

Laparoscopic-assisted methods for neovaginoplasty

Katharina Rall, MD

D. Wallwiener, MD

Sara Brucker, MD

Department of Obstetrics and Gynecology

Tübingen University Hospital

Tübingen, Germany

The most common cause of vaginal agenesis, which occurs in 1 in 4000 to 5000 females, is congenital absence of the uterus and vagina, also known as Müllerian agenesis or Mayer-Rokitansky-Küster-Hauser (MRKH) syndrome. Vaginal agenesis can also be caused by complete androgen insensitivity syndrome, other disorders of sex development, or major genitourinary anomalies.

Patients with MRKH syndrome have a female genotype (46,XX), ovarian function, and endocrine status that are normal, and they develop a normal female phenotype with adequate thelarche and pubarche (FIGURES 1 AND 2).^{1,2} Typical presentation of MRKH syndrome is primary amenorrhea with normal secondary sexual characteristics. Müllerian agenesis is second only to gonadal dysgenesis as a common cause of primary amenorrhea.³⁻⁵ The spectrum of phenotypic forms of vaginal aplasia—including malformation of internal genitalia—may remain undetected during gynecologic vaginal or ultrasound examination.

Although not a life-threatening disorder, vaginal aplasia can affect a woman's quality of life and may cause a psychological burden, making early diagnosis and timely initiation of therapy important. Gynecologists must be knowledgeable about vaginal agenesis, as vaginoplasty may be desired by young women and adolescents who have the disorder, and by

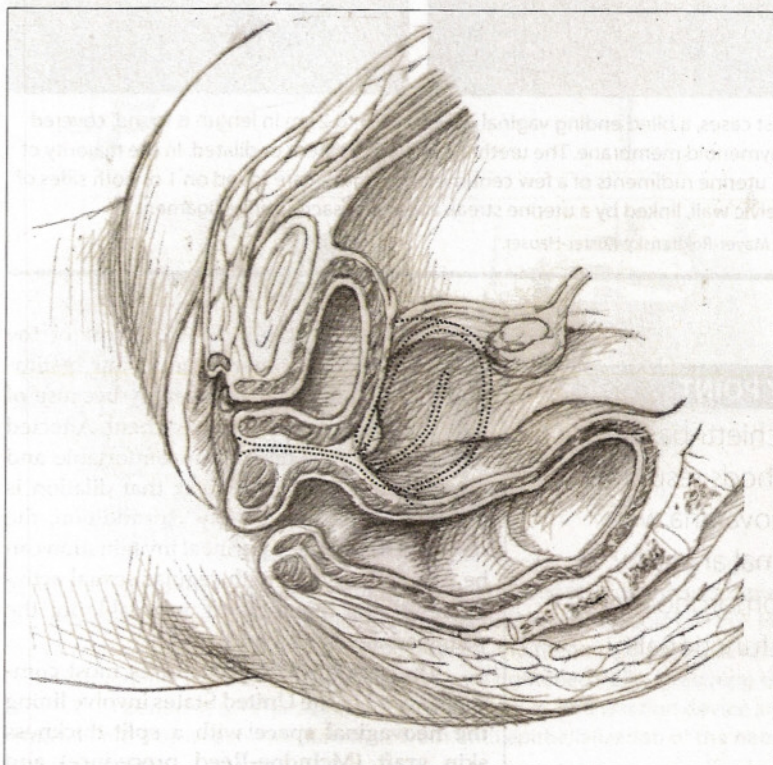


FIGURE 1 Vaginal and uterine aplasia

Congenital absence of the uterus and vagina, also known as Müllerian agenesis or Mayer-Rokitansky-Küster-Hauser (MRKH) syndrome.

those who have undergone radical surgery or radiotherapy for pelvic cancer treatment.

Treatment options for vaginal agenesis

Vaginal agenesis can be managed nonsurgically with the use of successive vaginal dilators only if the condition has been correctly diagnosed and the patient is sufficiently motivated. The American College of Obstetricians and Gynecologists (ACOG) states that nonsurgical creation of the vagina is the appropriate first-line approach in most cases because it is associated with the least morbidity.⁶ In our experience, however, we have not found the anatomic and functional success rates of dilator therapy

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FIGURE 2 Vaginal and laparoscopic findings of MRKH syndrome

In most cases, a blind ending vaginal pouch of 0.5 to 2 cm in length is found, covered by a hymenoid membrane. The urethra can be prominent or dilated. In the majority of cases, uterine rudiments of a few centimeters' diameter are found on 1 or both sides of the pelvic wall, linked by a uterine streak above the sacrouterine ligament.

