Transient Osteoporosis of the Hip Associated with Pregnancy

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Jill S. Boissonnault, PT, MS

BACKGROUND

Osteoporosis is generally defined as an age-related disorder characterized by decreased bone mass and increased bone fragility in the absence of other recognizable causes of bone loss. Osteoporosis, while occurring most commonly in Caucasian women over the age of 50 years, can occur at other points of the life cycle. During pregnancy, for example, transient osteoporosis is reported to occur in some women in the third trimester. In the women who develop transient osteoporosis, back, groin, hip, or lower extremity pain may result, and, in rare instances, this condition is manifested by bony fracture. Pregnancy increases the demand on maternal skeleton stores, with 30 grams of calcium required for mineralization of the fetal skeleton. This calcium need is met by increased maternal bone resorption, decreased maternal bone formation, increased intestinal calcium absorption, and decreased urinary calcium excretion. The maternal skeleton calcium store is said to be 1000 grams, which is generally thought to be adequate to meet both maternal and fetal requirements. The mechanism for the transient osteoporosis is not clear, as evidenced by the various theories and controversy over whether pregnancy and osteoporosis share a causal or accidental relationship.

Dunne et al studied 35 women with known histories of pregnancy-related osteoporosis and found a statistically significant higher prevalence of fracture occurring at a younger age in the mothers of these women. This led them to speculate that osteoporosis in pregnant women may be associated with some specific genetic factor that may possibly lead to lower bone densities. Conversely, Smith et al followed patients with osteoporosis for 24 years and noted normal collagen synthesis. Interestingly, these researchers also noted that only 4 of the 14 subsequent pregnancies among this group were accompanied by any symptoms of osteoporosis, which consisted of very mild pain complaints. Smith et al did not rule out a genetic or pre-existing osteoporotic condition contributing to pregnancy-related osteoporosis, but they suggested that the disease is related to a particular pregnancy (most often the first) and perhaps to characteristics of a given fetus.

Khastgir et al also believed that pregnancy is the precipitant, rather than the cause, of osteoporosis. They presented a case of a 34-year-old woman with ovarian dysgenesis who conceived following in vitro fertilization of donated oocytes. They followed her prospectively and were, therefore, able to document decreased bone mineral density at the hip and lumbosacral spine at 4 weeks postpartum. Of significance, however, is the fact that, prior to the pregnancy, this woman had low (< 2 SD) bone mineral density at the hip and of the spine compared to matched normals. Khastgir et al hypothesized that the degree of bone loss in this woman was similar to the loss noted by Drinkwater and Chestnut in their study of women without pre-existing osteopenia who were monitored throughout their pregnancies. All 6 of the women in this study demonstrated loss of bone density at the femoral neck (-2.4 ± 0.5%, P ≤ 0.05) without symptoms of osteoporosis. Considering the Drinkwater and Chestnut findings, Khastgir et al deduced that the bone loss noted in their patient would not have been enough on its own to produce osteoporosis. This led them to conclude that their patient’s pre-existing osteopenia, coupled with fetal calcium demands, induced the osteoporosis with resultant complaints of debilitating left hip and leg...
pain and an inability to bear weight by 35 weeks gestation.

Lending additional evidence to the potential genetic influence is a report by Carbone et al., who presented a 10-year follow-up of 2 patients with osteoporosis during pregnancy and their offspring. Not only did the osteopenia persist at the distal radii of these 2 women, the osteopenia was also present in the radii of their daughters, ages 11 and 13. Though osteoporosis in pregnancy is generally thought to be a transient process with a clinical course of spontaneous recovery, Carbone et al cautioned that it may have a permanent sequela and necessitate long-term follow-up of both mother and offspring. Other theories of the etiology include pressure on the obturator nerve by the fetus and hormonal or chemical factors. Chigira et al reported on osteoporosis of the hip in 2 successive pregnancies. When the second pregnancy was terminated in the first trimester, the patient experienced immediate relief of her hip pain, though it took longer for the osteoporosis to resolve. Chigira et al suggested that a rapid change in relevant hormonal or chemical factors might be responsible for the immediate pain relief. Samdani et al described a typical patient presentation for transient osteoporosis of the hip: third trimester onset, complaints of pain in the inguinal or greater trochanteric regions that may radiate to the anterior thigh, range of motion (ROM) limitations of the hip, and functionally restricted weight-bearing. Recovery time is said to be anywhere from 2 to 12 months, though lactation may prolong the process. More than 500 cases of osteoporosis of the hip during pregnancy are reported in the literature, and in at least 5 of these cases, hip fractures were present. No existing reports of physical therapy differential diagnosis or management of this condition were found in the literature.

