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A levator ani midurethral support via single vaginal incision technique to treat stress urinary incontinence: A case report

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ABSTRACT

Stress urinary incontinence affects more than one-fourth of adult women. The recommended surgical treatment involves the use of a synthetic mesh sling. Upon unsuccessful treatment using a mesh sling or when patients decline mesh, surgical treatments, including an autologous fascia sling, colposuspension, or bulking injections, are used. After unsuccessful treatment using three mesh slings, an autologous fascia sling, and a midurethral bulking agent, a patient was successfully treated with our modified Kelly plication technique.

A 51-year-old woman with recurrent stress urinary incontinence had had three previous mesh midurethral sling exposures with complete mesh removals followed by one autologous fascia sling with severe infection. We initially treated her with a set of urethral bulking injections, which was also unsuccessful. She was successfully treated with our modified Kelly plication technique, which plicates levator ani muscles to support the mid-urethral instead of plicating the vesicovaginal fascia at the bladder neck. The patient remained continent four years after the performance of this technique and had reported no pelvic pain or dyspareunia. The technique is detailed in this paper. This single vaginal incision native tissue technique may be considered when mesh slings or alternative native tissue procedures are not feasible for patients, as in this case.

1. Introduction

Stress urinary incontinence (SUI), the involuntary leakage of urine on effort, physical exertion, coughing, or straining, is reported to affect 25–45% of women [1]. Synthetic mesh midurethral sling (MUS) placement can be performed easily in an outpatient setting and has been widely used for over two decades with good efficacy [2,3]. However, short- and long-term complications have been reported, including vascular injury, nerve injury, pelvic pain, and mesh exposure to the adjacent organs, including the bladder, urethra, vagina, and intestine [4–6]. Some women decline to use mesh, and MUS is unavailable in some places. Native tissue options include an autologous fascia sling and colposuspension. A fascia sling involves harvesting either the rectus fascia or fascia lata [7,8]. Colposuspension requires either a mini abdominal incision or laparoscopy [9,10]. Although Kelly plication is a single vaginal incision native tissue procedure, it is rarely used because of its low efficacy [11,12].

Kelly plication was modified by the lead author of this paper. The resulting technique was initially named native tissue midurethral support [13]. It was renamed levator ani midurethral support (LAMS) via single vaginal incision to distinguish it from a fascia sling which also supports the midurethral with native tissue. The plication was placed underneath the midurethral versus the bladder neck. Instead of plicating the vesicovaginal fascia, the puborectalis muscle, the most medial part of the levator ani muscle, was plicated from both sides to support the midurethral. Triple plication was used to reinforce the support further.

Abbreviations: LAMS, levator ani midurethral support via a single vaginal incision; MUS, mesh midurethral sling; POP, pelvic organ prolapse; SUI, stress urinary incontinence.

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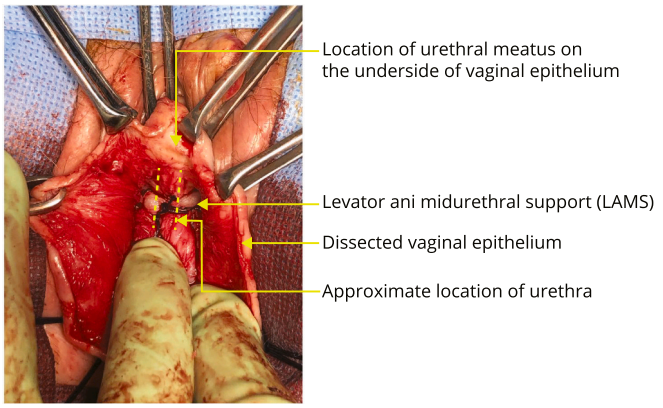

Fig. 1. Photograph of levator ani midurethral support (LAMS) after three passes of plication of levator ani muscle before trimming off excess vaginal epithelium during anterior repair, showing support of the midurethral by a strong band of muscle. This patient had pelvic organ prolapse without previous surgical treatment. Written consent was obtained from the patient to use this photograph.

LAMS was initially performed concomitantly with pelvic organ prolapse (POP) surgeries, utilizing the same incision for anterior repair, to treat and prevent postoperative urinary incontinence [13,14]. A photograph of LAMS before anterior repair in a patient with POP with no history of previous surgery is shown in Fig. 1. In this report, LAMS was used to successfully treat a patient after unsuccessful treatments using three synthetic mesh slings, an autologous fascia sling, and a midurethral bulking agent.

2. Case Presentation

A 51-year-old obese white woman who had had two spontaneous vaginal deliveries and two ectopic pregnancies, with a medical history notable for chronic tobacco use, gastroesophageal reflux, hypercholesterolemia, hypothyroidism, anxiety, depression, and allergic rhinitis, was referred for evaluation of persistent SUI after multiple prior surgeries.

