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Trachelectomy following supracervical hysterectomy

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All topics are updated as new evidence becomes available and our peer review process is complete.

Literature review current through: **Sep 2023.**
This topic last updated: **Nov 14, 2022.**

INTRODUCTION

Trachelectomy to remove the cervical stump after prior supracervical hysterectomy is typically performed to manage cervical symptoms, commonly pain, or conditions that develop postoperatively, such as abnormal bleeding, intraepithelial neoplasia, or prolapse.

This topic will review the indications for trachelectomy after supracervical hysterectomy, as well as techniques and possible complications. Radical trachelectomy performed as fertility-sparing surgery in individuals with early stage cervical cancer and routes of hysterectomy are discussed separately.

- (See "Fertility-sparing surgery for cervical cancer".)
- (See "Hysterectomy (benign indications): Selection of surgical route".)

When discussing study results, we will use the terms "women" or "patients" as they are used in the studies presented. However, we recognize that not all individuals with a cervix or uterus identify as women, and we encourage the reader to consider the specific counseling and treatment needs of transgender and gender non-binary individuals.

PATIENT SELECTION

Indications — Trachelectomy is typically performed after prior supracervical hysterectomy to treat disease or symptoms referable to the cervical stump. It may also be performed in conjunction with other pelvic surgery (eg, oophorectomy, bowel resection).

- **Incidence of symptoms –** Up to 25 percent of patients have reported new cervical symptoms following supracervical hysterectomy [1-4].
- **Surgical indication –** A retrospective cohort study of a United States national database including over 1100 individuals who underwent trachelectomy between 2010 and 2014 reported that 65 percent of procedures were for common gynecologic disease, 18 percent of patients had a cancer indication, and 17 percent had an "other" indication (table 1) [5]. The indications and their relative

frequencies have changed over time. In a 2005 review of 335 surgeries performed between 1974 and 2003, pelvic organ prolapse and pelvic mass accounted for over 75 percent of all trachelectomies (52 and 25 percent, respectively) [6].

- **Interval to trachelectomy –** There usually is an interval of years to trachelectomy. The mean duration of time between supracervical hysterectomy and trachelectomy was 21 years when the indication for trachelectomy was cervical cancer and 31 years when the indication was pelvic organ prolapse [6]. Fewer than 1.5 percent of patients undergo trachelectomy within three months of their supracervical hysterectomy [1-4,7].

Contraindications — The main contraindication to trachelectomy is patient desire to preserve the cervix (despite the new symptoms or disease) or the original issue that resulted in supracervical hysterectomy.

- **Desire for cervix preservation –** Many patients believe, even after counseling, that preserving the cervix reduces the risk of prolapse. Examples of alternative treatment options include:
  - Intraepithelial neoplasia could be treated with loop excision, although excision is associated with a higher recurrence rate than trachelectomy.
  - Abnormal or postcoital bleeding due to ectropion could be managed by CO_2 laser vaporization.
- **Prior indication for cervix retention –** The prior indication for retention of the cervix at the time of hysterectomy may also be a contraindication to specific surgical approaches for trachelectomy. In these situations, a minimally invasive transabdominal route, such as with conventional or robot-assisted laparoscopy, would be a safer surgical approach than transvaginal route.

  Examples in which vaginal approach for a trachelectomy would be contraindicated include patients with a symptomatic retained cervix due to unresectable ovarian cancer, rectosigmoid endometriosis resulting in obliteration of the paracervical spaces, or prior cervix surgery involving synthetic mesh, such as sacral colpopexy.

Factors that influence initial selection of supracervical versus total hysterectomy are reviewed in related content. (See "Hysterectomy (benign indications): Selection of surgical route", section on 'Supracervical (subtotal) hysterectomy'.)

OUR APPROACH TO SELECTION OF SURGICAL ROUTE

The selection of surgical approach depends on the specific indications for trachelectomy, the need for concomitant procedures, presence of medical comorbidities, surgeon's expertise with the surgical approach, and reasons for the retained cervix. (See 'Contraindications' above.).

Vaginal — For most patients, we suggest a vaginal trachelectomy because of the lower morbidity and faster recovery with transvaginal surgery compared with abdominal approaches [6,8]. Common candidates for vaginal trachelectomy include patients with cervical prolapse or a retained cervix, in the absence of other pelvic pathology at the time of supracervical hysterectomy, and who do not have other pelvic conditions that require a transabdominal approach. Also, vaginal surgery should be considered in patients unable to tolerate Trendelenburg position and those who prefer to avoid an open abdominal approach.

