Case Report

Opening the Anterior Vaginal Vault: A Novel Approach to Vaginoplasty with a Modified McIndoe Procedure Using an Artificial Dermis

Yasuhiko Kamada MD, PhD [1,*], Ai Sakamoto MD [1,2], Kazuhiro Tabuchi MD [1,2], Miwa Matsuda MD [1,2], Keiko Shimizu MD [1,2], Mikiya Nakatsuka MD, PhD [1,3], Yuji Hiramatsu MD, PhD [1,2]

[1] *Department of Obstetrics and Gynecology, Okayama University Hospital, Okayama, Japan*
[2] *Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Okayama University, Okayama, Japan*
[3] *Graduate School of Health Sciences, Okayama University, Okayama, Japan*

A B S T R A C T

Background: Although preparation of a potential vaginal space between the bladder and rectum is a pivotal step in various vaginal reconstructions for patients with vaginal agenesis, few papers have mentioned the importance of this procedure.
Case: We report the successful creation of a neovagina in 3 Japanese patients with Mayer-Rokitansky-Küster-Hauser syndrome using a novel modified McIndoe procedure that involved separation between the bladder and the rudimentary uterus in a laparoscopically assisted manner.
Summary and Conclusion: Opening "the anterior vaginal vault" between the bladder and uterus is a novel concept of vaginal reconstruction; this approach has not been described hitherto in the literature. Based on the outcome of our cases, we conclude that this procedure is advantageous in creating a large and soft neovagina.
Key Words: Anterior vaginal vault, Artificial dermis, Neovagina, Potential vaginal space, Vaginal agenesis, Vaginal canal, Vaginoplasty

Introduction

Mayer-Rokitansky-Küster-Hauser (MRKH) syndrome is characterized by the presence of congenital vaginal agenesis, a rudimentary uterus (although not in all MRKH cases), and normal fallopian tubes and ovaries.[1] This syndrome is estimated to occur in 1:1500 to 1:4000 female births.[2] The creation of a neovagina is a crucial requirement for these patients to have sexual intercourse.

Many surgical and nonsurgical techniques for vaginal reconstruction have been described thus far. Although preparation of a potential vaginal space between the bladder and rectum is a pivotal step in various vaginoplasties, few papers have mentioned the importance of this procedure. The apex of the space, as has been reported previously, anatomically corresponds to the "posterior vaginal vault." However, we experienced some functionally unsuccessful cases in which the neovagina undergoes shortening, shrinking, and tapering, despite daily self-dilation after surgery. Therefore, we conceived the idea of opening an "anterior vaginal vault" between the bladder and uterus to ensure a wider apex for the vesicorectal vaginal canal.

We report the successful creation of a neovagina in 3 Japanese patients with MRKH syndrome by a novel modified McIndoe procedure that involved the opening of an "anterior vaginal vault" in a laparoscopically assisted manner. All the cases were retrospectively analyzed after institutional review board approval was obtained for this study.

Cases

Case 1

A 20-year-old Japanese woman with vaginal agenesis was referred to us for further examination and treatment (Table 1). She had initially visited a gynecologist with primary amenorrhea at 19 years of age. Upon presentation at our hospital, normal secondary sexual development and a vaginal dimple without a vaginal orifice were noted. The patient's hormonal profile was the same as that of normal reproductive women. Abdominal and rectal ultrasonography revealed normal ovaries on both sides and a small uterus without endometrium. A magnetic resonance imaging scan of the pelvis also showed normal ovaries on both sides, a rudimentary uterus, and absence of a vagina. Chromosomal analysis showed a normal karyotype of 46,XX. Therefore, the patient was diagnosed with MRKH syndrome.

The woman and her parents requested vaginal reconstruction. The patient and her parents were presented with 3 treatment options, namely, structured use of vaginal dilators, our modified McIndoe procedure using an artificial dermis,[1] or our novel modified McIndoe procedure involving the opening of an "anterior vaginal vault." They were counseled about the objectives and possible complications of each procedure and provided written consent to undergo the newly developed procedure. The patient began to perform dilation daily for approximately

The authors indicate no conflicts of interest.

* *Address correspondence to*: Yasuhiko Kamada, MD, PhD, Department of Obstetrics and Gynecology, Okayama University Medical School, 2-5-1 Shikata, Kita-ku, Okayama-city, Okayama 700-8558, Japan; fax: +81-86-225-9570
E-mail address: ykamada@md.okayama-u.ac.jp (Y. Kamada).

1083-3188/$ - see front matter
http://dx.doi.org/10.1016/j.jpag.2014.02.016

Table 1
Characteristics of the Patients

Case	Age at Diagnosis*	Age at Operation*	Urinary Tract Anomaly	Length of the Vaginal Canal (cm)	Length of the Neovagina at Postoperative 3 Months (cm)	Length of the Neovagina at Postoperative 12 Months (cm)	Sexual Intercourse
1	19	20	(−)	11	8	7	(−)
2	13	20	(−)	12	8	8	(+)
3	16	17	(−)	12	9	8	(+)

* In years.

