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Symphysis Pubis Dysfunction: Analysis of Risk Factors and Basic Diagnostic Criteria

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ABSTRACT

BACKGROUND: Symphysis pubis dysfunction is a pregnancy complication with significant statistical variations in incidence due to the lack of clear diagnostic criteria and overdiagnosis. One of the causes of this complication is excessive relaxin production, which induces structural changes in the fibrocartilaginous disc and resorption of the symphyseal margins. During normal pregnancy, this discrepancy is insignificant and amounts to 2–3 mm by the end of the third trimester; it is adaptive in nature, while facilitating the unimpeded passage of the fetus through the mother's birth canal. However, if the pubic joint is excessively relaxed, it becomes unstable, with discomfort and lumbar or pelvic girdle pain appearing. To diagnose subluxation of the symphysis pubis, various provocative tests, echography, and radiography of the pubic joint are performed. However, the degree of discrepancy in the echographic picture rarely correlates with the severity of the clinical picture.

AIM: The aim of this study was to identify risk factors for symphysis pubis dysfunction and assess its ultrasound diagnostic criteria.

METHODS: We analyzed 40 medical histories of pregnant women with symphysis pubis dysfunction and 50 medical histories of those without the pathology. Risk factors were assessed and ultrasound diagnostics of the pubic joint was performed in all women before and after childbirth using Voluson 730 and Logiq 9 expert-class devices in three-dimensional mode with the 5–10 MHz linear sensor.

RESULTS: Most women with symphysis pubis dysfunction were multiparous under 35 years of age. Primiparous women were only diagnosed with grades I and II dysfunction (100%), while 14% of multiparous patients were diagnosed with grade III dysfunction. In patients with symphysis pubis dysfunction, inflammatory diseases of the uterus and appendages, infertility, and polycystic ovary syndrome were more common gynecological pathologies and were detected in 47.5%, 35% and 27.5% of cases versus 14%, 4% and 10% of cases in the control group, respectively ($p < 0.05$). Grades II and III dysfunction was most often detected in pregnant women with overweight and obesity – in 91.7% of cases ($p < 0.05$). In all patients with grade I dysfunction, the fetal weight was up to 3,500 g, while in the study groups with grades II and III dysfunction, the baby weighed more than 3,500 g and was large in 66.6% of patients ($p < 0.05$). During ultrasound examination, 83.3% of patients with grades II and III dysfunction, along with diastasis, revealed symptoms characteristic of inflammation ($p < 0.05$), and 28% of pregnant women in the control group were diagnosed with pubic symphysis divergence that corresponded to grades I and II dysfunction — 85.7% and 14.3% of cases, respectively. At the same time, no clinical manifestations were detected.

CONCLUSION: Important risk factors for symphysis pubis dysfunction are metabolic and endocrine disorders, inflammatory diseases of the female reproductive organs, repeated childbirth, and fetal weight of over 3,500 g. Ultrasound criteria for diagnosing this condition are not reliable for grade I dysfunction.

Keywords: symphysis pubis dysfunction; pregnancy; complicated childbirth; obesity; large fetus; ultrasound examination.

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Дисфункция лонного сочленения: анализ факторов риска и основных диагностических критериев

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АННОТАЦИЯ

Обоснование. Дисфункция лонного сочленения — осложнение беременности со значительными статистическими колебаниями встречаемости из-за отсутствия четких диагностических критериев и гипердиагностики. Одна из причин возникновения этого осложнения — избыточная выработка релаксина, вызывающая структурные изменения в межкостном фиброзном диске и резорбцию краев симфиза. При физиологически протекающей беременности данное расхождение незначительно и составляет 2–3 мм к концу III триместра беременности, носит адаптационный характер, облегчая беспрепятственное прохождение плода через родовые пути матери. Однако при чрезмерном расслаблении сустава возникает его нестабильность, появляются дискомфорт и поясничные или тазовые опоясывающие боли. Для диагностики подвывиха лонного сочленения проводят различные провокационные тесты, эхографию, рентгенографию лонного сочленения. Однако степень расхождения по эхографической картине редко коррелирует со степенью выраженности клинической картины.

Цель — выявить факторы риска дисфункции лонного сочленения и оценить его ультразвуковые диагностические критерии.

Материалы и методы. Проанализированы 40 историй болезни беременных с дисфункцией лонного сочленения и 50 историй болезни беременных без патологии симфиза. У всех женщин оценены факторы риска и проведено ультразвуковое исследование лонного сочленения до и после родов на аппаратах экспертного класса Voluson 730 и Logiq 9 в трехмерном режиме линейным датчиком с диапазоном частот 5–10 МГц.

