New Technique for Pelvic Floor Measurement - Transperineal Dynamic Ultrasound Measurement Method to Detection and Quantification of Rectocele, Cystocele, Enterocele and Perineal Descensus

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Abstract

The pelvic floor is a complex area, exhibiting diverse pathologies. Among the so-called emptying disorders is the Obstructive Defecation Syndrome (ODS). The diagnosis of the pelvic floor presents us with major challenges, as the anatomy of the region is complicated and the physiology is often difficult to understand. Previous investigation methods have included MR-defecography, classic defecography, uro-gynecological examinations, proctological examinations, scores etc. Ultrasound examination of the pelvic floor is unlikely to be sufficiently established for some time. The examiner’s interpretation dependency and the lack of anatomical landmarks are challenging, which detracts from the significance of the investigation.

The aim of this descriptive measurement study is to develop and describe a unique and reliable method for the assessment and quantification of all pelvic floor changes from the group of obstructive defecation disorders. This method should be applied to all affected patients regardless of their age, size, weight, whether they suffer from minor diseases, and/or after surgery, and should deliver reliable and unique data. It should provide a diagnosis without any interpretation from the examiner.

Material and method: After anamnesis with detection of clear symptoms of obstructive defecation syndrome (incomplete evacuation, constipation, foreign body sensation etc.), and clinical examination a consent to perform a pelvic floor sonography was obtained from all patients. To describe the measurement points we perform the examination for this study in primarily 25 women presenting obstructive defecation syndrome. In all examined patients, eight clearly defined measuring points were developed which can be found reliable at transperineal sonographic represented pelvic floor. These serve as a basis for the distance measurements in either a supine or a sitting position. The examinations were performed with an ultrasound scanner BK ProFocus ultra view, first supine and then in a sitting position. This resulted in selected measurement points and distances that were found in all the patients, and in both positions. Conversion of the absolute values as percentage changes allows for reliable diagnosis. Our study shows, in conclusion, that the new method of Transperineal Ultrasound Measurement on the Pelvic Floor (TUMPF) allows a reliable and unambiguous diagnosis in either the supine or the sitting position, whereby dependence on the ultrasound examiner can be avoided.

Statement

The aim is to develop a unique and reliable sonographic method for the assessment and quantification of all pelvic floor changes from the group of obstructive defecation disorders. This method applied to all affected patients regardless of their age, size, weight etc., should deliver reliable and unique data.

Introduction

The pelvic floor is a complex area, exhibiting diverse pathologies [1,2]. Within the so-called emptying disorders can be found the obstructive defecation syndromes. The causes of this type of syndrome include the deterioration of the structures holding the pelvic organs physiologically in their positions [3,4]. Previous investigation methods include MR, classic defecography, uro-gynecological, proctological examinations, scores etc., [5-9].

The diagnosis of each faculty differs fundamentally from the others, and even within the same pathological area there are different ideas about diagnostic methods and treatments. The results are classified with the Pelvic Organ Prolapse Quantification (POP-Q), as well as classified into different levels [6,10]. This is a rational approach, but has the disadvantage that only the gynecological pathologies are considered. The front compartment (urologic) is occasionally considered, but the rear compartment (proctologic) is practically never considered. POP-Q considered only the excess of the descent of the...

Pelvic floor examination using ultrasound has not until now been sufficiently established. Although a good correlation of ultrasound and proctologic measurements has been secured the lack of the ultrasound marker and examiner dependency are the most critical drawbacks [19,20]. The entire pelvic floor can be simply and reliably examined non-invasively by the transperineal pelvic floor 3D sonography assessment [19-24]. All three compartments are dynamically assessed at the same time, increasing the validity [17,25,26]. The study of a single compartment, however, seems to be insufficient for a firm diagnosis [27].

Due to the lack of standardized processes and sizes, the relevance of pelvic floor ultrasound treatment has not been sufficiently considered, although it is a direct method, simulating almost unchanged all the sequences of a defecation [28]. The necessity of a reproducible method delivering accurate, ubiquitous and comparable results at any time of the assessment is clear.

Despite the high level of availability and the increasing dissemination of transperineal sonography, relevant measuring points at the transperineal image of the pelvic floor are still missing (the pubis is the one bony structure that retains the position during movement, such as Valsalva) [29,30]. This however leaves too much scope for interpretation. It leaves the assessment examiner dependent and does not allow any clear quantification of the organ descend, even if it is very clearly visible. The previous measuring points at the transperineal representation were Bladder Symphysis Distance (BSD), anorectal angle, alpha, beta, gamma angle, hiatus size etc., [8,30-33].