MRKH, Mayer-Rokitansky-Küster-Hauser.

KEY POINT

Vecchietti-based methods result in a neovagina with normal anatomy, histomorphology, and functionality.

reported in the literature, with most of the girls and young women seen at our institution discontinuing dilator therapy because of pain and long duration of treatment. Affected females may find dilators uncomfortable and unpleasant, and many report that dilation is a reminder of abnormality.⁷ In addition, the resulting incomplete perineal invagination can be maintained only with regular sexual activity, rendering this method unsuitable for the young adolescent patient.

The two surgical procedures most commonly used in the United States involve lining the neovaginal space with a split-thickness skin graft (McIndoe-Reed procedure) and lining the neovaginal space with a section of intestine. Both are major surgical procedures with significant risks and potential complications. Women who undergo the McIndoe-Reed skin graft commonly have vaginal stenosis and scarring at the harvest site. Intestinal vaginoplasty can lead to foul-smelling vaginal discharge and diversion colitis. An increased risk of malignant transformation in these grafts has also been reported.⁸

Recently introduced laparoscopic approaches offer the benefits of reduced morbidity and faster recovery. This article focuses on these laparoscopic-assisted methods in vaginal reconstruction.

Laparoscopic modified Vecchietti procedure

A laparoscopic approach to the Vecchietti technique has benefited from continuous

improvements in instruments and in the procedure itself since it was first described in the early 1990s.⁹⁻¹² Outcomes using the Vecchietti technique laparoscopically have been comparable with those achieved by conventional laparotomy, and the technique is becoming the treatment of choice in Europe to correct vaginal agenesis in MRKH syndrome.¹³

The Vecchietti procedure allows the creation of a neovagina by passive traction, rather than dilation (FIGURES 3 AND 4).¹⁴ The advantage of Vecchietti-based methods is that they create a neovagina with normal anatomy, histomorphology, and functionality without the use of extraneous tissue such as skin, peritoneum, or intestine. In addition, there is no need for the patient to undergo plastic surgery, which can cause scarring, and a functional result is achieved quickly.¹⁴

Brun and colleagues found that the mean operative time for the Vecchietti procedure using the laparoscopic method in 3 women was comparable to the operative times in 17 Vecchietti procedures performed by laparotomy (mean operative time, 55 minutes; traction period, 7.7 days; vaginal size, 8.3 x 2.7 cm).¹⁵ Figueira and colleagues described outcomes in 18 patients following laparoscopic creation of a neovagina, applying principles of the Vecchietti procedure and implementing some useful modifications (mean traction period, 6.3 days; vaginal length, 11.3 cm; vaginal diameter, 2.4 cm).¹⁶

