Pelvic Floor Ultrasound Evaluation of the Impact of Delivery Times and Delivery Methods on the Anterior Pelvic Cavity

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Abstract: Objective: To evaluate the impact of delivery frequency and delivery method on the anterior pelvic cavity using pelvic floor ultrasound. Method: 200 women who gave birth in our hospital from January 2019 to January 2022 were selected as the research subjects, including 100 first-time vaginal delivery women, 50 second-time vaginal delivery women, and 50 cesarean section women each. The control group consisted of 100 women who underwent a 15 day follow-up examination after the first artificial abortion surgery in our hospital during the same period. The patients were divided into a control group, a first-time delivery group, a second-time delivery group, and a cesarean section group. Observing the changes in the anterior pelvic structure during resting state and maximum Valsalva movement through perineal ultrasound examination. Result: The distance from the bladder neck to the reference line in the resting state was significantly different between the control group, cesarean section group, first vaginal delivery group, and second vaginal delivery group ($P<0.05$); During the maximum Valsalva maneuver, the detection rate of bladder neck mobility, urethral rotation angle, posterior angle of bladder, and funneling of internal urethral orifice, the second vaginal delivery group, the first vaginal delivery group>the cesarean section group>the control group, and the difference between each group was statistically significant ($P<0.05$). During the maximum Valsalva maneuver in the first and second vaginal delivery groups, the lowest point of the bladder was located below the reference line, and there was no statistically significant difference between the two groups ($P>0.05$); During the maximum Valsalva maneuver in the cesarean section group and control group, the lowest point of the bladder was located on the reference line, and there was no statistically significant difference between the two groups ($P>0.05$); The difference between the vaginal delivery group and the cesarean section and control group was statistically significant ($P<0.05$). Conclusion: Different birth times and delivery methods have varying degrees of impact on the anterior pelvic cavity of women. Pelvic floor ultrasound can early evaluate these structural changes and provide reliable basis for the screening and diagnosis of pelvic floor dysfunction disease (PFD).
Keywords: Pelvic Floor Ultrasound; Anterior Pelvic Cavity; Delivery Method; Parity

1. Materials and Methods

1.1 Data sources

A questionnaire survey and pelvic floor ultrasound examination were conducted on 200 women who underwent routine postpartum examinations for 42-60 days from January 2019 to January 2022 in our hospital. 100 cases in the first vaginal delivery group; 50 cases in the second vaginal delivery group, with both fetuses delivered via vagina; The cesarean section group consists of 50 primiparous women. Exclusion criteria: (1) Have a history of premature birth and induced labor; (2) Have a history of abdominal surgery; (3) Individuals with large pelvic masses; (4) People with chronic diseases such as diabetes and hypertension. The control group consists of 100 women who underwent the first artificial abortion in our hospital at the same time and underwent a follow-up examination 15 days after delivery. The exclusion criteria are the same as above.

1.2 Method

1.2.1 Questionnaire survey

A general questionnaire survey was conducted among the selected subjects, including age, height, pre pregnancy and pre delivery quality, pelvic floor ultrasound body mass (that is, 42~60 days after delivery), delivery frequency and mode, newborn birth body mass, whether there is abnormal defecation and previous history (chronic cough, hypertension, diabetes, pelvic surgery, preterm delivery, induced labor history, etc.). Body mass index measurement: Body mass index (BMI)=body mass (kg)/height 2 (m2).

1.2.2 Inspection methods and anterior pelvic measurement indicators

Before the examination, the examinee was instructed to empty the stool. The bladder capacity was about 50~100ml. The structures of the bladder, urethra, vagina and anal canal were clearly displayed on the median sagittal plane plane. The pelvic floor ultrasonic reference line adopts the human horizontal line passing through the posterior lower edge of the pubic symphysis, that is, a 135 ° straight line passing through the posterior lower edge of the pubic symphysis and the central axis of the pubic symphysis. Measurement indicators under resting state: (1) The position of the bladder neck, i.e. the distance from the bladder neck to the reference line; (2) The posterior angle of the bladder, which is the angle between the posterior wall of the bladder triangle and the proximal urethra; (3) Urethral inclination angle refers to the angle between the proximal urethra and the longitudinal axis of the human body. Observation and measurement indicators during the maximum Valsalva action: (1) Bladder neck mobility, which is the difference between the position of the bladder neck during the maximum Valsalva action and the resting state position; (2) Urethral rotation angle, difference in urethral inclination angle between resting state and maximum Valsalva action; (3) The lowest point of the bladder (bladder neck or posterior wall), which is the vertical distance from the lowest point of the bladder to the reference line; (4) If the internal urethral orifice is funnel shaped, observe whether the internal urethral orifice is open and funnel shaped. The bladder neck or lowest point of the bladder is located on the head side of the reference line, defined as the reference line, represented by a positive number; If located on the foot side of the reference line, it is defined as below the reference line and represented by a negative number.