Результаты. Большинство женщин с дисфункцией лонного сочленения были повторнородящими в возрасте до 35 лет. У первородящих пациенток диагностирована дисфункция только I и II степени (100%), в то время как у 14% повторнородящих — III степени. Гинекологическая патология чаще встречалась у пациенток с дисфункцией лонного сочленения: воспалительные заболевания матки и придатков, бесплодие и синдром поликистозных яичников были выявлены в 47,5, 35 и 27,5% случаев против 14, 4 и 10% случаев в контрольной группе соответственно (p <0,05). Дисфункцию лонного сочленения II и III степеней чаще выявляли у беременных с избыточной массой тела и ожирением — в 91,7% случаев (p <0,05). У всех пациенток с дисфункцией I степени масса плода была до 3500 г, в то время как в группах со II и III степенями отметили массу плода более 3500 г или крупный плод у 66,6% пациенток (p <0,05). При ультразвуковом исследовании у 83,3% пациенток со II и III степенями патологии симфиза наряду с диастазом выявляли симптомы, характерные для воспалительного процесса (p <0,05), а у 28% беременных контрольной группы диагностировано расхождение лонного сочленения, соответствующее его дисфункции I и II степеней — 85,7 и 14,3% случаев соответственно. При этом никаких клинических проявлений не выявлено.

Заключение. Важными факторами риска развития дисфункции лонного сочленения являются обменно-эндокринные нарушения, воспалительные заболевания женских репродуктивных органов, повторные роды и масса плода более 3500 г. Ультразвуковые критерии диагностики состояния лонного сочленения не достоверны для диагностирования его дисфункции I степени.

Ключевые слова: дисфункция лонного сочленения; беременность; осложненные роды; ожирение; крупный плод; ультразвуковое исследование.

Как цитировать

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BACKGROUND

Symphysis pubis dysfunction (SPD) is a relatively uncommon pregnancy complication, with an incidence rate ranging from 0.12% to 56.00%. Such a significant variability can be attributed to the absence of clear diagnostic criteria and overdiagnosis [1]. Excessive relaxin production is a known cause of SPD during pregnancy, resulting in structural changes in the interosseous fibrous disc and resorption of the pubic symphysis margins [2]. This combination of factors increases pubic symphysis diastasis, bone ring instability, and pain. Clinically, SPD is considered a dislocated pubic symphysis. A history of SPD and pelvic instability due to pelvic asymmetry, osteochondrosis, or severe lordosis are possible predisposing factors [3]. During a normal pregnancy, pubic symphysis diastasis is typically minimal, ranging from 2 to 3 mm by the end of the third trimester. This diastasis is adaptive, facilitating the normal passage through the maternal pelvis [4–6]. However, in case of excessive joint laxity, a joint becomes unstable, resulting in discomfort and pain [7]. This condition is caused by three biochemical mechanisms: increased hyaluronidase levels, decreased collagen synthesis, and reduced calcium and vitamin D content. In addition, a dislocated pubic symphysis can be caused by traumatic events such as operative vaginal delivery, Kristeller maneuver, McRoberts maneuver, etc. [8, 9].

A dislocated pubic symphysis can manifest as lumbar or pelvic girdle pain, or both. The latter is known as lumbopelvic pain, which usually occurs during the second or third trimesters, during delivery, or within the first 24 to 48 hours after delivery [10]. Pelvic girdle pain of varying severity develops in 50%–70% of pregnant women [11] and can be continuous or episodic, unilateral or bilateral, with possible radiation to the thighs, knees, and calves [12]. Lumbar pain is typically less severe, rarely radiates to the lower extremities, and may be accompanied by hypersensitivity of paravertebral muscles [13].

A dislocated pubic symphysis is diagnosed using various provocation tests. The most sensitive and specific tests are those which detect pain when the pubic symphysis is palpated, including PPPP (Posterior Pelvic Pain Provocation) test, FABER (Flexion, Abduction and External Rotation) or Patrick test, modified Trendelenburg, and Menell test [14]. Investigations include echography and radiography of the pubic symphysis. Pubic symphysis diastasis is classified using an ultrasound classification system proposed by Serov et al. (2011). grade 1: 5–8 mm; grade 2: 8–10 mm; and grade 3: >10 mm. However, the absolute grade of pubic symphysis diastasis is the least significant diagnostic criterion and rarely correlates with the severity of clinical symptoms.

