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ORIGINAL RESEARCH

Female Sexual Dysfunction After High-Intensity Focused Ultrasound versus Laparoscopic Total Hysterectomy for Adenomyosis: Associations with Anxiety and Depression

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Background: Direct comparative data on postoperative sexual function between laparoscopic total hysterectomy (LTH) and high-intensity focused ultrasound (HIFU) in adenomyosis (AM) remain limited; therefore, this retrospective study compared sexual outcomes and their associations with psychological factors.

Methods and Materials: Medical records of 193 AM patients who underwent either LTH (n=102) or HIFU (n=91) and completed six-month follow-up were retrospectively reviewed. Sexual function was evaluated using the Female Sexual Function Index (FSFI), while psychological status was assessed using the Hamilton Anxiety Rating Scale (HAMA) and the Hamilton Depression Rating Scale (HAMD).

Results: HIFU group demonstrated significantly higher total FSFI scores when compared with LTH group at 6 months post-treatment (27.3 vs 23.8, $p<0.001$). Significant improvements were found in sexual desire (4.2 vs 3.6, $p<0.001$), lubrication (4.0 vs 3.5, $p<0.05$), orgasm (3.8 vs 3.2, $p<0.001$), and satisfaction (3.3 vs 2.7, $p<0.001$), while similar trend was observed in pain scores. It was further demonstrated that elevated anxiety and depression scores were negatively correlated with FSFI scores ($r=-0.39$ and -0.37, both $p<0.001$).

Conclusion: HIFU was associated with better sexual function compared to LTH in AM women, suggesting that HIFU may be a better strategy to preserve postoperative sexual function than LTH.

Keywords: adenomyosis, sexual dysfunction, HIFU, LTH, psychological factors

Introduction

As a prevalent gynecological disorder, adenomyosis (AM) is associated with female sexual dysfunction (FSD) and substantially decreased quality of life.[1] The clinical management of AM remains debated. Laparoscopic total hysterectomy (LTH) could offer definitive lesion removal, however its impact on postoperative sexual function varies among individuals, likely due to different vaginal shortening and neurovascular disruption.[2] High-intensity focused ultrasound (HIFU) could maintain sexual function by selectively ablating adenomyotic lesions at the same time preserving uterine anatomy.[3] However, The current literature predominantly examines symptom control and recurrence, offering limited systematic analysis of sexual health outcomes after treatment.[4]

The impact of LTH on sexual function remains controversial. Meta-analyses suggest that while overall sexual function is maintained or improved following surgery, approximately 15–20% of patients report declines in sexual desire or orgasmic response postoperatively.[5] Moreover, the surgical approach does not appear to significantly influence sexual outcomes.[6] In contrast, HIFU, particularly when combined with gonadotropin-releasing hormone agonists (GnRH-a) or levonorgestrel-releasing intrauterine systems (LNG-IUS), has demonstrated high clinical efficacy in alleviating dysmenorrhea.[7] HIFU's

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uterus-sparing nature is also more consistent with the reproductive goals of younger patients.[8] Additionally, HIFU's lower cost and wider insurance coverage may further shape patient preferences and treatment choices.[9]

Current evidence suggests that LTH may lead to transient improvements in sexual function. Female Sexual Function Index (FSFI) scores increased from 17.9 to 21.0 at six months postoperatively,[10] but these improvements often decline by one year, indicating limited long-term benefit. Moreover, preoperative sexual activity has been identified as a significant predictor of postoperative improvement.[11] Although the FSFI is not routinely utilized in studies of HIFU, follow-up data report dyspareunia relief rates ranging from 76% to 84%,[12,13] suggesting potential secondary benefits for sexual function. Ovarian preservation during hysterectomy is essential for maintaining postoperative sexual health, as bilateral salpingo-oophorectomy (BSO) has been associated with more pronounced impairments in vaginal lubrication and orgasmic function.[2,5]

Currently, a retrospective study suggested that a significantly higher fertility desire was found in patients undergoing HIFU compared to those receiving LTH,[8] but failed to include a comparative assessment of postoperative sexual function. Herein, the current study aimed to compare postoperative sexual outcomes in patients with AM undergoing HIFU versus LTH.