These readings attempt to establish some order in the sonographic view of the pelvic floor. The classic angles and distances can change (such as the valsalva maneuver, squeeze, etc.), and they are measured. They have however no unique expressiveness and do not describe any quantification of the pathological change. The corresponding image must be interpreted freely.

**Material and Method**

The observation of the change of the absolute values (bladder symphysis distance etc.) in reference to pubic symphysis is not sufficient for the evaluation of the expression of the pelvic organ descent. The relative changes in the organ position in relation to the normal state, which means the during valsalva provoked percentage change in the position to the baseline, seems much more important. The bench mark values are determined in the rest/supine position. In this way comparability for all issues is attained, regardless of the present pathology. The measuring method is lean on the existing Pelvic Organ Prolapse Quantification (POPQ) classification.

There are seven important factors for this measuring method:

- Reproducibility
- Can be applied to all patients (regardless of age, weight, height, pre-existing conditions, treatment etc.)
- Can be performed either pre- or post-procedure
- The values obtained are unique, fully reproducible, ubiquitous and comparable
- The determination of the value measured does not depend on the examiner (i.e., there is no room for misinterpretation)
- All three compartments can be simultaneously assessed; the isolated evaluation of several pathologies is blocked, and this which improves diagnostic safety
- Examination time is not significantly extended - the entire assessment requires approximately 15-20 minutes

**The measuring points of the pelvic floor (transperineal view)**

The method of measurement is based on the determination of eight points (measured in both the supine and the sitting positions, including the Valsalva). The change of one position to another and the value of this change is documented. The percentage change in the location of these points (organs) then leads to the diagnosis.

The measuring points must be clearly definable, and should be easily tracked by any movement of the pelvic floor (Valsalva or squeeze, etc.)

The following marks have been selected (Figure 1):

1. Symphysis pubis
2. Interior of ostium urethrae
3. External ostium urethrae
4. Cervix
5. Posterior rectal wall - height of symphysis pubis
6. Anterior rectal wall - height of cervix
7. Anterior rectal wall - height of symphysis pubis
8. Anterior rectal wall - height of internal ostium urethrae


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Во текот на времето, изолираните промени на половата површина често се случуваат, кога е глобален и стандартен експеримент бил констатиран за необходен [12,13]. Слично на тоа, ако се вклучат заболевувањата, кои се обично во правилото време на застапување во образот на пациентите, ако ги вклучиме во изразите на извршувањето, систематизирањето на експериментите е особено во основа за оптимално и специфично вршење на лечебниот план [11].

Во многу студии, експерименталниот преглед на половата површина е одговорен кај глобален и стандартен експеримент, ако ги вклучиме во изразите на извршувањето, систематизирањето на експериментите е особено во основа за оптимално и специфично вршење на лечебниот план [11].

Експериментите во времето на извршувањето следат нееднакво зазначените промени на половата површина, и тоа е особено во основа за оптимално и специфично вршење на лечебниот план [11].

Този конфликт може да биде преминаван чрез извршувањето на експерименти во единица што вклучува двата положаја. За да се добијат релевантни резултати, пакетот од резултати мора да биде проверен и да ја приложи независно од ова што е вклучено во извршувањето, бидејќи тоа не е физиолошки и гравитација се пренебрегнува, што значи дека не е уместно во случаи на изразите на извршувањето.
Measurement of individual distances

The following distances were measured at rest and then at the Valsalva, and received the following designations:

**Front compartment (Figure 2):**

1. The symphysis pubis - inside the Urethraostium (bladder symphysis distance) - 1
2. The inner ostium urethrae – the outer Ostium urethrae - 1a
3. The symphysis pubis - the bladder roof (regardless of the bladder filling) or (the cervix - if visible - is preferable) - 2
4. The bladder roof/cervix - the internal ostium urethrae - 2a

These measured values are used as a template for the other measurements and are transferred into the middle and posterior compartments (Table 1)

**Middle compartment (Figure 2):**

5. The outer introitus vaginae (at symphysis pubis) - value 1 is adopted - 3
6. From there the distance to the outer introitus vaginae - 3a
7. The outer introitus median (at symphysis pubis) - value 2 is adopted - 4
8. From there the distance to the outer introitus measured - 4a

**Dorsal compartment (Figure 2):**

9. The posterior rectal wall (height symphysis pubis) - value 1 is adopted - 5.
10. The longest distance to the anterior rectal wall (the height above the external sphincter) measured - 5a
11. The posterior rectal wall (the height of the symphysis pubis) - the value of 2 is adopted - 6

12. The longest distance to the anterior rectal wall is measured from that point (the height above external the sphincter) - 6a
The measurements for the determination of Enterocele (Figure 3):

13. The anterior rectal wall - the height of the cervix (bladder roof) - d
14. The anterior rectal wall - the interior of the ostium urethrae - e
15. The anterior rectal wall - the height of the symphysis pubis - f

This means in detail: A change in the position of, for example, the bladder (determined by a change in the position of the internal and external urethra, etc.). Less than 30% to the initial value means a bladder descensus of I°.

