Original Article

DOI: 10.4274/anajog.galenos.2026.41736

Anat J Obstet Gynecol Res 2026;3(2):105-111

Effect of Preoperative Pelvic Floor Muscle Training on Transobturator Tape Outcomes in Women with Stress-Predominant Mixed Urinary Incontinence: A Retrospective Cohort Study

Özgür Aslan, Tuğba Demirtaş, Mülayim Tetik, Özlem Yüksel Aybek, Hakan Güraslan

University of Health Sciences Turkey, Bağcılar Training and Research Hospital, Clinic of Obstetrics and Gynecology, İstanbul, Turkey

ABSTRACT

Purpose: Pelvic floor muscle training is the first-line conservative therapy for stress urinary incontinence, but its value as a preoperative adjunct to mid-urethral sling surgery remains uncertain. Our purpose was to determine whether structured six-week preoperative pelvic floor muscle training (PFMT) improved objective and subjective cure rates in women undergoing transobturator tape (TOT) surgery for stress-predominant mixed urinary incontinence (MUI).

Methods: In this single-center retrospective cohort study, we reviewed the records of women who underwent TOT for stress-predominant MUI between January 2020 and December 2024 and who attended an in-person follow-up with a cough stress test at 12 months or later. Patients were stratified by completion of a structured preoperative PFMT program of at least six weeks (PFMT group) versus proceeding directly to surgery (non-PFMT group). The primary outcome was objective cure, defined as the absence of leakage on a standardized cough stress test; the secondary outcome was subjective cure, defined as an improvement of at least 4 points on the international consultation on incontinence questionnaire-urinary incontinence short form (ICIQ-UI SF). Between-group and within-group comparisons were performed using non-parametric tests.

Results: Of 137 women, 82 completed preoperative PFMT and 55 proceeded directly to surgery; baseline characteristics were comparable. Objective cure occurred in 87.8% of the PFMT group versus 81.8% of the non-PFMT group ($p=0.468$), and subjective cure in 92.7% versus 85.5% ($p=0.280$); no between-group differences were significant. ICIQ-UI SF scores improved markedly in both groups, confirming effective surgery regardless of PFMT.

Conclusion: In this retrospective cohort, a six-week preoperative PFMT program was not associated with significantly higher objective or subjective cure rates after TOT in women with stress-predominant MUI. Given the high cure rate of surgery alone, this does not preclude a true benefit of PFMT. Whether such a benefit exists, particularly in women with greater baseline urgency, warrants confirmation in adequately powered prospective studies.

Keywords: Urinary incontinence stress, suburethral slings, pelvic floor, exercise therapy, treatment outcome

INTRODUCTION

Urinary incontinence is common among adult women. It is divided into three phenotypes: stress, urgency, and mixed incontinence. Stress urinary incontinence (SUI) refers to involuntary urine leakage during physical exertion, effort, sneezing, or coughing.[1,2] Recent data from the 2015-2018 National Health and Nutrition Examination Survey indicated that more than 60% of adult women experience some form of urinary incontinence, and over one in five report moderate to severe symptoms.[3] Among affected women, SUI is the most common subtype.[3] Despite this prevalence and its well-documented impact on quality of life, urinary incontinence remains underdiagnosed and undertreated worldwide.[3,4]

The therapeutic management of SUI follows a stepwise algorithm, prioritizing conservative modalities as first-line therapy, whereas surgical intervention is indicated for cases refractory to conservative management.[5,6] Pelvic floor muscle

Address for Correspondence: Özgür Aslan, MD, University of Health Sciences Turkey, Bağcılar Training and Research Hospital, Clinic of Obstetrics and Gynecology, İstanbul, Turkey

E-mail: ozgraslan92@gmail.com **ORCID ID:** orcid.org/0000-0002-7048-2100

Received: 01.06.2026 **Accepted:** 15.07.2026 **Publication Date:** 02.09.2026

Cite this article as: Cite this article as: Aslan Ö, Demirtaş T, Tetik M, Yüksel Aybek Ö, Güraslan H. Effect of preoperative pelvic floor muscle training on transobturator tape outcomes in women with stress-predominant mixed urinary incontinence: a retrospective cohort study. Anat J Obstet Gynecol Res. 2026;3(2):105-111

training (PFMT), commonly known as Kegel exercises, is the first-line conservative therapy for women with SUI.[5] A recent Cochrane systematic review of 31 trials concluded that women with SUI who undergo PFMT are approximately eight times more likely to report cure than untreated controls. Symptoms and quality of life also improved significantly.[5] When surgical intervention is required, the mid-urethral sling (MUS) is the standard procedure. The two principal approaches are the retropubic and transobturator routes.[6,7]