Materials and Methods

Participants

This is a retrospective study A total of 193 patients, who were clinically confirmed adenomyosis, were included in the analysis, and divided into two groups: LTH group (patients treated with LTH, n=102) and HIFU group (patients treated with HIFU, n=91). At the 6-month follow-up, 87 patients met the diagnostic criteria for FSD, while the remaining 106 did not exhibit evidence of FSD. The study was approved by the Fourth Hospital of Shijiazhuang, and written informed consent was obtained from the participants.

Treatment Allocation (Non-Randomized)

As a retrospective cohort study, treatment was not randomly assigned. After standardized counseling on the benefits and risks of LTH and HIFU, patients made an informed choice based on individual preference (eg, willingness to preserve the uterus), reproductive needs, and tolerance for surgical trauma. Clinical feasibility was simultaneously evaluated by physicians according to lesion type, uterine volume, and symptom severity.

Inclusion Criteria

Participants were included in this retrospective analysis if they met the following conditions: (1) a confirmed diagnosis of adenomyosis; (2) underwent either LTH or HIFU; (3) had normal sexual activity before treatment; (4) bilateral ovarian preservation during the procedure; and (5) completed a standardized 6-month postoperative follow-up with comprehensive clinical documentation.

Exclusion Criteria

Patients were excluded if they had conditions that could affect sexual function, such as pelvic organ prolapse, malignancy, psychiatric disorders, preoperative hormone therapy, prior oophorectomy, or congenital reproductive anomalies. Those with communication difficulties that could impair questionnaire accuracy were also excluded.

Interventions

LTH

LTH was performed as a routine standard laparoscopic total hysterectomy procedure at our institution, and no nerve-sparing technique was applied. All LTH procedures were performed by senior gynecologists with ≥5 years of laparoscopic surgery experience. The surgical workflow followed the Chinese Expert Consensus on the surgical pathway of hysterectomy for benign uterine diseases (2021). Preoperative evaluation included gynecologic ultrasonography, pelvic MRI, and CA125 testing, and vaginal antisepsis was performed for 3 consecutive days. Under general anesthesia,

a standard three- or four-port laparoscopic approach was used, with sequential ligation and transection of uterine ligaments, secure hemostasis of uterine vessels, and dissection of the cervix and vaginal fornix. The uterus was removed intact via the vaginal or abdominal route according to uterine size, and bilateral ovaries were preserved in all patients. Postoperatively, prophylactic antibiotics were administered for 24–48 h; pelvic drains were removed within 24–48 h in the absence of abnormal drainage. Patients were advised to abstain from sexual intercourse for 3 months.

HIFU

HIFU was delivered using a focused ultrasound uterine fibroid treatment system (PRO2008; Shenzhen PRO Medical Co., Ltd., Shenzhen, China) equipped with integrated ultrasound guidance and real-time monitoring. A standardized point-by-point sonication protocol was used with an output power of 280–300 W and a treatment duration of 40–120 min per session. During treatment, the dose and intensity were dynamically adjusted based on patient tolerance (eg, pain response and somatic reactions) and real-time ultrasound grayscale changes to achieve effective ablation while minimizing injury to surrounding tissues; the target ablation temperature was maintained within 65–100°C.

Preprocedural preparation followed a standardized workflow: patients were instructed to consume a light diet 1 day before treatment; fasting and water restriction were required on the treatment day; routine skin preparation was performed; bladder filling was ensured; intrauterine devices were removed in advance when present; and treatment was scheduled 7–10 days after menstruation with no abnormal vaginal bleeding. Laboratory testing (complete blood count, coagulation profile, liver and renal function, and tumor markers) and imaging evaluation (transvaginal color Doppler ultrasound and/or pelvic MRI) were completed to define lesion location and extent. Sedation and analgesia were provided before treatment. Postprocedurally, patients were encouraged to increase fluid intake and were monitored for vaginal bleeding/effusion and urinary status.

HIFU procedures were performed by credentialed physicians who had completed dedicated training. All operators followed unified institutional protocols and received standardized training before the study to reduce inter-operator variability.