- **Extrapolation from hysterectomy data –** While data specific to trachelectomy are limited, numerous studies support vaginal hysterectomy as the preferred surgical route compared with laparoscopic and open abdominal routes because of reduced morbidity [9]. (See "Hysterectomy (benign indications): Selection of surgical route", section on 'Vaginal hysterectomy'.)

- **Concomitant repair of pelvic organ prolapse –** Individuals undergoing vaginal trachelectomy who also have pelvic organ prolapse can have both issues addressed transvaginally. While trachelectomy is not required for prolapse repair, patients undergoing trachelectomy should be evaluated for concomitant prolapse and offered correction if appropriate. For individuals with isolated cervicovaginal prolapse who require abdominal trachelectomy for other indications, laparoscopic (conventional or robot-assisted) or traditional abdominal apical repair can be performed. (See "Pelvic organ prolapse in women: Surgical repair of apical prolapse (uterine or vaginal vault prolapse)", section on 'Abdominal versus vaginal approach'.)

Abdominal — We use an abdominal approach for patients who require abdominal exploration (eg, patients with pain) and/or intraperitoneal surgery (eg, patients with endometriosis, pelvic mass, or adhesions). Additional indications include those with a specific contraindication to vaginal surgery or patient preference for an abdominal approach. Compared with vaginal trachelectomy, the abdominal route has been associated with higher overall complication rates (43 versus 20 percent), but this difference may reflect that patients undergoing abdominal surgery are more likely to have concomitant pathology and/or additional surgery compared with those undergoing vaginal surgery [6]. (See 'Complications by route' below.)

Conventional or robot-assisted laparoscopy — For patients undergoing trachelectomy who require intra-abdominal exploration or surgery, we suggest minimally invasive techniques rather than traditional open incision because of the reduced morbidity and faster recovery compared with open surgery [9]. (See "Hysterectomy (benign indications): Selection of surgical route", section on 'Laparoscopic hysterectomy'.)

- **Choice of technique –** The choice of conventional versus robot-assisted laparoscopy is usually dependent on surgeon's preference and training as well as availability of a robotic system. Available limited data based on other benign gynecologic surgeries suggest similar outcomes for conventional and robot-assisted laparoscopy; specific patient populations who may benefit from one approach over the other have not yet been defined for benign surgery [10]. However, for both techniques, patients must be able to tolerate the physiologic challenges of laparoscopy (eg, Trendelenburg position [head down] and pneumoperitoneum).

  - (See "Overview of gynecologic laparoscopic surgery and non-umbilical entry sites", section on 'Laparoscopy versus laparotomy'.)

  - (See "Anesthesia for laparoscopic and abdominal robotic surgery in adults", section on 'Physiologic effects of laparoscopy'.)

- **Our approach –** We prefer robot-assisted laparoscopy due to the advantages of robotic technology over the rigid laparoscopic instruments. Robotic systems overcome many of the challenges of conventional laparoscopy. Robotic systems facilitate dissection, increase precision, and aid intracorporeal suturing through three-dimensional view, intuitive movements, articulation of the instrument tips, downscaling, and abolition of tremor. Surgeon postural fatigue is reduced with

robotics as compared with laparoscopy in surgeries over 120 minutes and in patients with obesity [11]. (See "Robot-assisted laparoscopy".)

Laparotomy (open abdominal incision) — Laparotomy (open abdominal incision) is reserved for patients who benefit from an abdominal approach but are unable to tolerate laparoscopic or robot-assisted procedures. Examples include patients who cannot tolerate Trendelenburg position and/or pneumoperitoneum, such as those with cardiac hypertrophy or ischemia, abdominal distension, increased intracranial pressure, ongoing infusions for neuraxial anesthesia, recent eye surgery, or gastric reflux or aspiration [12,13]. (See "Anesthesia for laparoscopic and abdominal robotic surgery in adults", section on 'Physiologic effects of laparoscopy'.)

Radical trachelectomy — Radical trachelectomy is a transabdominal operation performed for two different patient groups who have early cervical cancer suitable for surgical treatment. In one group, the uterus has been removed previously (supracervical hysterectomy) and the cancer has developed in the retained cervix. In the other group of patients, the uterus is still intact and the patient desires preservation of fertility. In both cases, the operation removes the parametria, the uterosacral ligaments, and the upper vagina, but while the retained cervix is completely removed, the upper portion of the cervix is preserved in the patient desiring fertility preservation.