Short-term subjective cure rates with MUS range between 62% and 98%, and the safety profile remains favorable.[6] Surgical success, however, is not uniform. Some patients still face persistent or recurrent symptoms afterward. In a large observational cohort, older age, elevated body mass index (BMI), and previous incontinence surgery were independent predictors of failure following transobturator sling placement.[8] Recurrence is also frequent over the long term. In a retrospective analysis, more than one third of women who were initially cured after transobturator tape (TOT) surgery developed recurrent incontinence within three years.[9] These findings have prompted investigation into whether perioperative interventions, particularly PFMT, may improve surgical outcomes.

The value of PFMT as an adjunct to MUS surgery remains controversial. Randomized and observational studies have diverged on both subjective and objective outcomes.[10,11] In a multicenter trial of women with mixed urinary incontinence (MUI), adding perioperative behavioral and PFMT to the sling improved continence over surgery alone, though the difference was statistically rather than clinically significant.[12] The more detailed evidence is no more encouraging. A retrospective cohort and a randomized controlled trial each reported limited and inconsistent effects of PFMT on objective continence after surgery.[10,11]

A more recent randomized trial focused on the preoperative window. In women awaiting surgery, PFMT yielded significant improvements in pelvic floor muscle strength and reductions in incontinence severity, although postoperative outcomes were not evaluated.[13] Whether this benefit persists after surgery is unknown. No study has examined the question directly in women undergoing TOT MUS for stress-predominant MUI. To address this gap, we conducted a retrospective cohort study comparing women who completed preoperative PFMT with those who proceeded directly to surgery. We examined whether this preoperative intervention was associated with postoperative cough stress test results and international consultation on incontinence questionnaire-urinary incontinence short form (ICIQ-UI SF) scores compared to the direct to surgery sub-group.

METHODS

Study Design and Setting

This single-center, retrospective, cohort study was conducted in the urogynecology unit of a tertiary referral center. Medical records of women who underwent TOT surgery for stress-predominant MUI between January 2020 and December 2024 were retrospectively reviewed. The study protocol was approved by the University of Health Sciences Turkey, Bağcılar Training and Research Hospital Non-Interventional Clinical Research Ethics Committee (approval no: 2025/08/12/075, date: 07.08.2025), and the requirement for informed consent was waived owing to the retrospective design of the study. All procedures conformed to the principles of the Declaration of Helsinki.

Participants and Eligibility Criteria

Women were eligible for inclusion if they had undergone TOT as a first-line surgical treatment for stress-predominant MUI and had completed an in-person, follow-up assessment, including a cough stress test at 12 months or later after surgery. Stress predominance was determined based on patient-reported symptom prominence, with stress symptoms being more bothersome than urgency symptoms. Exclusion criteria comprised a history of prior incontinence or pelvic organ prolapse surgery, concomitant pelvic organ prolapse surgery, stage ≥2 cystocele, neurogenic bladder, interstitial cystitis, mesh-related complications requiring reoperation, and missing preoperative or postoperative ICIQ-UI SF data.

Women were classified according to whether they underwent the structured, supervised preoperative PFMT program before surgery; those who proceeded directly to surgery without this program constituted the non-PFMT group. The PFMT group (n=82) comprised women who completed a structured preoperative PFMT program for at least six weeks before surgery. The non-PFMT group (n=55) comprised women who declined preoperative PFMT, had contraindications to PFMT, or proceeded directly to surgery owing to clinical urgency or patient preference.

Data Collection and Baseline Variables

Baseline demographic and clinical data were extracted from medical records using a standardized data-capture form. Recorded characteristics included age, BMI, parity, menopausal status, presence of diabetes mellitus, and the preoperative ICIQ-UI SF score.

Surgical Procedure

All procedures were performed using a standardized transobturator MUS technique. Sling placement followed an outside-in or inside-out transobturator approach with tension-free positioning at the mid-urethra after vaginal dissection. After positioning the tape, it was adjusted to achieve the desired tension. The protective sheath was subsequently withdrawn, excess mesh was trimmed, and the incisions were closed using sutures.

