MAKING THE CLINICAL CONNECTION

Ante/Postpartum Health and Musculoskeletal Treatment

Susan C. Clinton PT MHS OCS WCS
WomensRehab Residency Director
Centers for Rehab Services
Objectives

1. What are the common and potentially dangerous orthopedic conditions in the ante partum female?
2. What parameters for assessment and treatment need to be considered for this population?
3. What are the Red Flags?
4. How does examination and treatment differ in this population?
5. How does positioning considerations affect labor and delivery?
6. What are the potential orthopedic considerations in the post partum population?
Myths?

• Postural changes in pregnancy is the leading cause of musculoskeletal pain?
• Exercise of moderate intensity should be avoided in all pregnant women?
• Now that you are pregnant, it is OK to eat all of the calories you desire?
• It is normal for the baby to stop moving at various times during pregnancy?
• It is unnecessary to monitor vitals, past the initial examination, if this is a healthy pregnancy?
• It is OK to lie on your back for exercise for short periods of time?
• Urinary incontinence is normal in the last trimester and postpartum?
• Intercourse will never be as good as it was before pregnancy?
Case History

32 year old female, 28 weeks pregnant
referred to PT for left hip/groin pain

Pain 2 weeks ago after 4 mile run
Now only walking with persistent pain and discomfort
Pain with sitting and initially standing with weight bearing.
Difficult to find a position at night for rest
Aching in legs and feet at the end of the day
Stress urinary incontinence – has worsened in last two weeks
Past History

Gravida 1, Para 1 five years ago.
marathon runner since the age of 16
mild low back pain during her first pregnancy which resolved
orthopedic history of R hip tendonitis, L Achilles tendonitis and a runner’s toe on the (L) chronic — (orthotics).
Reflection

- Initial Assessment

- Questions?

- How do you feel? What am I looking for here?
Possible Diagnoses

- Hip impingement
- Labral tear
- Femoral neck stress fracture
- Round ligament pain
- Dysfunction of T11, 12 or L1
- Lumbar instability
- Iliolumbar ligament strain
- Pelvic ring dysfunction (SI joint &/or pubic symphysis strain/sprain)
Incidence

- Low back and pelvic pain – 72% (Albert, 2002), (Mogren, 2005)
  - Risk Factors: increased parity, history of hypermobility, periods of amenorrhea, increased BMI pre and end of pregnancy
- LBP in the USA – 56% (Fast, 1987)
  - Total objectively identifiable pelvic joint pain – 20.1% (Albert, 2000)
    - Pelvic Girdle Syndrome: 6%, Symphoysiolysis 2.3%, One-sided SIJ 5.5%, Double-sided SIJ 6.3%
- Herniated disc – 1:10,000 (LaBan, 1985)
Incidence

- Transient osteoporosis - Spine (BMD ↓ 3.4%) and femoral neck (BMD ↓ 4.3%) and calcaneus (BMD ↓ 6%) with loss of trabecular bone — (Boissonault, Boissonault, Bartoli, 2005).

- Diastasis Rectus Abdominis (DRA) — 66% in third trimester (Boissonault, 1998). Occurrence post partum — 39% significant after years - (Ranney, 1990)
Secondary considerations
Secondary Considerations

History of marathon runner

Nutrition

Gynecological issues (bleeding, cramping, urinary changes)

Intensity of exercise

Anemia/gestational diabetes

Postural pressure on inferior vena cava (standing/supine)

Cauda equina syndrome vs. pelvic floor weakness
Nutrition

- 300 more calories required -13th week of pregnancy (National Research Council, 1989) (Artal, 1991)
  - This number increases with exercise

- Carbohydrate intake must increase to supply “energy” at rest or with exercise with a preferential use of carbs for NWB exercise (Clapp, 1988) (Soultanakis, 1996) (Artal, 1989)

- Weight gain is generally 1 lbs/week
  - rapid in mid term.
Red Flags – changes in pregnancy

- Bleeding, change in vaginal discharge, fetal movement, contractions

- Fetal movement: felt by 16th week in woman who has delivered and by 20th week for first time

- 10 Kick counts before noon is normal
Normal labs at 28 weeks

- Hbg/Hct
- Glucose screening (50 g oral load with test in 1 hour)
ACOG and Research-Based Guidelines

EXERCISE IN PREGNANCY
Exercise in Pregnancy

- Regular/moderate exercise
  - Healthier pregnancy
  - Decrease of gestational diabetes

- Improved thermoregulation in females that exercised prior to pregnancy.

