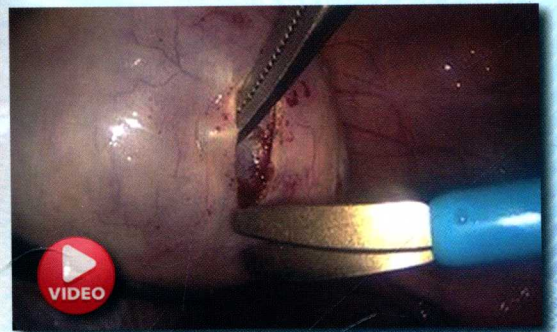
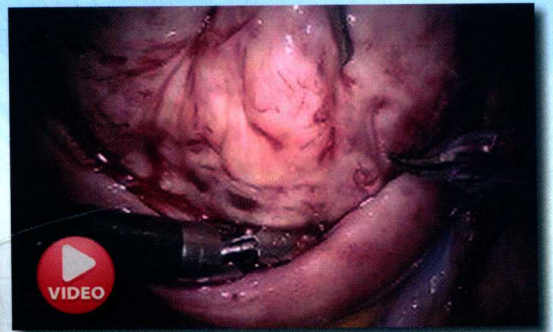




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OPERATIVE TECHNIQUES IN GYNECOLOGIC SURGERY

Reproductive Endocrinology and Infertility



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 **Wolters Kluwer**

Operative Techniques in Gynecologic Surgery

Reproductive Endocrinology and Infertility

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Operative Techniques in Gynecologic Surgery is presented in four volumes—*Gynecology*, *Reproductive Endocrinology and Infertility*, *Urogynecology and Pelvic Reconstructive Surgery*, and *Gynecologic Oncology*. Their purpose is to provide clear and concise illustrations of essential operations representing the fundamental procedures for each of these subspecialties.

This series is distinct from other textbooks in gynecology because of their focus as an illustrated practical guide to the surgical processes using easily accessible photographs and video clips.

In *Gynecology*, the first in the series, we depict the most common operations of our clinical specialty. The second does the same for *Reproductive Endocrinology and Infertility*, the third for *Urogynecology and Pelvic Reconstructive Surgery*, and the fourth for *Gynecologic Oncology*. We assembled a group of outstanding authors and contributors to produce these volumes, under the guidance of highly regarded expert senior book editors.

Gynecology—Tommaso Falcone, MD, is the Head of Gynecology at the Cleveland Clinic and is well known for his expertise in the operative management of benign gynecologic conditions. He and his co-authors, M. Jean Uy-Kroh, MD, and Linda D. Bradley, MD, have carefully assembled a very useful series of photographs and videos that highlight the fundamentals of the surgical operations in our field.

Reproductive Endocrinology and Infertility—Steven Nakajima, MD, is a Clinical Professor of Obstetrics and Gynecology in the Fertility and Reproductive Health group, Stanford University School of Medicine, and his focus is on the procedural and operative aspects of reproductive medicine. Along with the contributions from his colleagues, Travis W. McCoy, MD, and

Miriam S. Krause, MD, this book will serve as a clear summary of the necessary procedures in this specialty.

Urogynecology and Reconstructive Pelvic Surgery—Christopher Tarnay, MD, is an Associate Professor at the David Geffen School of Medicine at UCLA, where he is the Chief of Urogynecology and Reconstructive Pelvic Surgery. He and his colleague, Lisa Rugo-Gupta, MD, Clinical Assistant Professor, Stanford University School of Medicine, have contributed substantially to our understanding of the important discipline of Female Pelvic Medicine and Reconstructive Surgery.

Gynecologic Oncology—Kenneth Hatch, MD, is a well-known gynecologic oncologist who is a Professor at the University of Arizona School of Medicine. He is considered one of the primary experts in the surgical management of gynecologic malignancies. Dr. Hatch and his contributors will provide a precise visual explanation of the essential operative treatments in this subspecialty.

We intend this series to enhance the educational activities for our colleagues in the practice of gynecology and dedicate this series to our patients in the hope that it will facilitate optimal care and improved outcomes for our patients.

