Genitourinary syndrome of menopause in surgical versus natural menopause: standardized clinical scoring

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Abstract

Objectives: To compare genitourinary syndrome of menopause (GSM) symptoms and objective examination findings between women with surgical and natural menopause, and to evaluate the association between menopausal type and GSM severity.

Methods: This retrospective, single-center cross-sectional study included 422 postmenopausal women (218 surgical, 204 natural menopause). GSM was assessed using a standardized eight-component examination score (elasticity, lubrication, tissue integrity, introitus, labia, urethra, rugae, color; total score 0-22) and structured symptom inquiry. Group comparisons were performed with non-parametric and χ^2 tests. Multivariable logistic regression analysis was used to explore the association between menopausal type and GSM-related findings.

Results: Women with surgical menopause had significantly higher total GSM scores and more pronounced impairment in lubrication, tissue integrity, introitus, labial, and urethral components. Genital dryness, dyspareunia, reduced sexual desire, postcoital bleeding, dysuria, and urinary frequency were also more common in this group. In regression analysis, total GSM score was found to be independently associated with surgical menopause (adjusted odds ratio: 1.08, 95% CI: 1.04-1.12).

Conclusions: Surgical menopause is associated with a more severe GSM phenotype. The total GSM score may serve as a practical tool to assess symptom severity and support timely clinical management. Routine assessment of GSM, particularly in surgically menopausal women, should be integrated into gynecological care to improve quality of life.

Key Words: Genitourinary syndrome of menopause, GSM score, Surgical menopause.

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Genitourinary syndrome of menopause (GSM) is a chronic, multifactorial clinical condition caused by morphologic and functional changes in the lower urinary tract and genital tissues resulting from postmenopausal estrogen deprivation.[1-3] GSM develops as a consequence of menopausal estrogen withdrawal and atrophy of estrogen-responsive tissues and is characterized by a broad spectrum of symptoms including vaginal dryness, loss of elasticity, and lower urinary tract manifestations.[1,4] The reported prevalence of GSM ranges between 27% and 84%;[5] this variability has been attributed to differences in diagnostic criteria and study population characteristics.[2,6] Studies providing a systematic comparison of GSM in women with surgical menopause versus natural menopause in terms of clinical components and symptom profiles are limited in the literature. It has been suggested that the abrupt reduction in estrogen levels after surgical menopause may be associated with more pronounced effects at the tissue level.[7,8]

The assessment of GSM is based on clinical symptom scoring systems and objective evaluation of genital tissues. A comprehensive evaluation of vaginal epithelial thickness, elasticity, pH, vaginal microbiota, and urinary function is essential to more accurately reflect the impact of hormonal changes.[2,7]

This study aims to provide a quantitative assessment of GSM symptom profiles and objective examination findings in women with surgical and natural menopause, and to evaluate whether the total GSM score may provide clinically relevant information for characterizing disease severity and guiding management strategies.

METHODS

Study design

This study was conducted as a retrospective, single-center, cross-sectional observational study at the Department of Obstetrics and Gynecology, Torbalı State Hospital, İzmir, Türkiye. Postmenopausal women who

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This study was approved by the Non-Interventional Research Ethics Committee of Ege University Faculty of Medicine (Decision No: 26-2T/60, Date: 05.02.2026). All procedures were conducted in accordance with the ethical standards of the institutional and/or national research committee, as well as the 1964 Helsinki Declaration and its subsequent amendments.