Pelvic Floor Muscle Training Protocol

Preoperative PFMT was prescribed and supervised by the attending urogynecologists. The protocol consisted of an initial supervised instruction session, during which correct pelvic floor muscle activation was confirmed by digital vaginal palpation, followed by a daily structured home-exercise program of six weeks duration before surgery. Patients were provided with a standardized institutional written instruction

sheet and instructed to perform three exercise sets per day, each comprising slow-twitch contractions (6-10 seconds of contraction followed by an equivalent relaxation period, 8-12 repetitions) and fast-twitch contractions (1-second contraction and relaxation, 8-10 repetitions). Biofeedback and neuromuscular electrical stimulation were not used. Adherence to the prescribed regimen was assessed at the preoperative visit by the supervising urogynecologist and documented in the clinical record; only patients confirmed to have completed the program were included in the PFMT group. However, as the study was retrospective, PFMT completion was based on routine clinical documentation and was not independently verified; a validated exercise diary and quantitative compliance metrics were not available.

Postoperative Care and Follow-Up

Postoperative management followed institutional standard care. Patients were scheduled for in-person follow-up at 12 months or later postoperatively, at which the cough stress test was performed and the ICIQ-UI SF was administered again. The interval between surgery and the follow-up assessment was recorded for each patient.

Outcome Assessment

In accordance with contemporary recommendations for the assessment of SUI surgery outcomes, both objective and subjective endpoints were used.[14] The primary outcome was objective cure at the postoperative follow-up. Objective cure was defined as the absence of urine leakage on a standardized cough stress test performed at a bladder volume of 300 mL in the lithotomy position. The secondary outcome was subjective cure, assessed using the Turkish-validated ICIQ-UI SF,[15] administered preoperatively and at the postoperative follow-up. The ICIQ-UI SF is a widely used patient-reported instrument that captures the frequency and amount of urine leakage and its impact on quality of life, generating a total score from 0 to 21, with higher scores indicating greater symptom burden. Symptom change was expressed as ΔICIQ-UI SF (preoperative minus postoperative score), and subjective cure was defined a priori as ICIQ-UI SF ≥4, in accordance with the established minimum clinically important difference for this instrument.[16]

Statistical Analysis

Statistical analyses were performed using jamovi (version 2.6.19; The Jamovi project, Sydney, Australia). The normality of continuous variables was assessed with the Shapiro-Wilk test. As all continuous variables deviated from normal distribution, descriptive statistics are presented as median and [interquartile range (IQR): 25th-75th percentile]; categorical variables are presented as frequency (n) and percentage. Between-group comparisons of continuous variables used the Mann-Whitney U test. Categorical variables were compared using the chi-square test with continuity correction. Within-group pre- to postoperative changes in ICIQ-UI SF scores were assessed descriptively with the Wilcoxon signed-rank test. Treatment effects were summarized as odds ratios (ORs) and absolute risk differences with 95% confidence intervals (CIs). To address confounding arising from non-random treatment allocation, a propensity score for preoperative PFMT completion was estimated by logistic regression on age, BMI, parity, menopausal status, presence of diabetes mellitus, and baseline ICIQ-UI SF score, and covariate balance was assessed with standardized mean differences; the association between PFMT and each cure outcome was then re-estimated using Firth's penalized logistic regression adjusted for the propensity score, with a direct multivariable model and inverse-probability-of-treatment weighting as sensitivity analyses; full model estimates and covariate balance are provided in Supplementary Tables 1 and 2.[17] As the study was retrospective, no a priori sample-size calculation was performed; instead, a post-hoc minimal-detectable-effect analysis was conducted, which is a design-based precision analysis rather than a post-hoc observed-power calculation. Using a two-proportion comparison with the observed group sizes (82 versus 55) and the observed non-PFMT cure rate as the reference, at $\alpha=0.05$ (two-sided) and 80% power, the smallest detectable PFMT cure rates were approximately 96% (objective) and 98% (subjective); the study was therefore powered to detect only large between-group differences. All hypotheses were tested two-sided, and a p value <0.05 was considered statistically significant.

RESULTS

A total of 197 women were initially screened for eligibility. Sixty patients were excluded for one or more of the following reasons, with some meeting more than one exclusion criterion: concomitant pelvic organ prolapse surgery (n=43), stage ≥2 cystocele on Pelvic Organ Prolapse Quantification examination (stage 2, n=23; stage 3, n=17), missing preoperative or postoperative ICIQ-UI SF data (n=12), mesh-related complications requiring reoperation (n=7), and a history of prior incontinence or pelvic organ prolapse surgery (n=6). The final analytic cohort comprised 137 women, of whom 82 (59.9%) completed structured preoperative PFMT for at least six weeks before surgery (PFMT group) and 55 (40.1%) proceeded directly to surgery (non-PFMT group) (Figure 1). The median postoperative follow-up interval was 15.0 months (IQR: 14.0-16.0).

