Modified Laparoscopic Sacrocolpopexy with Kameda Technique for Severe Pelvic Organ Prolapse with Levator Ani Avulsion in Young Woman: An Evidence-Based Case Report

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Received: 26 February 2025

Accepted:20 July 2025

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DOI 10.5001/omj.2029.06

Abstract

Pelvic organ prolapse (POP) is characterized by the descent of pelvic organs into the vaginal canal, resulting from the weakening of the supportive ligaments and muscles that maintain these structures' position. Sacrocolpopexy is widely considered the gold standard surgical intervention for vaginal prolapse. This case report presents the clinical course of a 35-year-old, previously healthy woman who presented with a protruding vaginal mass for 9 months and subsequently underwent laparoscopic sacrocolpopexy. The primary aim of this evidence-based case report is to systematically compare the surgical outcomes of laparoscopic sacrocolpopexy (LSC) and abdominal sacrocolpopexy (ASC) in the management of pelvic organ prolapse. A systematic search strategy was employed across PubMed, Elsevier, and ProQuest databases using specific keywords aligned with the study objective.Three studies met the inclusion criteria and were critically appraised. The findings indicate that laparoscopic sacrocolpopexy is associated with improved postoperative morbidity and a shorter hospital length of stay compared to abdominal sacrocolpopexy. No significant differences in other clinical outcomes were observed. Furthermore, the modified laparoscopic sacrocolpopexy technique developed by Kameda demonstrated favorable surgical outcomes and prognosis over a 3-year follow-up period, suggesting its potential for routine clinical application. Laparoscopic sacrocolpopexy is associated with reduced postoperative morbidity and a shorter length of hospital stay. Several variations of laparoscopic sacrocolpopexy have been developed to optimize outcomes. Such as the modified laparoscopic sacrocolpopexy technique that demonstrated significant improvements in prolapse symptoms and a reduction in the severity of pelvic organ prolapse.

Keywords: Pelvic Organ Prolapse; Surgical Management; Laparoscopic sacrocolpopexy

Introduction

Surgical management of POP is generally classified into two broad categories: native tissue repair, which includes procedures such as colposuspension, colporrhaphy, and sacrospinous fixation, and mesh-based surgery. These procedures can be performed via abdominal or vaginal approaches. One of the most commonly performed surgical procedures for POP is sacrocolpopexy, which has traditionally been conducted as an open abdominal surgery and has long been considered the gold standard for the

treatment of apical vaginal prolapse. However, an alternative technique, laparoscopic sacrocolpopexy (LSC), has emerged as a less invasive option. LSC has demonstrated comparable efficacy to open abdominal sacrocolpopexy (ASC), with reported objective cure rates approaching 100%. The fundamental principle of sacrocolpopexy involves the suspension of the vaginal vault to the anterior longitudinal ligament at the level of the sacrum using prosthetic material. Over time, several technical variations of this procedure have been developed.[1-4]

Numerous studies have indicated that LSC offers several advantages over ASC, including faster recovery times, reduced postoperative pain, and the benefits associated with minimally invasive techniques. Additionally, LSC provides enhanced access and improved visualization of the posterior vaginal area and deeper pelvic structures, which may facilitate more precise surgical intervention. Given these advantages, LSC is increasingly being considered a viable and potentially superior treatment option for patients with POP, offering excellent surgical outcomes with reduced perioperative morbidity.[2-4]

Case Report

A 35-year-old previously healthy woman came complaining of a mass protruding from her vagina for 9 months. Initially the mass was the size of a quail egg, but the mass has gotten bigger in the last 3 months. The mass protruded especially during activities and retracted when the patient lied down. She felt discomfort during daily and sexual activity. She had a normal menstrual period. She's had problems during urinating since she had to push the mass out of the way to be able to urinate normally. She did not have any urinary incontinence symptoms. She also had normal bowel activity, had no urine or fecal leakage from the vagina.

She had two previous normal spontaneous deliveries with the heaviest baby weight 3700 gr. Her youngest child was 14 months old. She's used hormonal injection contraception since her second child. She is currently a housewife with normal daily activity, no history of heavy weightlifting. No history of surgery or any chronic illness (tuberculosis, lung disease, abdominal mass). Obesity, constipation, and related family history are denied.