Assessment of Sexual Function

Sexual function was assessed using the FSFI, a validated and widely adopted patient self-administered questionnaire developed by Rosen et al in 2000. The FSFI comprises 19 items across six domains (desire, arousal, lubrication, orgasm, satisfaction, and pain). The FSFI comprises 19 items across six domains: desire, arousal, lubrication, orgasm, satisfaction, and pain. Domain scores were calculated by summing item responses and applying domain-specific weighting factors, with the total score representing overall sexual function. Higher scores indicate better function, while a total score below 26.55 is indicative of FSD. Participants completed the FSFI independently; trained study staff provided standardized instructions and collected questionnaires.

FSFI Scoring

FSFI scoring was calculated based on the following domains: desire (1–2), arousal (3–6), lubrication (7–10), orgasm (11–13), satisfaction (14–16), and pain (17–19). Each item was scored on a scale from 0 or 1 to 5, depending on the domain. Domain scores were calculated by summing item scores and multiplying by a specific factor: 0.6 for desire, 0.3 for arousal and lubrication, 0.4 for orgasm, satisfaction, and pain. Domain scores range from 0 (or 0.8 for satisfaction) to 6.0. The total FSFI score ranges from 2.0 to 36.0, with higher scores indicating better sexual function.

Psychological Assessment

Anxiety and depressive symptoms were evaluated using validated clinician-administered scales. The Hamilton Anxiety Rating Scale (HAMA) was used to assess anxiety levels, comprising 14 items scored on a 5-point Likert scale (0–4). A total HAMA score >7 indicates possible anxiety, 14–21 suggests definite anxiety, and ≥22 indicates clinically significant anxiety.

Depressive symptoms were assessed using the Hamilton Depression Rating Scale (HAMD), which includes 24 items scored on either a 3-point (0–2) or 5-point (0–4) scale, depending on the item. A total score ≤8 indicates no depression;

scores of 9–20, 21–35, and >35 correspond to mild, moderate, and severe depression, respectively. All assessments were conducted by trained clinicians following standardized procedures.

FSFI, HAMA, and HAMD assessments at 6 months were conducted by independent gynecology healthcare staff who did not participate in treatment selection or procedures. Assessors were not informed of treatment allocation during evaluation (single-blind assessor design).

Statistics

Variables are presented as n (percentage, %) or mean ± SD. Categorical variables were compared using the chi-square test or Fisher's exact test, as appropriate. Continuous variables were compared using the Mann–Whitney *U*-test. A two-sided $p<0.05$ was considered statistically significant. Spearman correlation was used to assess associations between FSFI and HAMA/HAMD. Multivariate logistic regression was performed to identify independent predictors of FSD.

Results

Demographic and Clinical Characteristics of Adenomyosis Patients with FSD or without FSD (NFSD)

A total of 193 patients with AM were included, among whom 87 (45.1%) developed FSD at 6 months post-treatment, while 106 (54.9%) did not (NFSD group). As shown in Table 1, the two groups were comparable in age, parity, prior uterine surgery, lesion location, and education level ($p > 0.05$). However, the type of surgical intervention differed significantly ($p < 0.001$), with FSD more common among patients who underwent LTH, whereas HIFU was more frequent in the NFSD group. Diffuse lesions were more prevalent in the FSD group ($p = 0.009$), as was a larger preoperative uterine volume (≥200 cm^3; $p = 0.020$). Psychological assessments also revealed significantly higher rates of anxiety and depression in the FSD group, as indicated by elevated HAMA ($p = 0.016$) and HAMD ($p = 0.007$) scores.

Table 1 Demographic and Clinical Characteristics of Adenomyosis Patients with Female Sexual Dysfunction (FSD) or Not (NFSD) at 6 months After High Intensity Focused Ultrasound Ablation (HIFU) or Laparoscopic Total Hysterectomy (LTH)

Characteristics	Study Group		p
	NFSD (n = 106)	FSD (n = 87)	
Age (years)			
< 40	41 (38.7%)	25 (28.7%)	0.171
≥ 40	65 (61.3%)	62 (71.3%)	
Parity			
0	13 (12.3%)	6 (6.9%)	0.451
1 - 2	78 (73.6%)	67 (77.0%)	
≥ 3	15 (14.1%)	14 (16.1%)	
Uterine operation history			
Yes	60 (56.6%)	57 (65.5%)	0.237
No	46 (43.4%)	30 (34.5%)	
Operation type			
LTH	44 (41.5%)	58 (66.7%)	< 0.001
HIFU	62 (58.5%)	29 (33.3%)	

(*Continued*)

Table 1 (Continued).