Baseline demographic and clinical characteristics of the study population, stratified by group, are summarized in Table 1. Age, BMI, and parity were similar between the PFMT and non-PFMT groups (all $p>0.05$). The distribution of menopausal status and diabetes mellitus did not differ significantly between groups (all $p>0.05$). Preoperative ICIQ-UI SF scores were comparable between groups [median 19.0 (IQR 18.0-20.0) vs. 19.0 (IQR 17.0-21.0); $p = 0.936$].

Postoperative outcomes are presented in Table 2. The primary outcome, objective cure on the postoperative cough stress test, was achieved in 72 of 82 patients (87.8%) in the PFMT group and 45 of 55 patients (81.8%) in the non-PFMT group, with no significant between-group difference ($p=0.468$). The secondary outcome, subjective cure, defined as a pre- to postoperative ICIQ-UI SF improvement ≥4, was observed in 76 of 82 patients (92.7%) in the PFMT group and 47 of 55 patients

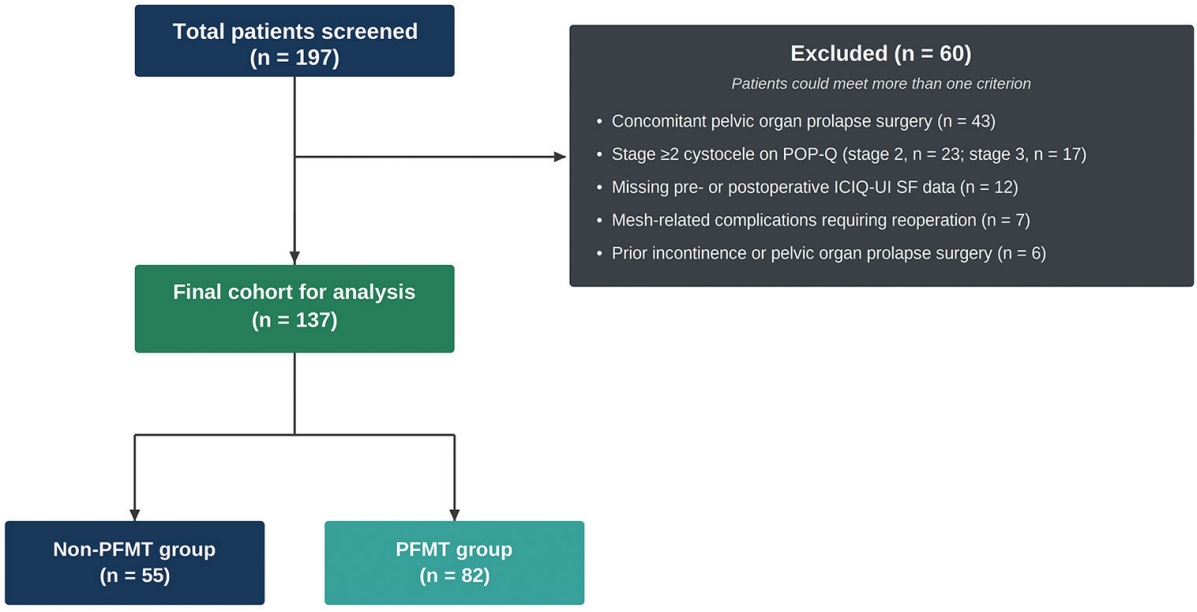

Figure 1. Flow diagram of patient selection through the study. Patients could meet more than one exclusion criterion

ICIQ-UI SF: International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form, PFMT: Pelvic floor muscle training, POP-Q: Pelvic Organ Prolapse Quantification

Table 1. Baseline demographic and clinical characteristics of the study cohort

Parameter	Non-PFMT group (n=55)	PFMT group (n=82)	*p* value
Age (years), median [IQR]	48.0 [44.5-57.5]	49.0 [45.0-53.8]	0.963
BMI (kg/m²), median [IQR]	29.0 [28.0-33.0]	29.5 [27.0-33.0]	0.897
Parity, median [IQR]	3.0 [2.0-4.0]	3.0 [2.0-4.0]	0.998
Menopausal status, n (%)	24 (43.6)	37 (45.1)	0.999
Diabetes mellitus, n (%)	18 (32.7)	20 (24.4)	0.382
Preoperative ICIQ-UI SF, median [IQR]	19.0 [17.0-21.0]	19.0 [18.0-20.0]	0.936
Follow-up (months), median [IQR]	15.0 [14.0-16.0]	15.0 [14.0-16.0]	0.768