Patient BMI is 17.8 kg/m^2 (*underweight*). On physical examination, a mass bulging from vaginal canal was identified, with the portio protruding 6 cm beyond the hymenal ring. The uterus was noted to be 9 cm in length and anteflexed. The levator ani muscle tone could not be assessed, while the anal sphincter tone was graded 3. The cough test was negative, with a spontaneous urine volume of 200 mL and a post-void residual volume of 50 mL. The transperineal ultrasound revealed a bladder neck descent of 2.34 cm and a maximum genital hiatal area of 35.16 cm^2. The rectovaginal angle during Valsalva maneuver was measured at 170°, and the anteroposterior hiatal diameter was 6.69 cm. The levator urethra gap (LUG) was 2.97 cm on the right side and 4.14 cm on the left side. Perineometer measurements showed a rest tone of 52.6 cm H_2O and a contraction tone of 2.8 cm H_2O. In conclusion, these findings suggest pelvic floor hypermobility, ballooning, and bilateral levator ani avulsion.The patient was diagnosed with grade 4 uterine prolapse, grade 3 cystocele, grade 3 rectocele and bilateral levator ani muscle avulsion.

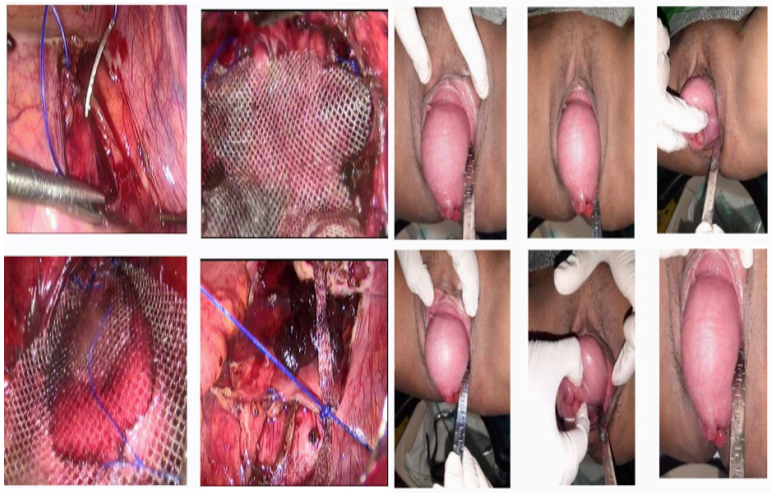

Figure 1: Clinical image of the pelvic organ prolapse on 35 year old woman with levator ani avulsion.