At age 40 years, the patient underwent total vaginal hysterectomy, McCall culdoplasty, anterior repair, and retropubic mesh sling placement for menorrhagia and SUI (Fig. 2). One year later, partial mesh exposure was identified, requiring excision. She developed recurrent SUI, confirmed with urodynamics and physical examination. At age 42 years, she underwent placement of another retropubic mesh sling. At age 45 years, she had recurrent mesh exposure requiring laparoscopic and vaginal mesh excision. She underwent urodynamic testing four months later, which demonstrated SUI without intrinsic sphincter deficiency and no detrusor overactivity. Five months after the mesh excision, she underwent laparoscopic paravaginal cystocele repair and placement of a third retropubic mesh sling. Postoperatively, she developed urinary retention, requiring clean intermittent catheterization. Three weeks later, 1.5 cm of sub-urethral mesh was excised for urinary obstruction and incision separation. Her SUI returned immediately after the sling excision, and she returned to the operating room for further mesh excision and retropubic autologous rectus fascia sling placement. This was complicated by postoperative abdominal wound hematoma, requiring wound exploration and vacuum-assisted closure.

At age 51 years, the patient was referred to our care for mixed urinary incontinence with components of stress and urge. She also had coital urinary incontinence. She wore incontinence pads during her

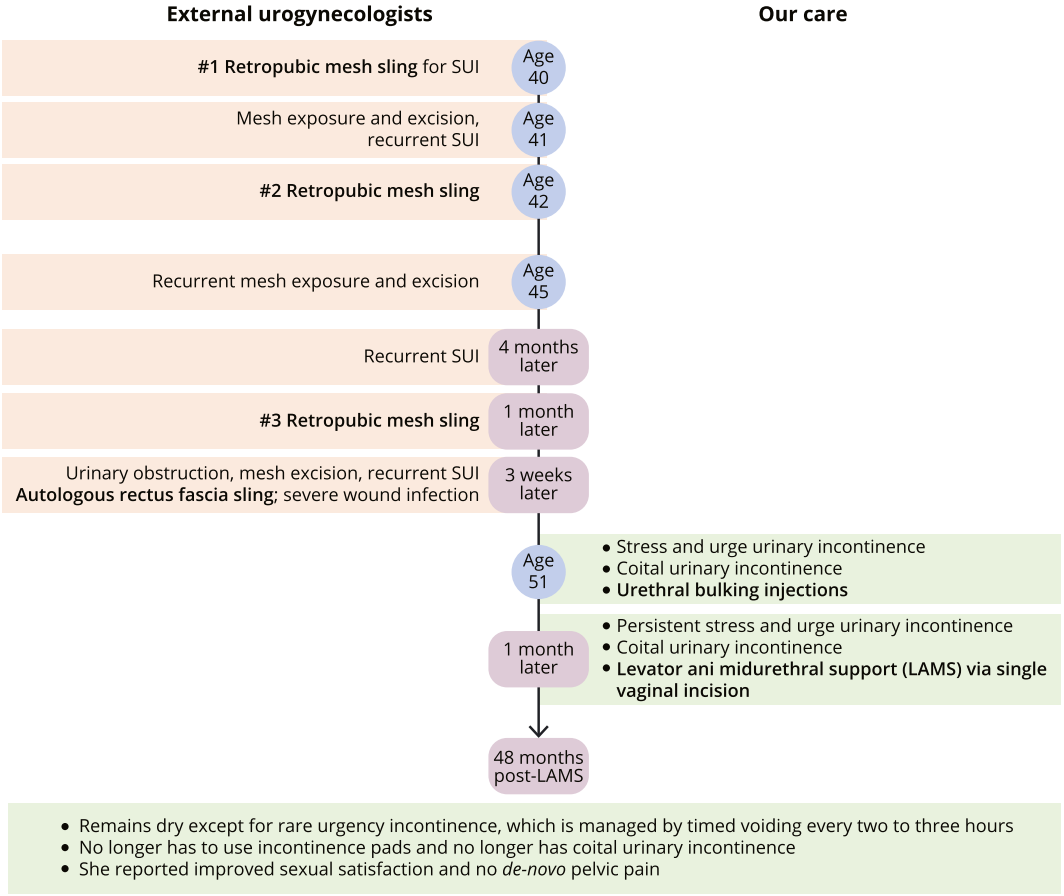

Fig. 2. Timeline of all the treatments the patient received from external urogynecologists (on the left) and under our care (on the right). The outcome of the levator ani midurethral support (LAMS) treatment is summarized at the bottom. Surgical treatments are highlighted in boldface type.