- (See "Management of early-stage cervical cancer".)
- (See "Radical hysterectomy", section on 'Radical trachelectomy'.)

DESCRIPTION OF PROCEDURES

Considerations for all surgical routes

Preoperative planning

- **Informed consent and patient education –** Standard preoperative evaluation for gynecologic surgery, informed consent, and, if applicable, enhanced recovery after surgery protocols are completed preoperatively.
  - (See "Overview of preoperative evaluation and preparation for gynecologic surgery".)
  - (See "Enhanced recovery after gynecologic surgery: Components and implementation".)
- **Prevention of surgical site infection and thromboembolism –** Prophylactic antibiotics are given prior to trachelectomy following society recommendations and regardless of the surgical approach (table 2). (See "Antimicrobial prophylaxis for prevention of surgical site infection in adults".)

Adhesiolysis — For any approach, the surgeon should be prepared to perform adhesiolysis, as intestinal adhesions to the cervix, bladder, and cul-de-sac are common. If dense adhesions are encountered while performing a vaginal trachelectomy, it may be necessary to convert to a transabdominal approach for a safe adhesiolysis. We perform intestinal and bladder adhesiolysis with sharp dissection, without the use of electrosurgery, in order to avoid potential risk of thermal injury to the bowel or bladder.

Cystoscopy — We prefer to perform cystoscopy at the end of the procedure to detect unrecognized bladder injury and ureteral entrapment. Cystoscopy is not helpful to identify bladder or ureteral thermal

injuries, since these often manifest themselves days after surgery. (See "Urinary tract injury in gynecologic surgery: Identification and management".)

Apical support procedure — Regardless of surgical route and technique, we commonly perform a uterosacral ligament suspension concomitantly to support the remaining vaginal apex. Supracervical hysterectomy does not prevent subsequent prolapse [4,14]. (See "Prophylactic vaginal apex suspension at the time of hysterectomy".)

The type of apical support procedure includes the uterosacral ligaments but varies by surgical route:

- For the transvaginal route, we perform a McCall culdoplasty. (See "Prophylactic vaginal apex suspension at the time of hysterectomy", section on 'Culdoplasty'.)
- For transabdominal surgery, the uterosacral ligaments are incorporated into the vaginal cuff. (See "Prophylactic vaginal apex suspension at the time of hysterectomy", section on 'Ligament suspension procedures'.)

Transvaginal — The patient is placed in the dorsal lithotomy position using candy cane stirrups. We attach a Magrina-Bookwalter vaginal retractor system to the foot of the operating table to maximize exposure with self-retaining retractors (picture 1). We also utilize a table-mounted camera to allow concomitant projection to external monitors. Just as with conventional or robot-assisted laparoscopy, the camera facilitates visualization of the surgery by the assistants and the entire operating room team [15]. The following synopsis describes our approach to the procedure:

- **Initial cervical incision and dissection**
  - Grasp the anterior and posterior lips of the cervix with Jacob tenacula for traction.
  - Inject 0.5% bupivacaine with 1:200,000 dilution of epinephrine into the uterosacral ligaments prior to incision to reduce postoperative pain (ie, preemptive analgesia) [16].
  - Inject 1% lidocaine with epinephrine or diluted vasopressin submucosally and into the pericervical areas to reduce bleeding.
  - Make an elliptical incision around the cervix with a #10-blade, taking care to avoid the distal margins of the bladder anteriorly and the rectovaginal junction posteriorly. Some surgeons keep the bladder distended during this step (eg, clamp the indwelling bladder catheter) to assist with identifying the bladder margins during transvaginal surgery.
  - Sharply dissect the anterior vaginal wall off the cervical stump using Mayo scissors. With a Deaver retractor in the dissected vesicovaginal space, displace the bladder pillars superiorly and laterally using the index finger (the knee of the ureter is in that location). This prevents ureteral injury when the cardinal ligaments are divided later. Ideally, anterior entry into the abdominal cavity is delayed until the cervical stump has further descended into the lower portion of the vagina and the vesicoperitoneal fold is clearly visualized.
- **Transect uterosacral and cardinal ligaments**
  - **Enter the posterior peritoneum –** Deflect the cervix acutely anteriorly by placing traction on the tenacula. The posterior cul-de-sac peritoneum is then exposed and incised with Mayo scissors.