Characteristics	Study Group		p
	NFSD (n = 106)	FSD (n = 87)	
Lesion location			
Anterior wall	24 (22.6%)	23 (26.4%)	0.812
Posterior wall	47 (44.3%)	38 (43.7%)	
Fundus	8 (7.5%)	4 (4.6%)	
Complex	27 (25.5%)	22 (25.3%)	
Lesion type			
Focal	59 (55.7%)	32 (36.8%)	0.009
Diffuse	47 (44.3%)	55 (63.2%)	
Preoperative uterine volume (cm^3)			
< 200	60 (56.6%)	34 (39.1%)	0.020
≥ 200	46 (43.4%)	53 (60.9%)	
Education			
Junior high school or below	14 (13.2%)	10 (11.5%)	0.886
Senior high school or secondary vocational school	49 (46.2%)	43 (49.4%)	
College or above	43 (40.6%)	34 (39.1%)	
HAMA score			
< 14	57 (53.8%)	30 (34.5%)	0.016
14 - 21	38 (35.8%)	39 (44.8%)	
> 21	11 (10.4%)	18 (20.7%)	
HAMD score			
< 9	66 (62.3%)	35 (40.2%)	0.007
9 - 20	35 (33.0%)	42 (48.3%)	
> 20	5 (4.7%)	10 (11.5%)	

Notes: Values were expressed as n (percentage, %). Chi-square test or Fisher's exact test was used for assessing distribution of observations or phenomena between different groups.

These results suggest that surgical approach, lesion type, uterine volume, and psychological status are important factors associated with postoperative sexual dysfunction in adenomyosis patients.

Multivariate Analysis of Risk Factors for FSD in Adenomyosis Patients

To identify independent predictors of FSD in patients with adenomyosis 6 months after treatment, a multivariate logistic regression analysis was performed. FSD status (FSD = 1; NFSD = 0) was set as the dependent variable, and variables with significant differences in univariate analysis—operation type, lesion type, preoperative uterine volume, and psychological scores—were included as independent variables (Table 2). As shown in Table 3, LTH was significantly associated with increased FSD risk compared to HIFU (OR = 1.736, $p = 0.002$). Diffuse lesions were also an independent risk factor (OR = 1.319, $p = 0.017$). Psychological factors were strongly associated with FSD: patients with HAMA

Table 2 Coding of Independent Variables in Multivariate Logistic Regression

Independent Variables	Coding
Operation type	HIFU = 0; LTH = 1
Lesion type	Focal = 0; Diffuse = 1
Preoperative uterine volume (cm^3)	< 200 = 0; ≥ 200 = 1
HAMA score	< 14 = 0; ≥ 14 = 1
HAMD score	< 9 = 0; ≥ 9 = 1

Table 3 Multivariate Logistic Analysis for Female Sexual Dysfunction (FSD) in Adenomyosis Patients at 6 months After High Intensity Focused Ultrasound Ablation (HIFU) or Laparoscopic Total Hysterectomy (LTH)

Variable	OR	95% Confidence Interval (CI)	p value
Operation type (LTH vs HIFU)	1.736	1.243 to 4.025	0.002
Lesion type (Diffuse vs Focal)	1.319	1.062 to 2.714	0.017
Preoperative uterine volume (≥ 200 cm^3 vs < 200 cm^3)	1.302	0.984 to 2.136	0.125
Anxiety status (HAMA score ≥ 14 vs < 14)	1.481	1.189 to 3.527	0.009
Depression status (HAMD score ≥ 9 vs < 9)	1.503	1.192 to 3.465	0.007

Notes: OR (Odds Ratio) > 1 indicates the factor is an independent risk factor for postoperative FSD. Statistical significance is confirmed if 95% CI does not include 1.

scores ≥14 (OR = 1.481, $p = 0.009$) and HAMD scores ≥9 (OR = 1.503, $p = 0.007$) had significantly higher risk. Preoperative uterine volume ≥200 cm^3 showed a non-significant trend toward increased risk (OR = 1.302, $p = 0.125$). These results highlight surgical approach, lesion characteristics, and psychological status as independent predictors of postoperative sexual dysfunction in adenomyosis.