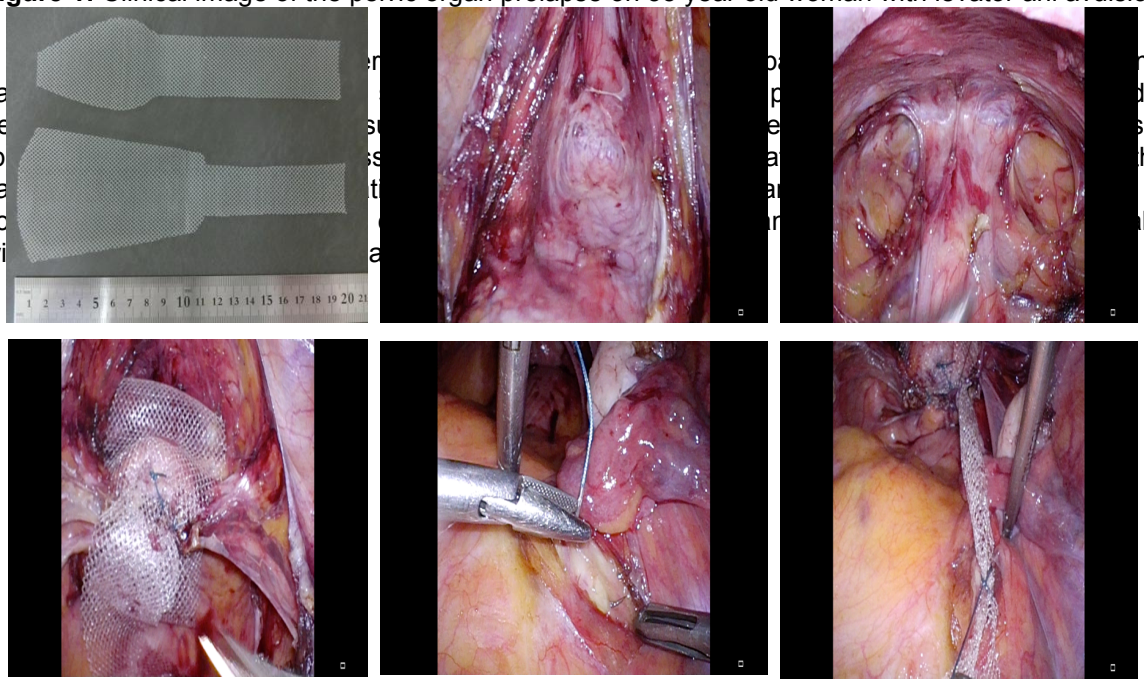

Figure 2: Modified Laparoscopic Sarocolpopexy with Kameda Technique using self-cut mesh.

Discussion

In this case, laparoscopic sacrolpopexy was performed to the patient. Sacrocolpopexy has traditionally been performed as an open abdominal surgery, with abdominal sacrocolpopexy (ASC) widely regarded

as the gold standard for the treatment of vaginal prolapse. However, laparoscopic sacrocolpopexy (LSC) has gained increasing popularity in recent years and has demonstrated clinical advantages over the traditional open approach. Evidence from studies included in this evidence-based case report suggests that LSC offers several benefits compared to ASC, particularly in terms of reducing postoperative morbidity, such as blood loss, and promoting shorter hospital stays and recovery times.[2,5-8] Pesebre et al. (2024) reported 96.9% anatomical success rate and 94.1% subjective success rate from 2180 patients performed with LSC. Moreover, the re-operation rate only 0.6%, either because of recurrence or complication.[9]

Table 1: Problem Formulation with PICO Method.

Patient/ Population	Intervention	Comparator	Outcome
Patients with pelvic organ prolapse	Laparoscopic sacrocolpopexy	Open abdominal/ laparotomy sacrocolpopexy	Post-operative morbidity and recurrency

Clinical question based on PICO:

In patients with pelvic organ prolapse, does laparoscopic sacrocolpopexy result in reduced postoperative morbidity and lower recurrence rates compared to open abdominal/ laparotomy sacrocolpopexy?

Type of question : Prognosis

Type of study/ methodology:

Meta-analysis/Systematic review / RCT/ Cross sectional

We performed thorough searches in three databases: Pubmed, Elsevier, and ProQuest, utilising MesH terms and keywords as shown in Table 2, which allows us to obtain studies investigating laparoscopic sacrocolpopexy and laparotomy sacrocolpopexy in management of POP patients.

Table 2: Search Strategy and Search Results.

Databases	Search Strategy	Results
Pubmed	(((((("pelvic organ prolapse"[Title/Abstract] OR "POP"[Title/Abstract] OR "levator ani avulsion"[Title/Abstract] OR "levator muscle avulsion"[Title/Abstract]) AND "laparoscopic sacrocolpopexy"[Title/Abstract]) OR "LSC"[Title/Abstract]) AND (("laparotomy"[MeSH Terms] OR "laparotomy"[All Fields] OR "laparotomies"[All Fields]) AND "sacrocolpopexy"[Title/Abstract]) AND "open abdominal sacrocolpopexy"[Title/Abstract]) OR "open abdominal sacrocolpopexy"[Title/Abstract] OR "ASC"[Title/Abstract]) AND ((y_10[Filter]) AND (meta-analysis[Filter] OR randomizedcontrolledtrial[Filter] OR systematicreview[Filter]) AND (fft[Filter]) AND (humans[Filter]) AND (female[Filter]) AND (english[Filter]))	95
Elsevier	pelvic organ prolapse AND laparoscopic sacrocolpopexy AND (laparotomy sacrocolpopexy OR open-abdominal sacrocolpopexy OR open abdominal sacrocolpopexy)	5
ProQuest	abstract(pelvic organ prolapse) AND abstract(laparoscopic sacrocolpopexy) AND abstract(laparotomy sacrocolpopexy) OR abstract(open abdominal sacrocolpopexy) AND (open-abdominal sacrocolpopexy)	4

A set of inclusion and exclusion criteria was applied during the selection process for this systematic review. The inclusion criteria were as follows: (1) human studies, primarily cohort studies, randomized controlled studies, and case control studies; (2) studies reporting on outcomes related to post-operative morbidity and recurrency; (3) studies published in English. The exclusion criteria were: (1) article types, including conference abstracts, book chapters, opinion papers, editorials, and letters; (2) studies with inaccessible full text; (3) studies with data that could not be extracted despite attempts to contact the corresponding author; (4) studies published in languages other than English.

