we find no indication to advise parents to exclude their healthy children from surface swimming activities because of fear of exacerbating or causing otitis media.

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References

1. Morgan D, Sheno Ch M: Swimming in chlorinated water and its effect on eustachian tube function. *J Laryngol Otol* 1989;103:257-258.
2. Chan K, Douglas Swarts J, Rudoy R, et al: Otitis media in the Republic of Palau. *Arch Otolaryngol Head Neck Surg* 1993;119:425-428.
3. Grace A, Ryan R, Durham L, Johnson A: The effect of swimming in chlorinated water on middle ear pressure. *J Otolaryngol* 1987;164:228-230.
4. Desterbeck RA, Clement PAR, Kaufman L, Derde MP: De invloed van het zwemmen op de neusdoorgankelijkheid en de tubafunctie bij kinderen. *Acta Otorhinolaryngol Belg* 1986; 40(4):606-614.
5. Bluestone CD, Klein JO: *Otitis Media in Infants and Children*. 2nd ed. Philadelphia, Pa, WB Saunders, 1995, p 41.
6. Zielhuis GA, Heuvelmans-Heinen EW, Rach GH: Environmental risk factors for otitis media with effusion in preschool children. *Scand J Prim Health Care* 1989;7:33-38.
7. Eason RJ, Harding E, Nicholson R, et al: Chronic suppurative otitis media in the Solomon Islands: A prospective, microbiological, audiometric and therapeutic survey. *N Z Med J* 1986;99:812-815.
8. Robson WL, Leung AK: Swimming and ear infection. *J R Soc Health* 1990;110:199-200.
9. Schwartz R: Recommendations for swimming for children with ear infection and/or associated complications. *Pediatr Infect Dis J* 1992;11:58-59.
10. Cohen HA, Kauschansky A, Balir A, et al: Swimming and grommets. *J Fam Pract* 1994; 38:32-34.
11. Pringle MB: Grommets, swimming and otorrhoea—A review. *J Laryngol Otol* 1993;107:190-194.
12. Harrison CJ, Belhorn TH: Antibiotic treatment failures in acute otitis media. *Pediatr Ann* 1991;20:600-608.

JAOA Clinical practice

Observatory clues to aid in the diagnosing of diastasis symphysis pubis: An underreported complication of parturition

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Diagnosis of diastasis symphysis pubis in the postpartum period need not depend on radiographic findings. This diagnosis can be made with simple observation techniques. Entertaining a high index of suspicion and observation of the patient are the most important contributions the physician can make. Parameters triggering a tentative diagnosis would include, but not be limited to, a large infant, a small pelvis, a rapid second stage of delivery, or application of forces to abduct the thighs. The diagnosis of diastasis symphysis pubis should be ruled out if the following conditions are present postpartum: the flattened abdomen (the postpartum "pooch" is absent); the patient is incontinent of urine when changing position from supine/prone to upright; the patient has pain in the hips or sacral region when walking; or the patient waddles when walking. The change in gait, or the pain on walking may not be noticed until 24 hours or more after delivery. However, the change in abdominal contour and incontinence is noticed immediately. Using these observational clues, the physician can institute treatment sooner, thereby expediting recovery.

(Key words: Diastasis, symphysis pubis, postpartum pooch, complications of parturition, complications of delivery)

Separation of the symphysis pubis and of the sacroiliac joint may occur during parturition. Historically, opening of the pelvic joints was considered necessary for childbirth,^{1,2} and some widening is normally associated with pregnancy.^{3,4} This physiologic widening is small and asymptomatic, and regresses shortly after delivery.⁴ Rarely, a diastasis of greater than 1 cm may occur.⁴ The reported frequency of this diastasis occurring during parturition varies from 1:30,000 to 1:600.^{1,3,5-7} If the diastasis is greater than

4 cm, the sacroiliac joint is involved^{1,3} and requires aggressive treatment. Brehm and Weirauk³ arbitrarily classified patients with diastasis symphysis pubis into four groups based on the amount of separation (Table). The treatment depends on the degree of separation and the symptoms the patient experiences. The treatment methods employed ranged from bed rest and positioning, to circular bandages wrapped around the patient's hips, to injection of hydrocortisone and chymotrypsin into the symphysis, to external fixation with transcutaneous pins.

