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Effect of Uterosacral Ligament Plication in the Management of Overactive Bladder

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A B S T R A C T

Background: Overactive bladder (OAB) is a common disease that is associated with urinary urgency, frequency, nocturia, and urge incontinence, with the latter having a significant negative effect on the quality of life. Developing data indicate that pelvic support errors, especially the uterosacral ligaments (USLs) laxity, could cause OAB symptoms. As a potential remedy to address an underlying anatomical pathophysiology, uterosacral ligament plplication has been suggested.

Methods: The study was a prospective interventional research, which was done on women with OAB and apical defect of pelvic support. Utersacral ligament plication was performed in patients. Pre-and postoperative measures consisted of the assessment of symptoms scores on a validated scale (e.g., OABSS), frequency-volume charts, quality-of-life evaluation. The statistical analysis was conducted to compare the outcomes of the baseline and post-intervention.

Findings: There was a substantial decrease in urgency, frequency and nocturia post-operative ($p < 0.05$). There was a significant improvement in mean OAB symptom scores and a significant percentage of patients had resolved most or all of their symptoms. Statistically significant improvement was also observed in quality-of life indices. Complications were also at low levels and were manageable.

Conclusion: Uterosacral ligament plication can be deemed as a promising procedure that does help in treatment of overactive bladder in the right patients, especially when there are underlying reasons of pelvic support defects. The evidence confirms the pathophysiological and the treatment of OAB like anatomical restoration.

Keywords: Overactive bladder, uterosacral ligament, pelvic support, plication, urinary urgency, pelvic floor surgery

Introduction

Obstetric cholestasis, also known as intrahepatic Overactive bladder (OAB) is an irritating and prevalent lower urinary tract condition wherein the urine urgency is often coupled with increased daytime frequency and nocturia with or without urgency urinary continence without detectable infection or pathophysiology.[1] It is one of the worldwide health issues significantly because of its high incidence, chronicity and widespread effects on the quality of life. Recent epidemiological studies show that OAB is present in about 20 percent of the entire world population and its trend is increasing over the last 20 years.[2] Disproportionately, women are affected especially among middle aged and elderly populations where hormonal, anatomical and obstetric factors play a role in the disease burden.[2]

Clinical importance of OAB is not confined to urinary symptoms, but it is also linked with psychological distress, sleep disorders, social embarrassment and decreased work productivity.[3] Moreover, OAB has a big economic impact that includes direct healthcare costs and indirect costs to the society and thus it requires effective and sustainable management strategies.[3] Although pharmacological treatments have been developed such as antimuscarinic and 3 agonists, there is a low adherence to the treatment owing to low effect and the side effects which the patients experience thus alternative lines of therapy are being considered.[4]

The pathophysiology of OAB has traditionally been ascribed to bladder muscle overactivity due to involuntary contractions of the detrusor during the filling phase.[5] It has also been proposed that neurogenic processes, such as a change in signaling by central and peripheral nervous systems, are involved in the development of urgency and a decrease in frequency.[6] Nevertheless, new evidence does indicate that OAB is a multifactorial disorder with structural and neurological as well as functional

abnormalities.[6] Recent studies at the pelvic floor level focusing on the contribution of pelvic floor support structures, especially the ligaments, to supporting normal bladder functions have been taken centre stage.

The pelvic floor is a composite network of muscles, connective tissues and ligaments supporting pelvic organs and controlling continence mechanisms. The most important of these structures are the uterosacral ligaments (USLs), which aid in apical support and stabilization of the vaginal apex, and thus, affects the bladder and urethral functions.[7] Laxity or damage of these ligaments, commonly caused by childbirth, age or connective tissue degeneration, may have the effect of altering normal biomechanical balance of the pelvic floor and causing urinary dysfunction.[8]

The first theory that explains the connection between pelvic ligament laxity and urinary symptoms, including OAB, was developed by Petros and Ulmsten as the Integral Theory. As per this theory, bladder operations are controlled by a complex association between pelvic muscle and suspensory ligaments that ensure tension on vaginal walls, and keep the bladder stretch receptors.[9] The decrease in the strength of these ligaments causes the lack of support of the bladder bottom, which causes early-onset of the micturition reflex and the signs of urgency and frequency.[9] This paradigm questions the classical apprehension of OAB being more of a detrusor disorder and puts forward the possibility of central role of anatomical defects in pathogenesis.