Study selection was conducted concurrently by two independent reviewers. Initially, the studies were screened based on their titles and abstracts, and those that met the preliminary inclusion criteria proceeded to a full-text review. The full-text screening was then performed in accordance with predefined eligibility criteria. In the event of discrepancies or conflicting decisions between the two reviewers, a discussion was held to reach a consensus. The Covidence© software platform was utilized to facilitate the study selection process, ensuring the accuracy and consistency of the final included studies. Critical appraisal was performed using Oxford CEBM prognosis critical appraisal sheet.

From our search across three databases, a total of 104 studies were retrieved, with no duplicates identified, as illustrated in **Figure 1.** These studies were subsequently screened for eligibility, first by title and abstract, and later by full text. During the title and abstract screening phase, 97 studies were excluded. In the full-text screening phase, a further 4 studies were excluded for the following reasons: four studies evaluated different interventions and compared them with laparotomy sacrocolpopexy, one study did not focus on postoperative morbidity and recurrence as primary outcomes, and one study employed an inappropriate study design. After the full-text screening, three studies remained, which were then subjected to critical appraisal.

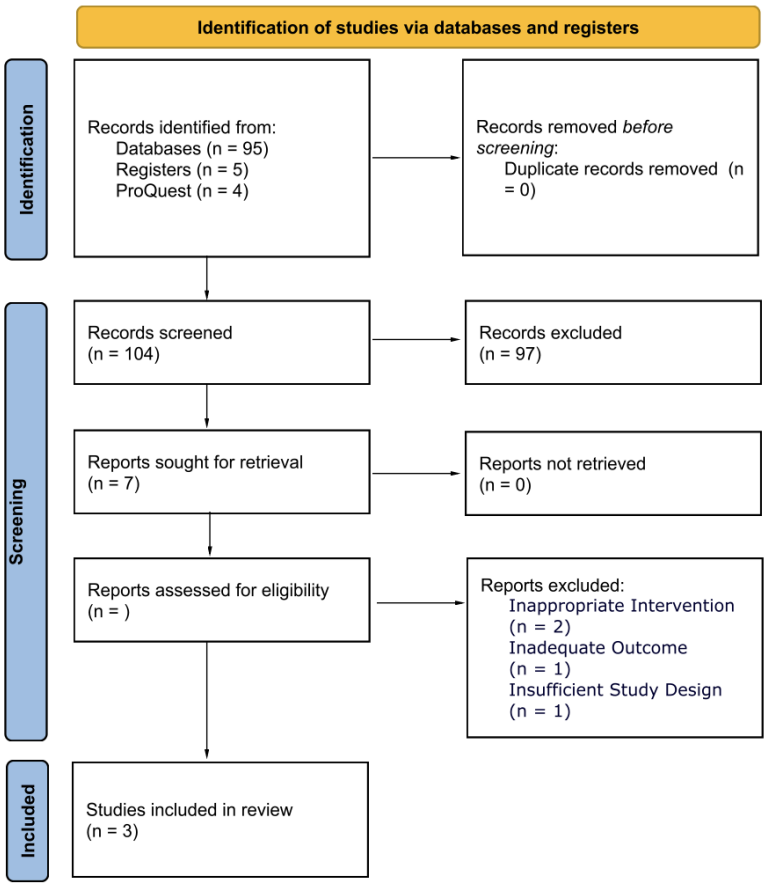

Figure 3: Study Selection Flow Chart.

A critical appraisal was conducted on the selected studies, and the findings are summarized in **Table 3.** Based on this evaluation, it can be concluded that the included studies are both methodologically sound and relevant to patient care. All of the studies demonstrate high-quality standards.

Table 3: Critical Appraisal of the Included Studies.