Jonathan S. Berek, MD, MMS

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Preface

It is our honor to serve as the editors for this book of operative and office procedures currently practiced in reproductive medicine. This summary reflects the changing focus of the subspecialty of reproductive endocrinology and infertility (REI). Many past surgical operations have been replaced by the office procedure of in vitro fertilization (IVF) and embryo transfer (ET). Surgical procedures that used to be routine have been supplanted by minimally invasive approaches, some of which rely on robotic assistance. The changing nature of reproductive medicine and the many new developments in our subspecialty make this book an invaluable resource for REI subspecialists.

Most contributors to this book have a connection with Stanford Medicine or the University of Louisville. Seven of the authors were clinical fellows in REI at the University of Louisville when Steven Nakajima was the Program Director of the REI fellowship (Travis McCoy, Miriam Krause,

Maheer Abdallah, Mazin Abdullah, John Preston Parry, and Peter Uzelac). Two contributors are current fellows at Stanford (Jonathan Kort in REI and Steven Co in Radiology). Ariel Revel was a Feldman Family Foundation Visiting Professor at Stanford in 2016. Camran Nezhat and Azadeh Nezhat are on the medical staff of Stanford Hospital.

The authors were chosen for their expertise and willingness to share personal surgical knowledge with the medical community. All have distinguished themselves as accomplished surgeons and caring physicians. During the development of this book, our contributors dedicated many hours to complete this project. We extend our appreciation to their family members who granted them the time to contribute.

Steven T. Nakajima, MD
Travis W. McCoy, MD
Miriam S. Krause, MD

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Chapter 1.1

Evaluation and Management of the Vaginal Septum

Jonathan D. Kort, Travis W. McCoy, Steven T. Nakajima

GENERAL PRINCIPLES

Definition

- The vaginal septum is at least a partially obstructive lesion along the course of the vagina resulting from failure of vertical fusion of the Müllerian ducts and the invagination of the urogenital sinus, or failure of lateral fusion of the two Müllerian ducts. The transverse septum, which may occur in the upper, middle, or lower vagina, is often obstructive, presenting with primary amenorrhea, muco- or hematocolpos, and cyclical pelvic pain.¹ Longitudinal vertical septae are often associated with concomitant uterine anomalies, and may be only partially obstructive and often present with difficulty placing a tampon, difficulty having intercourse, continued vaginal bleeding despite the use of a tampon or may be an asymptomatic finding during a pelvic exam.²
- A functional horizontal vaginal septum may be present from vaginal dilation of the space between a pinpoint or constricted true vaginal opening and the rectum.

Differential Diagnosis

- Transverse vaginal septum:
 - Müllerian agenesis (Mayer-Rokitansky-Kuster-Hauser syndrome)
 - Androgen insensitivity
 - Imperforate hymen
 - Cervical and/or vaginal agenesis
- Longitudinal vaginal septum:
 - Thick, portions of horizontal vaginal septae with fenestrations may occasionally appear similar to a partial longitudinal septum; however, the diagnosis of a complete or partial longitudinal vaginal septum is often straightforward. More attention must be paid to diagnose any associated uterine or renal anomalies.
- Horizontal vaginal septum:
 - Müllerian agenesis (Mayer-Rokitansky-Kuster-Hauser syndrome)
 - Androgen insensitivity
 - Cervical and/or vaginal agenesis

Nonoperative Management

- Transverse vaginal septum: Hormonal suppression of the hypothalamic-pituitary-ovarian axis to prevent cyclic development and shedding of the uterine lining may temporize the dysmenorrhea resulting from hematocolpos, but is only a temporary bridge to surgery.
- Longitudinal vaginal septum: Less than half of longitudinal vaginal septae are symptomatic enough to require surgical management.² For patients without dyspareunia or concern for dystocia in labor, expectant management may be the best option.
- Horizontal vaginal septum: Depending on the size of the vaginal opening, small to moderate amounts of retained menstrual blood may be present in the vagina. Hormonal suppression of the hypothalamic-pituitary-ovarian axis may temporize the dysmenorrhea resulting from the hematocolpos, but surgical correction is often necessary.