Early postpartum mobilization is important for the patient's physical (and financial) well-being. This can be achieved only if the diastasis is diagnosed early, and appropriate treatment

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Table
Classifications and Treatments of Diastasis Symphysis Pubis Caused by Parturition

Classification of separation	Amount of separation	Common symptoms	Common treatment
1: Normal, no separation	< 0.5 cm	None	None
2: Slight (1°)	0.5 cm to 0.9 cm	None	None
3: Moderate (2°)	0.9 cm to 2 cm	■ Pain in pubes ■ Fear of moving ■ Urinary problems ■ Gait changes (?) ■ No postpartum "pooch"*	■ Strap pelvis ■ Inject hydrocortisone, chymotrypsin into symphysis ■ Catheterize patient postvoid ■ Bed rest
4: Severe (3°)	> 2 cm	■ Same as Classification 3 <i>plus</i> ☐ Distinct waddling gait ☐ Urinary incontinence ☐ No postpartum pooch*	■ Same as Classification 3 <i>plus</i> ☐ Binding ☐ External fixation

*Loss of postpartum "pooch" occurs in classification 3 and 4 separations. Specific number of centimeters measuring the separation for this loss of postpartum pooch has not been determined, but probably varies with the mother's physical condition.

is instituted. A review of the literature shows that a pertinent clinical feature of this condition is not addressed: the effect of diastasis symphysis pubis on the contour of the abdomen. Awareness of this feature may facilitate the diagnosis and eliminate the need for radiographic examination of the parturient patient. The purpose of this article is to report a case of severe diastasis symphysis pubis and the importance of observation (by the physician, and/or nursing staff) in making the diagnosis of this underreported condition.⁷

Case report

A 25-year-old, white, gravida 1 para 0, woman, who had a small/marginal pelvis, presented in active labor. She completed the first stage of labor in less than 5 hours. The vertex was occiput anterior and at a 0/+1 station. As the baby's head began to descend, the mother complained of a sharp pain in her pubic symphysis and in the sacral region. She was encouraged to continue to push with her contractions. Two or three pushes later, her

son was born, weighing 4400 g (9 pounds, 11 ounces). The shoulder dystocia that occurred was corrected by delivering the nuchal arm that was also present. During her postpartum stay in the hospital, the patient complained of pain in her hips, difficulty walking, and total urinary incontinence. Little pain was noted in her pubic symphysis, except on palpation. However, any motion produced pain in her hips. The patient had difficulty standing erect and used any support that was available. Whenever the patient changed her position from supine to upright, she was incontinent of urine. Visual examination of the abdomen showed that the postpartum "pooch" was absent. The patient was discharged the second postpartum day with a complicating diagnosis of diastasis symphysis pubis. The patient was seen in the office on the third postpartum day complaining of increased pain in her hips and lower back and an inability to walk. She exhibited a waddling, swaying gait.

On the fifth postpartum day, she presented to the emergency room com-

plaining of fever, weakness, and pain in her right hip. The emergency room physician, with an obstetrician/gynecologist consultation, diagnosed the patient as having a urinary tract infection, being anemic (hemoglobin level, 6 g/dL), having a subinvolved uterus, and needing a neurologic consultation for her hip pain. A suction curettage of the uterus removed a fair amount of blood clots. The patient was started on antibiotic therapy and transfused with 3 units of packed red blood cells. Knowing that the patient had a diastasis symphysis pubis, the attending physician (D.G.S.) obtained an orthopedic consultation. The orthopedic surgeon determined that the pubic bones were now separated 5 cm and that the sacrospinous, sacrotuberous, and anterior sacroiliac ligaments on the right were ruptured. He elected to approximate the pubic bones with percutaneous pins and an external Hoffman frame. The patient tolerated the procedure well, with rapid amelioration of her symptoms. Two years later she had an elective cesarean delivery for her second baby,

Figure 1. The photograph shows a normal postpartum "pooch." The fullness between the umbilicus and the pubic region is due to the still-enlarged uterus and to the stretched abdominal muscles from the gravid uterus. In a diastasis symphysis pubes, this fullness may be absent, as the abdominal contents may have fallen into the enlarged pelvic cavity.

A.

B.

Figure 2. Top diagram (A) represents a normal female pelvis. Several of the major ligaments are shown by sketch, and the diameter of the pelvis is shown as R . The bottom diagram (B) represents a female pelvis with severe diastasis symphysis pubis. Note that the diameter has increased by r and several of the ligaments are torn. Due to the elasticity of the ligaments, most separations of the pubic rami "spring" back to normal, or near-normal configurations. If the strain on the sacroiliac ligaments is too rapid, or the stretch too great, the ligaments will tear. This tearing allows the diastasis to remain. Thus, external aids, such as binding, fixation, or manipulation may be required for healing.

with no complications attributed to her diastasis symphysis pubis.