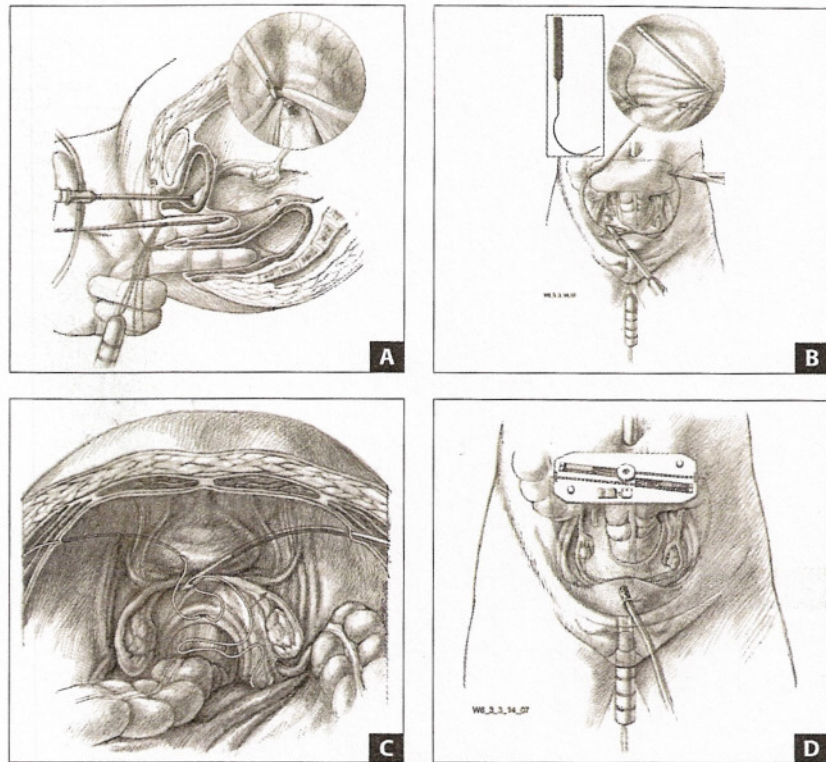
Our group studied an optimized Vecchietti procedure (without vesicorectal tunneling) in 101 patients, which used new instruments, including a modified traction device that allows for a stable direction of traction, and prevents unintentional opening and ripping off of the threads—typical complications of the older Vecchietti procedure. Our results demonstrated that mean operative time could be more than halved—from 113 to 47.5 minutes—with a significantly reduced complication rate for bladder lesions, and no bowel lesions when using the new instruments and skipping vesicorectal tunneling. Mean traction time was similarly reduced, from 11.7 to 4.8 days. No instrument-related complications were seen with our new instrument set. After 6 months, the longer neovagina of 10.6 cm that was achieved with the new method was 2.5 cm longer than that

achieved using the conventional method. No patient required use of lubricants or experienced pain during intercourse. After removal of the traction device and "olive" (or dummy), a hard vaginal mold was inserted, and patients were advised to keep the mold in situ at all times for 4 weeks, and then to reduce the wearing time until the 6th post-operative month or until sexually active. This method resulted in shorter operative and traction times, better functional results, and fewer surgical complications than with vesicorectal tunneling using the old instruments. It is, therefore, a safer, shorter, more effective and less traumatic procedure than vesicorectal tunneling.¹⁴

Fedele and colleagues reported their study of the laparoscopic Vecchiatti procedure in 52 patients with MRKH syndrome.¹⁷ Findings included a device placement duration of 7 days, achieving a vaginal length of >7 cm, and satisfying results reported by 94.2% of patients.¹⁷ Long-term follow-up results demonstrated anatomic success in 104 of 106 (98%) and functional success in 103 of 106 (97%) patients after the laparoscopic Vecchiatti technique.¹⁸ The traction device was removed between the 6th and 9th day after surgery. Postoperative, noncontinuous vaginal dilation for up to 6 months or until epithelialization is necessary in order to prevent vaginal stenosis. The criterion for anatomic success was a neovagina 6 cm or greater in length and easy introduction of 2 fingers within 6 months after corrective surgery. Scores on the Female Sexual Function Index (FSFI) were comparable with those of controls.¹⁸

A modified Vecchiatti-like procedure, the laparoscopically assisted balloon vaginoplasty, has been described as a treatment for vaginal aplasia.¹⁹⁻²¹ In this procedure, a Foley catheter is inserted laparoscopically in the space between the urethra and rectum to exert gradual traction and distension to create a neovagina; the catheter is removed after 7 days. In one study, depth of the vaginal dimple was between 6 and 12 cm.¹⁹ Risks of this procedure include abdominal wall ischemia and serious infection. The presence of the Foley catheter may also increase the risk of infection.²⁰ Retropubic balloon vaginoplasty has been recently described as an alternative for patients in whom laparoscopy cannot be used.²¹