This allows sharp entry into the peritoneal cavity.

- **Divide the uterosacral and cardinal ligaments**
  - First, we seal and divide the uterosacral ligaments. We prefer vessel-sealing devices such as the LigaSure Maryland or Impact (Medtronic, MN). However, others reasonably divide the ligaments by applying a Heaney clamp, sharply incising the tissue, and ligating with suture.
  - Next, the cardinal ligaments are divided similarly. The sealing device is applied to the space created by the displacement of the bladder pillars.
- **Check for adhesions to cervix –** With a finger in the posterior cul-de-sac, feel for adhesions on the cervix, especially on the upper and anterior surfaces.

- **Identify and incise anterior peritoneum –** The division of the uterosacral ligaments and the lower portion of the cardinal ligaments results in further descent of the cervix and facilitates exposure and the anterior entry into the pelvic cavity.
  - A Deaver blade is inserted in the vesicovaginal space to clearly expose the vesicovaginal peritoneum. The peritoneum is incised sharply and the peritoneal cavity is entered.
  - If anterior entry is not possible or appears unsafe, we slide a finger through the posterior cul-de-sac opening, over the cervix, and then on the anterior aspect of the cervix until it bulges through the vesicovaginal peritoneum. This maneuver clearly exposes the anterior peritoneum and allows safe sharp anterior entry.
  - Once the anterior peritoneum is incised, slide a Deaver retractor into the anterior cul-de-sac to retract the bladder.
- **Identify the position of the ureters**
  - Locate the ureters by palpating each one against a Deaver retractor placed against the vagina at the three o'clock and nine o'clock positions.
  - Clamp and divide the remaining cardinal ligaments away from the ureters.
- **Perform culdoplasty**
  - We routinely perform McCall's suture plication of the uterosacral ligaments to the midportion and corners of the vaginal cuff to prevent future prolapse of the vaginal apex [17]. In patients with cervicovaginal prolapse, our preferred primary approach is a native tissue repair, such as the modified McCall procedure, with high plication of the uterosacral ligaments to support the vaginal apex. We reserve synthetic mesh repairs (eg, sacrocervicopexy) for patients who have a high risk for failure with native tissue repair or in patients who choose to have the mesh repair.
    - (See "Prophylactic vaginal apex suspension at the time of hysterectomy", section on 'Description of prophylactic vaginal suspensions'.)
    - (See "Transvaginal synthetic mesh: Use in pelvic organ prolapse", section on 'Issues surrounding synthetic mesh for POP'.)

- Concomitant culdoplasty, anterior repairs, and posterior repairs can then be performed, if applicable.

  - (See "Pelvic organ prolapse in women: Choosing a primary surgical procedure", section on 'Concomitant repair of apical and anterior or posterior prolapse'.)

- **Close the vaginal cuff –** We close the vaginal cuff using a series of interrupted 2-0 delayed absorbable sutures, including full thickness to full thickness of the anterior and posterior vaginal walls.

Minimally invasive (conventional laparoscopy and robot-assisted) — The following synopsis describes our approach to the procedure, which is similar whether performed with conventional laparoscopy or robot assistance.

- **Initial patient preparation**

  - The patient is placed in the modified dorsal lithotomy position and directly on an anti-skid material to prevent sliding during steep Trendelenburg [18]. The patient's skin lies directly against the eggcrate material, and the arms are tucked safely at the sides (picture 2). (See "Overview of gynecologic laparoscopic surgery and non-umbilical entry sites", section on 'Patient positioning and preparation'.)

  - A three-way bladder catheter is inserted so the bladder can be distended to help distinguish its lower border from the cervix. A vaginal probe or manipulator is inserted to define the area for colpotomy: the cervicovaginal junction.

- **Trocar placement and adhesiolysis**

  - Make a small transumbilical incision, including the skin and rectus fascia (open technique), and insert a blunt optical trocar into the peritoneal cavity. Check for any abnormalities or injuries.

  - Insert three to four trocars in a position appropriate for the approach (conventional or robot-assisted laparoscopy) (figure 1). In the case of using the da Vinci Xi, the trocars are placed linearly at the level of the optical trocar. The surgeon should be prepared to handle any intestinal or bladder adhesions on the cervix, which are commonly found given the patient's previous supracervical hysterectomy.

