

Diagnosis of pelvic floor and pelvic organ prolapse by ultrasound examination

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Unified and systematized ultrasound hidden (preclinical) and clear signs of prolapse of the pelvic floor and all parts (anterior, middle and posterior) of the small pelvis. On the basis of displacement and deformation of organs, thickening of their walls, anatomical changes in the ligamentous-muscular structures, geometric and topometric deviations, isolated and concomitant prolapse of the pelvic organs was established. A three-stage ultrasound study was proposed, which contributed to the identification of the severity of prolapse and the establishment of its stage and the choice of the most rational therapeutic (surgical) tactics and its volume.

Keywords: *Pelvic prolapsus, prolapse of the rectum, rectocele, urethrocele, prolapse of the uterus, ultrasound semiotics*

INTRODUCTION

In clinical practice, sagging (falling) of the pelvis and small pelvic organs are isolated and in common cases - rectocele, rectum (rectum) and / or uterine (uterine rupture, uterine cervix, uterine cervix, uterine arch) sagging, bowel. They cover the most important sections of surgical coloproctological and urogynecology, with varicose veins of the upper extremities (enterocele), urethrocele, cystocele, urethral cystocele and others (Olsen et al., 1997). The prevalence of small pelvic organ prolapses (PVL) in adults ranges from 3-8% to 56% (Susan and Barbara B, 2005), and is more common in women over 80 years of age (Maher et al., 2008). In women around the age of 40, this figure is 30% (De Lancey et al., 2008; McLennan et al., 2006; Niggard et al., 2008). The peak of the disease corresponds to the age of 60-69 (McLennan et al., 2006). The frequency of pathology in the postmenopausal age varies between 60-80% (McLennan et al., 2006; Niggard et al., 2008). According to most authors, the actual figures are very different from the literature, as asymptomatic

patients and some women do not go to health facilities due to national-ethnic mentality and customs (Horst et al., 2017; Лолораева et al., 2019.) Pelvic prolapse is almost always manifested by dysfunction of the pelvic organs at one level or another: failure to hold defecation (feces and gas), sexual sphere (painful sexual intercourse), urinary excretion due to the lower urinary tract (lack of urinary retention) disorders, etc. (Abhyankar et al., 2019). The Department of Gynecology at the University of Toronto (Canada) has called the ICU a "hidden epidemic" of the century, based on a report on demographics. M.D.Moen found that anatomical abnormalities of the pelvic floor needed operative correction in 11% of the female population. Thirty percent of these women undergo repeated surgeries due to the recurrence of the disease (Marinkovic and Stanton, 2004).

Despite significant advances in diagnostic technology and tools, serious challenges remain in the recognition of pathology. According to M.Barber and M.Maher (2013), only 3-6% of patients in the early stages see a doctor with clinical symptoms, but up to 50% of patients show diagnostically significant symptoms on vaginal

examination, including ultrasound (Kayembe et al., 2024).

The purpose of the study. Study and diagnostic evaluation of ultra-sonographic semiotics of isolated and joint oscillations of the pelvic floor and small pelvic organs.

MATERIALS AND METHODS

The study included 85 patients aged 16-87 years (average age in women - 48.1 ± 1.3 years, men - 51.32 ± 1.8 years) with rectal prolapse of varying severity at the AMU TCC in 2014-2021 - 54 (63.5%). 41 women (75.9%) reported a history of severe traumatic birth. Ultrasound examination was performed in the morning on an empty stomach, without special training, with a device "Alake" SSD-630 (Japan), superficial, rectal and / or vaginal transmission (with sensors). We support the purposeful conduct of the examination based on the patient's complaints (fecal incontinence, diarrhea, constipation; painful sexual intercourse, foreign body sensation; urinary incontinence, painful, intermittent and intermittent urination).

The following exosonographic signs of pelvic floor and pelvic organ sagging were detected during USG. Distal displacement of the rectum, uterus, cervix, uterus, bladder relative to the groin, deformation of these organs or some of them, wall thickening, flattening of the rectum, dilation of the anus, anal canal, uterine dilatation, bladder uterus Displacement of the rectum towards the uterine tract or backward (rectocele)

Methods of perineal (middle) ultrasound examination. The examination is not related to the menstrual cycle, and we recommend that it be performed at any time, in the morning and on an empty stomach (which worsens the appearance of bloating after a meal). The bladder should be 100-150 ml full. An overcrowded bladder can distort the results by squeezing the pelvic organs, and an overcrowded bladder can cause difficulties in visualizing neighboring organs and elements. The patient is stretched on his back on the gynecological table, raises his legs by bending at the knees and squeezes the upper extremities to the abdomen.