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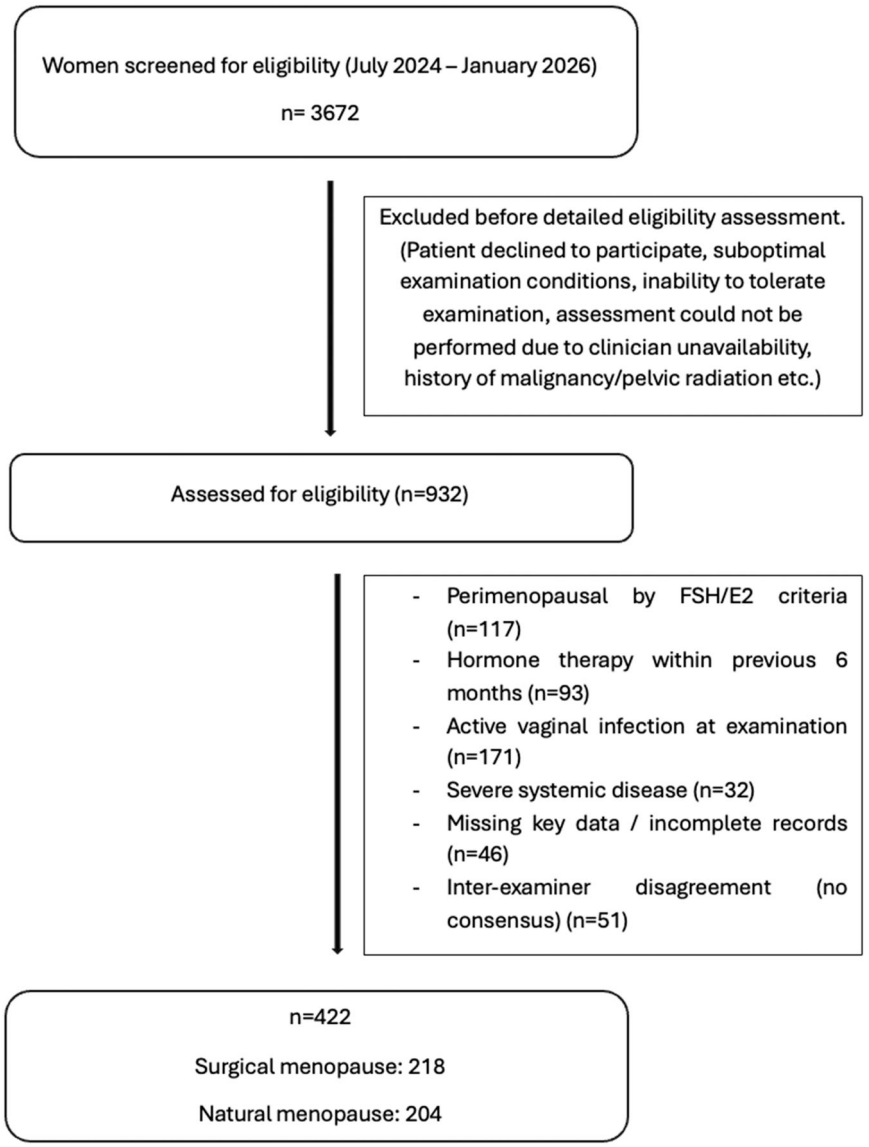

FIG. 1. Flow diagram of screening, eligibility, and inclusion. E2, estradiol; FSH, follicle-stimulating hormone.

attended the outpatient clinic between June 2024 and January 2026 and met the eligibility criteria were included in the study. Consecutive postmenopausal women attending the outpatient clinic were enrolled; no matching or quota-based sampling was applied. The study was approved by the Non-Interventional Research Ethics Committee of Ege University Faculty of Medicine, and all procedures were performed in accordance with the principles of the Declaration of Helsinki.

Definition of menopause

Menopausal status was primarily defined by the presence of amenorrhea for at least 12 months. In women with an amenorrhea duration of <12 months, menopausal status was determined through the combined assessment of serum follicle-stimulating hormone (FSH) and estradiol (E2) levels. Accordingly:

- Women with FSH >75 mIU/mL were considered postmenopausal,
- Women with FSH <25 mIU/mL were considered premenopausal,
- Among women with FSH levels between 25 and 75 mIU/mL, women with E2 <20 pg/mL were classified as postmenopausal, whereas those with E2 ≥ 20 pg/mL were classified as perimenopausal.