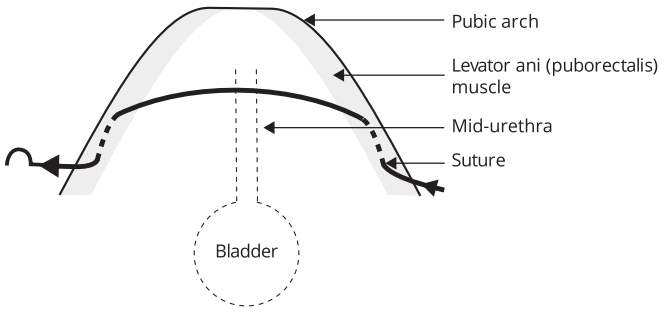

Fig. 3. Schematic drawing of levator ani midurethral support (LAMS) showing the first pass of plication of levator ani muscle before the suture ends are tied (frontal view).

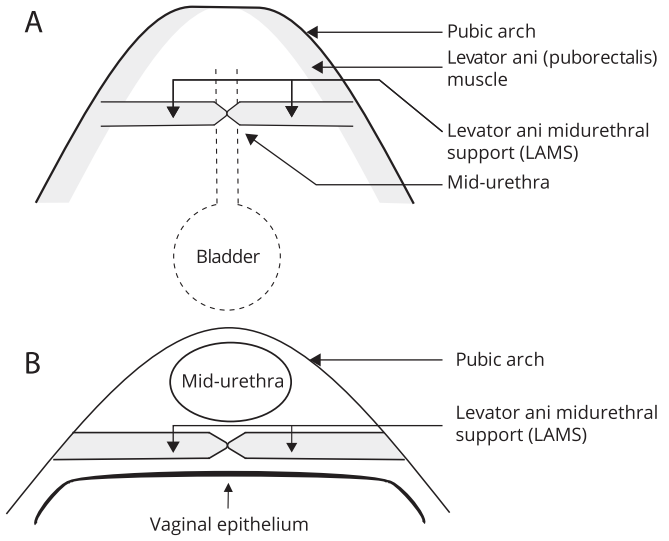

Fig. 4. Schematic drawings of levator ani midurethral support (LAMS) after three passes of plication of levator ani muscle and suture ends are tied, showing support of the midurethral by a strong band of muscle. (A) Frontal view. (B) Axial view. These schematic drawings correspond to the photograph in Fig. 1.

daily activities and continued to smoke cigarettes. Physical examination revealed vaginal scarring. The patient had no urinary retention, and no SUI was elicited while supine or standing. She was started on mirabegron without improvement and underwent urodynamics, notable for low capacity (218 mL), normal compliance, no evidence of detrusor overactivity, and a maximum flow rate of 4.0 mL/s at Pdet Qmax 26 cm H_2O with a non-sustained detrusor contraction characterized as mild detrusor underactivity. Her post-void residual volume was low (10 mL). Urodynamics did not reveal SUI; it was detected upon catheter removal with a full bladder. The decision was made to proceed with calcium hydroxyapatite urethral bulking injections to increase the urethral resistance [15]. Injections at the 3, 6, and 9 o'clock positions were placed at the midurethral with excellent coaptation of the urethra. One month later, she had persistent stress and urge urinary incontinence. She was counseled on the limited options available after the unsuccessful treatments of three MUSs, one autologous fascia sling with severe infection, and one set of urethral bulking injections. She opted to proceed with LAMS.

The patient was placed on vaginal estrogen cream and counseled to stop smoking. One month later, after informed consent was obtained, under general anesthesia, 1% lidocaine with 1/100,000 epinephrine was injected into the midline of the anterior vaginal epithelium from 0.5 cm to approximately 4 cm below the urethral meatus. An incision was then made on the hydro-dissected vaginal epithelium. The vaginal epithelium was separated from the underlying vesicovaginal fascia sharply and

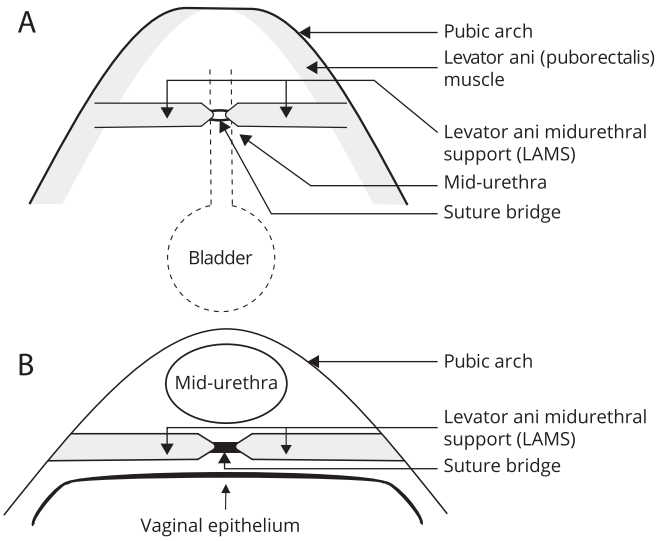

Fig. 5. Schematic drawings of levator ani midurethral support (LAMS) after three passes of plication of levator ani muscle and suture ends are tied, with dense tissue scarring and a suture bridge. (A) Frontal view. (B) Axial view. The patient in this case had dense scar tissue from multiple prior surgeries to treat stress urinary incontinence.

