Treatment of Sacroiliac Joint Dysfunction

Movement of sacrum on ilium
Sacroiliac Joint Axes

- Superior
- Middle
- Inferior
- Right Oblique
- Left Oblique
Sacroiliac Joint Movement

- Nutation: Anterior nutation or flexion
- Counternutation: Posterior nutation or extension
- Forward rotation around an oblique axis
- Backward rotation around an oblique axis
Sacroiliac Joint Movements

- **Physiologic**
  - Left sacral torsion on left oblique axis
  - Right sacral torsion on right oblique axis
  - Bilateral anterior sacral nutation
  - Bilateral posterior sacral nutation
  - Anterior sacral nutation with exhalation
  - Posterior sacral nutation with inhalation

- **Non-physiologic**
  - Left sacral torsion on right oblique axis
  - Right sacral torsion on left oblique axis
  - Left unilateral anterior nutation
  - Right unilateral anterior nutation
  - Left unilateral posterior nutation
  - Right unilateral posterior nutation
Sacral Nutation

- “Sacral locking”
- Base of sacrum moves into pelvis
  - Inferoposterior glide of articular surface of sacrum on ilium
  - Coronal axis of interosseous ligament
  - Iliac bones approximate, ischial tuberosities spread
  - Limited by interosseous, ant. sacroiliac, sacrotuberous and sacrospinous lig
- Bilateral
  - Early trunk extension
  - End range trunk flexion
  - Exhalation
- Unilateral
  - Hip flexion
Sacral Counternutation

- “Sacral unlocking”
- Backward motion of base of sacrum out of pelvis
  - Anterosuperior glide of articular surface of sacrum on ilium
  - Coronal axis of interosseous ligament
  - Iliac bones spread, ischial tuberosities approximate
  - Limited by long post sacroiliac ligament and multifidus contraction

- Bilateral
  - Early trunk flexion
  - End of trunk extension
  - Inhalation

- Unilateral
  - Hip extension
Reciprocal Movement at Lumbosacral Junction

- **Flexion of L5S1**
  - Sacral base moves posteriorly into extension (counternutates)

- **Extension of L5S1**
  - Sacral base moves anteriorly into flexion (nutates)

- **Right rotation and left sidebending of L5**
  - Sacral base rotates to left and side bends right
Muscle Functions

- **Piriformis**
  - Anterior tilt and rotate sacrum to opposite side
    - Assisted by ipsilateral gluteus maximus

- **Contralateral latissimus dorsi and gluteus maximus through LDF**
  - Nutation of sacrum and extension of LS junction

- **Long head of biceps**
  - Backward tilt and rotate sacrum to same side

- **Longissimus and multifidus**
  - Pull sacral base superiorly and posteriorly thru dorsal ligaments
Normal Gait Mechanics

- **Innominate**
  - Right innominate rotates anteriorly
  - Sacrum rotates toward it and sidebends away from it

- **Sacrum**
  - Sacrum moves into right forward torsion on right oblique axis the returns to neutral

- **L5**
  - As sacrum right rotates and left sidebends, L5 left rotates and right sidebends
Pelvic Girdle Function

- Form closure
  - Bones, joints, ligaments
- Force closure
  - Muscles, fascia
- Motor control
  - Neural patterning
- Emotions
  - Awareness
Impairments

- Excessive articular compression
  - Fusion (AS)
  - Capsular fibrosis
  - Overactivation of global myofascial system
  - Joint fixation (underlying instability)

- Insufficient articular compression
  - Ligamentous laxity
  - Underactivity of local myofascial system

Lee
Somatic Dysfunction

- **Function**
  - Stability and motion of SI joints result of shape of joint surfaces (form closure) and altering of ligamentous tension in response to changes of muscle tone (force closure) (Isaacs & Bookhout)

- **Dysfunction**
  - Imbalance of tension and tone between muscles and ligaments which locks SI joint and prevents normal function (Isaacs & Bookhout)

- **ARTT**
  - Asymmetry of position, restricted motion, tissue texture, tenderness
Sacroiliac Somatic Dysfunctions