Study groups

Between June 2024 and January 2026, a total of 422 postmenopausal women evaluated at the outpatient clinic were enrolled in the study. Participants were allocated into two groups according to menopausal type: surgical menopause and natural menopause. The flowchart is shown in

TABLE 1. Components of the GSM scoring system (0-3 for each item; total score 0-22)

Component	Score	Definition
Elasticity	0	Normal elasticity
	1	Mild reduction
	2	Marked rigidity
	3	Very rigid/friable tissue
Lubrication	0	Normal moisture
	1	Mildly decreased
	2	Markedly dry
	3	Completely dry
Tissue integrity	0	Normal
	1	Mild fragility
	2	Erosion tendency
	3	Tissue prone to bleeding
Introitus	0	Normal
	1	Mild narrowing
	2	Marked narrowing
	3	Severe painful narrowing
Labia majora/minora	0	Normal
	1	Mild atrophy
	2	Marked atrophy
	3	Advanced atrophy
Urethra	0	Normal
	1	Mild tenderness
	2	Marked tenderness
	3	Irritation or urethral caruncle
Rugae	0	Normal folds
	1	Mild flattening
	2	Marked flattening
	3	Complete loss
Color	0	Normal
	1	Pallor
	2	Marked pallor
	3	Severe pallor

The overall GSM score is calculated by summing all component scores (range 0-22). Higher scores represent more severe genitourinary involvement. GSM, genitourinary syndrome of menopause.

Figure 1.

The surgical menopause group comprised women who had previously undergone hysterectomy with bilateral salpingo-oopherectomy for benign indications at any medical center. In all cases, the absence of the uterus and ovaries was confirmed by medical records, verified by pathology reports and ultrasonographic evaluation.

The natural menopause group consisted of women who fulfilled the clinical and hormonal criteria specified in the study protocol.

Participants who had a history of malignancy and pelvic radiotherapy, or severe systemic disease were excluded from the study. Women with active vaginal infection were excluded from the study to avoid potential confounding effects on GSM-related mucosal findings. Women who had received systemic or local hormone therapy within the previous 6 months were excluded to minimize the potential short-term effects of exogenous estrogen on GSM-related findings. Women classified as perimenopausal were also excluded from the study.

TABLE 2. Demographic characteristics of the study population

Variable	Surgical (n = 218)	Natural (n = 204)	*P*
Age (y)	54.12 ± 4.98	53.87 ± 4.76	0.312
Height (m)	1.60 ± 0.05	1.61 ± 0.06	0.148
Weight (kg)	74.10 ± 9.32	72.95 ± 9.11	0.192
BMI (kg/m^2)	27.85 ± 3.28	27.71 ± 3.65	0.072
Duration of menopause (y)	5.62 ± 4.21	5.18 ± 4.07	0.221
Age at menopause (y)	48.50 ± 3.72	48.69 ± 3.14	0.448
Smoking (pack-years)	3.96 ± 9.58	3.72 ± 10.21	0.337

BMI, body mass index.

Values are presented as mean ± SD. Continuous variables were compared using the Mann-Whitney *U* test. $P < 0.05$ was considered statistically significant.

Data collection

Demographic data, obstetric history, smoking, and alcohol consumption were documented. GSM assessments were performed by the same clinical team according to a predefined and standardized examination protocol. Data were obtained from standardized clinical evaluations performed during routine outpatient visits and were retrospectively analyzed after ethical approval was obtained. In cases with borderline or potentially discrepant findings, evaluations were reviewed by a second gynecologist. Cases in which consensus could not be reached between evaluators were excluded from the analysis. As the study was based on retrospective analysis of routinely collected clinical data, information regarding refusal to participate was not available.

Standardized GSM examination and scoring

GSM was evaluated using a standardized scoring system consisting of predefined clinical components assessed during gynecological examination. Each component was scored on a 0-3 scale, with higher scores indicating more severe genitourinary involvement. The total GSM score was calculated as the sum of all components, ranging from 0 to 22.[9,10] The components of the GSM scoring system are defined in Table 1.

Assessment of symptoms

Symptoms were assessed using a structured, standardized inquiry form administered by the same clinical team. Participants were questioned regarding the presence or absence of the following symptoms: genital dryness, decreased lubrication, dyspareunia, postcoital bleeding, reduced libido, dysuria, and urinary frequency.

Statistical analysis

Data were analyzed using IBM SPSS Statistics version 24.0 (IBM Corp., Armonk, NY). Continuous variables were compared using the Mann-Whitney *U* test, and categorical variables were analyzed with the Pearson χ^2 test.