- Sedentary women /medical/ OB complications can exercise with guidelines

ACOG Summary

**DOs**

- **Continue regular exercise** – 3x/week
- Warm up/cool down – modulate according to symptoms
- **Stop exercise when fatigued**
- Increase calorie intake to compensate for exercise
- **Hydrate adequately with adequate ventilation**
- Prevent increased maternal temperature
ACOG Summary
DON'Ts

- Avoid exercise lying on your back
- Avoid exercise which may result in loss of balance
- Do not learn a new sport during pregnancy
- Avoid contact sports, racquet ball, scuba diving, skiing, etc.
30 minutes or more of moderate intensity physical activity on most/all days of the week
- Moderate=energy requirement of 3-5 METS.
  - Brisk walk at 3-4 mph
20-60 minutes - intense exercise 3-5 days per week results in higher levels of fitness.
- Caution – REGULATE and VENTILATE

Exercise Intensity:
- Heart rate 60-70% max
- Perceived exertion: 12-14 on the 6-20 Berg Scale

No negative impact of water exercise on pregnancy
Absolute Contraindications to Aerobic Exercise in Pregnancy

- Hemodynamically significant heart Pregnancy-induced hypertension
- Restrictive Lung Disease
- Incompetent cervix/cerclage
- Multiple gestation at risk for PTL
- Persistent second or third trimester bleeding
- Placenta Previa after 26 weeks
- Pre-term labor during the prior or current pregnancies or both
- Pre-term rupture of membrane
- Pregnancy induced hypertension
- Consider maternal conditions
- Ill, dehydrated, overheated

(ACOG, 2002)
Relative Contraindications for Aerobic Exercise During Pregnancy

- Severe anemia
- Unevaluated maternal cardiac arrhythmia
- Chronic bronchitis
- Poorly controlled type I DM
- Extreme morbid obesity
- BMI <12 extreme underweight
- History of very extreme sedentary lifestyle

- Intrauterine growth retardation
- Poorly controlled hypertension/preeclampsia
- Orthopedic limitations
- Poorly controlled seizure disorder
- Poorly controlled thyroid disease
- Heavy smoker

(ACOG, 2002)
Cardiovascular Changes and Body Position

- Decreased cardiac output due to compression of the Inferior Vena Cava in 2\textsuperscript{nd} to 3\textsuperscript{rd} trimesters: (Clark, 1991)
  - Static standing postures
  - Supine (4\textsuperscript{th} month)

\begin{itemize}
  \item Placenta
  \item Foetus
  \item Aorta
  \item L4
  \item Inferior vena cava
\end{itemize}
Examination – Systems Review

- **Vitals** – HR 65, BP 112/85, RR 13
- **Anthropometrics** – 5’6”, thin stature
- **Integumentary** – swelling noted of both feet
- **Neuroscan** -
  - Dermatomes, myotomes, reflexes, pulses (all WNL –
  - L hip not tested)
  - Balance – < 3 sec on LLE
  - Trendelenburg - + on L (pelvic ring, femoral neck, or L5?)
- **MSK scan**
  - Any other joint problems
  - history of inflammatory disease such as RA, ankylosing spondylitis
Cardiac Output/Blood Pressure

- **Heart rate increase by 15 beats per minute** – (Morton, 1991), (Pivaranik, 1996) (Morton, 1985)

- **Normal BP less than 140/90**
  - BP changes: mild dip in diastolic BP mid pregnancy (5-10 mmHg systolic) with return to normal in late pg.

- **Pregnancy induced hypertension guidelines:**
  - systolic increase 30 mm Hg; diastolic increase 15 mm Hg (Blackburn and Loper, 1992) (Artal, 2002)
Respiratory Changes

- Maternal oxygen consumption 16-32% greater than non pregnant controls.
  - Exercise intensity must be adjusted as oxygen demands of strenuous exercise may not be adequately met.

- In a Treadmill test, comparison of maternal arterial vs venous oxygen levels show reduced differences as compared to nonpregnant population.

- Gravid uterus limits diaphragmatic excursion perceived and objective increase in respiratory effort.

5-7 cm increase in rib cage diameter

4 cm elevation in diaphragm

(Boissonnault, 1997)
Reflection

- Continue with examination
- Refer back to MD
Examination and Intervention

What does the Clinician Avoid?

- **Prone position without modification**
  - 12-16\textsuperscript{th} weeks as the uterus rises out of the pelvic brim

- **Modified prone**
  - pillows above and below the abdomen
  - \(\frac{3}{4}\) prone
  - side lying
  - seated with arms over a plinth

(Sapsford, 1998) (George, 1998)
Eval and Tx: What do I avoid?