FIGURE 3 Vecchiatti procedure



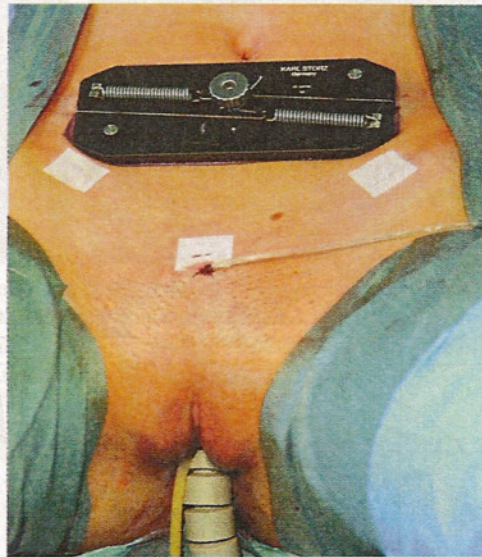
A. An acrylic "olive," or segmented dummy, with attached tension threads is placed at the vaginal dimple. **B.** The threads are passed, under laparoscopic control, from the vaginal dimple through the abdominal cavity and then to a traction device on the abdominal wall. **C.** The tension threads are tightened daily, stretching the vagina for a period of several days. **D.** The threads, olive, and traction device are removed and a postoperative dummy is worn until epithelialization of the neovagina is complete.

Laparoscopic Davydov technique

Use of the Davydov technique involves creation of a neovagina using the patient's own peritoneum for the lining. In 1994, Adamyan and colleagues first reported a case series of 324 Davydov colpoptosis procedures, 27 of which were performed laparoscopically, showing the major advantages of the endoscopic approach.²² The Davydov procedure is more suitable for those who have undergone unsuccessful vaginal surgery. It involves more extensive dissection, and residual scar tissue can be divided. The side walls of the vagina are lined with peritoneum, and no vaginal stretching is required.⁸

In a study conducted by Ismail and colleagues, a U-shaped perineal incision was made to create a flap and a neovaginal space created by blunt dissection vaginally and by

FIGURE 4 Position of the traction device in the Vecchietti procedure



The traction device is placed with its upper edge lying on the upper edge of the umbilical, allowing an optimal direction and angle of traction. In all cases where the segmented dummy is used, the transurethral catheter must be removed and replaced by a suprapubic one to prevent pressure necrosis of the urethra. The new traction device has a smooth surface preventing the threads from ripping off. Unintentional opening is impossible because of a security button below the screw.

opening the rectovesical space laparoscopically.⁸ In the pelvis, lateral releasing incisions were performed to free the peritoneum so that it could be directed down toward the vaginal incision. The peritoneum was then sutured to the vaginal edges. A soft vaginal mold was inserted and remained in situ until removed 1 week later. Patients were advised to wear a removable mold for 6 weeks thereafter, and then begin using vaginal dilators for 30 minutes every day. In this study of 5 women with an average preoperative vaginal length of 2.2 cm, 3 underwent the laparoscopic Vecchietti procedure and 2 underwent the laparoscopic Davydov procedure. The average vaginal length at 7 days following vaginoplasty was 7.6 cm, with no significant difference in the vaginal length achieved between the two techniques. The mean vaginal length at 6 months was 6.2 cm.⁸

Liu and colleagues successfully com-

pleted the laparoscopic Davydov procedure in 31 patients. Mean length of the neovagina was 6.27 cm, and the researchers found no statistical difference in the total FSFI score between the case and age-matched control groups.²³

Ma and colleagues used a novel instrument in 12 patients to push peritoneal tissue down to the introitus, and incised and sutured the peritoneal tissue to the margin of the skin and mucous membrane to form a new introitus.²⁴ After 7 days, the depths of the neovaginas were 8 to 10 cm. In all cases, a 2.5-cm diameter stent was easily inserted. These stents remained in the neovaginas for 3 months except for daily removal for cleaning. One-month postoperative examination demonstrated healing of all raw surfaces, and 6 months after surgery, depth and width were undiminished. Four patients had sexual intercourse and expressed satisfaction with sexual function.²⁴

In 1996, Soong and colleagues described the first results with the laparoscopic Davydov procedure in 18 patients. Mean operative time was as long as 125 ± 38 minutes, postoperative neovaginal length was 5.5 to 9 cm, and of the 16 patients who had sexual intercourse, 14 (85%) reported satisfaction.²⁵

Dargent and co-workers describe the laparoscopic Davydov technique as an alternative to complex or dangerous procedures such as sigmoid colpoplasty. Experience with 28 patients demonstrated a mean operative time of 119 ± 39.4 minutes, postoperative neovaginal length of 7.2 ± 1.3 cm, and FSFI scores comparable with those of an age-matched control cohort.²⁶