Multivariate logistic regression analysis was performed to explore the association between clinical variables and menopausal type, rather than to construct a predictive model. A *P*-value < 0.05 was considered statistically significant.

RESULTS

A total of 422 postmenopausal women were included in the study. Among these women, 218 (51.7%) were in the

TABLE 3. GSM examination components and total score

Component	Surgical	Natural	*P*
Elasticity	1.55 ± 0.86	1.39 ± 0.83	0.048
Lubrication	1.69 ± 0.95	1.42 ± 0.88	0.014
Tissue integrity	1.38 ± 0.77	1.01 ± 0.74	< 0.001
Introitus	1.34 ± 0.82	0.96 ± 0.76	< 0.001
Labia majora/minora	1.48 ± 0.87	0.95 ± 0.78	< 0.001
Urethra	1.39 ± 0.86	0.94 ± 0.79	< 0.001
Rugae	1.59 ± 0.90	1.39 ± 0.82	0.031
Color	1.41 ± 0.86	1.38 ± 0.81	0.812
Total GSM score	11.83 ± 6.02	9.64 ± 5.78	0.001

GSM, genitourinary syndrome of menopause.

Comparisons were performed using the Mann-Whitney *U* test. Higher scores represent more pronounced GSM findings (subscales 0-3; total score 0-22)

TABLE 4. GSM-related symptoms

Variable	SM group, n (%)	NM group, n (%)	*P*
Genital dryness	156 (71.6)	118 (57.8)	0.004
Decreased lubrication	154 (70.6)	116 (56.9)	0.006
Dysparonia	138 (63.3)	104 (51.0)	0.012
Postcoital bleeding	56 (25.7)	26 (12.7)	0.001
Decreased libido	146 (67.0)	92 (45.1)	< 0.001
Dysuria	88 (40.4)	52 (25.5)	0.002
Urinary frequency	86 (39.4)	62 (30.4)	0.049

GSM, genitourinary syndrome of menopause; NM, natural menopause; SM, surgical menopause.

Categorical variables were compared using the Pearson χ^2 test. Values are presented as n (%).

surgical menopause group and 204 (48.3%) were in the natural menopause group. Both groups were comparable in terms of age, height, weight, body mass index, duration of menopause, and smoking history, with no statistically significant differences detected. The demographic characteristics of the participants are presented in Table 2.

Analysis of GSM examination components revealed that lubrication, tissue integrity, introitus, labia majora/minora, and urethral scores were significantly higher in the surgical menopause group compared with the natural menopause group. In addition, the total GSM score was significantly elevated among women with surgical menopause. Comparative GSM scores of both groups are summarized in Table 3.

Symptom evaluation included genital dryness, dyspareunia, decreased lubrication, postcoital bleeding, decreased libido, dysuria, and urinary frequency. All assessed symptoms showed a statistically significant association with menopausal type, being more frequent in the surgical menopause group compared with the natural menopause group. The comparison between the two groups is presented in Table 4.

Multivariate logistic regression analysis showed that the total GSM score was independently associated with surgical menopause, with each one-point increase in score corresponding to an 8% rise in the odds of surgical menopause (adjusted odds ratio = 1.08; 95% CI: 1.04-1.12; $P = 0.001$) (Table 5).

DISCUSSION

In this study, women with surgical menopause were compared with those in natural menopause in terms of genitourinary syndrome findings, and the impact of menopausal type on GSM severity was evaluated. Our results demonstrated that the total GSM score, as well as the lubrication, tissue integrity, introitus, labia majora/minora, and urethral components, were significantly higher in the surgical menopause group. In addition, genital dryness, decreased libido, dyspareunia, postcoital bleeding, and lower urinary tract symptoms were more frequently observed among women with surgical menopause. The fact that the total GSM score was independently associated with surgical menopause, and that this group exhibited a distinctly more severe GSM phenotype, constitutes the key finding of our study. From a clinical perspective, this may be important, as these women may benefit from earlier and more proactive initiation of GSM-targeted therapies.