- **Extended periods of supine**
  - At the fourth month.
  - General guideline is 5 min
    - less if the patient shows poor tolerance

- **Alternate positions:**
  - side lying
  - ¾ supine—hips tilted 30 degrees.

(Sapsford, 1998) (George, 1998) (Stephensen, 2000)
Examination - Posture

- Increased pelvic tilt
- Asymmetry of abdomen with increased contour on R (rotation of lumbar spine?)
- Weight shift onto RLE
- Significant forward head (thoracic spine stiffness?)
Examination - Palpation

- Tenderness note over:
  - Left iliolumbar ligament
  - Left adductor tendon
  - pubic symphysis
  - Left anterior hip joint
  - (B) obliques
Examination - ROM

- **Lumbar spine**
  - Standing - decreased extension and decreased (R) SB (with lumbar/post pelvic pain)
  - Sidelying – full extension and side bending without pain

- **SI joints** –
  - Standing – unable to do marching test (Gillette), no problem with Forward Bend test. (Magee, 2006)

- **Hip** –
  - limitation and pain with flexion past 100, min. loss of internal and external rotation (hip flex/ext)
Examination - strength

Hip abduction – 4+/5 (B)

Hip adduction – weak/painful on L

Hip Flexion – weak/painful on L

PF mm – min. contraction with palpation (can confirm with external BFT)

Abdominals – 4/5 with 1.5cm Diastasis Rectus Abdominis (DRA)

All other mm were 5/5
Reflection

- Differential diagnosis?
  - Labral tear vs. femoral neck fractur
  - Lumbar strain vs. instability vs. pelvic ring dysfunction
    - DRA contribution
Red Flags – Transient Osteoporosis

- Pain in back, hip, knee, heel with weight bearing activities
- Inadequate pain relief with rest (with mechanical dysfunction generally rest reduces pain)
- Night pain—progressive
- Prior methods of pain control are ineffective
- ↓ROM, pain with WB, back pain, kyphosis, groin into thigh
Patellar-Pubic Percussion Test:
- Tap patella while auscultating at the symphysis pubis
- Dull sound noted on side of involvement
- Clear sound noted bilaterally if not involved

Labral tests of the hip (look for sharp pain and/or clicking)
- Scour
- Hip flexion/adduction/IR into extension/IR
Special Tests

• Hip joint vs. SI joint
  – FABER + for anterior hip pain

• SI joint provocation tests — requires a cluster of tests for a positive — (Albert, 2000)(Vleeming, 2008)
  – FABER, Posterior Pelvic Pain Test, Menell’s (long leg compression/distraction), Squish test, gap test
  – Load transfer tests — marching, trendelenburg, Active SLR (Mens, 1999 and 2002)
Special Tests

- Pubic symphysis –
  - Load transfer tests + with trendelenburg and ASLR

- Lumbar spine
  - PA glides – position for testing? +
  - Anterior instability test + @45 and 90 degrees
  - Prone instability test – N/A in this population
  - Tunning fork – neural arch or pars fracture (-)
  - Torsion test (-)
Postral changes in pregnancy: increased lordosis, pelvic tilt and posterior head position.

No correlate to LBP: (Franklin, 1998)

- Excessive cervical lordosis/thoracic kyphosis/lumbar lordosis
- Limited lumbar motion
- Pelvic asymmetry
- Scapular protraction
- Stretch and separation of abdominal muscles
- Hip/pelvic ring muscle pain
- Tight hamstrings
- Symphysis pubis separation/pressure/pain
- Hip flexor tightness
- Tight Achilles tendon
- Excessive pronation
- Poor sleep
PT Diagnosis

- Hip pathology –
  - Femoral neck stress fracture
    - Causes
      - Anemia
      - Nutritional
      - Abnormal forces over abnormal bone (loss of trabecular bone due to excessive hormonal changes)
  - Avascular necrosis – no history to lead to this conclusion
PT Diagnosis

- Lumbar instability
  - Decreased ROM with pain in weight bearing – extension/SB
  - Improved ROM unweighted – sidelying
  - Prone instability test – N/A
  - PA glides +
  - ROM of SLR > 91 degrees (Hicks)
  - Pain in groin region
  - Irritation of iliolumbar ligament due to increase strain with instability
  - Anterior Instability Test @ 45 degrees and 90 degrees
  - Load transfer problems
PT Diagnosis

- SI joint provocation tests (-)

- SUI vs. cauda equina syndrome
  - weak pelvic floor muscles
  - no multilevel myotomal weakness, saddle parasthesia, or urinary retention/bowel dysfunction

- DRA contribution — weakness of abdominal wall is associated with pelvic floor muscle weakness (Spitznagle, 2007)
  - Overuse of obliques due to DRA and loss of core muscle stabilizers
Interventions

• Unweight the hip —
  – PWB, WBAT, NWB?