- **Dissect bladder and ureters**

  - Instill the bladder with 300 mL of water so it is fully distended and then develop the vesicovaginal space. Next, dissect at least 2 cm beyond the intended colpotomy incision. A 2 cm margin is used because the vagina is stretched by the vaginal probe or manipulator; once the colpotomy is performed, the vaginal edge will be closer to the bladder.

  - Identify the ureter on the lateral pelvic peritoneum and trace it to where it crosses the uterine artery. The ureter may have to be mobilized and lateralized if too close to the cervix. This can be done by dividing the uterine artery at its crossing and then reflecting the ureter laterally.

- **Identify cervicovaginal junction and perform colpotomy incision**

  - Use the vaginal probe or manipulator to identify the cervicovaginal junction.

- Make the colpotomy incision at that junction of the cervix and the anterior vaginal fornix.
    - We prefer to begin at the 12 o'clock position of the vagina and then proceed completely around the entire cervicovaginal junction. If that location is unsafe, begin at a site with better surgical access or improved visualization.
    - Colpotomy is performed with a monopolar hook, spatula, or scissors, depending on the surgeon's preference; 35 watts of cutting or coagulating current is used. Thermal tissue damage is minimized by moving the instrument rapidly and coagulating only if necessary. Necrotic tissue delays vaginal cuff healing and may result in vaginal cuff dehiscence after trachelectomy [19].

- **Closure of the vaginal cuff**
    - The authors close the vaginal cuff with a continuous, non-locking, 2-0 or 0 delayed-absorbable suture, such as polydioxanone or V-loc. The uterosacral ligaments are included in the closure at each angle of the cuff.
    - Follow the rule of the 5x5 – Pass the needle at least 5 mm away from the coagulated edge of the anterior and posterior vaginal walls, including the full thickness of both walls, and place the sutures 5 mm apart.
    - For patients at high risk of vaginal cuff dehiscence, the authors place a second imbricating continuous suture, or additional figure-of-eight sutures, with near full thickness of tissue for reinforcement of the initial closure. (See "Vaginal cuff dehiscence after total hysterectomy", section on 'Risk Factors'.)

Laparotomy (open abdominal) — The open abdominal technique follows similar principles to the laparoscopic and robot-assisted techniques.

- **Incision, adhesiolysis, bowel packing –** The abdomen is entered through a low transverse incision or through the previous incision for the supracervical hysterectomy, if there is one. The abdominal contents are packed in the upper abdomen and a self-retaining retractor is placed. Adhesiolysis is first performed using cold scissors.
- **Bladder and ureters**
    - The bladder is distended with 300 mL of water and the vesicovaginal space is dissected 2 cm distal to the cervicovaginal junction, which is delineated by palpation.
    - The authors identify the ureters by placing an index finger in the posterior aspect of the broad ligament and a thumb over the anterior aspect of the broad ligament, and palpating to determine their position. The uterine vessels are sealed with a vessel sealer followed by the lower portion of the cardinal ligament until the lateral vaginal fornix is reached.
- **Colpotomy**
    - After placing a Deaver blade retractor to protect the bladder, a colpotomy is carried out starting at the three o'clock position and then circumferentially following the cervicovaginal junction.
- **Vaginal cuff closure**

- Vaginal cuff closure is performed following the principles addressed above. (See 'Minimally invasive (conventional laparoscopy and robot-assisted)' above.)

OUTCOMES

Information on outcomes and complications of trachelectomy is limited because most reports are small retrospective case series or descriptions of single cases, and the procedures were performed for a variety of indications, by different approaches, over a wide time range, and often with additional surgical procedures [20-24].

Complications by route — Trachelectomy after supracervical hysterectomy can be challenging because of bowel and bladder adhesions. In addition, scar tissue from the prior hysterectomy can make bladder dissection more challenging.

- **Overall rates –** Overall complication rates of up to 38 percent have been reported for patients undergoing trachelectomy (all routes) [5]. Bleeding is typically the most common problem (26 percent) with gastrointestinal ileus the next most common (7 percent) (table 3).

- **Vaginal versus abdominal routes –** In a series of 310 surgeries performed between 1974 and 2003, intra- and perioperative complications were more common with the abdominal approach than with the vaginal approach (43 versus 20 percent), including more infections and perioperative bleeding [6]. Urinary retention only occurred in patients who had a concomitant anterior colporrhaphy and urethrovesical plication.