GSM is a term used to describe the wide spectrum of symptoms and signs affecting the vulvovaginal and lower urinary tract resulting from reduced estrogenic stimulation in the postmenopausal period.[11,12] Estrogen deficiency is known to be associated with a decrease in glycogen content within the genital and urinary epithelium, which in turn results in an increase in vaginal pH.[11] Disruption of the vaginal microbiota is accompanied by a decline in lactobacilli, impairment of mucosal barrier function, and increased susceptibility to infection and tissue fragility.[11,13] These alterations lead to clinical manifestations such as irritation, vaginal dryness, dyspareunia, and lower urinary tract symptoms.[1,4,9]

GSM is reported to affect ~27%-84% of postmenopausal women.[5] Owing the abrupt and more pronounced loss of estrogen in surgical menopause, previous studies have emphasized that GSM symptoms tend to develop earlier and follow a more severe course in these women compared with those experiencing natural menopause.[7,14,15] These symptoms are generally progressive, do not resolve spontaneously, and have a significant negative impact on sexual function, psychosocial well-being, and overall quality of life.[1,3,16] Current therapeutic approaches are based on a stepwise algorithm tailored to symptom severity, ranging from non-hormone moisturizers and lubricants to local estrogen therapy, dehydroepiandrosterone (DHEA), and energy-based modalities.[1,5,16]

GSM scoring is based on the evaluation of genital and lower urinary tract findings, including lubrication, tissue integrity, elasticity, labia majora/minora, and rugae.[7,12,13] Each component of the scoring system reflects the impact of estrogen deficiency at different tissue levels. Decreased lubrication is associated with loss of glycogen within the vaginal epithelium and reduced secretory activity, whereas impairment of tissue integrity represents a marker of epithelial thinning and fragility resulting from the weakened collagen organization.[1,2,11] Atrophy observed in the introitus, and labial regions reflects loss of subcutaneous adipose tissue and elastic fibers, whereas urethral tenderness and dysuria arise from diminished estrogen-dependent trophic support of the

TABLE 5. Multivariate logistic regression analysis

Variable	aOR	95% CI	*P*
Total GSM score	1.08	1.04-1.12	0.001
Age	1.00	0.97-1.04	0.78
BMI	1.02	0.98-1.07	0.29
Duration of menopause	1.01	0.97-1.05	0.56
Smoking	0.91	0.58-1.41	0.66

aOR, adjusted odds ratio; BMI, body mass index; GSM, genitourinary syndrome of menopause.

Variables considered clinically relevant and/or showing $P < 0.20$ in univariable analyses were included in the model. Model fit statistics: Hosmer-Lameshow $P = 0.47$; Nagelkerke $R^2 = 0.07$.

urethral mucosa.[7,13]

In our study, significantly higher scores for lubrication, tissue integrity, introitus, and urethra in the surgical menopause group are consistent with these mechanisms, indicating that surgical menopause is associated with more pronounced mucosal and functional deterioration. In parallel with our findings, previous studies have demonstrated that vaginal dryness and dyspareunia are more frequent among women with surgical menopause than those with natural menopause, and that lower urinary tract symptoms tend to appear earlier in this population.[7,11,17] Furthermore, the markedly higher rate of postcoital bleeding observed in our cohort parallels the increase in tissue integrity scores and supports the concept of enhanced tissue fragility in earlier reports.[1,11,13]

Although our findings are in line with the majority of reports indicating more severe GSM manifestations after surgical menopause, not all studies have demonstrated a consistent increase across all urinary symptoms. In some cohorts, urgency, hesitancy, and incontinence have been reported to be more frequent among women with natural menopause.[18] This inconsistency is likely attributable to differences in surgical characteristics (age at surgery, indication of surgery etc.), variability in symptom assessment methods, and the multifactorial nature of urinary complaints, which are influenced not only by hypoestrogenism but also by comorbidities and pelvic floor dynamics.