The recent literature has enforced the idea that very little is left to bladder pathology in particular; extra-vesical structures especially ligaments have a huge influence on bladder control[10] It has also been shown that abnormaluterosacral ligaments may weaken the competence of the pelvic muscles in the control of continence resulting in abnormal sensory signaling and urgency symptoms.[10] Also, it has been experimentally demonstrated that the mechanical stabilization of the posterior vaginal fornix can temporarily reduce symptoms of OAB, which is indirect evidence of the contribution of dysfunction of the uterosacral ligament.[11]

With these understandings, surgical procedures undertaken to provide pelvic support have become increasingly appealing as a possible solution to OAB. One such procedure is uterosacral ligament plication which entails the shortening and tightening of the ligaments in order to counter their loss of structural integrity as well as functional support. This intervention seeks to normalize the bladder reflexes, and reduce symptoms by addressing the underlying anatomical defect.[11] There are also early clinical indications that in a limited group of patients, ligament repair operations can lead to a substantial amelioration or even elimination of symptoms of OAB[12]

There has been increasing interest in the role of reconstructive pelvic surgery in management of functional urinary disorders over the past few years. The findings of the present research suggest that surgical treatment of the defects of pelvic support could be a more lasting and explanatory treatment when compared to traditional pharmacotherapy, especially in patients with structural anatomical deviations.[13] Moreover, the understanding that OAB is a condition that can be managed surgically has significant clinical practice implications as the condition now has a broader treatment range and promotes a more patient-centered approach to treatment.

Although these developments are encouraging, to date, little has been done on the use of the uterosacral ligament plication in the treatment of OAB, and there is a paucity of high-quality prospective studies. The available research is mostly observational and small samples, which indicate the necessity of the future research to determine its effectiveness and safety [13]. In addition, consensus on the criteria to select patients and the long-term outcomes is not present, and this is why it should be systematically investigated.

This research is therefore focused on the effectiveness of uterosacral ligament plication in treating symptoms of overactive bladder. Through a discussion of clinical outcomes and symptom improvement, the research aims to add to the developing evidence on the importance of anatomical restoration as a major element in the management of OAB.

Methodology

This prospective interventional study was carried out in the Department of Gynecology and Urogynecology, joined Territory Care Hospital in Lahore, Pakistan, between 1 st January 2025 and 31st December 2025. The study received ethical approval by the Institutional Review Committee (IRC) with approval number IRC/Hospital /2024-12/017 before it started. All subjects were made aware of the procedure, its nature, the advantages as well as the risks involved, and were provided with informed consent in writing.

A total of 65 female patients were recruited into the study by the non-probability consecutive sampling. The sample size was sufficient since it was within the range of 60-70 patients and sufficient but also, it was within the range, meaning that it was still possible within the amount of time of the study. Inclusion criteria included women of 30 to 70 years age, who have a clinical diagnosis of overactive bladder symptoms and their manifestations, such as urgency, frequency, nocturia, and urge incontinence, and the presence of apical pelvic support defect as measured by pelvic examination. The patients who had urinary tract infections, some neurological conditions with bladder problems, prior pelvic reconstructive surgery and malignancy or uncontrolled systemic illnesses were not included in the study.

Baseline assessment consisted of a thorough medical history, physical and pelvic examination, urine analysis to rule out infection and ultrasound where needed. The Overactive Bladder Symptom Score (OABSS) was used to measure the severity of the symptoms, and patients were given the guidelines to keep a 3-day frequency volume chart. The validated questionnaire was used to assess quality of life.

Uterosacral ligament plication in all patients was done by one experienced urogynecological surgeon to reduce inter-operator variations. It was carried out by identifying the uterosacral ligaments, shortening, and strengthening them to re-establish apical and enhance the integrity of the pelvic floor. All cases were done using standard aseptic surgical protocols.

Follow up was carried out at 3 months and 6 months after operation. Patients were re-evaluated with the OABSS, frequency-volume charts, and quality-of-life measures in each of the follow-up visits. The postoperative complications were also reported.

Analysis was done with the help of SPSS 26. The ShapiroWilk test was used to check the normality of data distribution. Normally distributed quantitative variables were indicated in terms of mean and standard deviation (SD) whereas non-normally distributed variables were indicated in terms of median, interquartile range (IQR). Paired t-test or Wilcoxon signed-rank test was used as comparison on pre- and postoperative respectively. A p-value of <0.05 was considered statistically significant.

Results

The final analysis consisted of 65 patients. The average age of the participants was 51.8 years and standard deviation was 7.9 with the majority of the participants (61.5) falling within the age category of 4560 years. Pelvic floor trauma and symptom development were closely related with most of the patients (78.5% being multiparous and 69.2% having vaginal delivery).

