CASE SERIES

Laparoscopic Vaginoplasty Utilizing Davydov's Modified Peritoneal Pull-down Technique for Patients with Mayer–Rokitansky–Küster–Hauser Syndrome

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Abstract

Background: The congenital Mayer–Rokitansky–Küster–Hauser (MRKH) syndrome affects 1 in 4,500–5,000 live female births, causing uterine and vaginal agenesis, impairing their sexual life and ability to conceive. Both nonsurgical and surgical management strategies are available, and their outcomes depend on patient follow-up with serial vaginal dilatation. Historically, procedures such as Davydov's technique, Vecchietti operation, Sigmoid colpoplasty, McIndoe's, and its variants have been published. Compared to these conventional operations, laparoscopic vaginoplasty using Davydov's modified peritoneal pull-down technique is favored because of lesser postoperative pain and better outcomes.

Case description: Three patients with MRKH underwent laparoscopic vaginoplasty using Davydov's modified peritoneal pull-down technique at JSS Hospital, Mysuru. Several factors, including the surgical outcome, pain score, and postoperative complications, have been examined.

Conclusion: Due to its ease of use and safety, laparoscopic vaginoplasty using Davydov's modified peritoneal pull-down technique is a renowned procedure in constructing a neovagina. Compared to other conventional surgeries, it has fewer side effects and pain. The peritoneal lining aids in preventing adhesions and symptomatic vaginal atrophy, and fistulas. A neovagina with acceptable proportions is usually attained by patients, enabling regular sexual interactions.

Keywords: Davydov's modified peritoneal pull-down, Laparoscopic vaginoplasty, Mayer–Rokitansky–Küster–Hauser syndrome.

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Introduction

Patients with the congenital Mayer–Rokitansky–Küster–Hauser (MRKH) syndrome are born with uterine and vaginal agenesis, which impairs their capacity to have a normal sexual life and conceive.[1] The prevalence of MRKH syndrome is 1 in 4,500–5,000 live female births.[2] Mayer–Rokitansky–Küster–Hauser syndrome is classified as type I (isolated uterovaginal aplasia) or type II (associated with extragenital manifestations).[3] Extragenital anomalies typically include renal, skeletal, ear, or cardiac malformations. Patients present with primary amenorrhea but have normal external genitalia and secondary sexual characteristics with 46xx karyotype. Uterine and vaginal hypoplasia occur due to inadequate fusion of the müllerian ducts.[4] Young women with MRKH syndrome, lacking a uterus and vagina, are burdened with severe anxiety and psychological anguish. Therefore, thorough counseling of the patient and family, both before and throughout therapy, is mandatory. Creation of a neovagina is the cornerstone of treatment in patients when ready to start sexual activity and are emotionally mature. Both surgical and nonsurgical management exist for the same.[4] Among nonsurgical procedures, Franck's dilator approach is the most widely employed. It entails using vaginal dilators (Hegar candles), which gradually increase in length and diameter, initially by the clinician and subsequently by the patient. With a success rate ranging from 78 to 92%, the entire process takes 6 weeks to several months.[4] However, for nonsurgical care, the patient must be committed and have a 2–4 cm vaginal dimple. When the vaginal dimple is less than 2 cm, surgical intervention has the advantage. For women with müllerian agenesis, assisted reproductive methods involving the use of a gestational carrier (surrogate) have proven to be effective.[2] Moreover, uterine transplantation can enable MRKH syndrome patients to bear children, and the development of a neovagina permits satisfying sexual activity in these individuals.[5,6] There are currently several surgical methods suitable for correcting vaginal agenesis, and there is no universally accepted choice; instead, the method is typically determined by the experience of the surgeon. Davydov, in 1969, developed a three-stage procedure that involves dissecting the rectovesical gap, mobilizing a portion of the

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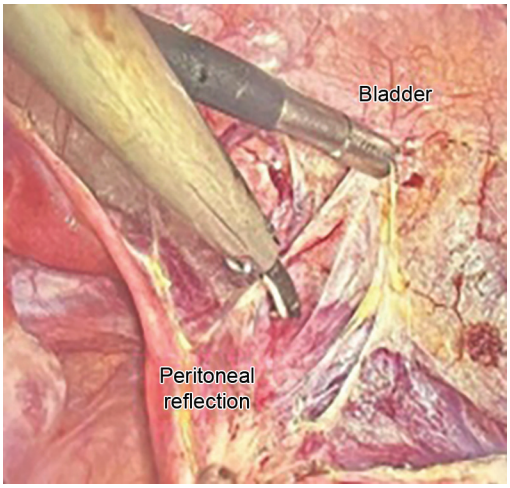