Values are presented as median interquartile range, (IQR) for continuous variables and n (%) for categorical variables. Between-group comparisons were performed using the Mann-Whitney U test for continuous variables and the Pearson chi-square test or Fisher's exact test for categorical variables, as appropriate.
BMI: Body mass index, ICIQ-UI SF: International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form, PFMT: Pelvic floor muscle training

(85.5%) in the non-PFMT group ($p=0.280$). Postoperative ICIQ-UI SF scores were 5.5 (IQR 1.0-10.0) in the PFMT group and 8.0 (IQR 1.0-11.0) in the non-PFMT group ($p=0.473$). The median pre- to postoperative ICIQ-UI SF improvement was 13.0 points (IQR 8.0-17.0) in the PFMT group and 11.0 points (IQR 6.0-16.0) in the non-PFMT group ($p=0.304$). Baseline covariates were well balanced between the groups (all standardized mean differences below 0.10 except diabetes mellitus, 0.18, which remained below the 0.25 threshold for important imbalance). For objective cure the crude OR favoured PFMT but was not statistically significant (OR 1.60, 95% CI 0.62-4.15; absolute risk difference +6.0 percentage points, 95% CI -6.4 to +18.4) and was essentially unchanged after propensity-score adjustment (adjusted OR 1.63, 95% CI 0.63-4.21). Corresponding estimates for subjective cure were OR 2.16 (95% CI 0.70-6.60; risk difference +7.2 percentage points, 95% CI -3.7 to +18.1) and adjusted OR 2.22 (95% CI 0.75-6.89). The width of these intervals indicates limited precision.

As a descriptive check, ICIQ-UI SF scores fell markedly from baseline to follow-up within each group (both $p<0.0001$; Table 3), confirming that surgery was effective in both arms; these within-group comparisons are descriptive and do not address the study question, which is answered by the between-group analysis above. A floor effect was evident on the postoperative ICIQ-UI SF: 19.7% of patients (PFMT 17.1%, non-PFMT 23.6%) achieved the best possible score of zero.

Table 2. Comparison of postoperative outcomes between the PFMT and non-PFMT groups

Outcome measure	Non-PFMT group (n=55)	PFMT group (n=82)	*p* value	Crude OR (95% CI)	Adjusted OR (95% CI)
ICIQ-UI SF, postoperative, median [IQR]	8.0 [1.0-11.0]	5.5 [1.0-10.0]	0.473	-	-
ICIQ-UI SF, change score, median [IQR]	11.0 [6.0-16.0]	13.0 [8.0-17.0]	0.304	-	-
Objective cure (negative CST), n (%)	45 (81.8)	72 (87.8)	0.468	1.60 (0.62-4.15)	1.63 (0.63-4.21)
Subjective cure (ΔICIQ-UI SF ≥4), n (%)	47 (85.5)	76 (92.7)	0.280	2.16 (0.70-6.60)	2.22 (0.75-6.89)

Values are presented as median interquartile range (IQR) for continuous variables and n (%) for categorical variables. Between-group comparisons were performed using the Mann-Whitney U test for continuous variables and the chi-square test with continuity correction for categorical variables. Objective cure was defined as the absence of urine leakage on a standardized cough stress test performed at a bladder volume of 300 mL in the lithotomy position. Subjective cure was defined as a pre- to postoperative improvement of ≥4 points in the ICIQ-UI SF score, corresponding to the established minimum clinically important difference for this instrument
CST: Cough stress test, ICIQ-UI SF: International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form, ΔICIQ-UI SF: Pre- to postoperative ICIQ-UI SF score difference, OR: Odds ratio, CI: Confidence interval, adjusted OR: Propensity-score-adjusted firth penalized estimate, PFMT: Pelvic floor muscle training

Table 3. Within-group comparison of preoperative and postoperative ICIQ-UI SF scores

Group	Preoperative ICIQ-UI SF, median [IQR]	Postoperative ICIQ-UI SF, median [IQR]	*p* value
Non-PFMT group (n=55)	19.0 [17.0-21.0]	8.0 [1.0-11.0]	<0.0001
PFMT group (n=82)	19.0 [18.0-20.0]	5.5 [1.0-10.0]	<0.0001

Values are presented as median interquartile range, (IQR). Within-group comparisons were performed using the Wilcoxon signed-rank test
ICIQ-UI SF: International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form, PFMT: Pelvic floor muscle training

DISCUSSION

In this retrospective cohort study, the addition of a structured six-week preoperative PFMT program to TOT surgery was not associated with a significantly higher objective or subjective cure rate in women with stress-predominant MUI ($p=0.468$ and $p=0.280$, respectively). Although the absolute cure rates were numerically higher in the PFMT group for both outcomes, the between-group differences did not reach statistical significance. Symptom scores fell markedly from baseline in both groups, confirming that this absence of a between-group difference was not attributable to ineffective surgery in either arm.