• Increased time resting (swelling and reduce pressure on inferior vena cava)

• Begin deep core muscle stabilization — transversus abdominus, pelvic floor, multifidus
  – Protection of DRA
  – Consider lumbar support and/or abdominal support

• Isometric hip exercises and AROM within pain free ROM

• Body mechanics, bed positioning, ADL’s

• Aerobic Exercise — recumbent bike, water ex
  – Instruction in monitoring vitals
LEFT side lying allows optimal profusion of blood to fetus...
Postural Correction Assessment and Treatment
Secondary Interventions

- Refer to nutritionist
- Refer to psychologist
- Discuss with OB/Gyn MD
  - status of possible hip stress fracture, inferior vena cava compression in standing (swelling of LE’s)
  - referral to orthopedist, CV?
- Implications for labor and delivery
Interventions

• When able to WB without pain
  – Standing stabilization exercises including load transfer
  – Ball exercises
  – Walking with parameters
  – Body mechanics – lift, carry,

• Address thoracic spine stiffness and forward head posture
  – Manual therapy
  – Breathing exercises
Other considerations in Antepartum population

- Pelvic ring instability
  - Pelvic belts
  - Maternity support
  - Taping
  - Decrease load transfers and asymmetrical movements until healed

- HNP
  - Extension and sidebending mobilizations and exercise done in the sidelying positions
  - Considerations for labor and delivery
External Stabilization/Support
Emergencies in Pregnancy

- Fluid leakage
- Vaginal bleeding
- Sudden swelling
- Severe headaches
- Changes in vision
- Dizziness fainting
- Sudden weight gain
- Abdominal pain
- Fever 101 or greater
- Pain with Urination
- Contractions or pelvic pressure
- Vomiting lasting >24 hours
- Decrease in fetal movement
POSTPARTUM AND PHYSICAL THERAPY
Psychological Health

- **Psychiatric disorders:**
  - Postpartum blues
  - Postpartum depression
  - Postpartum psychosis

- 80% experience mood fluctuation
- 10-20% major depression
- 0.1-0.2% signs of psychosis
  (Steiner, 1998)

- Lactating women have increased estrogen/progesterone and prolactin and may be at less risk for mental health disorders
Return of Normal Menses

- Return to ovulation and cyclical changes by 55-60 days in non-lactating women

- Ovulation returns at 30-40 weeks with menses return at 8-15 months in lactating women
  (Wang IY, Fraser IS, 1994)

- FACT: the longer the mother breastfeeds, the more likely it is that menses will resume and ovulation will proceed even while lactation is still in progress!
  (Laskey MA, Prentice A 1999)
Changes in Bone Mineral Density

- Lactation – 1.5 liters of milk produced (50g of fat, 100g of lactose and 2-3g calcium phosphate lost each day) requires large quantities of dairy and vitamin D

- Parathyroid glands remain enlarged keeping the bones at risk for progressive decalcification

(Hosking DJ, 1996)
Changes in Bone Mineral Density

- 3-5 day postpartum females have significantly lower lumbar BMD’s than controls suggesting that BMD loss may be caused by pregnancy itself

- 3 months post lactation and formula feeding women show BMD back up to prepregnant levels in all areas except the femoral neck (still suggests that the pregnancy is the cause)

(Laskey MA, Prentice A, 1999)
Lactation induced decreased BMD’s are independent of exercise and calcium intake, vitamin D, post partum weight change or use of progesterone only contraceptive (Laskey, et al, 1998)

Pregnant and postpartum women are at an increased risk for fracture (especially the femoral neck)
Ligamentous Instability

- Changes in pelvic diameter and SI joint mobility occur during delivery (not before as assumed), not pathological unless greater than 10mm (Scriven MW, Jones DA, McKnight L, 1995)

- Large infant size, small pelvis, rapid 2nd stage delivery, application of force to abduct thighs (Spaeth DG, 1997)
Ligamentous Instability

- Relaxin: conflicting studies vary on association with joint laxity and pelvic pain in post partum women

- Due to estrogen/progesterone influence over ligamentous composition

- Lactating women are at greater risk for delayed return to normal ligamentous joint stability due to delay of return to prepregnant hormone values
DRA

- Can return to normal by 4 weeks
- Muscle performance significantly impaired at 8 weeks
  