Cervical histology — In a series of 310 surgeries performed between 1974 and 2003, histological examination of the cervical stump revealed multiple findings: no pathological abnormalities (32 percent), cervicitis (53 percent), squamous dysplasia (6 percent), cancer (6 percent), fibroids (1 percent), and other (2 percent) [6]. It should be noted that these procedures were performed between 1974 and 2003, which might be a factor in the type and distribution of pathology.

INFORMATION FOR PATIENTS

UpToDate offers two types of patient education materials, "The Basics" and "Beyond the Basics." The Basics patient education pieces are written in plain language, at the 5th to 6th grade reading level, and they answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials. Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are written at the 10th to 12th grade reading level and are best for patients who want in-depth information and are comfortable with some medical jargon.

Here are the patient education articles that are relevant to this topic. We encourage you to print or e-mail these topics to your patients. (You can also locate patient education articles on a variety of subjects by searching on "patient info" and the keyword(s) of interest.)

- Basics topics (see "Patient education: Deciding to have a hysterectomy (The Basics)")

- Beyond the Basics topics (see "Patient education: Abdominal hysterectomy (Beyond the Basics)" and "Patient education: Vaginal hysterectomy (Beyond the Basics)")

SUMMARY AND RECOMMENDATIONS

- Trachelectomy is performed to treat disease or symptoms that originate from the cervical stump that remains following supracervical hysterectomy. Common indications include prolapse, pain, cyclical bleeding, postcoital bleeding, intraepithelial neoplasia, and cervical abnormalities, such as hypertrophy. (See 'Indications' above.)

- The selection of surgical approach depends on the specific indications for trachelectomy, the need for concomitant procedures, the presence of comorbidities, surgeon's expertise with the surgical approach, and reasons for the retained cervix. (See 'Contraindications' above and 'Our approach to selection of surgical route' above.)

  - For patients requiring trachelectomy who do not require concomitant abdominal exploration or surgery, we suggest a vaginal approach rather than an abdominal approach (**Grade 2C**). For those with expertise in vaginal surgery, a vaginal approach is associated with lower morbidity and faster recovery. Patients with prolapse of multiple compartments can have trachelectomy and prolapse repair through one surgical route. (See 'Vaginal' above.)

  - For patients requiring trachelectomy in whom abdominal exploration is necessary and/or intraperitoneal surgery may be required, we suggest a transabdominal approach. Examples of such patients include those with pain, endometriosis (suspected or confirmed), pelvic or adnexal mass, adhesions, or previous pelvic pathology at the time of supracervical hysterectomy. Abdominal approaches include conventional laparoscopy, robot-assisted laparoscopy, and laparotomy (open abdominal incision). (See 'Abdominal' above.)

    - For patients who are able to tolerate laparoscopy, we suggest a laparoscopic approach rather than an abdominal incision (**Grade 2C**). The laparoscopic approach is associated with reduced morbidity and faster recovery compared with laparotomy (open incision). In some centers, robot-assisted laparoscopy is used. Specific patient groups who may benefit from robot-assisted laparoscopy have not yet been defined. (See 'Conventional or robot-assisted laparoscopy' above.)

    - Patients who require abdominal exploration or other pelvic surgery but are unable to tolerate Trendelenburg and pneumoperitoneum require an open abdominal approach (ie, laparotomy) for their trachelectomy. (See 'Laparotomy (open abdominal incision)' above.)

  - For patients with an early cancer of the retained cervix, a radical trachelectomy may be an optional treatment if they desire preservation of fertility. (See 'Radical trachelectomy' above.)

- Regardless of trachelectomy route, we perform a concomitant vaginal apical support procedure with the goal of reducing risk of future apical prolapse. (See 'Apical support procedure' above.)

- Key steps in avoiding complications during trachelectomy are identification of the ureters (before dividing the cardinal ligaments in the vaginal approach and before dividing the uterine artery in the abdominal approach) and careful adhesiolysis. (See 'Description of procedures' above.)

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Topic 16668 Version 17.0

GRAPHICS

Indications for trachelectomy

Indication	Percent	95% CI
Uterine fibroids (leiomyomas)	35.3	29.1-41.5
Pelvic organ prolapse	13.6	9.1-18.1
Bleeding	10.3	6.4-14.3
Endometriosis	6.2	3.0-9.3
Cancer – uterus	5.7	2.7-8.8
Cancer – cervix	4.4	1.7-7.1
Cancer – ovary	3.5	1.1-5.9
Cancer – other	3.5	0-8.4
Other	17.5	2.0-38.6

CI: confidence interval.