Watchful waiting is necessary for pregnant women at risk of SPD, as well as for those with pubic symphysis changes that were first identified by ultrasound. The grade of pubic symphysis diastasis by the end of pregnancy is one of the criteria used to diagnose SPD and determine the delivery method to prevent birth trauma and maternal disability.

The study aimed to identify risk factors for SPD and evaluate pubic symphysis changes using ultrasound in pregnant women with and without symphysis pain.

METHODS

A retrospective analysis of pregnancy and delivery outcomes included 40 women with SPD enrolled from 2020 to 2023 at the Trans-Baikal Regional Perinatal Center (Chita, Russia). Grade 1, 2, and 3 SPD was diagnosed in 16, 20, and 4 women, respectively. The control group included 50 women with full-term pregnancies who did not have SPD and underwent pubic symphysis ultrasound before and after delivery. Pregnancy after cesarean section was an exclusion criterion. All women underwent clinical blood tests, blood chemistry, and investigations to evaluate the fetus's condition (ultrasound, Doppler ultrasound, and cardiotocography). A three-dimensional ultrasound of the pubic symphysis was performed using Voluson 730 and Logiq 9 expert systems with a 5–10 MHz linear sensor. Ultrasound was indicated for discomfort and/or pain in the pubic symphysis when walking or palpating. Statistica 10 and Microsoft Excel 2013 were used to process the results statistically. Statistical significance (p) was assessed based on 95% confidence intervals. In all cases, the results were statistically significant at $p < 0.05$.

RESULTS AND DISCUSSION

Most pregnant women in the SPD group were of childbearing potential and were distributed as follows: 18–25 years: 40% (16 women); 26–35 years: 55% (22 women); >35 years: 5% (2 women). In addition, 70% (28) of the women in the SPD group were multiparous, whereas 30% (12) were primiparous. In the control group, 58% (29) of women were primiparous and 42% (21) were multiparous ($p < 0.05$).

The parity distribution in the SPD group was as follows: 64.3% (18 women) had 3–4 deliveries; 21.4% (6) had >4 deliveries; 14.3% (4) had 1–2 deliveries. In the control group, most multiparous women had 1–2 deliveries; 71% (15) had 3–4 deliveries, and only 9.5% (2) had >4 deliveries ($p < 0.05$).

In the SPD group, 66.6% (8) of primiparous women had grades 1 and 2 SPD, and 33.3% (4) had grade 3 SPD ($p < 0.05$). In multiparous women, only 28.6% (8) had grade 1 SPD, 57.1% (16) women had grade 2 SPD, and 14.3% (4) had grade 3 SPD ($p < 0.05$).

The study groups showed unremarkable development and characteristics of menstrual function. More women in the SPD group had gynecological disorders compared with

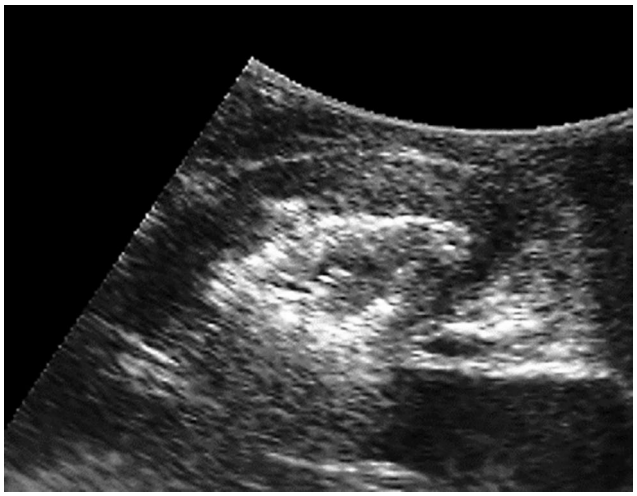

Fig. 1. Echogram of the patient's symphysis pubis in the sagittal plane.
Рис. 1. Эхограмма лонного симфиза пациентки в сагиттальной плоскости.

the control group. For example, 47.5% (19) in the SPD group and only 14% (7) women in the control group had a history of uterine and adnexal inflammation ($p < 0.05$). A history of infertility was reported in 35% (14) of women in the SPD group, with 57% (8) of cases associated with endometriosis. In the control group, infertility of unknown origin was diagnosed in 4% (2) of pregnant women ($p < 0.05$). Polycystic ovary syndrome was detected in 27.5% (11) of women in the SPD group and in 10% (5) in the control group ($p < 0.05$). There was no statistical difference in the uterine fibroid rates between the SPD and control groups: 15% (6) vs 6% (3).