Fig. 1: Creation of anterior vaginal flap with bladder dissection

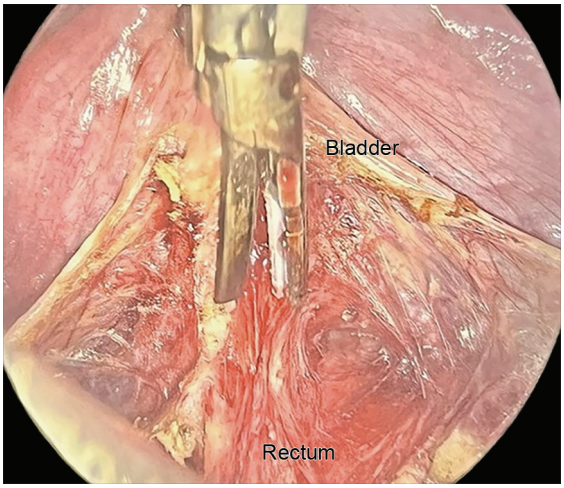

Fig. 2: Creation of posterior vaginal flap after bladder dissection

peritoneum in the abdomen, and then lowering the peritoneum to join at the introitus. Laparoscopic modification of Davydov's technique, first described by Allahbadia et al.,[7] is a very safe and effective technique of vaginoplasty. Inadequate pull-down of the peritoneum, obliteration of the neovaginal vault or shortening of the neovagina, granulation tissue formation, and prolapse of the neovagina or bowel are potential limitations of this procedure. Therefore, various modified laparoscopic Davydov procedures have been developed.[8,9] Recently, laparoscopic vaginoplasty using a modified peritoneal pull-down approach has become more popular in creating a neovagina that is both functionally and anatomically effective with the fewest possible postoperative complications.[9–12] The present case series describes the technique and outcomes of laparoscopic vaginoplasty with a modified peritoneal pull-through technique.

Case Series

We present a series of three cases of unmarried females who presented to the Department of Obstetrics and Gynecology, JSS Hospital, Mysuru, between January 2023 and June 2024, with primary amenorrhea and were diagnosed with MRKH syndrome. Patients were counseled along with their parents regarding the implications of the diagnosis and the pros and cons of both nonsurgical and surgical methods for the creation of a neovagina for sexual function and reproductive options, such as the use of surrogacy. All three patients opted for the surgical method of vaginal creation and underwent laparoscopic vaginoplasty by the modified peritoneal pull-through technique.

Surgical Technique

Under strict asepsis under combined general and spinal anesthesia, the bladder was catheterized with a Foley's catheter. A laparoscopically transverse incision was made in front of the strands that connected the bilateral uterine anlagen from one round ligament to the other. Peritoneum in the supravesical region was incised, and the bladder was pushed down and the anterior vaginal flap was created as shown in Figure 1. Posteriorly rectovesical space was dissected and rectum was pushed down till the pelvic floor was visualized and a posterior vaginal wall flap was created as shown in Figure 2. Bridging tissue between the vagina and peritoneum was delineated by a sponge on swab from the blind vagina below