IMAGING AND OTHER DIAGNOSTICS

- In patients with a suspected imperforate hymen, an ultrasound and pelvic exam are usually sufficient to make the diagnosis. A bulging membrane at the vaginal introitus with bluish discoloration (caused by accumulated menstrual blood) is a characteristic presentation. The hymenal membrane usually distends if the patient is asked to perform a Valsalva maneuver. Patients typically complain of cyclic pain occurring at the time of menses. A uterus is present and can be seen on transabdominal ultrasound. An asymptomatic presentation of an imperforate hymen has been reported, but it is an atypical occurrence ([Figure 1.1.1A-D](#)).³
- For patients with a blind-ending vaginal pouch in which a transverse vaginal septum is suspected, a magnetic resonance imaging (MRI) is useful to confirm the diagnosis as well as identify the location and thickness of the septum.⁴
- For patients with a suspected longitudinal vaginal septum in which a concomitant uterine anomaly is suspected, MRI or ultrasound should be used to evaluate the uterus.
- In patients with a horizontal vaginal septum, a pelvic exam under anesthesia may help to identify the pinpoint or constricted vaginal opening. An ultrasound or MRI are often

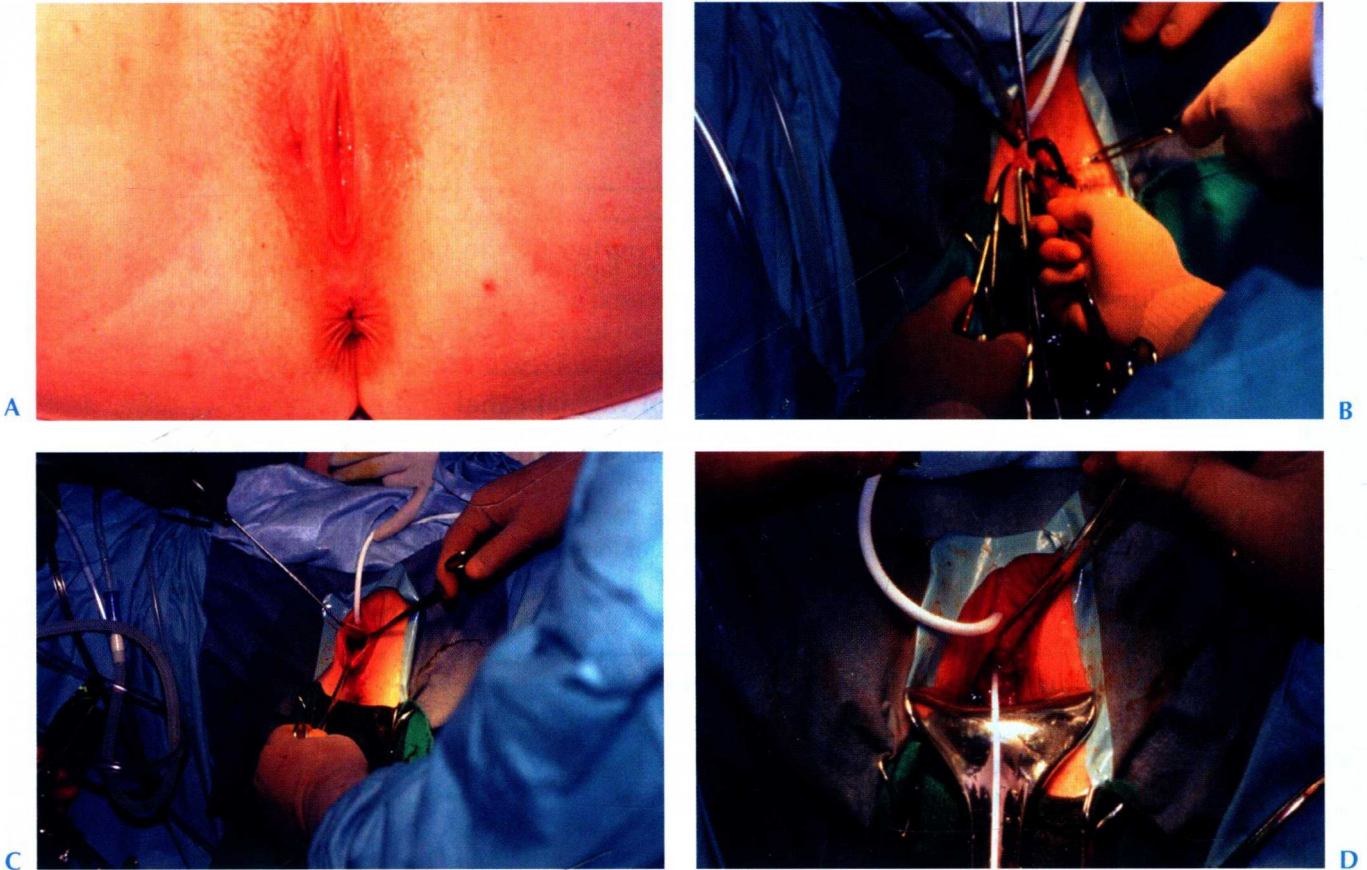


Figure 1.1.1. **A:** Normal external female genitalia. **B:** After entry through the imperforate hymen, 1,200 mL of retained menstrual blood noted to flow out of a 16 × 12 × 10-cm hematocolpos. **C:** Portions of the imperforate hymen prior to excision. **D:** Pediatric Foley catheter inserted through the cervix into the uterine cavity.

useful to confirm the presence of a cervix, uterus, and a possible hematocolpos.

PREOPERATIVE PLANNING

- Prior to surgery, the location and the thickness of the septum should be elucidated by physical exam and imaging. In addition, it is also critical to confirm the presence of the cervix and exclude the diagnosis of cervical agenesis, particularly in cases of a high septum, which would require different surgical management.