A change in the position of the bladder by more than 30% but less than 60% of the initial value means a bladder descensus of II°.

A change of more than 90% to the initial value means a bladder descensus of III°.

The approach in evaluation of the middle and the dorsal compartment is here the same (Figures 4 and 5).

Evaluation

The values obtained in the supine position (without the Valsalva) are entered in a corresponding table. Afterwards the patient in the sitting position is prompted to execute the Valsalva maneuver, and the same points are measured and entered in the same table.

The values are then compared. The difference is first represented as an absolute number and also as a percentage variation. To increase the accuracy of the figures of the respective compartments (for example, 2 and 2a, or 4 and 4a), they are combined to form an arithmetic mean. This improves the accuracy and corrects any measurement outliers.

The values for the Enterocele in the tables are entered in the next step. Here, the differences in the percentage variation of the absolute numbers are also converted.

Results

The investigation results show the percentage change in the position of clearly defined measuring points in all pelvic floor organs (bladder, uterus, rectum) due to the Valsalva in the sitting position (Figure 4). The evaluation is based on the previous pelvic organ prolapse classification.

Cystocele

For anterior compartment measurements it is important to measure the distance (1a, 2a) between the internal and external ostium of the urethra to determine the maximum bladder expansion (Figure 5).

Descensus vaginae

The determination of vaginal descensus (with measurements of 3a and 4a) should include the distal visible vaginal tissue. Here identification can be difficult, due to compression of the soft tissue by the transducer (Figures 4 and 5).

Rectocele

The measurement of the extension of the rectocele (5a, 6a) has the endpoint with regard to the rectum anterior wall just above the front edge of the Musculus Sphincter Ani Externus (MSAE). Here the farthest distance should be chosen. During the Valsalva this point is detached according to the shape of the rectocele (Figure 4).
Perineal descensus

The shape of the descensus perinei (levels I, II and III) can be calculated from the previous values.

Enterocoele

The evaluation of the Enterocoele shows a peculiarity. Changing all three output values determined by more than 50% secures an Enterocoele II°. (The anterior rectal wall - the height of the cervix/bladder roof - value is d) if the change is more than 50% - an Enterocoele I°. A change of the two upper output values (the anterior rectal wall - the height of the cervix/bladder roof value is d and the anterior rectal wall - ostium urethrae - e) is more than 50% - an Enterocoele II°. An Enterocoele is excluded in all other cases/configurations (Figure 3).

Conclusion

Offering a high level of acceptance and validity, ultrasound should be established as a standard testing method for assessing the pelvic floor [2,5,32,34,35]. It is a highly relevant screening examination for women with defecation irregularities and can be used both before and after surgery of the pelvic floor [36]. We use this tool to evaluate our procedures performed in our patients, what in the future may provide changes in the assessment of pelvic floor disorders [37]. This new measurement method for evaluation of the pelvic floor (TUMPF) can help to standardize sonographic diagnosis and to establish clearly defined parameters (until now a major deficiency) for the assessment and quantification of pathology on pelvic floor. Through this unique and comparable pathology quantification, the existing pelvic organ prolapse quantification classification can now be used in the field of ultrasound. This simple, fast and reliable examination method can be used to provide a clear picture of pathological changes and to provide quantification of the degree of each pathology both before and after therapy [18]. This could also improve communication between the various disciplines [34]. Through consistent and correct use of this method the correlation between clinical symptoms and pathology can be helpfully clarified, which in turn promises significant improvement in the therapy outcome [26]. This method is simple (examination time approximately 20 minutes), easy to perform, standardized and allows to the surgeon to choose the right individual and comparable treatment option for all pelvic floor compartments in each patient, independently of any previous interpretation of the examiner. This in the long term could provide an improvement of the treatment effectiveness in all involved faculties and help to identify unique corresponding procedures for all emptying disorders.

References