Differential Impact of LTH and HIFU on Postoperative Sexual Function

To assess the impact of surgical approaches on female sexual function, the FSFI scores were compared between patients who underwent LTH and those treated with HIFU, both at baseline and 6 months postoperatively. Preoperatively, no significant differences were observed between the two groups across all FSFI domains. The mean sexual desire scores were comparable (LTH: 3.2; HIFU: 3.1; Figure 1A), as were scores for arousal (LTH: 2.7; HIFU: 2.6; Figure 1B), lubrication (LTH: 3.4; HIFU: 3.5; Figure 1C), orgasm (LTH: 2.8; HIFU: 2.7; Figure 1D), satisfaction (LTH: 2.2; HIFU: 2.2; Figure 1E), and pain (LTH: 1.4; HIFU: 1.4; Figure 1F), with all p values > 0.05.

At 6 months post-treatment, HIFU group showed significantly higher scores in several FSFI domains. Specifically, sexual desire was higher in the HIFU group (4.2) compared to the LTH group (3.6) (Figure 1G, $p < 0.001$). No significant between-group difference was observed in arousal (HIFU: 3.3; LTH: 3.1; Figure 1H). Lubrication scores were also elevated in HIFU group (4.0) comparing with LTH group (3.5) (Figure 1I, $p < 0.05$). Importantly, HIFU group reported higher orgasm (3.8 vs 3.2; Figure 1J, $p < 0.001$) and satisfaction scores (3.3 vs 2.7; Figure 1K, $p < 0.001$). However, no significant group differences were observed in pain (Figure 1L). Pain scores relative to baseline were significantly improved in both groups, indicating effective postoperative relief of dyspareunia.