- Hormonal suppression of menses prior to surgery may alleviate discomfort while waiting for definitive management.
- Vaginal dilator therapy preoperatively will help thin thick septae and elongate the lower vagina, facilitating surgical correction.⁴

SURGICAL MANAGEMENT

- Patients with a transverse vaginal septum usually suffer from obstructive amenorrhea and cyclical pelvic pain, and definitive surgical management is typically required. Due to the high rates of concurrent endometriosis, they should consider a laparoscopy at the time of resection of the septum.⁵
- It may be helpful for visualization not to drain the hematocolpos prior to surgical management.

- Patients with a longitudinal septum and dyspareunia or anticipating a vaginal delivery should have the septum resected.⁶
- Patients with a horizontal vaginal septum may present with cyclical pelvic pain depending on the size of the vaginal opening. Definitive surgical management is typically required for normal menstrual flow and the ability to conceive with vaginal intercourse.

Positioning

- Transverse vaginal septum: Patients with transverse vaginal septum should be positioned in the dorsal lithotomy position to allow access to the vagina and laparoscopy.
- Longitudinal vaginal septum: Patients with a longitudinal vaginal septum should also be positioned in dorsal lithotomy position, but only access to the vagina is required.
- Horizontal vaginal septum: Patients with horizontal vaginal septum should be positioned in the dorsal lithotomy position to allow access to the vagina and a possible laparoscopy.

Approach

- Resection of all vaginal septae require a vaginal approach, but simultaneous laparoscopy is helpful in cases of transverse vaginal septae due to the high rates of concurrent endometriosis.⁵
- Cases of longitudinal vaginal septae with a concurrent uterine septum may require the ability to correct the uterine septum with a hysteroscopic procedure.