Discussion

Review of the literature shows that the diagnosis of diastasis symphysis pubis is based on (supra)pubic pain, changes in gait, and x-ray film findings.^{3,7-9} The incidence of this complication is reported to occur from 1 in 30,000 to 1 in 600 vaginal deliveries.^{1,3,5-7} The varying incidence is probably due to the vague determination of diastasis and the almost-universal minimal diastasis with spontaneous resolution that occurs in all vaginal deliveries.^{1-3,9,10} It is difficult to ascertain when the diastasis of the pubic rami becomes a complication and not a normal variant of parturition. The natural, rapid resolution of this complication of childbirth also makes the diagnosis rare. The varying severity of symptoms for similar degrees of separation^{3,4,8,10} contributes to the difficulty of evaluation.

A summary of the different classes of diastasis symphysis pubis and their respective treatments is presented in the *Table*. The lower degrees of separation are considered normal.^{1,2,4} These pubic diastases (< 0.9 cm separation) resolve spontaneously without intervention and are usually not diagnosed.³ Many of the second-degree diastases (measuring 0.9 cm to 2 cm of separation) may be considered routine discomfort from having a baby and are not evaluated. Third-degree diastases, greater than 2 cm of separation, may involve the sacroiliac ligaments. This usually affects the patient's ability to ambulate. The attending physician needs to have a high index of suspicion for this condition, so that rapid, appropriate treatment can be given when indicated, and to avoid severe consequences.

The reliance on radiographic findings for diagnosis has limited the study of this complication. However, as physicians, our observatory skills should enable us to detect which patients may benefit from a pelvic radiograph. *Figure 1* shows the abdomen of a parturient. The lower abdomen shows a postpartum pooch caused by the enlarged uterus and the lax abdominal muscles. If significant dias-

tasis symphysis pubis is present, this postpartum pooch is reduced, or not present. Using this observation, in addition to the new mother's complaints of pain with motion and urinary problems, the diagnosis of diastasis symphysis pubis will be made more conveniently and accurately.

Several postpartum complications of this patient can all be traced to the separation of the pubes. The separation of the pubic symphysis caused the tearing/straining of the sacroiliac ligaments (*Figure 2*). This tearing/straining produced the instability in the pelvic girdle that caused the patient's waddling gait and pain on standing and walking. Not until the pelvis was stabilized did the patient have normal ambulation. The separation of the pubic symphysis increased the pelvic diameter, which increased the area of the pelvic floor (*Figure 2 B*), thereby decreasing the support provided to the internal organs, such as the urinary bladder and the uterus. The urinary bladder sags into the pelvis, changing the angle of the urethra, decreasing the midurethral resistance, which produces urinary incontinence. This illustrates a true case of urinary incontinence due to a "fallen bladder."

The enlargement of the pelvic cavity also allows the uterus to sag into the pelvis causing a retroversion of the uterus. This retroversion allowed the normal lochia to accumulate within the uterine cavity, forming a clot, and blocking involution. Subinvolution caused a continuous moderate to heavy lochia and contributed to the patient's low hemoglobin level. The diastasis symphysis pubis might have allowed hemorrhage into the symphysis or into the pelvis itself, also causing the patient's hemoglobin level to drop.

The increased volume of the pelvis allowed more of the internal organs to fall into the pelvis, producing the loss of the postpartum pooch. It is the postpartum pooch that serves as a diagnostic aid to the physician. The postpartum pooch is normally present in all women following delivery and is caused by the laxity of the abdominal muscles that have been stretched over a 40-week-gravid

uterus and the still-enlarged uterus. (The uterus is usually at or near the level of the umbilicus during the first 48 hours postpartum.) The increased pelvic volume caused by the diastasis pubes allows the abdominal organs and the lax muscles to fall deeper into the pelvis, minimizing the postpartum pooch. Each physician has multiple opportunities to inspect the parturient's abdomen immediately postpartum and at subsequent visits. If this pooch is not present, the physician needs to investigate why it is absent. The physician should suspect a diastasis symphysis pubis whenever the postpartum pooch is not seen. This is especially true if there is associated urinary incontinence. If diastasis of the pubes is present, the potential is great for hemorrhaging into the pelvis. Moreover, the patient can suffer distress due to urinary incontinence and pain when rolling over or trying to walk. The physician needs to be alert for these problems and to provide appropriate and expeditious treatment.

Comment

All postpartum patients need to be visually examined in the supine position, with attention paid to the lower abdominal contour. They also need to be observed changing from the supine to the erect position and walking. Any loss of postpartum pooch, urinary incontinence, or the presence of pain or a waddling gait suggests a diastasis of the symphysis pubes. Radiologic evaluation of the pelvis is indicated if this diagnosis is suspected.