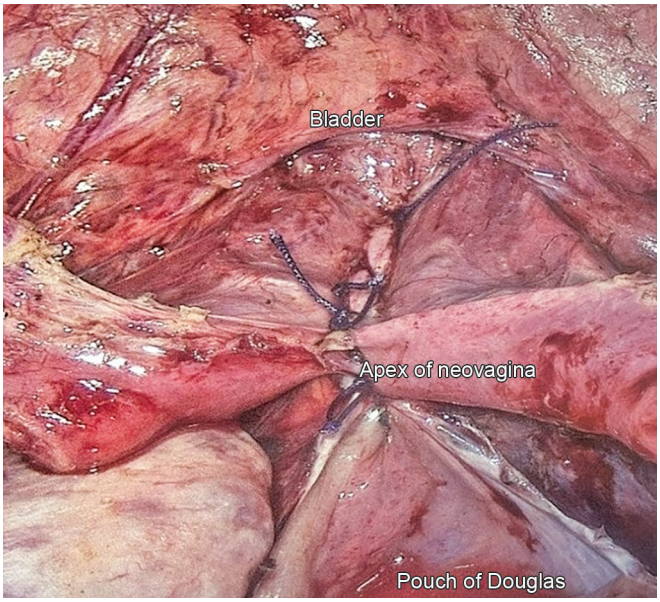

Fig. 3: Creation of the apex of the neovagina using the peritoneum

and a transverse incision was made on the blind vaginal summit using harmonic laparoscopically. Vaginally anterior peritoneal flap was sutured anterolaterally at the level of introitus, and the posterior flap was sutured posterolateral at the level of introitus with the help of four stitches using 2-0 vicryl. Apex of neovagina was made by closure of peritoneum with No 1-0 vicryl, in a purse string manner, starting from anterior peritoneum between the uterine rudimentary horns, the peritoneum on the right pelvic wall, rectal serosa, and adjacent peritoneum posteriorly, and peritoneum over the left pelvic wall back to anterior peritoneum with ureter under vision as shown in Figure 3. All patients underwent bilateral salpingectomy.

Rubber foam was rolled over an infant feeding tube and covered with condoms and covered with lignocaine jelly to cause less pain, as shown in Figure 4. The mold was kept in place by suturing the labia minora, as shown in Figure 5. Patients were reexamined 4 days after the surgery, and the catheter and mold were removed. The neovagina was inspected and washed with normal saline.

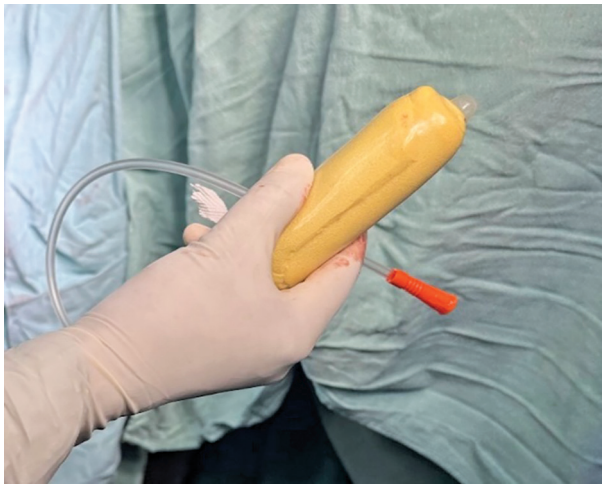

Fig. 4: Preparation of a mold using rubber foam over an infant feeding tube covered by condoms

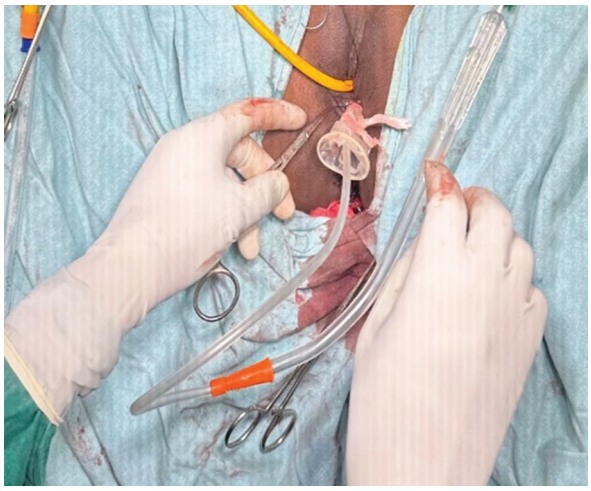

Fig. 5: Mold is kept in the neovagina using lignocaine jelly and suturing to the labia minora

The patients were taught to apply a soft silicone mold that was 10 cm long and 2.8 cm wide to maintain the length and width of the neovagina, as shown in Figure 6. Before each use, the mold was washed with betadine solution and water. Dilatation was performed continuously during the night for the first 3 months after surgery. All patients were called for follow-up at 1, 3, 6, and 12 months after surgery. At each follow-up, the width, length, granulation tissue, and stenosis of the neovagina were examined and recorded.

