The Value of Automated Pelvic Floor Ultrasound in Evaluating New Urinary Incontinence after Surgery for Pelvic Floor Dysfunction

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Abstract: Objective: To analyze the value of automated pelvic floor ultrasound in evaluating new urinary incontinence after surgery for pelvic floor dysfunction. Methods: A total of 120 patients with pelvic floor dysfunction who were treated in our hospital from January 2019 to January 2021 were selected, and they were diagnosed as pelvic floor dysfunction after the study. They underwent obturator vaginal tension free sling surgery (TVT-O), simple anterior and posterior vaginal wall repair, and anterior pelvic mesh implantation in our hospital. And 40 patients with benign gynecological diseases who underwent simple hysterectomy were selected as the control group. All patients were investigated with a brief urinary incontinence questionnaire (ICIQ-SF questionnaire) and automated pelvic floor ultrasound after surgery. To evaluate the consistency between automated pelvic floor ultrasound and the ICIQ-SF questionnaire, the specificity, sensitivity, positive predictive value, and negative predictive value of new postoperative SUI were calculated using specific ultrasound parameters measured by automated pelvic floor ultrasound. Results The urethral rotation angle (58.61 ± 41.02) ° in the repair group was significantly greater than that in the mesh group (25.69 ± 24.55) °, with a statistically significant difference (P<0.05). The sensitivity, specificity, positive predictive value, and negative predictive value for the combined diagnosis of new postoperative SUI were 27%, 98%, 69%, and 90%, respectively. Conclusion The combination of ICIQ-SF questionnaire and automated pelvic floor ultrasound can effectively improve the value of postoperative follow-up in patients with PFD. Automated pelvic floor ultrasound assessment of new urinary incontinence after PFD has significant clinical significance.

Keywords: Pelvic Floor Dysfunction Disease; Automated Pelvic Floor Ultrasound; ICIQ-SF Questionnaire Survey

1. Data and Methods

1.1 Case data

A total of 120 patients with pelvic floor dysfunction who were treated in our hospital from January 2019 to January 2021 were selected, and they were diagnosed as pelvic floor dysfunction patients after study. They received obturator vaginal tension free sling surgery (TVT-O), simple anterior and posterior vaginal wall repair, and anterior pelvic mesh implantation in our hospital. And 40 patients with benign gynecological diseases who underwent simple hysterectomy were selected as the control group. There were no significant differences in age, parity, pregnancy, and BMI among the four groups (P>0.05). In addition, the results of the preoperative urinary incontinence questionnaire (ICIQ-SF questionnaire) in each group suggest that there is no SUI; Preoperative physical examination ruled out occult urinary incontinence.

1.2 Inclusion and Exclusion Criteria

Inclusion criteria: (1) All patients had symptoms and signs related to PFD before surgery, and had been diagnosed clinically. (2) During the preoperative physical examination of the patient, the prolapse site was retracted and no urinary incontinence occurred to rule out occult urinary incontinence. (3) All patients underwent surgical treatment in the hospital where the author works, and the surgical time was>3 months. (4) I am knowledgeable and ethical about this study. All

patients signed an informed consent form. Exclusion criteria: (1) The patient has a history of malignant tumors. (2) Suffer from serious mental system diseases and consciousness disorders. (3) Patients with poor compliance, poor coordination, or refusal to follow up.

1.3 Instruments and inspection methods

Current research has shown that automated pelvic floor ultrasound and traditional manual measurement of pelvic floor ultrasound have high consistency in measurement results, and the automatic measurement software included in automated pelvic floor ultrasound has enabled pelvic floor ultrasound to achieve high clinical effects. Therefore, this study uses the latest intelligent judgment ultrasound for measurement. The ultrasound examination uses the Resona8 color ultrasound diagnostic instrument of Mindray Company, with an abdominal volume probe, a frequency of 2 to 8 MHz, and a scanning angle of 120°. Intracavity probe: frequency 3-11MHz, scanning angle 179 °. Method: Before examination, the patient's bladder was moderately filled with 50 to 100 mL, and the lithotomy position was taken. The probe surface was coated with a sterile neutral coupling agent. The labia majoris on both sides were separated, and the upper edge of the probe was placed close to the lower edge of the pubic symphysis and placed in the perineum. Sagittal images of the pubic symphysis, bladder, and urethra in the resting Valsalva state were taken. Turn on the "automatic pelvic floor" function and label each indicator point according to the schematic diagram: S: posterior lower edge of the pubic symphysis, P: distal end of the pubic symphysis central axis, U: urethro-bladder junction, E: proximal central axis of the urethra, R: posterior wall of the bladder near the urethra, and V: lowest point of the posterior wall of the bladder. The required values can be automatically obtained, such as bladder neck distance (BSD), bladder neck mobility (BND), bladder posterior angle (RA), urethral inclination angle (UTA), urethral rotation angle (URA), and so on.