  (Gillett WL, Brown JM, 1996)
Muscle Function

- Pelvic Floor
  - Vaginal delivery — decreased ability to generate intra-vaginal and intra-anal pressure as measured by mamometry

- 21% SUI with spontaneous delivery, 37% with instrument assisted

- 5.5% of spontaneous and 4% of instrument assisted c/o fecal incontinence
  (Peschers UM et al, 1997)
Muscle Function

- Pelvic floor - Changes in post partum incontinence
  - Prolonged 1\textsuperscript{st} and 2\textsuperscript{nd} stage labor
  - Operative vaginal delivery
  - Episiotomy
  - Pudendal nerve latency – (return to normal rates at 2-3 months with continued problems with pelvic floor muscle function at 6 months)
Lactation has higher calorie intake and increased energy demand

Lactation requires 55% increase of protein

Weight loss is better determined by amount gained prior to delivery, smoking and lack of exercise
Cardiovascular and Pulmonary Function

Cardiac output reaches baseline at 2 weeks post delivery.
PHYSICAL SIGNS AND SYMPTOMS COMMON IN POSTPARTUM WOMEN
Low Back Pain

- Clinical Considerations
  - Musculoskeletal and hormonal changes contribute
  - Strong association between low back pain in pregnancy and subsequent postpartum pain
  - Postpartum pain negatively affects quality of life
Low Back Pain

PT implications:
- Prevent and treat low back pain during pregnancy
  - Posture and body mechanics education
  - Stabilization exercises
  - Supportive devices as needed
Clinical considerations:
- Autonomic and hormonal changes of pregnancy may create reduced stability – especially hips, knees and feet
- Postpartum pain linked with pain during pregnancy, increased age, and previous injury
PT implications:
- Evaluate LE alignment and gait
- Restore normal muscle balance through exercise, supportive devices and orthotics
Clinical considerations:

- Migraine, tension and vascular headaches associated with pregnancy
- Postpartum headaches possibly related to pressure changes of the CSF, hormone changes, multiparity, past history of headaches (including during pregnancy)
Headaches

- PT implications:
  - Education on prevention and management of headaches, including relaxation and massage techniques
Carpal Tunnel Syndrome

- Clinical considerations:
  - Pregnancy primary risk factor due to generalized edema (resolve within one month post delivery)
  - Postpartum CTS linked to lactation related fluid retention
  - Symptoms aggravated by static postures while breastfeeding
Carpal Tunnel Syndrome

PT implications
- Education on proper body mechanics and posture while breastfeeding
- Gloves or splints as needed to reduce symptoms
Dyspareunia

- Clinical considerations:
  - Postpartum linked to poor episiotomy repair and healing, decreased estrogen levels
  - Significantly under reported by women
Dyspareunia

- **PT implications**
  - Pelvic floor muscle relaxation and perineal stretching before delivery to minimize pelvic floor trauma
  - Postpartum pelvic floor muscle rehabilitation including scar tissue massage, relaxation and desensitization
Varicosities

- Clinical considerations:
  - Caused by increased venous pressure, reduced venous blood flow, and venous dilation during pregnancy
  - Most commonly in the form of hemorrhoids and varicose veins
Varicosities

PT implications:

- Prevention through active LE exercise, compression stockings, avoidance of static postures such as prolonged standing and crossing legs
Weight Retention

- **Clinical considerations:**
  - Failure to return to prepartum (80% loose weight but not to prepartum) weight linked to lifestyle factors such as decreased exercise and increased caloric intake
  - Evidence that vigorous exercise during the postpartum period is safe (no adverse effects on milk composition or volume)
  - Physically active postpartum women report decrease in mood disturbances and increased sense of well-being
Weight Retention

- PT implications:
  - Education on and recommendations for healthy nutrition and safe exercise
Urinary/Fecal Incontinence

- Clinical considerations:
  - UI linked to vaginal delivery, parity and UI during pregnancy, and pelvic floor muscle weakness
  - FI linked to mode of delivery, parity, episiotomy, sphincter trauma and pelvic floor muscle weakness
PT implications:

- Education and training in pelvic floor muscle strengthening, relaxation and preparation for of the perineum for child birth
- Postpartum training in muscle performance, posture and activity
- Studies show early intervention, education and working on exercises for slow and fast twitch fibers are most effective
- No evidence for length of time for exercise, long term benefits or how long benefits are maintained
## Considerations to Manage

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<td>Reduced exercise level with weight gain</td>
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QUESTIONS?
clightonsc@upmc.edu