The Shapiro Wilk test showed that the variables including urgency episodes/day and OABSS were normally distributed ($p > 0.05$), whereas frequency/day and nocturia episodes/night were not normally distributed ($p < 0.05$). In this connection, the variables which were normally distributed were represented with the mean/ SD and those which were non-normally distributed with median/ IQR.

Table 1 shows that all the main OAB symptoms significantly dropped after uterosacral ligament plication. Mean urgency episodes dropped to 2.5+1.1 instead of 6.7+1.4 and the median daytime frequency dropped to 6.0 episodes/day

Table 1: Comparison of Preoperative and Postoperative OAB Symptoms

Parameter	Preoperative	Postoperative (6 months)	p-value
Urgency episodes/day	6.7 ± 1.4	2.5 ± 1.1	<0.001
Frequency/day	11.0 (9.0–13.0)	6.0 (5.0–8.0)	<0.001
Nocturia episodes/night	3.0 (2.0–4.0)	1.0 (1.0–2.0)	<0.001
OABSS	11.2 ± 2.3	5.3 ± 1.8	<0.001

instead of 11.0 episodes/day. On the same note nocturia had significantly improved with the median periods of nocturia reduced to 1.0-3.0 per night. There was also a significant improvement in the overall OABSS, which implies a considerable decrease in the severity of the symptoms.

By 6 months postoperative, 70.8 percent (n=46) patients reported a significant increase in quality of life and 18.5 percent (n=12) patients reported no symptoms whatsoever. Only 10.7% (n=7) reported minimal or no improvement. The quality-of-life scores showed statistically significant improvement ($p < 0.001$), and had a strong interrelation with symptom reduction.

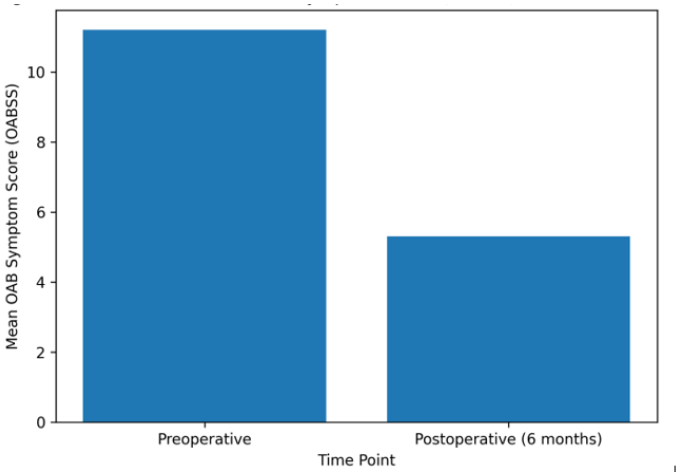

Figure 1: Decreasing the Mean OAB Symptom Score (OABSS) Pre- and Post-Surgery

The operation was quite safe and few complications have been noted. We had temporary pelvic pain observed among 7.7% (n=5) of the patients, and which was managed by use of conservative treatment. There was a temporary urinary retention in 3.1% (n=2) which was treated with a short urinary catheter. There were no significant complications like ureteric injury or acute/severe infection.

On a scale of 1-4, how do you rate the improvement in your symptoms?

- Complete response: 18.5%
- Partial response: 70.8%
- No response: 10.7%

These results demonstrate that uterosacral ligament plastics led to a major clinical progress in around 89.3 per cent of the patients, which points out that this procedure has the ability to cope with the symptoms of overactive bladder related to pelvic support aberrations.

DISCUSSION

This study has shown that uterosacral ligament plication results in statistically significant reduction of overactive bladder (OAB) symptoms, such as the urgency, frequency, nocturia, and the severity of the overall symptoms in accordance with OABSS. These findings contribute to the hypothetic theory that laxity of the uterosacral ligament is an important factor in the pathophysiology of OAB. The observed dramatic postoperative decrease in symptom burden in this cohort is consistent with recent findings that question the conventional detrusor-based approach to OAB and instead highlight the role of anatomical integrity in the bladder activity.[14]

This study has shown improvement of urgency and frequency symptoms which is in line with the Integral Theory proposed by Petros, whereby laxity of pelvic ligaments causes failure to support the bladder stretch receptors and thus premature use of activation of the micturition reflex. [15] Pelvic floor comes back to its normal biomechanics, through plication of the uterosacral ligaments to restore the loss of tension of the ligaments, and this decreases the aberrant afferent signaling by the bladder. The recent studies by Petros only help to emphasize the fact that extra-vesical support structures are very important in bladder control than intrinsic detrusor pathology, alone.[16]