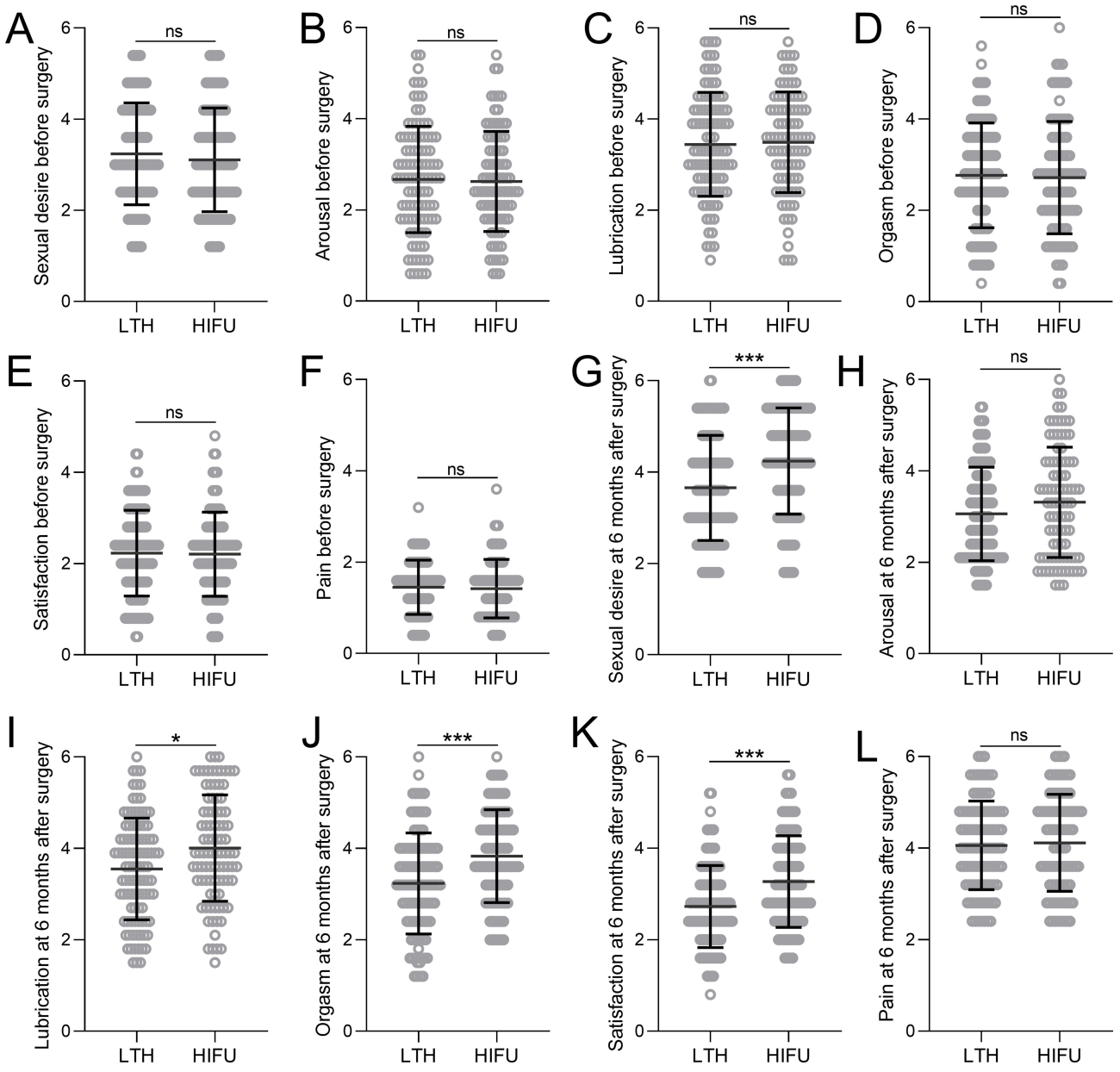

Figure 1 Comparisons of the six dimensions in the FSFI including Sexual desire (**A** and **G**), Arousal (**B** and **H**), Lubrication (**C** and **I**), Orgasm (**D** and **J**), Satisfaction (**E** and **K**), Pain (**F** and **L**) between adenomyosis patients received HIFU or LTH at the time of before surgery and 6 months after surgery. Values were expressed as mean ± SD. *p < 0.001, ***p < 0.001, ns means no significance, from the Mann–Whitney test.

The Association with Overall Sexual Function

To further evaluate the impact on sexual function, total FSFI scores were compared between the two groups at baseline and 6 months post-treatment. At baseline, no significant difference was found in the total FSFI scores in these two groups (16.7 for HIFU and 16.2 for LTH, Figure 2A, $p > 0.05$), suggesting comparable pre-operative sexual function. At 6 months postoperatively, a significantly higher total FSFI score was found in HIFU group (27.3) compared to LTH group (23.8) (Figure 2B, $p < 0.001$), indicating superior postoperative sexual outcomes.

The Relationship Between Sexual Dysfunction and Psychological Status

Last, to explore the relationship between sexual function and psychological status, Spearman correlation analysis was performed between total FSFI scores and HAMA and HAMD scores in the participants at 6 months post-

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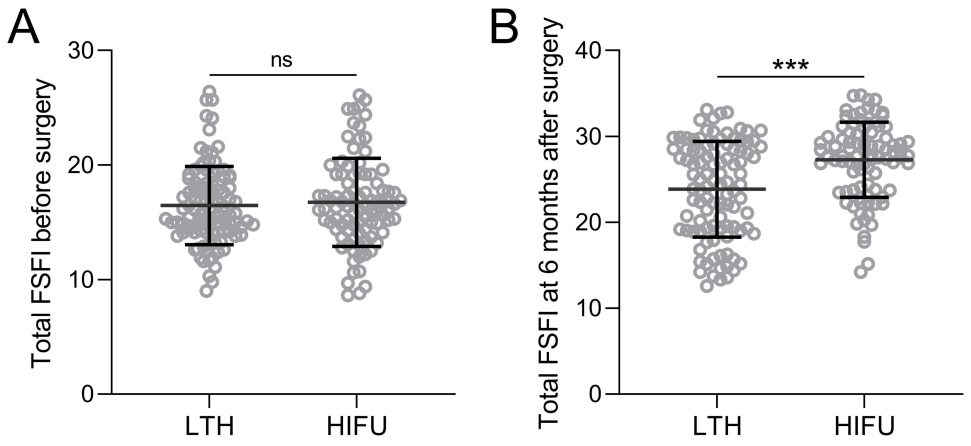