Case 1

A 30-year-old married woman diagnosed with MRKH syndrome at 18 years of age came to the Department of Obstetrics and Gynecology at JSS Hospital in January 2023 for further management after her marriage. She had not attained menarche and had a history of dyspareunia with no other significant medical, surgical, personal, or family history. On examination, breast development was Tanner staging 5 and axillary hair Tanner staging 5 with normal systemic examination. Local examination showed pubic hair Tanner staging 5, normal labia majora and minora, and normal urethral opening. A hymenal opening was present, and a blind vagina of 2 cm was

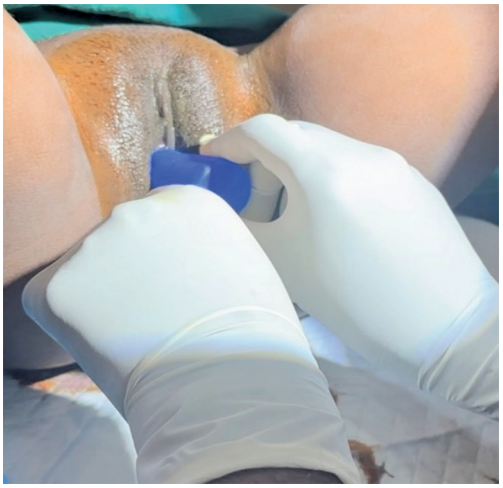

Fig. 6: Dilatation of the neovagina using a soft silicone mold

seen. The uterus was not visualized on MRI with bilateral normal ovaries and normal bilateral kidneys, with a diagnosis of class 1 müllerian duct anomaly. Her karyotyping was 46, chromosomal karyotype with normal blood investigations. The patient underwent laparoscopic vaginoplasty by modified peritoneal pull-through. The patient had a pain score of 3/10 on postoperative day 1 and 0/10 on postoperative day 3. The patient was advised bed rest and the mold was removed on pod-4. Serial dilatation with dilators was done, and the patient was discharged on postoperative day 6 and was counseled regarding the use of the dilator daily. On follow-up after 1 month length of the neovagina was 8 cm.

Case 2

An 18-year-old unmarried girl came to the Department of Obstetrics and Gynecology, JSS Hospital, Mysuru, in November 2023 with complaints of not attaining menarche and was diagnosed with MRKH syndrome with no significant medical, surgical, personal, or family history. On examination, breast development was Tanner staging 5, axillary hair Tanner staging 5, with normal systemic examination. Local examination showed pubic hair Tanner staging 5, labia majora, and minora normal with a normal urethral opening. No hymenal opening was seen with a blind vagina. Ultrasound showed a hypoplastic uterus ($2.9 \times 2 \times 1.9$ cm) and normal bilateral ovaries, and MRI showed non-visualization of the cervical segment of the uterus and vagina with normal bilateral ovaries and kidneys. A diagnosis of class 1 müllerian duct anomaly was made. Karyotyping was 46, XX with normal blood investigations. Intraoperatively, a hypoplastic uterus was visualized with no cervix. Laparoscopic vaginoplasty by modified peritoneal pull-through was performed. The patient had a pain score of 5/10 on postoperative day 1 and 1/10 on postoperative day 3. The patient was advised bed rest and the mold was removed on pod-7. Serial dilatation with dilators was done, and the patient was discharged after 8 days and was counseled regarding the use of the dilator daily. On follow-up after 1 month length of the neovagina was 7 cm.

Case 3

A 23-year-old unmarried woman came to the Department of Obstetrics and Gynecology, JSS Hospital, Mysuru, in March 2024, diagnosed with MRKH syndrome at 18 years of age, for further management as she was due for her marriage. The patient had not

attained menarche with no significant medical, surgical, personal, or family history. On examination, breast development was Tanner staging 3, axillary hair Tanner staging 5. Systemic examination was normal, and local examination showed pubic hair Tanner staging 5, labia majora and minora normal, and a normal urethral opening. The hymenal opening was present with a 1 cm blind vagina. Ultrasound showed a hypoplastic Uterus (33 × 15 × 15 mm) with thin endometrial echoes. Both the ovaries were normal in size. On MRI scan, a Hypoplastic uterus measuring 2.3 × 1.1 × 1.7 cm was seen with normal bilateral ovaries and kidneys and an absent cervix. Karyotyping was 46, XX with normal blood investigations. Intraoperatively, there was a hypoplastic uterus with an absent cervix. Laparoscopic vaginoplasty by modified peritoneal pull-through was performed. The patient had a pain score of 4 on postoperative day 1 and 0/10 on postoperative day 3. The patient was advised bed rest and the mold was removed on pod-7. Serial dilatation with dilators was done. The patient was discharged on postoperative day 8 and was counseled regarding the use of a dilator daily. Length of neovagina was 8 cm at 1-month follow-up. Patient is planned for creation of a connection between the uterine cavity and vagina by creating an opening in the region of the cervix.