Transverse Vaginal Septum

Visualization

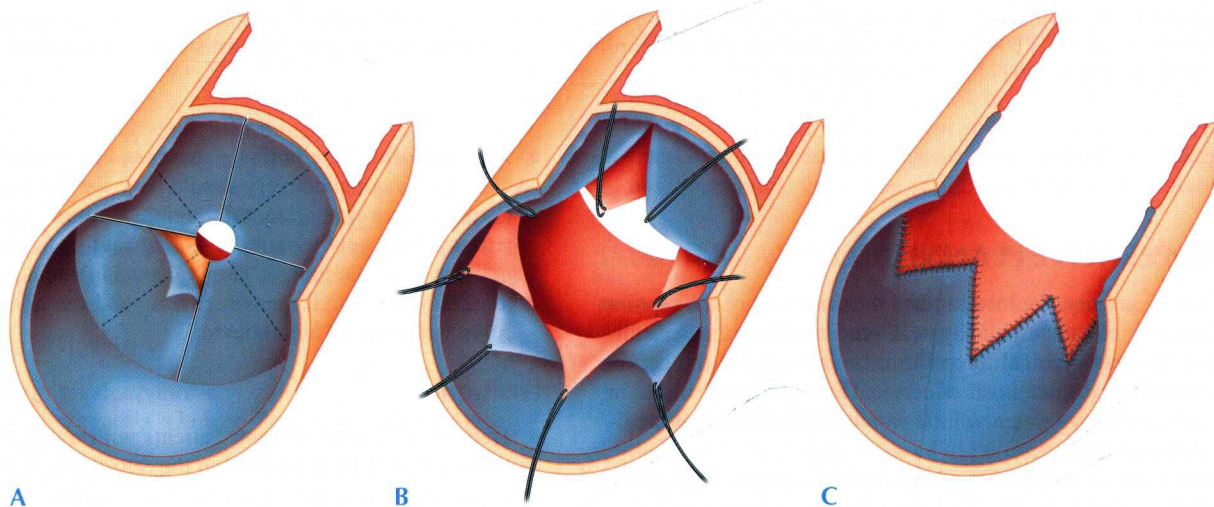
- A Foley catheter should be placed and a diagnostic laparoscopy should be performed to visualize the hematocolpos from above.

Confirmation of diagnosis and localization of vaginal canal

- With the bladder drained, and a rectal exam confirming the path and angle of vaginal canal, a needle should be placed into the hematocolpos to confirm the diagnosis.⁶
- For a high thick septum that is difficult to localize despite laparoscopic visualization and rectal exam, a probe can be placed through the fundus of the uterus, through the cervix, to localize the upper vagina.

Incising the lower aspect of the septum from below

- Two oblique, crossed incisions should be made in the vaginal mucosa and four triangular vaginal flaps are created with sharp and blunt dissection (**Tech Figure 1.1.1A–C**).⁷
- The vaginal flaps are then stabilized with stay sutures.



Tech Figure 1.1.1. **A:** The mucosa of the vaginal vault (the anterior portion of the septum) is colored blue. It is incised with a crossed incision leaving four flaps. **B:** The mucosa of the upper portion of the vagina (the posterior portion of the septum) is colored light brown. It is incised leaving four flaps at 45 degrees to the anterior portion of the septum. **C:** The upper and lower vaginal flaps are rotated toward each other and sutured with a single layer of interrupted sutures leading to a continuous Z-plasty.

Resection of the areolar septal tissue

- Palpating the Foley catheter anteriorly, and the rectal hand posteriorly in order to avoid the complications of bowel or bladder injury, the areolar tissue exposed from the initial step is resected sharply or with cautery.

Incising the upper aspect of the septum from below

- Two crossed incisions are made in the posterior aspect of the septum, with the crossed incisions from the anterior and posterior aspect of the septum positioned at 45 degrees from one another, creating four more triangular flaps of vaginal mucosa.

Z-plasty: Re-anastomosis of the upper and lower portions of the septum

- The upper and lower vaginal flaps are rotated toward each other. If needed, the underlying tissue can be dissected further with careful attention paid to avoid the bowel and bladder, to allow re-anastomosis without tension with a single layer of interrupted, delayed absorbable sutures.⁷ This step completes the continuous Z-plasty.

Avoidance of postoperative complications

- Many surgeons will coat the Z-plasty anastomosis with a topical estrogen cream.
- Some will place a rigid vaginal mold in the vagina until discharge, changing it daily. An elastic mold can be used as an outpatient afterward.
- Vaginal intercourse is contraindicated for at least 6 weeks postoperatively.