Pregnant women with musculoskeletal complaints significant enough to diminish function are generally no longer told to "endure until delivery." It is our experience that a referral of these patients to physical therapy is now more commonplace. It is estimated that 47 to 90% of women experience some type of back or posterior pelvic pain in pregnancy and that posterior pelvic pain is 4 times more common than back pain. Pubic symphysis symptoms may also be associated with these complaints. Pain secondary to pelvic ring dysfunction (ie, sacroiliac joint and pubic symphysis dysfunction) can be perceived about the hip or groin, which is also where pain may be noted by women with transient osteoporosis of the hip. Physical therapists examining pregnant women with low back and pelvic ring pain must consider the lumbar spine, sacroiliac joints, pubic symphysis, and hip joints as possible sources of the pain. The following case report describes a patient referred to physical therapy with a chief complaint that was found to be unrelated to the original medical diagnosis. The purpose of this report is to describe the physical therapy differential diagnostic process that led to the patient's referral to a physician and the subsequent diagnosis of transient osteoporosis of the hip.

**HISTORY**

A 32-year-old credit records specialist was referred to the first author with a diagnosis of sciatica. The referral was initiated by an obstetric and gynecologic physician and a certified nurse midwife approximately 2 weeks prior to the initial physical therapy visit. Symptom investigation revealed a multitude of complaints (Figure 1). The chief pain complaint interfering with function was deep right groin pain. The groin symptoms began approximately 4 weeks prior to the initial physical therapy visit. Initially, and at the time of the most recent nurse midwife visit, the complaints were of intermittent stiffness, not pain. The patient could not relate the onset of the stiffness to a particular incident or accident, nor could she describe any change in physical activity level pre-
TABLE 1. Patient’s relevant medical history.

<table>
<thead>
<tr>
<th>Past medical history</th>
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<tbody>
<tr>
<td>Depression (1994)</td>
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<tr>
<td>Tonsillectomy (1972)</td>
<td></td>
</tr>
<tr>
<td>Eye surgery (1971)</td>
<td></td>
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<tr>
<td>Eye surgery (1979)</td>
<td></td>
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<tr>
<td>L5-S1 herniated nucleus pulposis (1996)</td>
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<table>
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<tr>
<th>Family medical history</th>
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<tbody>
<tr>
<td>Diabetes</td>
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<td>Hypertension</td>
<td></td>
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<tr>
<td>Cancer</td>
<td></td>
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<tr>
<td>Arthritis</td>
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<table>
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<tr>
<th>Medication</th>
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</thead>
<tbody>
<tr>
<td>Tylenol (over-the-counter)</td>
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</table>

ceeding the onset. Seven to 10 days prior to the physical therapy visit the hip stiffness was replaced by intense, sharp groin pain and a constant aching sensation that she felt deep inside her hip. The patient could not relate the sudden worsening to any trauma and had not reported the exacerbation to the nurse midwife.

At the time of the initial physical therapy visit, the patient rated the hip pain intensity between 4 and 9 on a scale of 0–10, with zero being pain free and 10 being the worst pain imaginable. The intense sharp pain (9/10) was provoked immediately with weight-bearing. Functionally, standing was limited to 10 minutes and walking to 2–3 blocks. Up until 1 week prior to the initial physical therapy visit, sitting and lying down would completely relieve the chief complaint, but now these positions relieved only the sharp pain, while the deep aching pain (4/10) remained. The patient also described a need to lift the right leg with both hands in order to get into and out of the car and bed. When first questioned, she stated that the right leg felt weak; but upon further probing, she admitted it was not lack of power but avoidance of the sharp groin pain that necessitated the lifting of her leg. The patient stated she had never experienced hip pain like this prior to the 7–10 days leading up to the physical therapy visit.

