift leg with ease
- Increase in pain with addition of manual pelvic compression and local stabilising muscle activation

Neurological screening examination (Hall and Elvey, 1999)

- Absence of neurological findings (normal neural provocation testing, reflexes, sensation and manual muscle tests)

SIJ provocation tests (Laslett et al., 2003)

- All tests positive—except she experienced relief with lateral distraction of the ilium

Passive physiological motion segment testing (Maitland, 1986)

- Normal for spine and pelvis

Lumbar spine palpation (Maitland, 1986)

- Tenderness of right inferior sulcus of SIJ
- Trigger points and tenderness over gluteal and piriformis muscles

2.9.5. Key features of physical examination findings

- Full ROM spinal mobility (active and passive)
- High tone in pelvic stabilising muscles with erect rigid spinal postures with pain
- Relaxation of spino-pelvic postures and local pelvic muscles reduced pain

Fig. 7. (a) Subject in Case 3 adopts an erect active sitting posture with high levels of activation in the superficial abdominal wall and the thoracolumbar erector spinae, as well as an apical breathing pattern. (b) Relaxed sitting results in relaxation of the abdominal wall, back and pelvic floor muscles with an associated reduction in pelvic girdle pain.
• Ability to activate local stabilising muscles but difficulty relaxing them
• +ve SIJ provocation tests
• −ve ASLR in prone and supine with increased pain on addition of manual compression and local muscle activation
• Abnormal movement behaviours—erect and rigid movement
• Current beliefs that pelvis is ‘unstable’ were not confirmed by examination
• Current coping strategies were provocative of pain
• High levels of anxiety

2.9.6. Diagnosis

• Non-specific PGP

2.9.7. Classification: mal-adaptive movement disorder

• Peripheral drivers: excessive force closure of SIJ and associated myofascial pain (Fig. 5)
• Cognitive drivers: faulty beliefs, anxiety, lack of pacing, inability to relax, hyper-vigilance

2.9.8. Stage

• Chronic/stable

Other important factors contributing to disorder

• Belief that pelvis is unstable and that more muscle activity is better
• Lack of accurate awareness of basis (i.e. mechanism) of the pain disorder
• Coping strategy (increasing muscle activation) is provocative
• Lack of pacing, rest, relaxation and unloading of pelvic structures

Ironically, treatments that gave relief were those that induce relaxation of pelvic muscles—massage, trigger point work and heat (in contrast to her beliefs)

Management: cognitive

• Educate regarding vicious cycle (Fig. 8)
• Provide an awareness of pain mechanism—the fact that increasing pelvic compression increases pain and reducing it decreases pain.
• Change beliefs—pelvis is stable, muscles are strong and the inability to relax the pelvic muscles abnormally loads the pelvic structures which increases pain
• Importance of pacing, learning to relax postures, not consciously activating the pelvic and trunk muscles, use breathing control to relax and reduce anxiety levels—in order to reduce peripheral and central pain drive
• Seek psychological/medical help with regards to reducing anxiety levels
• Implement strategies to reduce work hours/introduce breaks into working day/reduce manual ‘demonstrations’ in Pilates classes and focus more on instruction
• Importance of relaxing during exercise

Management: motor learning

• Teach relaxation strategies—breathing control, relaxation
• Instruct on relaxation of spinal postures in sitting and standing
• Teach strategies to relax and move normally with movement—such as rolling, sit to stand, bending, walking

Fig. 8. The vicious pain cycle of pelvic girdle pain with a classification of excessive force closure.
- Maintain cardiovascular fitness but with relaxed spinal postures and increased trunk rotation
- Reduce exercise levels to four times per week
- Prescribed rest each day
- Cease stabilising exercises
- Relaxation yoga

2.9.9. Outcome

Twelve months later this patient had changed jobs, reduced her activity levels to a normal level, stopped contracting her pelvic muscles, normalised her movement behaviours and had very little pain or disability. Her bladder control had also normalised.

2.9.10. Commentary

This disorder was driven by the belief that the pelvis was ‘unstable’ reinforced by her physiotherapists and her own belief system. The management and coping strategies that the patient has been taught to develop (conscious activation of pelvic stabilising muscles) and the belief that her pelvis is unstable are highly provocative for these disorders, reinforcing hypervigilance and abnormally high levels of dynamic compression across her sensitised pelvic joints (Fig. 8). Her long work hours, the active nature of her work, the lack of rest, high levels of exercise, high levels of anxiety and focus on pain further increase the muscle tone resulting in increased central and peripheral drive of pain. All these factors contributed to maintaining a vicious pain cycle (Fig. 8).

Management must address both cognitive and motor control factors that drive pain. Providing a new belief system and different coping strategies is critical for this patient. Learning to relax, move normally, cease stabilisation exercises and passive treatments, change the focus away from pain towards relaxation and appropriate pacing is critical. This highlights how faulty belief systems and abnormal motor control strategies reinforced by physiotherapists and adopted by patient’s can be potentially detrimental to a patients disorder.

3. Summary

These three distinct cases act as clinical examples highlighting the importance of classification and specifically directed management of PGP disorders. Working within a biopsychosocial framework is critical for the management of these disorders. Management strategies that target both the physical and cognitive impairments associated with these disorders has the potential to positively impact on long-term PGP disorders.

References