Discussion

The anatomical and functional success rate of surgical vaginoplasty is higher than that of Frank and Ingram's vaginal dilatation, although it is regarded as a noninvasive and first-line surgery for the development of a neovagina (90–96% vs 70–78%). Additionally, only vaginal dilatation necessitates a great deal of patient commitment and persistence.[13] The literature mentions several surgical techniques for giving MRKH patients a functional vagina. Although there is little variation in the results obtained, each of these treatments has unique benefits and drawbacks. Based on the patient's characteristics and the surgeon's ability to create a neovagina with sufficient length and width while ensuring patient satisfaction and minimizing problems, the best vaginoplasty procedure is selected. The classic McIndoe vaginal procedure avoids the risk of abdominal surgery. Nevertheless, the drawbacks include the possibility of infection, cheloid growth, and scarring in the grafted area.[14] To construct the neovagina, the Vecchietti procedure uses traction instead of dilatation by either an open or a laparoscopic abdominal procedure. The patient may find it difficult to bear the excruciating discomfort of the "olive" being pulled at the vaginal dimple.[14] Other techniques utilize an intestinal graft in neovaginal creation, which has a natural lubricating effect, no shrinking or narrowing following surgery, and the elimination of the necessity for dilatation. Considering the requirement of laparotomy, many surgeons do not opt for it as the first choice due to the hazards of intestinal stenosis, dehiscence, fistula formation, and significant infection. Intestinal graft-created vaginas provide less sensation and are more likely to produce a lot of mucus. Additionally, there is a rare chance of malignancy.[14] The three-step Davydov method used in this series involves dissecting the area between the rectum, bladder, and urethra, then mobilizing the peritoneum and suturing it to the edges of the vaginal vestibulum. Although one of the easiest, safest, and fastest techniques, it also necessitates postoperative dilatation. It has several benefits, such as adequate lubrication with satisfying intercourse, no granulation tissue, and no scarring.[15] Compared to other transplanted grafts, there is a lower chance of rejection and peritoneal flap necrosis. Following surgery, peritoneal epithelialization starts right away since it has a strong capacity for regeneration and can undergo squamous metaplasia when exposed to the external environment.[9] Earlier studies revealed the risk of damage to the bladder and/or ureter, and the risk of peritonitis and vesicovaginal fistula formation with the Davydov technique.[16] Recent studies have shown fewer complications of urogenital fistula, rectal injury, urethral injury, vaginal stenosis, and granulation tissue compared with the McIndoe technique. Also, decreasing the possibility of injury to the bladder by the use of a catheter and to the rectum by the assistant placing a finger in the rectum is very practical.[10,17] A study by Deldar-Pesikhani et al.[10] revealed higher postoperative complications in the modified McIndoe compared to the Davydov group. There were no significant differences in the neovaginal length and width of the two groups at the 6-month follow-up ($p > 0.05$). The chronic use of painkillers in the McIndoe group was significantly more than that in the Davydov group.[10,17] In the present study, we have assessed the pain score by the visual pain scale, which ranged from 3 to 4/10 on postoperative day 1 and was 0/10 on postoperative day 3 for all the patients. The present case series showed lesser bleeding and postoperative pain, shorter stay, quicker recovery, and satisfactory cosmetic outcome, which is similar to various other studies.[11–13] The present case series describes the technique and outcomes of laparoscopic vaginoplasty using modified peritoneal pull-down with purse string sutures taken involving the anterior, lateral, and posterior peritoneum to form the apex of the neovagina. The modification is simple to perform and different from the other studies. We have observed no complications and good vaginal length comparable to other modifications.[9–12] Regular mold use for a longer time is crucial in this study to attain optimal vaginal length after surgery, particularly in patients who have irregular or no sexual activity, as in other studies.[9,14,17] The small sample size and lack of a control group to compare other procedures are the study's limitations. Furthermore, no studies have been conducted to evaluate the functional sexual outcomes following neovaginal construction.

Conclusion

There is no single technique that is better than another to create a functional vagina. Laparoscopic vaginoplasty using Davydov's modified peritoneal pull-down technique is a common procedure due to its safety and simplicity. When compared to other conventional surgeries, the pain and complications are significantly lower. The lining of the peritoneum aids in preventing adhesions and vaginal atrophy. In general, they don't develop fistulas, vaginal strictures, or epithelial defects. Usually, patients attain a neovagina with adequate proportions, enabling regular sexual intercourse. The neovagina's mucosa, strength, and sensation are comparable to those of a normal vagina during sexual activity. Davydov's method with modified peritoneal down can therefore be regarded as the most effective surgical alternative.

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