- Forward sacral torsion
- Backward sacral torsion
- Bilateral sacral anterior nutation
- Bilateral sacral posterior nutation
- Unilateral sacral anterior nutation
- Unilateral sacral posterior nutation
Symptoms

- Stiffness and pain with walking
- Pain opposite side with walking – SI
- Pain same side with walking – IS
- Unilateral pain below L5
- Pain with sit to stand
- Coccydynia (torsions)
- Groin pain
Examination

- Positional tests
- Motion tests
- Passive mobility tests
- Pain provocation tests
- Palpation
Positional Tests

- **Landmarks**
  - ASIS
  - PSIS
  - Sacral sulcus
  - ILM
  - Medial malleoli (prone)
  - L5
  - Pubic tubercle

- **Positions**
  - Neutral, extended and flexed
Active Motion Tests

- Standing flexion test
- Stork test
  - Gillet’s test
- Seated flexion test
  - Piedallu’s test
Passive Mobility Testing

- Osteokinematic
  - Nutation/counternutation
    - Prone
  - Anterior/posterior innominate rotation
    - Sidelying
- Arthrokinematic
  - Inferoposterior glide
    - Anterior innominate rotation
  - Superoanterior glide
    - Posterior innominate rotation
  - Horizontal translation
    - Squish test
  - Vertical translation
- Lumbar spring test
Palpation

- Tension (ligaments)
  - Sacrotuberous
  - Long dorsal ligament
- Tone (muscles)
  - Piriformis
  - Psoas/Iliacus
  - Coccygeus
  - Gluteus maximus
  - Latissimus dorsi
  - Multifidus
  - Erector spinae
- Tenderness
Tenderness

- L5S1 – yellow
- Lumbar – black
- SI joint - blue
Pain Provocation Tests

- Anterior gapping (Distraction)
- Posterior gapping (Compression)
- Gaenslen’s
- Thigh thrust
- Sacral thrust
Standing

- Anatomic landmarks
- Standing flexion test
  - Symmetrical superior movement of PSIS’s
- Stork test (Gillet’s march test)
  - PSIS should drop (also move laterally after 90°)
- Hip drop test
  - Anterior nutation on side of bent knee, rotate toward lumbar concavity
- Side bending
  - Anterior nutation on side of convexity, rotate toward lumbar concavity
  - Anterior innominate rotation (side of concavity), posterior innominate rotation (side of convexity)
Seated

- Seated forward flexion test
  - Symmetrical superior/anterior movement of PSIS’s
  - Positive seated flexion test indicates sacroiliac dysfunction
  - Indicates dysfunctional side

- Palpation
  - ILA’s
    - Symmetrical in upright, flexed and extended positions
  - Lumbar laminae (L5) and transverse processes
    - Symmetrical
Seated Flexion Test

- If ILA’s become symmetrical
  - Rule out
    - Unilateral anterior or posterior sacral nutations
    - Forward sacral torsion

- If positive on left
  - Rule out
    - Bilateral anterior or posterior nutations
  - Could be
    - Left unilateral anterior nutrition
    - ROR forward sacral torsion
    - LOR backward sacral torsion
Supine

- Palpate
  - ASIS’s, pubic tubercles, medial malleoli
    - Helps define etiology
    - Is it purely sacral or mixed problem (iliac and pubic dysfunction)

- Squish test
  - Symmetrical resistance

- Pain provocation tests
  - Gaenslen’s test
  - SI compression/distraction
    - Compression in sidelying
  - Thigh thrust

- ASLR (Active SLR test)
Prone

- **Palpation**
  - Sacral base and ILA’s
    - Prone and prone-on elbows positions
  - Malleoli position
  - Long dorsal sacroiliac joint ligament
  - Sacrotuberous ligament
  - Muscles
    - Piriformis, gluteal, paraspinal

- **Mobility**
  - Spring test
    - Lumbar
    - Sacral (transverse axis & oblique axis)