In addition to the chief complaint, the patient also described an ache that extended from the central low lumbar region into the right buttock and lateral thigh to just distal to the lateral knee joint line. This intermittent ache was accompanied by right lower leg paresthesia (Figure 1). These symptoms began insidiously 3 months prior to the initial physical therapy visit, had slowly worsened over the subsequent 12 weeks, and were the patient’s chief complaint when the nurse midwife examined her. The intensity of these symptoms ranged between 2 and 5 out of 10 with sitting and forward flexed trunk postures being the most provocative factors. Sitting was now limited to 10 minutes. The patient stated that these symptoms were very similar to the left leg symptoms she had experienced in 1996 when she had been treated for a herniated disc at L5-S1.

A review of the patient’s current medical history revealed she was a nullipara at 29 weeks gestation. She reported no complications with the pregnancy and was seeing a nurse midwife every 2 weeks. The patient’s past medical history and family medical history are detailed in Table 1. Her depression had been successfully managed in the past, and the first author had successfully treated the patient in 1996 for left low back pain and left sciatica from an L5-S1 herniated nucleus pulposis. Weight gain, fatigue, and dysuria were noted by the patient during the review of systems questioning. The weight gain and fatigue were considered appropriate by the nurse midwife for the current stage of pregnancy, and the complaints of dysuria were being investigated by the nurse midwife and physician.

**Impression From Patient’s History**

Certain aspects of the patient’s description of her chief complaint raised concern about the underlying cause of the symptoms. Data that were inconsistent with symptoms typically associated with joint and soft tissue impairments included the pain intensity (9/10), the sudden onset of the symptoms, and the inability to lift the right lower extremity, none of which could be attributed to a precipitating incident or accident. In addition, the location of the chief pain complaint was the right groin area, which is inconsistent with the referral diagnosis of sciatica. Lastly, the fact that the patient no longer noted complete relief with the assumption of non-weight-bearing positions

FIGURE 3. Magnetic resonance coronal image of the pelvis and hips. The 3 arrows identify the high-signal intensity zone representing bone marrow edema of the proximal right femur (upper shaft, femoral neck, and head) and the right hip joint effusion when compared to the corresponding areas of the left hip.
TABLE 2. Hip range of motion (ROM) findings in degrees.

<table>
<thead>
<tr>
<th>Motion (normal ROM)*</th>
<th>Right hip ROM/passive ROM</th>
<th>Left hip ROM (active ROM)</th>
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</thead>
<tbody>
<tr>
<td>Flexion (110–120)</td>
<td>85°/85°</td>
<td>125</td>
</tr>
<tr>
<td>Internal rotation (30–40)</td>
<td>5°/5°</td>
<td>40</td>
</tr>
<tr>
<td>External rotation (40–60)</td>
<td>50/55</td>
<td>55</td>
</tr>
<tr>
<td>Abduction (30–50)</td>
<td>20/20</td>
<td>45</td>
</tr>
<tr>
<td>Extension (10–15)</td>
<td>5/8</td>
<td>15</td>
</tr>
<tr>
<td>Adduction (30)</td>
<td>Not tested</td>
<td>Not tested</td>
</tr>
</tbody>
</table>

* Normal ROM figures from Magee.15

1 Right hip adduction was not tested due to the increasing right hip pain following the assessment of the other movements.

2 Indicates the chief complaint of sharp groin pain was provoked at the end of the movement.

as she had a week ago (the deep aching remained) suggested her condition was worsening. This recent worsening also could not be attributed to an incident or accident.

In addition to the pain presentation, the patient’s medical history included dysuria (of yet to be determined origin) and the current pregnancy. Dysuria is a potential symptom of urinary tract infections, which is a risk factor for osteomyelitis. However, osteomyelitis in adults occurs more frequently in the elderly and most commonly involves the vertebral column as opposed to the long bones of the extremities.3 The first author was also aware of the possibility of reduced bone density during pregnancy and the associated potential complications. The sharp groin pain and deep hip aching indicated that a detailed examination of the hip and pelvis, including sacroiliac joints, pubic symphysis, and associated soft tissue structures, be completed. A screening of the lumbar spine and a neurologic examination were also planned based on the secondary complaints of buttock and thigh aching and lower leg paresthesia.