From: McHale MP, Smith AJ, Fader AN, Wethington SL. Outcomes of Women Undergoing Excision of the Retained Cervix After Supracervical Hysterectomy. Obstet Gynecol 2021; 137:831. DOI: 10.1097/AOG.0000000000004360.

Graphic 131307 Version 2.0

Antimicrobial prophylaxis for gynecologic and obstetric surgery in adults*

Procedure	ACOG preferred regimen[¶ 1,2]	Dose	Alternative regimens[Δ 3,4]	Dose
Hysterectomy (abdominal, including supracervical, vaginal, laparoscopic, or robotic) Pelvic reconstruction procedures, including colporrhaphy or those involving mesh or vaginal sling placement	Cefazolin, cefoxitin or cefotetan	Cefazolin: <120 kg: 2 g IV ≥120 kg: 3 g IV Cefoxitin or cefotetan: 2 g IV	**Regimen:**	
			Ampicillin-sulbactam	3 g IV
			Regimen:	
			Clindamycin **OR**	900 mg IV[◇]
			Vancomycin[¶]	15 mg/kg IV (not to exceed 2 g per dose)
			PLUS one of the following:	
			Gentamicin **OR**	5 mg/kg IV (if overweight or obese, based on adjusted body weight)[§]
			Aztreonam **OR**	2 g IV
			Fluoroquinolone[¶ ¥]	
			Regimen:	
			Metronidazole	500 mg IV
			PLUS one of the following:	
			Gentamicin **OR**	5 mg/kg IV (if overweight or obese, based on adjusted body weight)[§]
			Fluoroquinolone[¶ ¥]	
Cesarean delivery (intact membranes, not in labor)	Cefazolin	<120 kg: 2 g IV ≥120 kg: 3 g IV	Clindamycin	900 mg IV[◇]
			PLUS	
			Gentamicin	5 mg/kg IV (if overweight or obese, based on adjusted body weight)[§]
Cesarean delivery (in labor, ruptured membrane)	Cefazolin	<120 kg: 2 g IV >120 kg: 3 g IV	Clindamycin	900 mg IV
	PLUS		**PLUS**	
	Azithromycin	500 mg IV	Gentamicin	5 mg/kg IV (if overweight, or obese, based on adjusted body weight)

			PLUS	
			Azithromycin	500 mg IV
Uterine evacuation (including surgical abortion, suction D&C, and D&E)	Doxycycline	200 mg orally		
Hysterosalpingogram, including chromotubation or saline infusion sonography	Not recommended[‡]			
Laparotomy without entry into bowel or vagina	Consider cefazolin	<120 kg: 2 g IV ≥120 kg: 3 g IV		
Laparoscopy (diagnostic, tubal sterilization, operative except for hysterectomy) Other transcervical procedures: ▪ Cystoscopy[†] ▪ Hysteroscopy (diagnostic or operative) ▪ Intrauterine device insertion ▪ Endometrial biopsy ▪ Oocyte retrieval ▪ D&C for non-pregnancy indication ▪ Cervical tissue biopsy, including LEEP or endocervical curettage	Not recommended			

ACOG: American College of Obstetricians and Gynecologists; IV: intravenous; D&C: dilation and curettage; D&E: dilation and evacuation; LEEP: loop electrosurgical excision procedure; IDSA: Infectious Diseases Society of America; ASHP: American Society of Health-System Pharmacists; HSG: hysterosalpingogram; PID: pelvic inflammatory disease.

* Common pathogens: Enteric gram-negative bacilli, anaerobes, group B *Streptococcus*, enterococci.

¶ Parenteral prophylactic antimicrobials can be given as a single IV dose begun within 60 minutes before the procedure. If vancomycin or a fluoroquinolone is used, the infusion should be given over 60 to 90 minutes and started within 60 to 120 minutes before the initial incision.

Δ An alternative regimen should be used in women with history of immediate hypersensitivity to beta-lactam agents. Due to increasing resistance of *Escherichia coli* to ampicillin-sulbactam and fluoroquinolones, local sensitivity profiles should be reviewed prior to use.