The relatively limited differences observed in certain examination components, such as color, elasticity, and rugae, are consistent with previous reports.[1,13] This may be explained by the fact that some of these findings become more prominent in later stages of GSM, whereas others are largely dependent on the visual interpretation of the examining physician.[5] The lack of a significant difference in the color subscale is not unexpected. Color assessment relies largely on visual interpretation and may therefore be more prone to observer variability. In addition, vulvovaginal scoring systems differ in how their components are defined and applied, and the contribution of individual parameters to the overall score remains unclear, as also noted in previous literature.[19] Moreover, a considerable proportion of women in the surgical menopause group had undergone surgery at external centers; variations in surgical techniques and in postoperative hormonal or symptom management may therefore have attenuated the differences in physical examination findings between the two groups. Accordingly, the relatively modest differences observed in certain subcomponents are more likely related to the inherently variable and less discriminative nature of these parameters rather than indicating a true absence of GSM involvement.[6]

When all findings are considered together, the total GSM score seems to represent a meaningful clinical construct reflecting the genitourinary phenotype associated with surgical menopause, although the discriminative value of individual components may vary. Consistent with the previous studies evaluating vaginal health indices and GSM-based scoring systems, these tools have been recommended not for definitive classification, but for enhancing clinical awareness and prioritizing treatment needs.[5,10] In line with this perspective, our findings support the use of the total GSM score as a practical clinical assessment tool—particularly in women with a history of surgical menopause—to facilitate timely initiation of local therapies and quality-of-life-oriented interventions.[8] This approach may ultimately contribute to more patient-centered management of GSM in routine clinical practice.

One of the strengths of our study is that GSM was assessed not solely through symptom inquiry, but by means of a multi-component, clinic-standardized examination scoring system. This approach enabled a clearer demonstration of the relationship between subjective complaints and objective findings. The inclusion of women who had undergone surgery at external centers also enhanced the representativeness of the study population and contributed to the generalizability of our results. Compared with previous studies, the relatively larger sample size and the comparison of surgical and natural menopause groups with similar age distribution within the same center constitute additional methodological strengths.

Our study also has several limitations. Because of its cross-sectional design, dynamic changes occurring over time after surgical menopause could not be evaluated. The single-center nature of the study and the reliance on examiner-based scoring may have introduced potential measurement bias. In addition, differences in surgical techniques and postoperative management within the surgical menopause group could not be controlled, which may partly explain the heterogeneity observed in certain subcomponents. Although evaluations were performed according to a standardized protocol and reviewed by a second clinician, formal inter-rater reliability analysis (eg, Cohen kappa or intraclass correlation coefficient) was not performed, which represents a reproducibility limitation that future studies should address. A considerable proportion of initially screened women were excluded due to active vaginal infection; although this was necessary to avoid confounding of mucosal findings, we cannot exclude the possibility that infection prevalence differed between groups before exclusion. Clinically relevant confounders—including parity, pelvic floor disorders, and surgical

characteristics—were not available for inclusion in the regression model, which may have limited its explanatory capacity. Finally, symptom data were recorded as binary variables rather than with validated patient-reported outcome instruments, which may limit the ability to fully capture symptom severity. Despite these limitations, the consistent increase in both objective GSM scores and symptom frequency in the surgical menopause group suggests a coherent and clinically meaningful pattern.

CONCLUSIONS

GSM is a condition that significantly affects the quality of life of postmenopausal women, yet it is frequently overlooked in routine practice, as it is often perceived as a natural consequence of aging. Consequently, its actual prevalence is likely to exceed the figures reported in the literature.

This study demonstrates that women with surgical menopause exhibit a more severe GSM phenotype compared with those experiencing natural menopause, and that the total GSM score represents the most relevant clinical indicator reflecting this difference. Our findings emphasize that GSM extends beyond vaginal dryness and constitutes a multidimensional syndrome involving urinary symptoms and sexual function. Therefore, systematic inquiry into GSM symptoms, the use of standardized examination scores, and early initiation of stepwise treatment according to symptom severity are essential, particularly in women with surgical menopause.

The results also support the preference for ovarian-conserving approaches during hysterectomy whenever clinically feasible, given their potential benefits for long-term genitourinary health. Integrating GSM assessment into routine gynecological care, coupled with patient education and multidisciplinary management, may improve both treatment uptake and quality of life. Future prospective studies incorporating hormonal, microbiological, and patient-reported outcome measures are needed to refine GSM management and to develop individualized therapeutic strategies.

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