Pelvic Physical Therapy Distance Journal Club
July 12, 2023
Terri Robertson Elder, PT, DPT, WCS, CLT-LANA

Predictive value of pelvic floor muscle morphometry using 3D/4D ultrasound in relation to the success of pelvic floor muscle training in women with stress urinary incontinence. Hagovska M, Svihra J, Urdzik P. Int J Environ Res Public Health 2022; Nov 10;19(22):14757. Doi:10.3390/ijerph192214757.

Introduction: Previous studies have looked at PFM morphometry however none have established a predictive value of PFM morphometry in relation to the success of PFMT.

Aim/Primary Aim:
Establish the predictive value of PFM morphometry using 3D/4D US in relation to the success of PFMT.

Study Design/Study Format: Interventional single-arm study
Methods:

- **Participants:** n=68 women from gynae and urogynae outpatient clinics, mean age 40.4, mean duration SUI 23.5 mo, mean childbirths 1.7, mean # of incontinence episodes 8.7 per week, mean pads used 1.2/day
- **Inclusion criteria:**
    - ≥18 y/o, uncomplicated SUI, score on ICIQ-UI-SF≥ 6, Sx's of UI for at least 3 consecutive months, degree of POP ≤ stage 2
- **Exclusion criteria:**
    - Complicated SUI, h/o PFMT prior 12 mo, see pg. 3 for full list
    - Use of rehabilitation aids (pessary, urethral plugs, vaginal beads, etc.).
    - Insufficient understanding of pelvic floor exercises and/or omitting exercises, Incomplete questionnaire (suggesting they looked at program adherence)
- **Procedures**:
    - 12-week PFMT with stabilization exercises
        - Education: general A&P and function of PFM, "correct posture" and understanding of the exercise
        - PFMT in various positions, i.e. supine, sidelying, sitting, standing, walking
            - No descriptions were provided for PFMT programming
        - PFMT with static and dynamic stabilization (see p. 4 sec 2.6 for full list): breathing ex, TA activatino, PFM during bridge, bird-dog, variations of push-ups ("man and woman push-ups")
        - Dosage: 12 weeks, on avg 3x/week for 20 min/day, 5 times with training by a physiotherapist followed by continuation in the home environment
- **Primary measures:**
    - ICIQ-UI-SF, OAB Questionnaire- Symptoms Score (OAB-q SS)
- **Secondary measures:**

    - PFM exam: perineometer used to quantify MvC (maximal voluntary contraction), endurance, repeated, and fast contractions
    - PFM morphometry using 3D/4D USG

Results:

- Pre-treatment mean ICIQ-UI SF score 9.8 (moderate SUI); value of lower than 8 deemed a successful result
- After Tx:
    - 22.1% no leakage
    - 8.8% slight leakage
    - 58.8% moderate SUI
    - 10.3% severe SUI
- Moderately significant negative correlation found b/w reduction in total ICIQ-UI SF score and increase in strength, endurance, and # of contractions
- Morphometric changes: Moderately significant (0.001) + correlations between ICIQ-UI SF score and PFM morphometry, reduction in size of the urogenital hiatus at rest (r+ 0.453) , with contraction (r= 0.533), with valsalva (assuming they mean bearing down) (r = 0.442).
- Prediction of SUI ***development*** according to ROC (area under curve):
    - HA (hiatal area) during the Valsalva was most strongly associated with a reduction in SUI with an AUC of 0.87.
    - The HA at rest and during contraction values were smaller but strongly associated with a reduction in SUI with an AUC of 0.74–0.78.
    - PFM morphometry positively predicted a reduction in the ICIQ-UI SF to a score below 8

Discussion:

- Dosage: 12 weeks, on avg 3x/week for 20 min/day, 5 times with training by a physiotherapist followed by continuation in the home environment, is this enough? So only supervised for 5 visits?
    - “We believe that if the intensity of the exercise could be increased from 3 times a week for 20 min a day, e.g., to 6 times a week, we would notice a more significant reduction in SUI symptoms.”
- When discussing results and listing morphometric changes, the authors state “this means that, with a smaller hiatal area at rest, during contraction and the valsalva maneuver, the symptoms of urine leakage were reduced”. They have moderately strong r values (correlation coefficients) showing a positive relationship that as morphometry changes, symptoms improve.
- MVC and it’s duration (strength and endurance of the PFM) did not indicate a positive prediction of a decrease in ICIQ-UI SF score to below 8.

Strengths/weaknesses:

In general, not as strong as the first article we discussed.

Strengths: objective measurements were used (3D/4D US), validated outcome measures

Weaknesses:

- Patient-reported measures were used, a pad test or other objective measure would have strengthened results
- It seems a lot of assumptions are made throughout the article, for example:
    - Intro pg 2 “US helps to visualize the function of the PFM, and to assess **the tonus of the PF muscles by measuring the hiatal space”.** Can tone be visualized with imaging?
    - Pg 9 “hypotonicity” term is used incorrectly
- Small sample size (n=68), not a multi-center study
- Average age was around 40, may not be able to generalize results to older individuals
- Longer follow-up (ie 1 year) would be ideal to confirm lasting effect
- Values not provided for morphometric changes

Conclusion/Summary: It appears PFM morphometry as visualized on 3D/4D US *after treatment* can predict success of PFMT. The authors again state “PFMT intensity had a partial clinical impact on SUI reduction. Therefore the intensity of PFMT should be increased.”

Clinical Application: Let’s discuss…

List discussion questions:

- It appears PFM morphometry as visualized on 3D/4D US can predict success of PFMT, but is this clinically applicable?
- Pre-treatment mean ICIQ-UI SF score 9.8 (moderate SUI); value of lower than 8 deemed a successful result, do you think this is clinically meaningful?
- MVC and it’s duration (strength and endurance of the PFM) did not indicate a positive prediction of a decrease in ICIQ-UI SF score to their cutoff threshold (8 or less), so does this mean that its the morphometric changes to the PFM that allows for reduction to SUI vs the improvements to strength and endurance? If that is the case, what else might we be able to do clinically to enhance morphometric changes?

Other References:

- Karmakar, D., Mostafa, A., & Abdel-Fattah, M. (2017). A new validated score for detecting patient-reported success on postoperative ICIQ-SF: a novel two-stage analysis from two large RCT cohorts. International urogynecology journal, 28(1), 95–100. https://doi.org/10.1007/s00192-016-3070-0
- Lim R, Liong ML, Lim KK, Leong WS, Yuen KH. The Minimum Clinically Important Difference of the International Consultation on Incontinence Questionnaires (ICIQ-UI SF and ICIQ-LUTSqol). Urology. 2019;133:91-95. doi:10.1016/j.urology.2019.08.004