A history of abortion was reported in 75% (30) of cases of the SPD group compared with 52% (26) cases of the control group. For example, the termination of more than two pregnancies was reported by 66.7% (20) of women in the SPD group and 38.5% (10) in the control group ($p < 0.05$). There was no statistically significant difference in the history of spontaneous miscarriage between the SPD and control groups: 20% (8) vs 12% (6).

In the SPD group, 45% (18) of women were overweight, 25% (10) had grade 1–2 obesity, and only 30% (12) had a normal body mass index. In the control group, 80% (40) of women had a normal body weight ($p < 0.05$), 12% (6) were overweight and 8% (4) had grade 1 diet-induced constitutive obesity. A higher percentage of overweight or diet-induced obese women had grades 2 and 3 SPD (91.7%, or 22 women), whereas only 37.5% (6 women) had grade 1 SPD ($p < 0,05$). No significant differences were found in cardiovascular, urinary, gastrointestinal, or pulmonary disorders.

The fetal weight ranged from 3,000 to 3,500 g in 60% (24) of women with SPD, exceeded 3,500 g in 35% (14) of women, and a large fetus was diagnosed in 5% (2) of women. In addition, all 16 women with grade 1 SPD had a fetal weight of 3,500 g, whereas 66.6% (16) of women with grades 2 and 3 SPD had a fetal weight of >3,500 g or a large fetus ($p < 0.05$).

All pregnant women with SPD reported varying degrees of pain when their pubic symphysis was palpated or when they changed positions. For example, women with grades 2 and 3 SPD complained of severe pubic symphysis pain that worsened when walking or changing positions: 100% (4) and 75% (15), respectively. Mild pain and discomfort in the pubic symphysis were reported in 87.5% (14) of patients with grade 1 SPD and 25% (5) of women with grade 2 SPD. Severe pain, edema, suprapubic swelling, and waddling gait were observed in 100% (4) of women with grade 3 SPD and in 50% (10) of women with grade 2 SPD.

An ultrasound examination of women with grade 1 SPD showed no changes in the pubic symphysis except for diastasis. In addition to diastasis, typical inflammatory symptoms were found in 83.3% (20) of women with grades 2 and 3 SPD. A heterogeneous symphysis with hypoechoic inclusions and an irregular contour was reported, with a total of 50% structural changes ($p < 0.05$) (Fig. 1).

It should be noted that ultrasound showed pubic symphysis diastasis in 28% (14) of women in the control group, including 85.7% (12) of women with grade 1 SPD and 14.3% (2) of women with grade 2 SPD. However, no clinical symptoms were identified, such as pain or an abnormal gait. Therefore, the symphysis width in normal cases and in grade 1 SPD falls within the margin of error of ultrasound measurements, which are an unreliable parameter for assessing tissue changes and insufficient for diagnosing SPD. In addition, pain is not always associated with SPD due to the increased tension in the ligaments and muscles that occurs during the third trimester.

CONCLUSION

Significant risk factors for SPD during pregnancy include being overweight or obese, having gynecological inflammation, having ≥2 abortions, having >2 vaginal deliveries, and having a fetus weighing >3,500 g. Ultrasound criteria alone are insufficient for diagnosing grade 1 SPD. Therefore, additional predictors should be identified, and an ultrasound classification system for SPD may need to be revised.

ADDITIONAL INFORMATION

Author contributions: *E.S. Akhmetova:* investigation, formal analysis, writing – original draft; *M.N. Mochalova:* conceptualization, writing – review & editing; *A.I. Galeeva:* writing – original draft, writing – review & editing. All authors approved the version of the manuscript to be published, and agreed to be accountable for all aspects of the work, ensuring that questions related to the accuracy or integrity of any part of it are appropriately reviewed and resolved.

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ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ

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Этический комитет. Проведение исследования одобрено локальным этическим комитетом Читинской государственной медицинской академии (№ 97 от 06.11.2024). Все участники исследования добровольно подписали форму информированного согласия на участие в исследовании. Исследование и его протокол не регистрировали.
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Раскрытие интересов. Авторы заявляют об отсутствии отношений, деятельности и интересов за последние три года, связанных с третьими лицами (коммерческими и некоммерческими), интересы которых могут быть затронуты содержанием статьи.
Оригинальность. При создании настоящей работы авторы не использовали ранее опубликованные сведения (текст, иллюстрации, данные).
Доступ к данным. Все данные, полученные в настоящем исследовании, доступны в статье.
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