PHYSICAL EXAMINATION

While standing during the postural assessment, the patient’s weight was almost fully shifted over the left lower extremity, and the right lower extremity was externally rotated. Any attempt to have the patient internally rotate the right lower extremity and weight-bear symmetrically resulted in the provocation of the sharp right groin pain. She also presented with a very slow antalgic gait pattern with the deep groin pain provoked by each step onto the right foot. Trunk active ROM provoked the right groin pain at end range of forward flexion and right sidebending. During forward flexion, the patient’s fingertips reached 4 inches below the knees, and during right sidebending her fingertips reached 2 inches above the lateral right knee joint line. Prior to the patient reaching end range of forward flexion, she experienced a moderate stretch in the posterior aspect of the right thigh. Trunk backward bending was reduced at the lumbosacral junction, and right lumboSacral junction pressure was noted by the patient. During left sidebending, the patient’s fingertips reached 3 inches below the lateral left knee joint line. The patient felt a mild stretch at the right iliac crest at end range of left sidebending.

With the patient in a supine position, palpation revealed moderate to severe tenderness over the right femoral triangle and just distal to the triangle. Palpation and application of firm pressure over the pubic symphysis resulted in the patient feeling local pressure, but no tenderness nor pain were provoked. The iliac shear and sacroiliac joint tapping tests, as described by Magee,15 did not increase existing complaints nor provoke the sharp groin pain. The patient was unable to actively move the right hip because of the sharp groin pain. Active-assistive hip ROM and passive ROM assessment resulted in provocation of the patient’s chief complaint (sharp groin pain) at the end range of flexion and internal rotation. Right hip abduction and extension resulted in a sharp pulling sensation in the groin area, while end range of external rotation produced only a “slight twinge of pain” in the groin area. Table 2 summarizes hip ROM findings. During the passive ROM assessment, an empty end-feel was noted with right hip flexion and internal rotation, and a spasm end-feel was found with abduction. Cyriax8 described the empty end-feel as provocation of considerable pain before the examiner senses any tissue resistance to the passive movement and the spasm end-feel as an

FIGURE 4. Magnetic resonance axial image of the right hip. The 3 arrows identify the high-signal intensity zone representing bone marrow edema of the right femoral head and the right hip joint effusion.
complaint. Weight-bearing on the right lower extremity, right hip flexion, internal rotation, active-assistive ROM, passive ROM, and passive right straight leg raise provoked sharp right groin pain. The right hip ROM findings suggested the presence of a capsular pattern of restriction, which Cyriax described as a pattern of movement limitation characteristic of a specific joint when a lesion involves either the joint capsule or the synovial membrane. The capsular pattern of the hip is defined as gross limitation of flexion, abduction, and medial rotation with slight limitation of extension and little or no limitation of lateral rotation. The most painful area during palpation was over the femoral triangle. A potentially confounding finding was the provocation of the right hip pain with active trunk forward flexion and right sidebending. However, the patient reported that the hip tests provoked a much more intense pain than the trunk movements. Also, the first author observed that during active trunk right sidebending, the patient began to shift weight over the right lower extremity just prior to complaining of the groin pain. Similarly, during trunk forward flexion, the first author noted the pelvis rotating anteriorly (relative hip flexion) just prior to the provocation of the sharp hip pain. The first author, therefore, concluded that the right hip joint and associated structures were more likely to be the source of the patient’s debilitating complaints than sciatica. If the right hip tests had not been so provocative of pain, further testing of the sacroiliac and lumbar region would have been completed.

The second important clinical decision concerned the etiology of the chief complaint and whether physical therapy intervention was appropriate. The factors raising concern from the patient’s history were supported by the physical examination findings. The extent of right hip ROM loss was consistent with the subjective complaint of the pain severity (9/10). The empty end-feel noted with right hip flexion and internal rotation indicated the potential presence of hip pathology. Cyriax stated that when intense pain stops the passive movement at this point in the ROM, it could be associated with serious disease, such as infection, neoplasm, or acute bursitis. Also alarming was the provocation of sharp groin pain with straight leg raise to 30 degrees. The discomfort or pain typically associated with straight leg raise is felt on the posterior aspect of the lower extremity.