- **Pain provocation test**
  - Sacral thrust
Forward Sacral Torsion

- Forward rotation around oblique axis
  - 85% LOL (common in R handed people)
- Imbalance between piriformis and hip rotator muscles. After posterolateral disc.
- Symptoms
  - No low back pain, unless associated with ERS
  - Piriformis symptoms, gluteal pain
  - Occasional sciatica
  - Standing, walking and stair climbing
  - Little or no pelvic restriction with gait
    - In gait, on R heel strike, sacrum turns L and L5 turns R
    - At R mid-stance, sacrum rotates right on ROA, L5 rotates L and SB R
- Must treat lumbar non-neutral dysfunctions first
Backward Sacral Torsion

- Backward rotation around oblique axis
  - 85% LOR
- Lumbar sidebending and rotation to same side while fully flexed. Locks with attempt to return to upright position.
  - Left L/S SB/ROT in F will cause right sacral rotation on LOA
  - “the well bent over and the cripple stood up” syndrome
- Symptoms:
  - Testicle pain, heel burning, lateral knee pain, back of leg numb; can’t lie side of torsion; can’t lie prone; morning stiffness; inability to cross legs; inability to sweep or vacuum; pain with walking; sit-to-stand; rising from FB position
- Must treat non-neutral lumbar dysfunction first
Sacral Torsion Diagnosis

- Sulcus deep and ILA posterior on opposite sides
- Sulcus determines torsion
  - Left sulcus deep is RST
- Axis and direction determination
  - Piriformis
    - Left tight creates ROA
    - Positive left seated flexion test indicates tight left piriformis
  - Spring test positive in backward, negative in forward
  - Forward torsions become asymmetric in flexion and symmetric in extension (ILA’s)
  - Backward torsions become asymmetric in extension and symmetric in flexion (ILA’s)
- Normal lumbar adaptation
  - ROT in direction of deep sulcus, SB away
## Sacral Torsions

### Sacral Torsion Dysfunctions

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Bilateral Anterior Sacral Nutation

- Also known as bilaterally flexed sacrum or bilateral inferior sacral shear
- Forward rotation on MTA
  - Rare
- Jumping from a height and landing
- Symptoms:
  - Persistent lumbosacral and gluteal pain
  - Lumbosacral/gluteal pain worse with forward bending, walking, standing, down stairs
  - Prefers to lie prone
  - Stands with accentuated lordosis
  - Uncomfortable sitting
  - Lumbosacral flexion limited
Bilateral Posterior Sacral Nutation

- Also known as bilaterally extended sacrum or bilateral superior sacral shear
- Backward sacral rotation on MTA
- Lifting heavy load in midline position
- Symptoms:
  - Constant lumbosacral pain
  - Lumbosacral pain worse with backward bending, sit-to-stand, walking down stairs, patient prefers to sit slumped with arms on thighs, lie supine or fetal position, stands with flat back
  - Lumbosacral extension limited
# Bilateral SI Dysfunctions

## Bilateral Sacroiliac Dysfunctions

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### Palpation

- **Backward bending**: No change in findings | Sacral sulci more shallow ILA's more anterior
- **Lumbar lordosis**: Increased | Decreased (may be increased)
- **Restricted motion**
  - Seated flexion test: Positive bilaterally | Positive bilaterally
  - Standing flexion test: Positive bilaterally | Positive bilaterally
  - Gillet's or Stork test: Positive bilaterally | Positive bilaterally
  - Lumbosacral spring test: Negative | Positive
  - Resisted motion: Sacral edenision | Sacral flexion

### Tissue texture change

- **Tension**: Bilateral around sacral sulci | Bilateral around sacral sulci
- **Hypertonus**: Piriformis, psoas | Pelvic floor, longissimus
- **Tenderness**
- **Palpation**: Dorsal SI ligaments, Baer's point, ILA | Dorsal SI ligaments
Unilateral Anterior Sacral Nutation