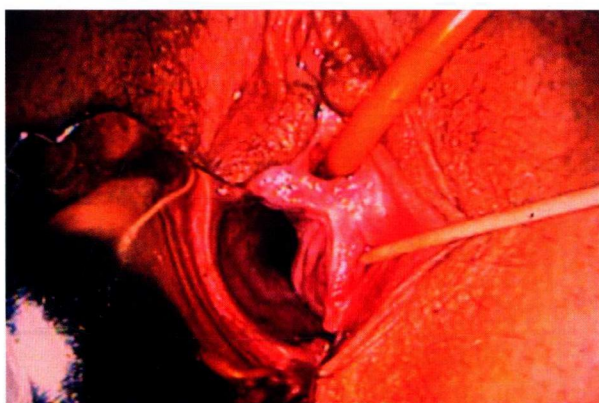
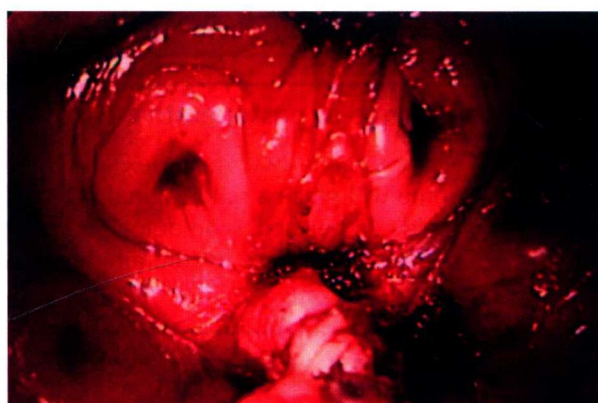
Alternative procedure to avoid disruption of the hymen

- For patients who desire to preserve hymenal integrity for cultural reasons, perforating the hymen only enough to allow placement of a Foley catheter through the transverse septum for 2 weeks may also resolve dysmenorrhea and muco- or hematocolpos. To facilitate the placement of the Foley catheter, Gezginç and colleagues⁸ entered the abdomen via a laparotomy incision and made a vertical incision on the posterior vaginal wall. The Foley catheter was guided through perforation in the transverse vaginal septum located in the upper third of the vagina.

Longitudinal Vertical Vaginal Septum

Resection of the anterior aspect

- This surgery can be performed under general or local anesthesia. A Foley catheter is placed to protect the bladder from the dissection.
- One side of the vagina may be preferentially enlarged due to prior sexual intercourse and the smaller diameter vagina may be difficult to locate or have been missed on prior pelvic exams (**Tech Figure 1.1.2A–C**).
- One Allis clamp is placed at the ventral aspect of the septum, and another at the dorsal aspect of the septum, at the level of separation from the vaginal mucosa. An anterior dissection with an electrocautery needle should then be made from the introitus to the cervix, ending several millimeters from the cervix to avoid any damage to the cervix.⁴

**A****B****C**

Tech Figure 1.1.2. **A:** Patient with a longitudinal vertical vaginal septum. Speculum is in the right vaginal canal. Sterile tip applicator is located in the left vaginal canal. Foley catheter placed through the urethra into the bladder. **B:** Vaginal septum excised and two cervical openings noted. **C:** Laparoscopic view of a single fundus containing two separate uterine cavities.

Resection of the posterior aspect

- This dissection can then be continued posteriorly, also stopping several millimeters from the cervix, with the electrocautery.

Closure

- The edges of resection should then be sutured with 3-0 or 4-0 delayed absorbable material interrupted sutures.

Alternative technique

- The longitudinal septum could be excised with a tissue-sealing instrument LigaSure Impact™, (Covidien, Minneapolis, MN) and may preclude the need to suture any edges of the resected tissue (**Video 1.1 Vaginal vertical septoplasty** ).

Prevention of adhesions

- The suture line can then be coated with topical estrogen. If the resection was extensive or the resection lines are close to one another, a vaginal mold can be placed for 1 to 2 weeks postoperatively.