Author; year	**Sample Size**	**Study Design**	**Validity**				**Importance**	**Applicability**	
			Was the defined representative sample of patients assembled at a common (usually early) point in the course of their disease?	Was the patient follow-up sufficiently long and complete?	Were outcome criteria either objective or applied in a "blind" fashion?	If subgroups with different prognoses are identified, did adjustment for important prognostic factors take place?		Is my patient so different to those in the study that the results can not apply?	Will this evidence make a clinically important impact on my conclusions about what to offer to tell my patients?
Cho et al[2] 2022	105	Retrospective cohort study	Yes	Yes	Yes	Yes	Recurrence free survival longer in ASC. No reoperation of POP.	No	Yes
Costantini[5] 2016	200	Randomized controlled trial	Yes	Yes	Yes	Yes	Post-operative complications and recurrencies are comparable between both groups.	No	Yes
Coolen AWM[6] 2017	74	Randomized controlled trial	Yes	Yes	Yes	Yes	Post-operative complications were	No	Yes

			lower in LSC. UDI scores were comparable.

A detailed summary of the study results is presented in **Table 4.** All studies indicate that, in the LSC procedure, estimated blood loss and length of hospital stay are significantly shorter compared to the ASC. However, Costantini et al. observed that recurrence-free survival was longer following the ASC procedure. With regard to other complications, the two groups were found to be comparable.

Table 4: Summary of all Study's Results.

Authors; Year, Journal	Patient Group	Outcomes	Key Results
Cho et al; 2022, *Annals of Medicine and Surgery* [2]	105 patients with POP were included. 41 patients underwent ASC with hysterectomy and 64 underwent LSC with hysterectomy	Clinical outcomes consist of estimated blood loss, operative time, and complications (stump inflammation, postoperative fever, wound problem, recurrence, micturition disorder, and etc.)	● The intraoperative estimated blood loss was significantly lower in the LSC group than in the ASC group (177.8 vs. 89.3 mL, P < 0.001). ● Operative time was shorter for the LSC group than for the ASC group (132.0 vs. 112.3 min, P < 0.001). ● The complication rates of the two groups were comparable (26.8% vs. 26.6%, P = 0.976).
Costantini et al; 2016, *The Journal of Urology* [5]	200 patients affected by symptomatic Stage >2 POP	Quantitative evaluation of the anatomic apical correction based on POP-Q system and assessment of morbidity and complications.	● Significant statistical improvement for each POP-Q point for both groups ● POP recurrence-free survival is significantly longer (p=0.03) following ASC based on Kaplan-Meier curves. ● Intra-operative median blood loss was higher and hospital stays were longer following AS, while median operating time was longer for LS. ● No statistical difference between ASC and LSC in terms of complications
Coolen et al; 2017, *Int Urogynecol J* [6]	74 patients with vault prolapse. 37 patients underwent LSC and 37 patients underwent ASC. 3 patients were	Functional outcome with Urinary Distress Inventory (UDI), Defecatory Distress Inventory (DDI), and the Incontinence Impact Questionnaire	● No statistical differences for functional outcome using UDI, DDI, and IIQ questionnaire for both groups. ● Laparoscopic sacrocolpopexy group blood loss (86 ml) was significantly lower compared to the abdominal group (200 ml) (p < 0.001). ● Hospital stay for LSC (2 days) were significantly shorter compared to ASC (4 days) (p < 0.001). ● There were no statistically significant difference for duration of surgery (125 vs 115 min; p = 0.31), number of complications during surgery (5.6% vs 0%, p = 0.15), and number of

loss-to follow up.	(IIQ). Other outcome consisting of procedure time, amount of estimated blood loss and hospital stay, perioperative complications, re-interventions and long-term complications	complications during admission (5.6% vs 18.9%, p = 0.06) between both groups. ● There were no statistically significant differences for surgical re-interventions for pelvic organ prolapse and occult/new urinary incontinence between both groups. ● No significant differences were found between the groups in anatomical results 12 months postoperatively using POP-Q

Nevertheless, no significant differences have been observed between LSC and ASC in terms of postoperative complications or long-term anatomical outcomes. For instance, Cho et al. (2022) reported that LSC significantly reduced operating time compared with ASC. However, two other studies found no statistically significant differences in operating times between the two techniques. In addition, while Costantini et al. (2016) reported longer recurrence-free survival following ASC, the other two studies included in the analysis found no significant differences in recurrence rates between the two surgical approaches.[2,5,6]