Images (topography) and tonometry of the rectum on intermediate USG. The anal canal, the

attitude of the rectum to the uterine tract, the deformations along the course, the bulge towards the uterus (rectocele) are studied. The anorectal angle is the angle formed by the intersection of the longitudinal axis of the anal canal and the line passing along the posterior wall of the distal branch of the rectum. USG allows you to determine the dimensions of the angle. The relationship of the anorectal region to the groin line (imaginary line connecting the symphysis with the groin) is studied. Swelling of the anterior or posterior walls of the rectum anteriorly (towards the bladder in men, towards the uterus in women) and posteriorly with respect to normal gait is determined during rest and relaxation (Valsalva test). Intermediate USG allows for assessment of the condition of the mesorectum, parametrium, Para vesical and Para urethral area, rectovaginal septum (rectovaginal fistula), retro rectal area (Perirectal fistulas), pathological, including volume derivatives. USG examination of the rectum reveals deformities, thickening, external compression, swelling, sagging, and volume derivatives, sometimes a fistula, or even an internal hole in the anterior and posterior walls. Examination of the distal retroperitoneal part of the organ reveals fascial defects at the level of the dentate gyrus, dilatation of the rectovaginal septum (diastasis of the anterior and posterior groups), and m. Different degrees of swelling due to layering of the mus. levator any (diastases of the clusters) - rectocele is visible. However, data on perineal USG are limited compared to end rectal and transvaginal USG examinations.

Ultrasound visualization, topography of the uterus, cervix, uterine tract and arch. Ultrasound visualization, appearance of the uterus, cervix, uterine tract and arch, displacements, deformations, compression of external organs, their symphysis, seminal vesicles, urethra and rectum (anal canal) are studied at rest and during exertion (Valsalva test) (Fig. 1).

Ultrasound imaging, topography and tonometry of the bladder and lower urinary tract. The smoothness of the bladder walls, roughness, thickening, derivatives in the bladder, compression by the surrounding organ, etc. Ultrasound signs appear. Length of the urethra (distance from the neck of the bladder to the symphysis), then the angle of inclination of the urethra (α), posterior bladder - the urethra (β),

pubic-urethral (angle of intersection of the axis passing through the symphysis) (γ), from the symphysis the angle δ formed by the intersection

of the horizontal axis with the line passing through the support area of the bladder is measured (Fig. 2).



Fig. 1. Ultrasound image of a prolapsed uterus.



Fig. 2. Ultrasound image of a prolapsed Vesical seller.

Endorectal and transvaginal Ultrasound examinations were performed by us on a multi-stage basis. On endorectal Ultrasound examination:

I stage:

- Determination of the completeness and weakness of the anal sphincter muscles (expansion, contraction, scarring, etc.);
- pelvic diaphragm muscles, m. study of the condition of the levator ani (layering, diastases,

scars and scar deformities);

- completeness, weakness of the rectovaginal wall (layering, diastasis, fistula and perforations);
- the height of the gap (distance from the anal opening to the bottom of the rectum-bladder (in men), rectum-uterus and uterus-bladder (in women)).

On transvaginal USG:

- completeness, weakness of the rectovaginal wall (layering, diastasis, fistula and perforations);

- condition of the pelvic diaphragm.

Stage II USG: - 3D-reconstruction of anal sphincter muscles and internal sphincter muscle of urethra and assessment of their condition.

Stage III USG: The condition of the rectum, the anterior and posterior walls of the uterus, the length, width and wall thickness of the urethra, the condition of the cervix, the bottom of the bladder are studied. At this stage, swelling of the posterior wall of the bladder (cystocele), anterior (anterior rectocele) and posterior walls (posterior rectocele) of the rectum, as well as the length and degree of flexion of the urethra, the symphysis of the uterine cervix is determined at rest.

Localization and demonstration of pelvic floor and limb sagging in the USG. The following localizations of anatomical USG-changes of the urethrocele in the anterior compartment have been identified: in the anterior, middle, and posterior sections of the pelvis, systole and urethrocytosele (the anterior wall of the uterus may also be involved in the process); in the middle section, there is a fall of the arch of the uterus (occurs after amputation or extrapolation of the uterus), joint sagging of the uterus and neck (apical prolapse), enterocele (small bowel loops with competition) and in the posterior rectocele, rectum fall, enterocele (Fig. 3).