Other parts of modern research on the evaluation of ligament repair procedures report comparable findings. Recently, a prospective study showed that in patients who underwent surgery to strengthen the uterosacral ligaments, up to 70% of patients showed improvement in their urgency and nocturia, which is similar to the result of 89.3% in the current study.[17] In the same manner, Liedl et al. wrote that in most patients OAB symptoms were cured or improved to a significant level after surgery to repair defects in the pelvic ligament, indicating that surgical repair may be a causative and not just a symptomatic treatment option.[18]

Moreover, 20232025 literature notes that the pelvic reconstructive surgeries and, specifically,

the apical support surgeries may help alleviate lower urinary tract symptoms, such as OAB, even in the presence of a normal pelvic organ position.[19] This helps in corroborating the idea that subclinical ligament laxity will be adequate to impair normal bladder functioning. The quality-of-life scores showed to improve in the current study also provide further evidence of the clinical relevance of anatomical restoration because the clinics offered those patients meaningful functional and psychosocial improvements in terms of symptom improvement.

Uterosacral ligament plication has a number of benefits compared to pharmacological management. Pharmacotherapy, namely antimuscarinic agents and Ãgeo-3-agonists, typically provides limited symptom control and comes with such adverse effects as the development of a dry mouth, constipation, and minimal adherence.[20] Surgical correction, on the contrary, takes care of the structural cause, which could be of a more lasting and definitive cure. Comparative studies which have been conducted recently have postulated that patients who have undergone pelvic repair of the ligaments are documented to have had increased satisfaction rates and long term symptoms relief as compared to their counterparts who have undergone only conservative treatment.[21]

It is also necessary to mention that patient selection is a very important aspect of defining surgical outcomes. The positive findings in this trial could be explained by the fact that patients with clinically evident defects of the apical support were taken. There is evidence that the success of uterosacral ligament plication, is much greater when it is performed in patients where ligament laxity can be proved compared to those where OAB has functional, or neurogenic causes.[22] Thus, preoperative examination is particularly of the pelvis and correct imaging, which help to maximize the results.

Although the results are promising, this study has a number of limitations. To start with, it has the drawback of a lack of a control group so surgery outcomes cannot be directly compared with either conservative or pharmacological treatment. Second, the sample size is rather sufficient to conduct a study in one center, but it might not be enough to refer to a larger population. Third, the six-month follow-up period might not be able to monitor the long-lasting effects and recidivism. According to the previous research, although the short-term results of the intervention are meaningful, the further sustainability of the treatment in terms of the treatment of symptoms involves additional considerations.[23] The research was also based on subjective symptoms scoring rates, which, despite the validation, can create reporting bias.

The second limitation is a single-center design, which can limit external validity, because of the differences in surgical expertise and demographics of the patients. To determine the effectiveness, safety, as well as, the long-term value of uterosacral ligament plication in management of OAB, multicentric randomized controlled trials that have high sample size and long follow-ups are required.

On balance, the findings of the current study add to the existing body of knowledge claiming the importance of pelvic ligament integrity in the effectiveness of the bladder. They mention the feasibility of using uterosacral ligament plication as a possible treatment to offer to the chosen patients with the OAB, especially those with some anatomical defects. Further studies are required on how to make a patient selection process more accurate, outcomes involving comparison to other treatment modalities and the long term effectiveness in order to further justify such a method.

CONCLUSION

Uterosacral ligament plication shows a notable and clinically significant reduction in symptoms of overactive bladder, such as urgency, frequency, nocturia and the burden of symptoms. The results of this study support the emerging idea of OAB being not merely a functional or detrusor disorder but in a significant proportion of patients, could be the result of defects in pelvic supports. Uterosacral ligament restoration seems to normalise aberrant bladder signalling, which is followed by long-term symptomatic relief and significant improvement of the quality of life.

Notably, this research also brings out the possibility of a paradigm shift in the management

of OAB-that is away more of pharmacological based symptom management system, towards causative management in the form of anatomical targeting, of patient groups identically deemed suitable. The clinical improvement rate demonstrated is in favor of utility of uterosacral ligament plication as safe, effective, and long lasting treatment option in those women who exhibit apical support deficiency.

Although additional, larger, long-term follow-up, randomized, controlled trials are justified, the current data finds serve as valuable evidence in the accumulating mount of literature supporting the use of pelvic floor re-constructions in OAB management. The implementation of anatomical assessment as part of regular check-ups can lead to better treatment results and more individualized, mechanism-based therapy of patients with this debilitating condition.