Figure 2 Comparisons of total FSFI between adenomyosis patients received HIFU or LTH at the time of before surgery (**A**), and 6 months after surgery (**B**). Values were expressed as mean ± SD. ***p < 0.001, ns means no significance, from the Mann–Whitney test.

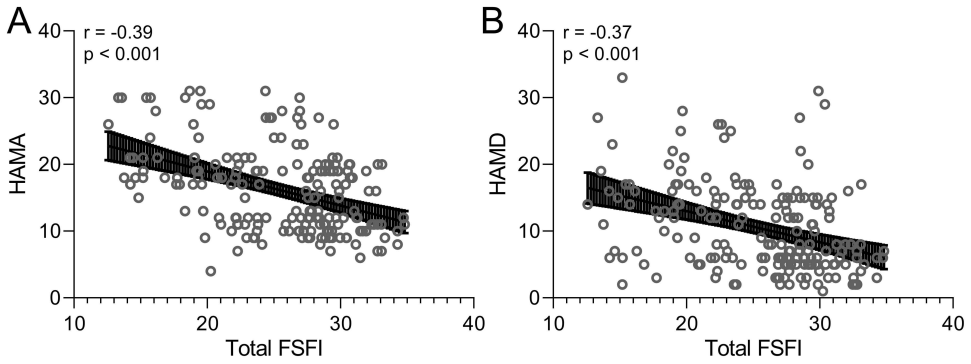

Figure 3 Spearman correlation analysis of total FSFI with HAMA (**A**) and HAMD (**B**) in adenomyosis patients at 6 months after the treatments of HIFU or LTH.

treatment. Total FSFI scores were negatively correlated with both anxiety ($r = -0.39$, $p < 0.001$; Figure 3A) and depression ($r = -0.37$, $p < 0.001$; Figure 3B).

Discussion

The current findings reveal an obvious difference in the incidence of post-operative FSD between LTH and HIFU, with a higher risk of FSD in the LTH group, which is consistent with the reports in the previous studies.[3] LTH may result in sexual dysfunction due to disruptions in pelvic anatomy, blood flow, and nerve function.[14] In contrast, HIFU, as a non-invasive surgery, precisely ablates lesions while preserving the uterus and surrounding tissues, which could minimize collateral damage and reduce negative effects on sexual function.[15] Moreover, combining HIFU with conservative treatments such as the LNG-IUS further enhances long-term outcomes.[16] This preservation of tissue and function possibly accounts for the better sexual outcomes observed in the HIFU group.

Diffuse lesions were identified as an independent risk factor for FSD, likely due to their broader anatomical involvement and impact on neurovascular structures. Previous studies indicate that extensive uterine lesions, such as adenomyosis, impair sexual function by disrupting uterine contractions and pelvic nerve pathways.[17] These changes may cause dyspareunia, the most frequently reported symptom,[18] or indirectly affect arousal and desire through chronic inflammation and hormonal imbalance.[19] The strong association between urological dysfunction and FSD further suggests that diffuse lesions may worsen sexual dysfunction via multi-system interactions.[20] Further studies are needed to clarify the underlying biological mechanisms and their interplay with psychological factors.

Interestingly, our results also highlight the importance of psychological factors in sexual function in AM patients. It was reported that higher anxiety and depression were associated with increased FSD risk.[21] Similarly, a previous study suggested that negative emotional states could impair multiple aspects of sexual function, including desire, arousal, and satisfaction.[22] Sexual distress may mediate the relationship between psychological symptoms and sexual dysfunction,[23] while persistent anxiety and depression can further hinder self-management.[24] These studies, together with our results, underscore the need to consider psychological support into AM treatment to enhance sexual function recovery.