bluntly. The vaginal epithelium was dissected as far laterally as possible and at least 2–3 cm cephalad to create a retropubic space, allowing space to place serial plication sutures at the midurethral level. Synthetic mesh fibers from previous surgeries were identified and excised. A 0-Vicryl suture on a UR-6 needle was placed down-to-up, posterior to anterior, on the vesicovaginal fascia as laterally and as deeply as possible on the patient's left side to include the puborectalis muscle, the most medial part of the levator ani muscle. A strong pull on the suture allowed the surgeon to confirm that the anchoring suture had included the puborectalis muscle. The same suture was brought to the right side and placed up-to-down, anterior to posterior, again as laterally and as deeply as possible to include the contralateral puborectalis muscle (Fig. 3). After a strong pull, the suture ends of the resulting inverted U shape were tied together to bring the puborectalis muscle from the two sides to the midline to support the midurethral. After the suture was tied, a more lateral portion of the muscle became accessible. A second suture was used to make another inverted U plication. This was repeated a third time to include the puborectalis muscle to ensure good support of the midurethral. Plication was technically challenging owing to the significant scar tissue. The optimal result of the complete mobilization of the puborectalis muscles with apposition in the midline (Fig. 4) was not possible; there was a small suture bridge between the two sides of the puborectalis muscle (Fig. 5). The patient was observed overnight and failed the trial of void on postoperative day 1; she subsequently passed an outpatient voiding trial on postoperative day 3. She developed recurrent urinary retention requiring temporary clean intermittent catheterization for one month.

At the time of this report, 48 months postoperatively, the patient remains dry except for rare urgency incontinence, which is managed with timed voiding every two to three hours. She no longer has to wear incontinence pads or experiences coital urinary incontinence. She reported improved sexual satisfaction and no de-novo pelvic pain.

3. Discussion

After three MUSs, an autologous fascia sling was used for this patient. However, she developed a severe abdominal wound infection and had recurrent SUI. Urethral bulking injections were administered, but the SUI was not resolved. Although informed of the uncertain success rate of LAMS because of her previous surgeries, she opted for LAMS.

LAMS successfully treated this patient's SUI. Anatomically, there are no major vessels or nerves near the single vaginal incision or lateral dissection of the avascular plane underneath the vaginal epithelium. The whole procedure is performed under direct visualization. For 56 patients with LAMS concomitant with POP surgery, the perioperative complications were urinary infection and temporary urinary retention; there were no other complications, such as bleeding and visceral or nerve injuries [13]. Patients reported they had no de-novo urgency incontinence, de-novo pelvic pain, or dyspareunia. LAMS is a native tissue technique that uses only absorbable sutures; therefore, there is no source for tissue reaction, which might lead to pelvic pain and dyspareunia in some patients. Since the suturing is done as laterally as possible away from the midurethral to include the puborectalis muscle, the possibility of trauma to the midurethral should be minimal. The LAMS procedure time ranges from 20 to 40 min. The main challenge of the technique is to ensure inclusion of the levator ani muscle. If the suture is placed only on the vesicovaginal fascia, it will tear off with a strong pull.

This is the first report on using LAMS to treat a woman with SUI after the placement of three MUSs with total removals, one autologous fascia sling with severe infection, and one set of urethral bulking injections. Although there was a small suture bridge due to the severe scarring in this case, her SUI was successfully treated. LAMS may be considered when mesh slings or alternative native tissue procedures are not feasible for patients, as in this case.

Contributors

Lai-Yet Lam was responsible for the conception of the case report, participated in the direct care and treatment of the patient, acquired the data, and contributed to the writing and editing of the manuscript.

Janice A. Santos-Cortes was responsible for the conception of the case report, participated in the direct care and treatment of the patient, and contributed to the writing and editing of the manuscript.

Timothy K. O'Rourke, Jr. participated in the direct care and treatment of the patient, acquired the data, and contributed to the writing and editing of the manuscript.

All authors approved the final submitted manuscript.

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Patient consent

Written consent for the use of the photograph in this case report was obtained from the patient. Written consent for the publication of this case was obtained from the patient in this case.

Provenance and peer review

This article was not commissioned and was peer reviewed.

Conflict of interest statement

The authors declare that they have no conflict of interest regarding the publication of this case report.

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