The decision was made to refer the patient back to her physician for an evaluation prior to initiating any physical therapy treatment. Table 3 summarizes the most significant findings leading to this decision. These findings were communicated to the nurse midwife as the rationale for the referral, as was the concern of a possible presence of fracture, avascular necrosis, or infection. The patient was, subsequently,

**Impression From The Physical Examination**

The initial challenge in differential diagnosis was to attempt to identify the source of the patient’s chief complaint. The physical examination findings were not consistent with the medical diagnosis of sciatica but indicated that the right hip joint and associated structures were the potential source of her chief

![Figure 5](image-url) Follow-up conventional radiograph of the pelvis and hips taken approximately 13 weeks after the initial radiograph (Figure 2). According to the radiologist, this radiograph revealed normal mineralization of the right femur and acetabulum. The arrows identify the femoral neck and head and the acetabulum.

abrupt stop to the passive movement secondary to muscle spasm. A capsular end-feel was noted with hip external rotation and extension. Cyriax described the capsular end-feel as a firm arrest of movement with some give noted at the end of the passive range. Passive right straight leg raise was limited to 30 degrees with the patient noting provocation of the sharp groin pain. The first author’s attempt to assess right hip joint lateral distraction and long axis distraction, as described by Magee, was unsuccessful due to the patient’s inability to relax sufficiently because of the intense groin pain. Muscle length and strength testing were not attempted because of the acuteness of the patient’s condition.

The neurologic examination revealed slightly decreased light touch sensation over the lateral aspect of the right lower leg. The right Achilles reflex was graded 1+, while the quadriceps reflexes and the left Achilles reflex were graded 2+. Bates described the range of deep tendon reflex findings as: 0, no response; 1+, somewhat diminished response; 2+, normal response; 3+, brisk response; and 4+, very brisk response. There were no other neurologic signs present, although the myotome tests (isometric muscle contraction held for at least 5 seconds) for knee extension and hip flexion could not be completed because of the provocation of sharp right hip pain.
TABLE 3. Symptoms and signs leading to the decision to refer the patient to her obstetrician.

<table>
<thead>
<tr>
<th>Symptoms</th>
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<tbody>
<tr>
<td>Sudden onset of chief complaint (sharp groin and aching hip pain)</td>
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<tr>
<td>Severe, incapacitating pain (9/10)</td>
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<tr>
<td>Inability to actively lift right lower extremity</td>
</tr>
<tr>
<td>No precipitating incident or accident</td>
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<tr>
<td>Insufficient relief of pain with rest</td>
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<tr>
<td>Physician unaware of the patient's worsening condition</td>
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<td></td>
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<tr>
<td>Signs</td>
</tr>
<tr>
<td>Significant active-assistive ROM and passive ROM loss: right hip flexion and internal rotation and abduction</td>
</tr>
<tr>
<td>Empty end-feel with passive right hip flexion, internal rotation, and straight leg raise</td>
</tr>
<tr>
<td>Spasm end-feel with passive right hip abduction</td>
</tr>
<tr>
<td>Sharp groin pain provoked with right straight leg raise to 30 degrees</td>
</tr>
<tr>
<td>Inability to tolerate muscle length and strength testing due to intense groin pain</td>
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seen by her obstetrician the day after the initial physical therapy visit.

**COURSE OF TREATMENT**

The patient called the first author approximately 2 weeks after the initial physical therapy visit, stating that blood tests and urinalysis were negative and the hip pain had decreased to 6/10. She stated the lab tests were to check for an infection. She attributed the improvement in her pain to using crutches when standing and walking and spending less time on her feet because she had taken leave from work. The doctor had recommended that if the pain did not improve within a couple of weeks, she should go to an orthopaedic physician. The patient felt she had improved enough that she would continue with the current plan of using crutches and a leave from work until delivery.

The patient returned to see the first author 1-week postpartum for a re-evaluation. The examination findings were similar to the findings noted when the patient was seen at the 29th week of her pregnancy, and she had not yet seen an orthopaedist. The nurse midwife was contacted about the previous and current concerns, and the first author was directed to refer the patient to an orthopaedist. The physician requested conventional radiographs of the hips and pelvis, and the films revealed osteopenia of the right proximal femur and acetabulum (Figure 2). No evidence of fracture or avascular necrosis was noted. Wanting to identify the cause of the osteopenia, the physician then ordered magnetic resonance imaging (MRI) of the pelvis and hip. The MRI revealed bone marrow edema of the right femoral head, neck, and intertrochanteric region (Figures 3 and 4). The radiologist’s impression included possible very early avascular necrosis, but he believed the findings were due to transient osteoporosis. Based on this information, combined with the clinical examination findings, the orthopaedist diagnosed the patient with transient osteoporosis of the hip associated with pregnancy. The patient was told the condition was self-limiting and would resolve over time, and she was instructed to use the crutches until she could ambulate without the sharp groin pain. The patient was also scheduled to have conventional radiographs taken of the right hip in 2 months.