The procedure has been modified to a first laparoscopic step during which mobilization is achieved and 2 purse-string sutures are made; a second, final step includes vesicorectal dissection and anastomosis of the peritoneum to the vaginal vestibulum. The Müllerian rudiments are not removed because there have been no reports of neoplastic degeneration and their excision could temporarily affect the ovarian vascularization.²⁷

A modification of the laparoscopic Davydov method, the Louisville modification, has been described that prevents distortion of the proximal and distal portions of the ureters via relaxing incisions and allows for ovarian structures to remain in their anatomic position.²⁸

KEY POINT

The Davydov procedure is more suitable for patients who have undergone unsuccessful vaginal surgery.

As with the Vecchietti procedure, the main advantage of vaginal approaches is the lack of major scarring from skin grafting in these typically young patients. This procedure is more suitable for women with perineal scarring, as the vaginal skin is not required to stretch.

Laparoscopic vaginoplasty using an intestinal segment

The use of intestinal segments to reconstruct the vagina was first described by Baldwin in 1904, via laparotomy.²⁹ Segments of rectum, ileum, and sigmoid colon have been used in vaginal replacement. A segment of bowel approximately 10 to 12 cm in length is removed, with its vascular pedicle still intact. This segment is transposed into the pelvis, creating a neovagina with the proximal end closed. This procedure is usually performed via laparotomy, but there are increasing reports of laparoscopic approaches.^{30,31}

The Ruge procedure is characterized by the formation of a neovagina using sigmoid colon grafts, with reports of a successful laparoscopy-assisted Ruge operation in one case of MRKH syndrome. In this patient, a 12-cm neovagina was created, with no stenosis observed 3 months postoperatively and no postoperative self-dilation required.³²

In a comparison of the laparoscopic and perineal approaches with laparotomy, researchers observed not only the classic advantages of laparoscopy, but also less analgesic drug use, shorter time to gas and stool recovery, and a shorter hospital stay.³³ In one study of 7 cases, the sigmoid transplant remained vascularized by the inferior sigmoid artery, and the suprapubic incision was enlarged to allow the descending colon to be exteriorized and a purse to be created. Perineal cleavage up to the vestigial lamina between the bladder and the rectum was performed using a perineal H or inverted U incision. The neovaginas all had adequate length, demonstrated no shrinkage during follow-up, and gave good functional results.³³ Feasibility of laparoscopic-perineal neovagina construction by sigmoid colpoplasty performed by surgeons with extensive experience in both gynecologic and digestive laparoscopic surgery could be confirmed.³⁴

Four additional cases were reported of a combined laparoscopic-perineal procedure

confirming the feasibility of this method leading to good neovaginal lengths and without any intraoperative complications.³⁵

Sigmoid grafting offers adequate length, natural lubrication, early coitus, and lack of shrinkage, narrowing, and stenosis at the perineal introitus. This method involves major surgery, however, and carries the risks of bowel surgery. Furthermore, excessive secretions, colitis, and unpleasant odor have been reported. Prolapse of the sigmoid vagina can occur, and vaginal malignancy has also been reported.⁷ Laparoscopic-perineal sigmoid neovaginoplasty appears suitable in women who do not engage in frequent sexual intercourse and in cases where more extensive oncologic surgery is necessary at the same time. Immediate postoperative self-dilation is usually not necessary.

Summary

No consensus exists regarding the best option for surgical creation of a neovagina. Methods that use a segment of intestine are major operations and are associated with all of the risks of bowel surgery. In our opinion, such methods are not suitable first-line treatments and should be reserved for highly complex anomalies in patients who have undergone unsuccessful reconstructive surgery.

More studies are needed that compare the effectiveness of the Vecchietti and Davydov procedures, and longer follow-up is necessary before recommending either as first-line treatment. The Vecchietti technique offers good functional results because the neovagina is lined by the typical vaginal epithelium, whereas the Davydov procedure does not require the use of a traction device.

The procedures discussed should be performed only by surgeons with experience in vaginal reconstruction and laparoscopic surgery, with support from a clinical nurse specialist and psychologist to optimize the postoperative outcome. The need for a multidisciplinary approach to all aspects of care cannot be overemphasized.

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KEY POINT

Sigmoid grafting offers benefits but carries all the risks of bowel surgery.

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