1.2.3 Instruments

The Mindray Resona8 color Doppler ultrasound diagnostic instrument has an intracavity volume probe frequency of 3-9MHz and a volume scanning angle of 120 °.

SPSS17.0 statistical software was used to analyze the data, with econometric data expressed in ($x \pm s$) and inter group differences analyzed using analysis of variance; The counting data is represented by [example (%)], and comparison is made using χ 2 Inspection. $P<0.05$ indicates a statistically significant difference.

2. Results

2.1 Data sources

There was no statistically significant difference in pre pregnancy, pre delivery, and post partum BMI, as well as newborn birth weight among the groups of second vaginal delivery, first vaginal delivery, and cesarean section (all $P>0.05$). There was a statistically significant difference in age between the groups ($P<0.05$), with the second vaginal delivery group and the first vaginal delivery group being higher than the cesarean section group and higher than the control group. However, there was no statistically significant difference between the first vaginal delivery group and the cesarean section group (P>0.05).

2.2 Observation indicators of anterior pelvic cavity

Compare the distance between the bladder neck and the reference line in a resting state. The difference between the control group, cesarean section group, first vaginal delivery group, and second vaginal delivery group was statistically significant (P<0.05); There was no statistically significant difference in the posterior horn of the bladder between the groups (P>0.05). The bladder neck movement, urethral rotation angle, and posterior bladder angle during the maximum Valsalva maneuver were significantly higher in the second and first vaginal delivery groups than those in the cesarean section group and control group (P<0.05); The lowest point of the bladder during the maximum Valsalva maneuver in the first and second vaginal delivery groups was below the reference line, and there was no statistically significant difference between the two groups (P>0.05); The lowest point of the bladder during the maximum Valsalva maneuver in the cesarean section group and control group was located on the reference line, and there was no statistically significant difference between the two groups (P>0.05); The differences between the first and second vaginal delivery groups, the cesarean section group, and the control group were statistically significant (all P<0.05). The detection rate of funneling of the internal urethral orifice of the urethra during the maximum Valsalva maneuver: the second vaginal delivery group, the first vaginal delivery group>the cesarean section group>the control group. There was no significant difference between the cesarean section group and the control group (P>0.05), and there was significant difference between the other groups (P<0.05).

3. Discussion

The hormone changes in women's body during pregnancy, the estrogen level decreases, and the nourishing effect on levator ani muscle decreases, resulting in atrophy of levator ani muscle. The enlarged uterus compresses the iliac vein, causing blood reflux disorders, resulting in insufficient blood supply to pelvic floor tissue and metabolic imbalance. In the non pregnancy state, the force of the uterine center of gravity points to the sacrococcygeal bone. The increased uterine center of gravity during pregnancy changes, and the force points to the levator ani muscle. Under the downward pressure, the levator ani muscle is overstretched for a long time, or even exceeds the stretch limit of nerve fibers and loses control of the divine channel. In the process of vaginal delivery, the coronation of the fetal head and the delivery of the fetus mechanically compress the pelvic floor tissues such as the levator ani muscle and ligament fascia, causing extreme tissue expansion, directly leading to myogenic injury. These factors can all lead to damage to the pelvic floor support structure, which may persist until postpartum or even be irreversible.

Therefore, both pregnancy and delivery can cause damage to the pelvic floor supporting tissue in women, leading to changes in pelvic floor structure and being two independent risk factors for PFD. The main manifestations of anterior pelvic PFD are stress urinary incontinence (SUI) and bladder prolapse. Some studies suggest that the prevalence of SUI is higher in pregnant and postpartum women. In patients with SUI, including asymptomatic women, the formation of funneling of the internal urethral orifice can be observed by pelvic floor ultrasound during Valsalva movement and even at rest. This phenomenon is caused by insufficient urethral closure pressure, and is the most relevant indicator with SUI. Morphologically, when the internal urethral orifice is funneled, there is a lower position of the bladder neck and a larger posterior bladder angle, which may be a pathological change formed under the condition of urethral detrusor reflex, detrusor contraction and pressure, suggesting that the supporting structure around the bladder neck and proximal urethra is weakened, leading to the descent of the bladder neck and proximal urethra.

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