The patient returned to physical therapy for rehabilitation. Due to the degree of pain provoked when attempting land-based exercises, an aquatics therapy program was initiated. The primary goals were to increase right hip ROM and strength and to promote an increase in bone density. The emphasis of this program included forward, backward, and sidestepping ambulation, as well as trunk stabilization exercises and right hip ROM exercises. The general instruction was to avoid or not provoke the sharp right groin pain. After 4 weeks of rehabilitation, which included 10 aquatic therapy visits (4 with a physical therapist, 1 with a physical therapist assistant, and 5 independent), the patient returned to see the first author. She was now no longer using the crutches, and the sharp groin and aching pain (chief complaint) had been alleviated. She still experienced an intermittent deep ache in the right hip area, though, especially at the end of the day. Right groin pain was still provoked at the end range of hip flexion and internal rotation, but ROM had increased to 95 and 15 degrees respectively. The patient also stated the lateral thigh aching and right lower leg paresthesia had resolved. After 4 additional weeks of the aquatic therapy, she returned to see the orthopaedist for a follow-up pelvis and hip radiograph. This plain film revealed a significantly increased degree of bone density in the proximal femur and acetabulum (Figure 5).
She was advised to continue slowly progressing her activity level and that she was still at risk for developing a stress fracture if she became too aggressive with her weight-bearing activities. The patient returned to the physician's office for a follow-up MRI approximately 3-4 weeks (15 weeks postpartum) after the follow-up plain film. The axial view revealed slight residual high-signal intensity in the right femoral head and acetabulum (Figure 6), indicating a marked reduction of the bone marrow edema compared to the MRI findings noted in Figure 4.

Shortly after the follow-up MRI, the patient called the first author to report that she and her family were moving out of the area. She stated that she still experienced daily right hip stiffness and soreness with an intensity range of zero to 4 out of 10. She had not experienced any of the initially noted aching in the right thigh or lower leg paresthesia for several weeks, but she had injured her right knee for which she would seek care after her move.

CONCLUSION

Physical therapists must decide if a patient presents with a condition for which physical therapy intervention is appropriate or if a physician referral and consult are warranted. The fact that this patient's chief complaint changed dramatically between her last obstetric appointment and her initial physical therapy visit illustrates how patients with medical conditions that necessitate physician involvement can be referred to a physical therapist. Determining the source of a patient's chief complaint is always a challenge. The difficulty of this patient's assessment was compounded by the need to limit the examination of the patient to standing, sitting, and supine positions because of the pregnancy and the severe hip pain. Fortunately, the hip joint examination clearly revealed a cluster of findings that implicated the hip joint and associated structures as the source of the patient's chief complaint. These symptoms were atypical for musculoskeletal conditions that commonly respond to physical therapy intervention. Osteoporosis occurring in women of child-bearing age who do not have a history of relevant comorbidities, such as chronic renal or gastrointestinal disease, could easily be overlooked by clinicians. Although symptoms from bone density loss during pregnancy occur relatively infrequently, physical therapists working with this population must remain aware of such a possibility.

REFERENCES

Invited Commentary

First and foremost, the authors should be commended for focusing our attention on the physical signs and symptoms that physical therapy practitioners may encounter during evaluation that should serve as indicators of when not to treat. Our natural tendency as clinicians is to make patients feel better, but there are times when doing nothing is the most beneficial course of action. The woman in the Resident’s Case Problem had several signs and symptoms (eg, empty end-feel, pain with weight-bearing) that should have provoked concern during evaluation, and the authors nicely describe a conservative approach to her treatment.

One aspect of the case problem that warrants additional mention is the idea of 'transient' osteoporosis, indicating that this form of osteoporosis is distinctly different from the senile variety of bone loss. It made sense to put the patient with 'transient' osteoporosis on an aquatics program to reduce pain, gain range of motion, and enhance muscle activation. The aquatics program, however, did not in all likelihood have anything to do with the increase in bone mass that occurred in this woman. For most patients with post-menopausal osteoporosis, an aquatic treatment approach is inadequate.