According to the POP-Q classification (1996), the stages of prolapse can be determined on the basis of USG data:

- Stage I – the bottom of the swinging part of

the limb is located 1 cm above the hymen ring;

- Stage II – the bottom of the swinging part of the limb is located 1 cm above the end of the uterine corridor;

- Stage III – 2/3 of the uterine tract protrudes from the genital cleft;

- Stage IV – the uterus goes completely out (Persu et al., 2011).

Statistical analysis. The incidence of events (ultrasound signs) in cases of pelvic floor and pelvic floor prolapse was calculated by performing a multiple chance analysis of the images (ultrasound clinical signs):

$$C = \frac{p}{1-p}$$

Here: C – chance of encountering ultrasound signs; p – the probability of occurrence of ultrasound signs in the studied collection.

For the comparison and statistical evaluation of the obtained indicators, the odds ratio (OR) and the 95% confidence interval (CI) of this indicator were calculated in the comparison groups.

$$OR = \frac{ad}{bc}$$

$$CI = e^{\ln OR \pm 1.96 \sqrt{\frac{1}{a} + \frac{1}{b} + \frac{1}{c} + \frac{1}{d}}}$$

Here: a, b, c and d are numbers in a 4-cell table; OR – odds ratio; CI – 95% confidence interval; 1.96 – the crisis price corresponding to the p=0.05 level of the standard normal distribution.



Fig. 3. USG image: Enterocele.

If the OR indicator is less than 1, it means a decrease in chance, if it is greater than 1, it means an increase, if it is equal to 1, there is no difference. The inclusion of OR=1 or 1 in the CI means that the difference between the indicators in the groups is not statistically correct. If OR>1 and 1 is not included in the EI, the decision is made that the studied event met with a statistically correct high chance. On the contrary, if OR<1 and 1 is not included in the CI, the chance of encountering the ultrasound sign is estimated as statistically incorrect.

Normally, the anorectal angle ranges from 85-95°, and during exacerbation, it ranges from 100-110°. The angle is blind in rectal prolapses. When the angle is in the range of 110-115°, when it is reconciled with clinical data and other instrumental examinations (X-ray defecography), we consider it as grade I, 115-125° - II, and more than 125° as grade III sagging (normal indicators are taken on the basis of literature data) (Persu et al., 2011; Walters and Daneshgari, 2004). In silence during perineal USG, the anorectal region should be located up to 3 cm below the imaginary line of the inguinal crease, and more than 3 cm during excitation. If this indicator is ≤3 cm in silence and ≤4-5 cm during exacerbation, it is considered prolapse of the rectum. The degree of sagging depends on the size of the distance: up to 3.5 cm - I, 3.5-4.5 cm - II, 5-6 cm and more - III degree (OR>1 and 1 are not included in CI, i.e. the results are statistically correct).

Normally, during perineal USG, the neck of the uterus is not visible in standard views (projections). The fact that the neck appears above the symphysis at rest and does not descend below the symphysis in the Valsalva test is consistent with grade I drooping of this limb; at the time of exacerbation, the length of the uterus descends up to 2 cm below the symphysis II; when it is visible at the lower edge of the symphysis at rest and when it is strong it goes down to the external opening of the uterus, which corresponds to grade III (OR>1 and 1 is not included in the CI, it means, the results are statistically correct).

The condition of the ligamentous apparatus of the neck of the bladder allows studying the condition of both it and the muscles of the pelvic diaphragm. At rest, the shortening of the distance

from the neck of the sac to the symphysis is lig. the vertical part of the pubocervical, and the greater shortening of the m. puborectalis, m. decrease in the tone of the muscles of the pubococcygeus and the anterior wall of the uterus, it means, symptoms of cystocele and sagging of the cervix (OR=1 and 1 is included in the CI, that is, the result is not statistically correct).

Perineal, endorectal, and transvaginal USG provides diagnostic and differential diagnosis of pelvic floor condition and limb sags, pathologies; determination of pelvic limb sagging and degrees of severity; selection of surgical tactics, volume and method; in the diagnosis of organic causes of urinary incontinence in women; assessment of end prosthesis condition, migration, shrinkage; control of the condition of the pelvic floor in the period after the surgical operation; diagnosis of concurrent and postoperative diseases and complications (rectovaginal and anorectal fistulas, abscesses, volume processes, recurrences), the ability to provide an assessment of the results of surgical treatment (Drutz and Alarab, 2006).