- Also known as inferior sacral shear, unilateral flexed sacrum or side bent lesion
- Usually traumatic
  - Land on one leg with spine extended (volleyball/basketball) Superior transverse axis
- Associated with posterior innominate rotation and non-neutral L5 dysfunction (L innominate posterior rotation with L5 ERSL)
  - Treat L5 dysfunction first
- Less common than torsions 3:2, left flexion most common
- Symptoms
  - Pain usually in sacral and gluteal areas, unilateral
  - Ipsilateral sciatica
  - Gait problem, pain opposite side
  - Worse with standing (<20 min)
  - Relieved by sitting
- Tests for sacral sulci and ILA’s definitive
Unilateral Posterior Sacral Nutation

- Also known as superior sacral shear or unilateral sacral extension
- Superior transverse axis
- Rare, most common on right
- May be associated with anterior innominate dysfunction
- May be confused with R on L torsion
- Caused by bending and twisting followed by forceful extension with load. Hypertonus of ipsilateral longissimus thoracis as result of thoracolumbar area strain
- Often treating source of hypertonus (TL junction) fixes problem
- Sometimes must treat L5 (FRSR)
Unilateral Sacral Nutation Diagnosis

- Sulcus deep and ILA inferior/posterior on same side (anterior nutation)
- Flexed and extended positions
  - ILA’s never become symmetric with unilateral nutations
- Seated flexion test
  - Positive on left with left anterior nutation
- Normal lumbar adaptation
  - ROT in direction of deep sulcus, SB away
# Unilateral SI Dysfunctions

## Unilateral Sacroiliac Nutation Dysfunctions

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Treatment

- Muscle energy
- Joint mobilization
- Joint manipulation
- Muscle stretching
- Trunk stabilization
Correction of Forward Sacral Torsion

- Lie axis side down
- Rotate trunk to right with right arm off table
- Flex knees and hips to localize forces at L/S junction
- Resist bottom heel lifting toward ceiling
Correction of Backward Sacral Torsion

- Lie axis side down
- Extend lower leg to induce some sacral flexion
- Flex upper hip so leg off table
- Extend trunk to L/S junction
- Rotate trunk left to L/S junction
- Resist lifting upper leg toward ceiling
Correction of Bilateral Anterior Nutated Sacrum

- Patient seated
- Feet apart and legs internally rotated
- Patient flexes forward
- ATC hands on sacral apex and thoracic spine
- Maintain pressure on sacral apex (ILA’s) and resist trunk extension with full inhalation
Correction of Bilateral Posterior Nutated Sacrum

- Patient seated
- Feet together and legs externally rotated
- Arms crossed
- ATC hands on sacral base and across anterior chest
- Maintain pressure on sacral base and resist trunk flexion with full exhalation or have patient arch back by pushing abdomen to knees
Correction of Unilateral Anterior Sacral Nutation

- Patient prone
- Abduct (15°) and internally rotate left leg
- ATC’s right hand on left ILA
- Apply and maintain anterior and superior pressure on left ILA as patient inhales and holds breath
- ATC maintains pressure as patient exhales

Left Unilateral Anterior Nutation
Correction of Unilateral Posterior Sacral Nutation

- Patient prone
- Abduct (15°) and externally rotate right leg
- Trunk extended via prone on elbow position
- ATC’s right hand on right sacral base
- Apply and maintain anterior and inferior pressure with right hand as patient exhales
- ATC’s left hand applies posterior pressure to right ASIS
- After exhalation, patient pulls ASIS toward table
- Return to prone lying position while maintaining pressure

Right Unilateral Posterior Sacral Nutation
Treatment Sequence

- Lumbar spine, pubes, innominate shears, sacroiliac dysfunction, iliosacral dysfunction, muscle imbalances (Greenman)
- Pubes, innominate shears, lumbar spine, sacroiliac dysfunction, iliosacral dysfunction (Issacs & Bookhout)
- Leg muscles, pubes, iliosacral (flares, innominate shears, rotations), sacroiliac, lumbar (unless L5, then before sacrum) (Rex)
- Pubes, iliosacral (rotations, innominate shears, flares) sacroiliac (Mitchell)
References

- Rex L. Ursa Foundation, Edmonds, WA.