Most randomized and observational studies that have asked this question have reached the same answer. ESTEEM, the largest trial in this area, found a statistically significant improvement with combined therapy that nevertheless did not reach the trial's pre-specified clinically important threshold.[12] McLean et al.[11] reported a higher cure rate when physiotherapy was added to surgery, but the advantage held only for patient-reported symptoms and disappeared on pad testing and bladder diary. Nauman et al.,[10] in a retrospective cohort closely matching ours in clinical profile, drew the same conclusion; preoperative training before retropubic sling did not meaningfully improve stress incontinence resolution (79.2% versus 69.4%). Üzelpasaci et al.[13] recently confirmed that an intensive six-week preoperative protocol can substantially improve pelvic floor muscle strength and symptom severity before surgery. Whether these preoperative gains carry into surgical outcomes remains an open question, since that study did not include postoperative follow-up.[13] A secondary analysis of the ESTEEM cohort offered a plausible explanation for the broader pattern, which was that most treatment failures after a MUS involved persistent urgency rather than recurrent stress incontinence, and further stress incontinence treatment was needed in only a small minority of women.[18] Once a MUS has effectively addressed the stress component, adjunctive PFMT appears to have limited room to add measurable benefit in stress-predominant populations like ours.

PFMT and a MUS treat the same continence failure by different mechanisms. PFMT works gradually, building levator plate bulk, increasing resting muscle tone, and training a voluntary pre-contraction that occludes the urethra before exertion, whereas a sling provides passive mechanical support at the mid-urethral level from day one.[5] Muscle adaptations take time. Most randomised trials showing clinical benefit used supervised protocols of eight to twelve weeks; a six-week preoperative course may not be long enough for full strength gains to develop.[5,19] Even when a short preoperative course does produce measurable strength gains,[13] those gains add little once the sling has corrected the stress component. The remaining value of PFMT is probably in residual urgency. This matches the failure pattern seen after surgery; in a secondary analysis of the ESTEEM cohort, most women who needed further treatment after a MUS were treated for persistent urgency, not recurrent stress incontinence.[18]

MUS surgery offers high, durable cure rates for SUI.[6] Serati and colleagues documented this prospectively across multiple centres: at ten years after tension-free vaginal tape-obturator in women with pure SUI, objective and subjective cure rates remained at 92% and 97%, with no meaningful deterioration over follow-up.[20] In our cohort, even the non-PFMT group achieved an objective cure rate of 81.8%, leaving little head-room to a complete response. Consistent with this, the postoperative symptom measure showed a pronounced floor effect: 19.7% of patients reached the best possible ICIQ-UI SF

score of zero, exceeding the 15% threshold conventionally used to define such an effect,[21] so there was limited capacity to detect further improvement. The numerically higher but non-significant 6.0 percentage-point difference is therefore consistent with a ceiling effect of effective surgery rather than evidence that PFMT confers no benefit; alternative explanations are considered among the limitations below.

Lack of statistical significance in our cohort does not mean PFMT plays no role. Two further analyses of the ESTEEM cohort suggest its benefit is concentrated rather than evenly spread. A planned interaction analysis showed that the benefit varied with baseline urgency. In the highest Urogenital Distress Inventory (UDI)-irritative quartile, sling alone carried a substantially higher failure risk; combined therapy did not.[18] A parallel cost-effectiveness analysis reached the same conclusion. In the overall MUI population, combined treatment was not good value. It became cost-effective in women with more bothersome baseline urgency, and cost-saving in the most severe stratum from the societal perspective.[22] Our cohort was stress-predominant, so by definition it contains fewer women in this responsive subgroup. The non-significant difference we observed fits this picture. The implication for practice is selective rather than universal use. Structured preoperative PFMT is unlikely to help across the board, but may be worth offering to women whose baseline urgency burden is greatest. This interpretation rests on external evidence rather than on our own data. This was because a validated measure of baseline urgency burden was not available, and so we could not test the urgency-stratified hypothesis directly in this cohort. It is therefore best regarded as hypothesis-generating. Prospective studies should stratify by baseline urgency and be powered for the subgroup most likely to benefit.