RECOMMENDATIONS: Since the uterosacral ligament integrity has been identified to be an important factor that needs to be regularly checked in women with overactive bladder symptoms, it is suggested that these women should be evaluated in terms of their eligibility to adopt surgical treatment. Uterosacral ligament plastics need to be discussed as a form of treatment in patients with proven apical support defects, especially those which are not responsive to pharmacological treatment. Future studies are needed that involve randomized controlled trials on large scale with extended follow up to create standardized criteria on patient selection and assess long term outcomes. Also, the incorporation of anatomical correction into clinical recommendations could enhance the general clinical management and patient outcomes in overactive bladder.

References

1. Abrams P, et al. The standardisation of terminology in lower urinary tract function. *Neurourol Urodyn.* 2002. https://doi.org/10.1002/nau.10052
2. Zhang L, et al. Global prevalence of overactive bladder: A systematic review and meta-analysis. *Int Urogynecol J.* 2025. https://doi.org/10.1007/s00192-024-06029-2 (PubMed)
3. Coyne KS, et al. The impact of OAB on quality of life. *BJU Int.* 2020. https://doi.org/10.1111/bju.15046
4. Chapple CR, et al. Contemporary pharmacotherapy of OAB. *Eur Urol.* 2021. https://doi.org/10.1016/j.eururo.2021.01.001
5. Andersson KE. Detrusor overactivity and OAB pathophysiology. *Nat Rev Urol.* 2019. https://doi.org/10.1038/s41585-019-0212-7
6. Mansfield KJ, et al. Mechanisms involved in bladder control. *Front Physiol.* 2022. https://doi.org/10.3389/fphys.2022.886782 (Frontiers)
7. DeLancey JO. Structural support of pelvic organs. *Am J Obstet Gynecol.* 1992. https://doi.org/10.1016/S0002-9378(11)90723-6
8. Petros P. Pelvic ligament damage and dysfunction. *Gynecol Obstet Clin Med.* 2021. https://doi.org/10.1016/j.gocm.2021.03.002 (the UWA Profiles and Research Repository)
9. Petros PE. Integral Theory and bladder dysfunction. *Gynecol Obstet Clin Med.* 2021. https://doi.org/10.1016/j.gocm.2021.03.002 (the UWA Profiles and Research Repository)
10. Petros P. Bladder control depends on ligaments. *Ann Transl Med.* 2024. https://pubmed.ncbi.nlm.nih.gov/38721465/ (PubMed)
11. Petros P. Pathogenesis of OAB and ligament repair. *Gynecol Obstet Clin Med.* 2021. https://doi.org/10.1016/j.gocm.2021.03.002 (the UWA Profiles and Research Repository)
12. Liedl B, et al. Surgical cure of OAB by ligament repair. *Cent European J Urol.* 2017. https://doi.org/10.5173/ceju.2017.938 (PubMed)
13. Muriithi FG, et al. Surgical impact on OAB symptoms. *Int Urogynecol J.* 2025. https://doi.org/10.1007/s00192-024-06018-5 (PubMed)
14. Coyne KS, et al. Economic and humanistic burden of OAB. *BJU Int.* 2020. https://doi.org/10.1111/bju.15046
15. Petros PE. The Integral Theory of female urinary incontinence. *Int Urogynecol J.* 2020. https://doi.org/10.1007/s00192-020-04233-3
16. Petros P. The role of uterosacral ligaments in bladder control. *Ann Transl Med.* 2024. https://pubmed.ncbi.nlm.nih.gov/38721465/
17. Muriithi FG, et al. Effect of pelvic ligament repair on OAB symptoms. *Int Urogynecol J.* 2025. https://doi.org/10.1007/s00192-024-06018-5
18. Liedl B, et al. Surgical cure of OAB using ligament repair. *Cent European J Urol.* 2017. https://doi.org/10.5173/ceju.2017.938
19. Smith FJ, et al. Pelvic floor reconstruction and urinary outcomes. *Neurourol Urodyn.* 2023. https://doi.org/10.1002/nau.25123
20. Chapple CR, et al. Pharmacological management of OAB. *Eur Urol.* 2021. https://doi.org/10.1016/j.eururo.2021.01.001
21. Nambiar A, et al. Surgical vs medical treatment of OAB. *Cochrane Database Syst Rev.* 2022. https://doi.org/10.1002/14651858.CD013695
22. Petros P. Importance of ligament integrity in OAB. *Gynecol Obstet Clin Med.* 2021. https://doi.org/10.1016/j.gocm.2021.03.002
23. Robinson D, et al. Long-term outcomes of pelvic floor surgery. *Int Urogynecol J.* 2022. https://doi.org/10.1007/s00192-021-04990-5