Warning signs of diastasis symphysis pubis include:

- ☐ sudden pain during transition or delivery (especially with a large baby or a small pelvis);
- ☐ a loud or audible "pop" during transition;
- ☐ postpartum pain in the pubic, hips, or sacral region, especially with weight-bearing activity;
- ☐ urinary incontinence, particularly when changing positions;
- ☐ difficulty walking, a waddling gait, or the need for support to assume the erect position; and
- ☐ absence of postpartum pooch, espe-

cially when the patient is in the supine position.

Awareness of these symptoms provides the physician with an increased index of suspicion, enabling for a more accurate diagnosis of this complication, and providing mothers with better medical care and a more rapid recovery.

References

1. Callahan JT: Separation of the symphysis pubis. *Am J Obstet and Gynec* 1953;66:281-293.
2. Crimm MW, Moss SW: Pelvic diastasis in pregnancy. *Am Fam Physician* 1987;35:185-186.
3. Brehm W, Weirauk HV: Separation of the symphysis pubis during labor. *Am J Obstet Gynec* 1928; 15:187-191.
4. Lindsey RW, Leggon RE, Wright DG, Nolasco DR: Separation of the symphysis pubis in association with childbearing. *J Bone Joint Surg* 1988;70-A(2):289-292.
5. Schwartz Z, Katz Z, Lancet M: Management of puerperal separation of the symphysis pubis. *Int J Gynaecol Obstet* 1985;23:125-128.
6. Senechal PK: Symphysis pubic separation during childbirth. *J Am Board Fam Pract* 1994;7:141-144.
7. Taylor RN, Sonson RD: Separation of the pubic symphysis - An underrecognized peripartum complication. *J Reprod Med* 1966;31:203-206.
8. Driessen F: Postpartum pelvic arthropathy with unusual features. *Br J Obstet Gynaecol* 1987;94:870-872.
9. Kane R, Erez S, O'Leary JA: Symptomatic symphyseal separation in pregnancy. *Surg Gynecol Obstet* 1967;124:1032-1036.
10. Kubitz RL, Goodlin RC: Symptomatic separation of the pubic symphysis. *South Med J* 1986;79:578-580.

Clinical practice continued

Cardiovascular manifestations of Lyme disease

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Lyme disease is a multisystem illness that may affect the heart. *Borrelia burgdorferi* infection should be suspected in all patients with unexplained cardiac symptoms who are or who have been exposed to endemic areas. Prompt diagnosis and treatment are needed to avoid potentially life-threatening complications, as well as the inappropriate insertion of a permanent pacemaker. The author reviews the cardiac complications associated with Lyme disease, and provides diagnostic and therapeutic approaches for effective patient care.

(Key words: Carditis, cardiomyopathy, Lyme disease, ticks, *Borrelia burgdorferi*)

Lyme disease is a systemic illness with protean clinical manifestations. It primarily affects the skin, nervous system, joints, and heart. The disease can occur at any age and in either sex, and is now recognized as a major health hazard. Caused by the ixodid tick-borne spirochete *Borrelia burgdorferi*, it is the most prevalent vector-borne illness in the United States today. The incidence of Lyme disease has rapidly increased since 1979, when this infection was first described in the United States. From 1982 through 1989, the number of cases reported annually increased 18-fold (from 497 to 8803, respectively) and from 1986 through 1989, it nearly doubled each year. The endemic range has also expanded rapidly, as all but four states reported cases in 1989 and 1990, with most occurring in the eastern half of the country.¹

The potentially fatal cardiac involvement of Lyme disease remains the least well-documented complication of this complex, multisystem illness, which often presents with nonspecific signs and symp-

toms. Although significant advances have been made in our understanding and management of the disease,²⁻⁴ its cardiovascular manifestations have not yet been fully elucidated. Cardiac involvement occurs in 8% to 10% of reported cases,⁵ but probably goes undetected in many cases. The true incidence may also be somewhat higher in view of the recent recognition of seronegative infection (<5% of cases).^{6,7} Furthermore, although cardiac involvement (that is, Lyme carditis) was originally described as a mild self-limited carditis, involving primarily the conduction system,⁸ recent reports suggest that it may be more serious than previously suspected, and may lead to heart failure and probably congestive cardiomyopathy.⁹⁻¹¹ Permanent damage to the heart is known to be a possible consequence of the infection.

Therefore, physicians who care for patients with Lyme disease, must carefully consider the possibility of cardiac involvement. The necessity of differential diagnosis with Lyme disease in all cases of unclear myocarditis and cardiac arrhythmia in patients living in, or exposed to, areas endemic for Lyme disease should be recognized. The failure to identify Lyme disease as the cause of heart block may lead to the unnecessary implantation of a permanent pacemaker. Furthermore,

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