2 months before the surgery. After hospitalization, she received a low-fiber diet for 2 days before the operation. On the evening before the operation, she was administered a cleansing enema.

Under general and epidural anesthesia, the patient was placed in the lithotomy position. Before the surgery, urologists performed cystoscopy, placed bilateral ureteral stents for the visualization of the ureter, and inserted a Foley catheter into the urinary bladder.

A 5-mm optical trocar was directly inserted into the abdominal cavity through the center of the navel. A 5-mm wide laparoscope was introduced via the umbilical trocar after the establishment of an adequate pneumoperitoneum. Pelvic exploration revealed a cord connecting 2 rudimentary uterine horns. The ovaries and fallopian tubes on both sides appeared normal. The amount of peritoneal fluid pooled in the cul-de-sac was within the physiological limit.

An H-shaped incision was made in the vestibular part of the vagina and a potential vaginal space was created. With a finger in the rectum, the bladder and rectal lumen were detached bluntly and sharply until the peritoneum was visualized (Fig. 1, A). The light of the laparoscope was identified through the peritoneum between the rectum and the cord of the rudimentary uterus. Then, the vesicorectal vaginal canal was extended by using a vaginal speculum. A peritoneal dome of diameter 4 cm was created on the apex of the vaginal canal.

Next, the bladder was separated from the rudimentary uterus by sharp and blunt dissection (Fig. 1, B). Before creating the vesicouterine space (that is, the "anterior vaginal vault"), the position of the ureters of both sides around the uterine cord was confirmed by placing a finger under the laparoscope (Fig. 2, A). On reaching the peritoneum, the space was extended laterally with special care to avoid injury to the ureters (Fig. 2, B). Then, the hard tissues on the peritoneum lining the uterine cord were removed carefully (Fig. 2, C). The removed tissues contained smooth muscles, connective fibers, vessels, and nerve fibers and were histologically similar to the normal uterus and parametrium (Fig. 2, D). Finally, a vaginal canal, at least 4 cm in diameter and 11 cm in length, was prepared.

A large (4 cm × 9 cm), bullet-shaped mold (Zoutituyoprothese, Atom Medical, Tokyo, Japan) made of acrylic resin was wrapped with the artificial dermis lined with silicone membrane (Terudermis, Terumo, Tokyo, Japan), and the edge of the artificial dermis was sutured with 2-0 polyglactin 910 (Coated Vicryl Rapide, Johnson and Johnson, Tokyo, Japan). The mold with the artificial dermis was then inserted into the newly created vaginal canal and the edge of the dermis was sutured to the vaginal orifice in an interrupted fashion using 2-0 polyglactin 910 circumferentially. After the ureteral stents were removed from both sides, the labia were sutured together over the mold to prevent prolapse. The operation time was 2 hours 24 minutes, and the blood loss was estimated to be 100 g.

The patient wore an intermittent pneumatic compression device and was permitted minimal walking within her room. Antibiotics were administered for prophylaxis. A liquid diet or a low-fiber diet was recommended to avoid defecation. The urinary catheter was maintained in place for 1 week to avoid urinary retention and the external genitalia were washed with warm saline twice a day to prevent contamination. Epidural anesthesia was continued for 2 days after surgery, and appropriate painkillers were administered, as required. The intravaginal mold was removed on the 7th postoperative day, without

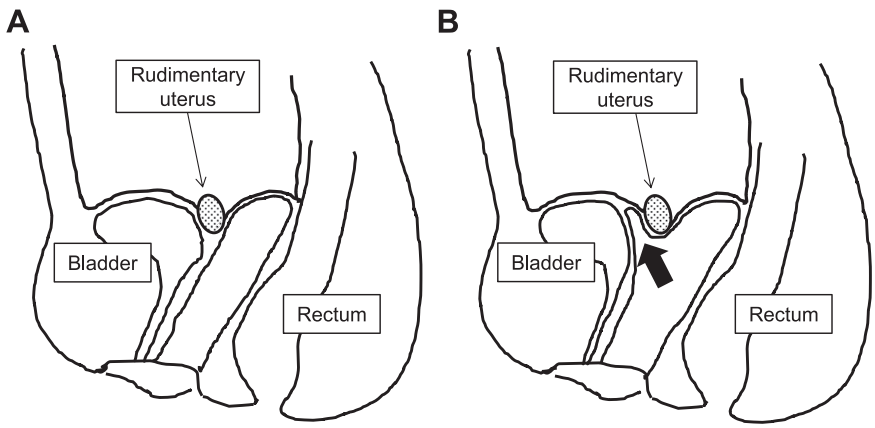

Fig. 1. Schematic diagram of the new procedure. Preparation of a potential vaginal space: (A) The bladder and rectal lumen were detached bluntly and sharply until the peritoneum was visualized. (B) To open the "anterior vaginal vault" (*arrow*), the bladder was separated carefully from the rudimentary uterus by sharp and blunt dissection toward the peritoneum under laparoscopic view.