It was also found that the HIFU group scored significantly higher than the LTH group across multiple FSFI domains, including desire, lubrication, orgasm, and satisfaction, aligning with existing evidence on HIFU's protective effects on sexual function. HIFU not only effectively relieves symptoms such as dysmenorrhea and menorrhagia,[25] but also preserves the structural integrity of the myometrium and endometrium while precisely targeting lesions.[26] This tissue-sparing property likely contributes to better sexual outcomes compared to hysterectomy. For patients with fertility needs, HIFU has also been associated with higher natural pregnancy rates.[27] Its benefit in preserving sexual function is further supported by improvements across FSFI domains and enhanced quality of life reported in previous studies.[28,29] Collectively, these findings support HIFU as a preferred option for maintaining sexual function in adenomyosis patients.

At 6 months post-treatment, the HIFU group showed significantly higher total FSFI scores than the LTH group, consistent with evidence supporting the sexual function benefits of non-invasive therapies.[30] Both groups showed improvements in the pain dimension, indicating that both HIFU and traditional surgery can effectively alleviate dyspareunia. This pain relief may be related to the neuroprotective effects of HIFU treatment,[31] and its short-term, manageable treatment-related pain characteristics also contribute to the rapid recovery of sexual function post-surgery.[32] These findings support HIFU as a treatment that not only manages disease effectively but also better preserves the sexual quality of life. Nonetheless, further studies are needed to assess long-term outcomes and clarify its effects on specific FSFI domains.

Last, consistent with other literatures, our study also shows a significant negative correlation between total FSFI scores and both anxiety and depression scores. For example, women with anxiety or depression were at a higher risk of sexual dysfunction,[33] and FSFI scores were significantly negatively correlated with depression.[34] Also, anxiety symptoms showed a negative correlation with FSFI scores.[35] These findings indicate a bidirectional association between sexual dysfunction and psychological health. Also, the results underscore the need to include psychological support in comprehensive treatment strategies.

Despite its strengths, this study has several limitations. First, the retrospective design may introduce selection bias, and the lack of randomization could lead to baseline differences between groups, affecting the generalizability of results. In addition, residual confounding from unmeasured variables cannot be excluded. Second, although the FSFI is a validated tool, it relies on self-reported data, which may be subject to bias. Other influencing factors, such as sexually transmitted infections or medication use, were not fully assessed. Although assessors were blinded to treatment allocation, self-reported outcomes may still be influenced by reporting bias. Third, outcomes were assessed only at 6 months, which represents short-term postoperative status. Sexual function after hysterectomy may continue to change between 6 and 12 months as healing, hormonal adaptation, and psychological adjustment evolve, and HIFU-related outcomes may also improve beyond 6 months; therefore, longer follow-up is needed to define long-term trajectories and durability. Moreover, baseline HAMA/HAMD data were unavailable; therefore, pre-treatment psychological differences between groups could not be evaluated. In addition, although ovaries were preserved in all patients, sex hormone levels and menopausal symptoms were not assessed, limiting evaluation of endocrine influences on sexual outcomes. We also did not apply a standardized adenomyosis severity scoring system, which may limit adjustment for baseline disease severity. Finally, although a standardized HIFU protocol was used, intra-procedural dose adjustment based on real-time feedback may have introduced some variability in treatment exposure. Future studies should include more comprehensive mental health evaluations and examine the impact of psychological interventions on sexual function recovery.

Conclusion

HIFU is associated with higher total and domain-specific FSFI scores than LTH. LTH, diffuse lesions, and elevated anxiety and depression are confirmed as independent risk factors for FSD. The inverse correlations between FSFI scores

and psychological distress further emphasize the role of mental health in sexual recovery. These findings suggest that HIFU may better preserve postoperative sexual function and highlight the potential value of incorporating psychological care, which should be confirmed in prospective studies.

Data Sharing Statement

Data are available on reasonable request to the corresponding author [Wei Zhang].

Ethical Approval

The study was approved by the ethical approval of the Fourth Hospital of Shijiazhuang. The study was performed in strict accordance with the Declaration of Helsinki, Ethical Principles for Medical Research Involving Human Subjects.

Informed Consent

All patients signed the informed consent.

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Disclosure

The authors report no conflicts of interest in this work.

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