There is a substantial body of evidence indicating that it is possible to enhance bone mass in post-menopausal osteoporotic women with exercise. The stimulus for an increase in bone, however, must be activity over and above that which is performed routinely. Typically, resistance training or impact loading are the most suitable forms of exercise. Most of our patients are inactive, particularly those who are older, and an ‘adequate stimulus’ for an increase in bone mass might be less rigorous for an older osteoporotic woman than the stimulus required for a younger, more active woman. For example, ascending multiple flights of stairs or wearing a weighted vest may increase bone mass in an older osteoporotic woman, whereas this activity may be insufficient to produce any change in a young woman. A more demanding sport, such as tennis or actual weight training, may be required for a younger woman with poor bone stock.

Regardless of age, there have been a number of risk factors associated with bone loss in women. All of our patients, regardless of age and whether pregnant or post-menopausal, should be reminded of the importance of diet and adequate calcium intake. Even the best weight-bearing exercise prescription will be useless unless calcium intake is adequate. Some women may need to be apprised of the potential negative effects on bone mass from excessive alcohol intake and smoking behavior. On occasion it may be necessary to refer a patient to her physician to consider hormone replacement therapy or Raloxifene.

Because women with osteoporosis can increase their bone mass with exercise, physical therapists have the potential to markedly influence quality of life in these individuals. As practitioners, however, we need to be mindful of all factors associated with successful physical therapy intervention. In addition we should be mindful of therapies other health care professionals can offer that will augment our success.

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REFERENCES
We thank Dr. Brown for her review and commentary of our paper. The primary purpose of this Resident's Case Problem was to describe the clinical manifestations of transient osteoporosis of the hip (TOH). Equally important, this case illustrates how patients with occult medical disease can be referred to a physical therapy clinic. The patient described in this article experienced a significant worsening of symptoms between the most recent medical clinic visit and the initial physical therapy visit. She had not contacted her physician or nurse midwife because she associated the increased pain with sciatica, a condition she had treated in the past. The outcome of this case, consultation, and subsequent diagnosis of TOH also illustrates one of the important roles a physical therapist can play in a collaborative medical model, that associated with secondary prevention.

While we agree with Dr. Brown's statement that "Our natural tendency as clinicians is to make patients feel better...", we would like to discuss her statement "...there are times when doing nothing is the most beneficial course of action." Although relatively uncommon, there are times when not initiating treatment is in fact the therapist's most appropriate clinical decision. However, reaching this conclusion, and subsequently referring a patient to a physician, should not be construed as doing nothing. In this case, truly doing nothing would have entailed completing the patient examination and then sending her home without a treatment program in place or a recommendation that she return to her physician. Evaluation is one of the elements of the Patient/Client Management Model illustrated in the Guide To Physical Therapy Practice and is described as the making of clinical judgments based on data collected during the examination. A possible outcome of the evaluation is the identification of possible problems that require consultation with or referral to another provider. By taking this action, physical therapists may contribute to the earlier diagnosis of an occult medical condition by a physician. Although our paper is not the first case published regarding a patient with occult bony hip disease being referred by a physical therapist to a physician for subsequent diagnosis, to our knowledge it is the first such case with TOH accounting for the etiology of the hip pain.

With regard to the issue of transient osteoporosis, we agree with Dr. Brown that there is no direct evidence that the aquatics program was responsible for the increase in bone mass noted in the patient's follow-up radiographs. The aquatics program was initiated because a land-based exercise program was not possible because of the intense hip pain she was experiencing. The aquatics program was intended to be a transition from her initial state of inactivity to land-based exercise and functional activities.

Theoretically, TOH is unlike osteoporosis seen with senile bone loss in that it is supposedly "transient," but not all studies support this notion. Dunne et al. questioned this concept of transience when they researched 29 women with pregnancy-related osteoporosis and noted a possible prolongation of osteopenia in lactating women. Dunne et al. stated that there was no information on bone density recovery in this population. Carbone et al. examined 2 women 10 years after pregnancies complicated by TOH and found they continued to exhibit osteopenia of the hip. If TOH demonstrates a truly transient decrease in bone density, then focusing on return to function and investigation of underlying etiological factors would comprise the most important medical and rehabilitative strategy. If TOH is not as transient as much of the literature purports it to be, then continued multifaceted management for this population as described by Dr. Brown would be very important.

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