The sonographic sign of diastases of the levator muscles is the appearance of swelling, m. is a clear and precise visualization of the transverse perineal superficial muscle (OR>1 and 1 is not included in CI, it means, the result is statistically correct).

The thickness of the fibers of the diaphragm muscle in women without sagging of the pelvic floor and limbs is not less than 15 mm, and in men it is not less than 12 mm (OR>1 and 1 is not included in CI), it means, the result is statistically correct. A low index is one of the indirect signs of muscle failure.

DISCUSSION

Perineal, endorectal and transvaginal US provides diagnostic and differential diagnosis of the state of the pelvic floor and sagging of its limbs, pathologies; determination of pelvic limb sagging and degrees of severity; selection of surgical tactics, volume and method; in the diagnosis of organic causes of urinary incontinence in women; assessment of endoprosthesis (mesh) condition, migration,

shrinkage; control of the condition of the pelvic floor in the period after the surgical operation; besides, it has the ability to provide diagnosis of post-operative diseases, complications (rectovaginal and anorectal fistulas, abscess, volume processes, recurrence events), evaluation of the results of surgical treatment.

CONCLUSIONS

USG semiotics of pelvic floor insufficiency and pelvic organ sagging: anal and urethral sphincter, thinning of the diaphragmatic muscle groups, scarring, deformation of the tendon of the diaphragm, m. Diastases of the levator ani, layering, swelling of the contours to the neighboring organs (bladder, uterus) (rectocele), displacement of the pelvic organs to the symphysis, the imaginary lines passing through the symphysis, changes in distance and angle, etc. These symptoms can be considered the first preclinical, latent and early signs of pelvic floor musculoskeletal insufficiency. USG of the pelvis and limbs reveals the preclinical signs of prolapse, opens a wide range of opportunities for preventive and therapeutic (intermediate gymnastics, biological feedback therapy, etc.) and dynamic follow-up, planning and selection of surgical treatment (tactics, scope and method).

1. When reconciling with clinical data and other instrumental examinations (RH-ji defecography), if the angle is within the limits of 110-1150, we consider it as grade I, 115-1250 - II, and more than 1250 as grade III sagging. Normal indicators are presented in the literature [Persu et al., 2011; Susan et al., 2005]. Normally, the anorectal angle ranges from 85-950, and during exacerbation, it ranges from 100-1100. The angle is blind in rectal prolapses.
2. During perineal USM at rest, the anorectal region should be located up to 3 cm below the imaginary line of the inguinal fold, and more than 3 cm during exacerbation. If this indicator is ≤ 3 cm at rest and $\leq 4-5$ cm during exacerbation, it is considered prolapse of the rectum. The degree of sagging depends on the size of the distance: up to 3.5 cm - I, 3.5-4.5 cm - II, 5-6 cm and more - III degree (SN>1

and 1 are not included in EI, i.e. the results are statistically honest).

3. The appearance of the cervix above the symphysis at rest and not descending below the symphysis during the Valsalva test corresponds to the I-degree prolapse of this member: at the moment of exacerbation, the cervix descends up to 2 cm below the symphysis II; appearing at the lower edge of the symphysis at rest and descending to the external opening of the uterus during exacerbation corresponds to grade III (SN>1 and 1 are not included in the EI, that is, the results are statistically honest). Normally, during perineal USM, the neck of the uterus is not visible in standard views (projections).
4. The sonographic sign of diastasis of the levator muscles is the appearance of swelling, m. is a clear and accurate visualization of the transverse perineal superficial muscle (SN>1 and 1 is not included in the EI, that is, the result is statistically honest).
5. A decrease in the thickness of the fibers of the pelvic diaphragm muscle is one of the main sonographic signs of the failure of that muscle. The thickness of the fibers of the pelvic diaphragm muscle is 15 and 12 mm higher in healthy women without sagging of the pelvic floor and limbs (SN>1 and 1 are not included in the EI, that is, the result is statistically honest).
6. The condition of the ligamentous apparatus of the neck of the bladder allows studying the condition of both it and the muscles of the pelvic diaphragm. At rest, the shortening of the distance from the neck of the sac to the symphysis is lig. the vertical part of the pubocervicale, and the greater shortening of the m. puborectalis, m. pubococcygeus and anterior wall of the uterus are signs of a decrease in tone, that is, a cystocele and a sagging cervix (SN=1 and 1 are included in the EI, that is, the result is not statistically honest).

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