The cohort reflects routine clinical practice, and all patients underwent the same surgical procedure (TOT), removing variability across sling types. The preoperative PFMT protocol was standardized across exposed patients, six weeks of structured supervised training. Outcomes were assessed both objectively (postoperative cough stress test) and through a validated patient-reported instrument (ICIQ-UI SF), and the findings from these two measures were consistent with each other.

Study Limitations

Several limitations qualify these findings. The study is subject to selection bias because treatment allocation was not randomized but was determined by patient preference and clinical judgement; the non-PFMT group included women who declined training, had contraindications, or proceeded directly to surgery. Although baseline characteristics, including symptom severity, were comparable and the treatment effect was unchanged after propensity-score adjustment, unmeasured factors such as motivation and treatment expectations could not be captured from the medical record, and residual confounding cannot be excluded. Baseline urgency burden was not quantified with a validated instrument (such as the UDI-irritative subscale or an overactive-bladder symptom score), and urgency incontinence episode counts, bladder diaries, and urodynamic parameters were unavailable. Consequently, the analysis could not be stratified by baseline urgency severity, and a subgroup benefit of PFMT concentrated in women with greater urgency burden may have gone undetected. Adherence to preoperative PFMT was ascertained from the preoperative clinical notes rather than quantified with a validated diary, and reliable measurement of PFMT adherence remains an unresolved methodological problem across the literature;[23] any residual misclassification of PFMT status would most likely be non-differential and would bias the treatment estimate toward the null, potentially masking a true benefit. Outcome assessment was not blinded. The CIs around the treatment estimates were wide and the sample was powered to detect only large between-group differences, so a type II error cannot be excluded. We reiterate that the non-significant result should not be read as evidence that PFMT confers no benefit, and limited power, residual confounding, and a possibly insufficient six-week training regime cannot be distinguished from a ceiling effect of effective surgery as explanations for it. The primary outcomes were captured at a single timepoint roughly 15 months after surgery, leaving the possibility of later recurrences undetected.

CONCLUSION

In this retrospective cohort of women undergoing TOT for stress-predominant MUI, a six-week structured preoperative PFMT program did not significantly improve either objective or subjective cure rates. This pattern is consistent with a ceiling effect, in which the high cure rate of surgery alone, together with a floor effect on the symptom measure, limits both the room for and the power to detect an incremental benefit and it does not establish that PFMT is without effect. Combined with the broader evidence, any incremental gain from preoperative PFMT, if present, may concentrate in women with the heaviest baseline urgency and because urgency was not formally measured, this is best regarded as hypothesis-generating and would be most directly tested by future, adequately powered, urgency-stratified prospective studies.

Supplementary Tables Link: https://d2v96fxpocvxx.cloudfront.net/bda9171a-fae8-4995-8276-2138323f1e16/content-images/8d77713d-181a-4bd3-8050-ceb9e4f346bd.pdf

Ethics

Ethics Committee Approval: The study was approved by the University of Health Sciences Turkey, Bağcılar Training and Research Hospital Non-Interventional Clinical Research Ethics Committee (approval no: 2025/08/12/075, date: 07.08.2025).

Informed Consent: Owing to the retrospective design of the study, the requirement for informed consent was waived by the ethics committee.

Footnotes

Authorship Contributions

Surgical and Medical Practices: Ö.A., T.D., M.T., Ö.Y.A., H.G., Concept: Ö.A., H.G., Design: Ö.A., H.G., Data Collection or Processing: Ö.A., M.T., Ö.Y.A., Analysis or Interpretation: Ö.A., Ö.Y.A., Literature Search: T.D., M.T., Writing: Ö.A., H.G.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

Declaration on the Use of Artificial Intelligence (AI): No artificial intelligence tools were used in the preparation of this manuscript.