1.4 Observation indicators

Compare the two-dimensional ultrasound measurements (bladder neck mobility, urethral rotation angle, and posterior bladder angle under Valsalva status) of the four groups of patients at rest and Valsalva status, as well as the subjective incidence of postoperative urinary incontinence (evaluated using the ICIQ-SF questionnaire, which is currently widely used internationally, and ruled out the possibility of postoperative urgent urinary incontinence and occult urinary incontinence). The ICIQ-SF questionnaire has important clinical value for the diagnosis of SUI. The questionnaire included a comprehensive assessment of the frequency and volume of urine leakage, the extent of its impact on daily life, and when it occurred, as well as the condition of urinary incontinence in patients. The main types of SUI under ultrasound are the opening of the posterior bladder angle at 140 °, the rotation angle of the urethra at 45° to 120°, and the formation of a urethral orifice funnel.

1.5 Statistical processing

SPSS20.0 was used to process the data, and the measurement data were expressed as mean ± standard deviation. Non parametric tests were conducted among the four groups, and further paired comparisons were conducted; Comparison and adoption of rates χ Test 2: $P<0.05$ indicates a statistically significant difference.

2. Discussion

In the study, we selected automated pelvic floor ultrasound to objectively measure the anatomical structure of the pelvic floor of patients after PFD surgery, and combined with the ICIQ-SF questionnaire, hoping to evaluate the value of pelvic floor surgery more comprehensively, and provide more accurate anatomical guidance for improving surgical methods and patients' postoperative satisfaction in the future. Currently, the follow-up of patients after surgery is mainly based on their subjective feelings. Simple questionnaire surveys lack analysis of the anatomy of the patient's pelvic floor structure after surgery, unable to link the patient's subjective feelings with objective anatomical structures, and unable to consider how to continuously improve surgical methods through follow-up of PFD patients to reduce the incidence of postoperative complications.

Therefore, this study will follow up patients after PFD, conduct ICIQ-SF questionnaire survey and automated pelvic

floor ultrasound examination. However, during the follow-up process, we found that some patients showed an increase in the posterior bladder angle and urethral rotation angle under Valsalva's action under ultrasound, but there were no subjective symptoms of urinary incontinence, indicating that the anatomical structure of the pelvic floor of some patients undergoing surgery cannot fully represent their current functional status. Therefore, it is necessary to combine the subjective feelings of patients with objective diagnostic indicators under ultrasound for comprehensive postoperative follow-up. This study shows that there is a statistically significant difference in the urethral rotation angle under ultrasound in the four groups of patients, indicating that different PFD surgical methods have different effects on the urethral rotation angle, while the urethral rotation angle in the simple repair group is significantly greater than that in the mesh group, indicating that the implantation of mesh can effectively reduce the movement of the urethra under Valsalva's action and play a fixed role. Patients undergoing simple vaginal anterior and posterior wall repair surgery have weak pelvic floor support structures, Therefore, after Valsalva maneuver, the movement of the urethra is more significant in patients with mesh implantation. There was no statistically significant difference in the posterior angle of the bladder and the mobility of the bladder neck under Valsalva's maneuver, indicating that the three PFD surgical methods had a small impact on the bladder neck and did not affect the postoperative bladder neck activity. The sensitivity, positive predictive value, and negative predictive value of ultrasound in diagnosing SUI after PFD were as high as 68.97%, 62.33%, and 94.22%, respectively; At the same time, different PFD operations mainly change the size of the urethral rotation angle, which indicates that the urethral rotation angle as an objective diagnostic indicator has more important clinical significance than the formation of the posterior bladder angle and urethral funnel. The specificity of ultrasound combined with urethral rotation angle, posterior bladder angle, and urethral funnel in the diagnosis of SUI was 97.44%.

3. Summary

In summary, patient subjective questionnaires combined with multiple objective automated pelvic floor ultrasound indicators can significantly improve the value of postoperative follow-up for patients with PFD. The combined diagnosis of SUI with various ultrasound parameters has important clinical significance. At the same time, automated pelvic floor ultrasound is simple, time-consuming, and highly repeatable. It can dynamically observe the anatomical structure of the patient's pelvic floor, the location of implanted materials, and the three-dimensional condition of the pelvic floor. It can provide meaningful pelvic floor functional measurement parameters for the postoperative follow-up of PFD, provide more objective data support for the patient's postoperative efficacy, and also provide anatomical support for the PFD surgical method.

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