These discrepancies in outcomes may be attributed to the diversity in techniques employed for both LSC and ASC, as variations in surgical techniques and technology could influence the clinical results. Pesebre et al. (2024) reported limitation for LSC are extensive dissection, advanced skills for suturing, and longer procedure duration.[9] Therefore, while LSC offers clear advantages in terms of reducing short-term morbidity, the long-term outcomes and recurrence rates remain comparable to those associated with ASC, underscoring the need for further research to refine surgical techniques and establish definitive conclusions.[2,5,6]

As of now, there is no universally accepted standard for the LSC procedure. Various technical modifications have been introduced regarding the extent of dissection of the vesicovaginal and rectovaginal spaces, the site of vaginal mesh fixation, the point of mesh fixation to the sacral promontory, and the method of fixation. These variations have the potential to influence both the success rates and the incidence of complications associated with the procedure. One of the most widely adopted variants is the LSC Kameda technique, which involves deep dissection of the vaginal walls. For anterior compartment, the mesh is fixed as distal as possible from the bladder neck, while for posterior compartment, it is secured to the levator ani muscle (m.puborectalis). The rationale behind this approach is that deep dissection of the vesicovaginal space to the bladder neck and the rectovaginal space to the levator ani and perineum provides level 2 support, simultaneously correcting both the anterior and posterior compartments including levator ani avulsion. This comprehensive approach is believed to reduce the need for separate anterior or posterior repairs. However, concerns have been raised regarding the potential adverse effects of such deep dissection and mesh fixation near the bladder neck and levator ani, particularly regarding postoperative urinary and bowel function. These concerns can be mitigated by careful avoidance of injury to the superior hypogastric plexus and the right hypogastric nerve during the procedure.[10-13]

A study by Cortes et al. demonstrated that the LSC Kameda technique resulted in significant improvement in prolapse symptoms and a reduction in pelvic organ prolapse (POP) stages across all follow-up periods. No anatomical recurrence was observed in any compartment during the follow-up period. However, at the three-year follow-up, there was an increased prevalence of de novo stress urinary incontinence (SUI), while the number of patients experiencing voiding dysfunction decreased. Additionally, symptoms of mixed urinary incontinence and stress urinary incontinence were found to

decrease, though this change was not statistically significant. Notably, there was a significant reduction in bowel dysfunction, including constipation, fecal incontinence, pain with defecation, and fecal urgency, at the three-year follow-up. The study also revealed that both bladder and bowel function improved progressively with each follow-up, further supporting the clinical efficacy of the LSC Kameda approach in managing prolapse and related symptoms.[11] A study by Meutia et al. also demonstrated that LSC using self-cut mesh can reduce the magnitude of POP descent and symptoms of POP in the 6-month and 1-year follow-up period.[14]

This case report presents several strengths and limitations. Among the strengths, the use of three well-established scientific databases to identify relevant studies is a notable advantage. Additionally, an independent screening process was employed to ensure objectivity and rigor in the study selection. However, several limitations must be acknowledged. A significant barrier was the language restrictions, which led to the exclusion of relevant studies published in languages other than English, thereby reducing the number of appraised studies. Furthermore, the current body of evidence remains limited, and there is a clear need for larger, multicenter, randomized controlled trials to better validate the long-term efficacy and safety of LSC. Additionally, future research should focus on exploring advancements in surgical techniques and innovations in laparoscopic technology that may enhance LSC outcomes. Investigating patient-reported outcomes, such as quality of life and satisfaction, is also essential for providing a more comprehensive assessment of the procedure's impact on patient well-being.

Conclusion

Laparoscopic sacrocolpopexy is associated with reduced postoperative morbidity and a shorter length of hospital stay, and is increasingly considered an equivalent to abdominal sacrocolpopexy, which remains the gold standard surgical treatment for apical prolapse. Several variations of laparoscopic sacrocolpopexy have been developed to optimize outcomes. Notably, the modified laparoscopic sacrocolpopexy technique, as described by Kameda and Meutia et al., has demonstrated significant improvements in prolapse symptoms and a reduction in the severity of pelvic organ prolapse. Additionally, this approach has been shown to enhance bladder and bowel function over time, contributing to improved overall patient outcomes.

Disclosure

The authors declared no conflicts of interest. Written consent was obtained from the patient.

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