REFERENCES

1. Haylen BT, de Ridder D, Freeman RM, et al. An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction. Int Urogynecol J. 2010;21(1):5-26.
2. Abrams P, Cardozo L, Fall M, et al.; Standardisation Sub-committee of the International Continence Society. The standardisation of terminology of lower urinary tract function: report from the Standardisation Sub-committee of the International Continence Society. Neurourol Urodyn. 2002;21(2):167-178.
3. Patel UJ, Godecker AL, Giles DL, Brown HW. Updated prevalence of urinary incontinence in women: 2015-2018 national population-based survey data. Female Pelvic Med Reconstr Surg. 2022;28(4):181-187.
4. Luber KM. The definition, prevalence, and risk factors for stress urinary incontinence. Rev Urol. 2004;6(Suppl 3):S3-S9.
5. Dumoulin C, Cacciari LP, Hay-Smith EJC. Pelvic floor muscle training versus no treatment, or inactive control treatments, for urinary incontinence in women. Cochrane Database Syst Rev. 2018;10(10):CD005654.
6. Ford AA, Rogerson L, Cody JD, Ogah J. Mid-urethral sling operations for stress urinary incontinence in women. Cochrane Database Syst Rev. 2015;(7):CD006375.
7. Kobashi KC, Albo ME, Dmochowski RR, et al. Surgical treatment of female stress urinary incontinence: AUA/SUFU guideline. J Urol. 2017;198(4):875-883.
8. Sabadell J, Montero-Armengol A, Salicrú S, Catalán-Martínez M, Gil-Moreno A, Poza JL. Long-term outcomes of transobturator suburethral tapes for female stress urinary incontinence. Neurourol Urodyn. 2022;41(1):391-398.
9. Jun T, Yoon HS, Kim HS, Lee JW, Bae J, Lee HW. Recurrence rate of stress urinary incontinence in females with initial cure after transobturator tape procedure at 3-year follow-up. Investig Clin Urol. 2017;58(1):54-60.
10. Nauman K, Stolzle A, Owens L, Frilot CF 2nd, Gomelsky A. Impact of preoperative pelvic floor muscle training (pretraining) on urinary storage and emptying symptoms in women undergoing sling surgery. Int Urogynecol J. 2022;33(3):673-679.
11. McLean L, Charette M, Varette K, et al. Pelvic floor muscle training as an adjunct to a midurethral sling: a single-blind randomised controlled trial. Int Urogynecol J. 2022;33(4):809-819.
12. Sung VW, Borello-France D, Newman DK, et al. Effect of behavioral and pelvic floor muscle therapy combined with surgery vs surgery alone on incontinence symptoms among women with mixed urinary incontinence: the ESTEEM randomized clinical trial. JAMA. 2019;322(11):1066-1076.
13. Üzelpasaci E, Özkutlu Ö, Demir E, Dülger A, Ün Yildirim N, Özdemir Ö. Effectiveness of intensive preoperative pelvic floor muscle training in women with stress urinary incontinence awaiting surgery: a randomized controlled trial. Int Urogynecol J. 2026;37(6):1743-1754.
14. Carmel ME, Deng DY, Greenwell TJ, Zimmern PE. Definition of success after surgery for female stress incontinence or voiding dysfunction: an attempt at standardization. Eur Urol Focus. 2016;2(3):231-237.
15. Çetinel B, Özkan B, Can G. The validation study of ICIQ-SF Turkish version. Turk J Urol. 2004;30(3):332-338.
16. 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.
17. Heinze G, Schemper M. A solution to the problem of separation in logistic regression. Stat Med. 2002;21(16):2409-2419.
18. Sung VW, Richter HE, Moalli P, et al.; Eunice Kennedy Shriver National Institute of Child Health and Human Development Pelvic Floor Disorders Network*. Characteristics associated with treatment failure 1 year after midurethral sling in women with mixed urinary incontinence. Obstet Gynecol. 2020;136(3):482-491. Retraction in: Obstet Gynecol. 2021;138(2):312.
19. Bø K, Hilde G. Does it work in the long term?—A systematic review on pelvic floor muscle training for female stress urinary incontinence. Neurourol Urodyn. 2013;32(3):215-223.
20. Serati M, Braga A, Athanasiou S, et al. Tension-free vaginal tape-obturator for treatment of pure urodynamic stress urinary incontinence: efficacy and adverse effects at 10-year follow-up. Eur Urol. 2017;71(4):674-679.
21. Terwee CB, Bot SDM, de Boer MR, et al. Quality criteria were proposed for measurement properties of health status questionnaires. J Clin Epidemiol. 2007;60(1):34-42.
22. Harvie HS, Sung VW, Neuwahl SJ, et al.; Eunice Kennedy Shriver National Institute of Child Health and Human Development Pelvic Floor Disorders Network. Cost-effectiveness of behavioral and pelvic floor muscle therapy combined with midurethral sling surgery vs surgery alone among women with mixed urinary incontinence: results of the effects of surgical treatment enhanced with exercise for mixed urinary incontinence randomized trial. Am J Obstet Gynecol. 2021;225(6):651.e1-651.e26.
23. Sacomori C, Berghmans B, Mesters I, de Bie R, Cardoso FL. Strategies to enhance self-efficacy and adherence to home-based pelvic floor muscle exercises did not improve adherence in women with urinary incontinence: a randomised trial. J Physiother. 2015;61(4):190-198.