◇ When clindamycin prophylaxis is warranted, UpToDate authors prefer a single dose of 900 mg based upon pharmacokinetic considerations according to 2013 IDSA/ASHP surgical antibiotic prophylaxis guidelines.[3] However, a 600 mg dose consistent with ACOG guidance may be sufficient.[1,2]

§ Gentamicin use for surgical antibiotic prophylaxis should be limited to a single dose given preoperatively. Based on evidence from colorectal procedures, a single dose of approximately 5 mg/kg gentamicin appears more effective for the prevention of surgical site infection than multiple doses of gentamicin 1.5 mg/kg every 8 hours.[4] For overweight and obese patients (ie, actual weight is >125% of ideal body weight), a dosing weight should be used. A calculator to determine ideal body weight and dosing weight is available in UpToDate.

¥ Ciprofloxacin 400 mg IV **OR** levofloxacin 500 mg IV **OR** moxifloxacin 400 mg IV. Fluoroquinolones are contraindicated in pregnancy and in women who are breastfeeding.

‡ Antimicrobial prophylaxis is recommended for women undergoing HSG or chromotubation with a history of PID or abnormal tubes noted on HSG or laparoscopy. For these women, an antibiotic prophylaxis regimen of doxycycline, 100 mg twice daily for 5 days, can be considered to reduce the incidence of post-procedural PID.[5,6] For women undergoing chromotubation, a single preoperative 2 gram dose of intravenous cefazolin is recommended, and the patient can be discharged on the same doxycycline regimen recommended for abnormal HSG.

† Most clinicians exclude urinary tract infection with a urinalysis before cystoscopy, with subsequent urine culture performed to confirm findings suggestive of infection. Patients with positive test results should be given antibiotic treatment.

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1. *ACOG practice bulletin No. 195: Prevention of infection after gynecologic procedures. Obstet Gynecol 2018; 131:e172.*
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3. *Clinical practice guidelines for antimicrobial prophylaxis in surgery. Am J Health Syst Pharm 2013; 70:195.*
4. *Zelenitsky SA, Silverman RE, Duckworth H, Harding GK. A prospective, randomized, double-blind study of single high dose versus multiple standard dose gentamicin both in combination with metronidazole for colorectal surgical prophylaxis. J Hosp Infect 2000; 46:135.*
5. *Pittaway DE, Winfield AC, Maxson W, et al. Antibiotic prophylaxis for gynecologic procedures prior to and during the utilization of assisted reproductive technologies: a systematic review. Am J Obstet Gynecol 1983; 147:623.*
6. *Pereira N, Hutchinson AP, Lekovich JP, et al. Antibiotic prophylaxis for gynecologic procedures prior to and during the utilization of assisted reproductive technologies: a systematic review. J Pathog 2016; 2016:4698314.*

Adapted from: Antimicrobial prophylaxis for surgery. Med Lett Drugs Ther 2016; 58:63.

Graphic 87200 Version 36.0

Magrina-Bookwalter vaginal retractor

Magrina-Bookwalter vaginal retractor system is attached to the operating table. Self-retaining retractors are attached to the ring, which avoids the need for bedside assistants and provides maximum exposure.

Courtesy of Rosanne M Kho, MD.

Graphic 87612 Version 1.0

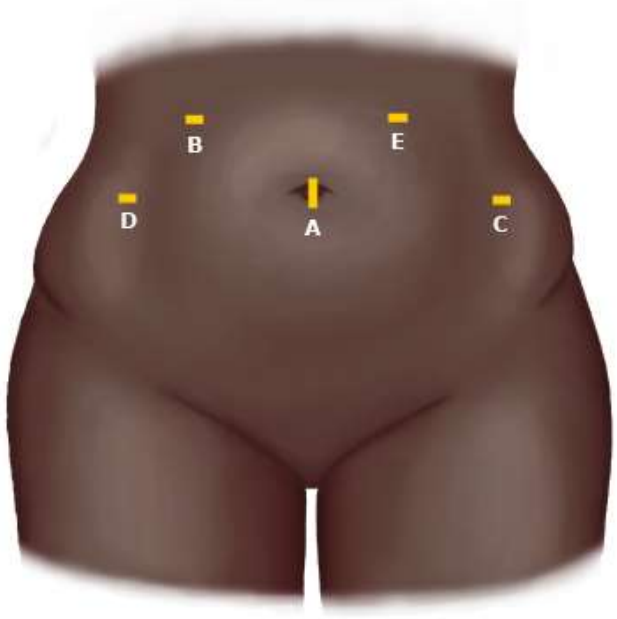
Patient position for laparoscopic or robotic trachelectomy

Patient lies directly on an anti-skid material that is taped securely to the operating table. No straps or blocks are utilized to minimize risk of neuropathies. The arms are tucked on the patient's sides using blankets.

Courtesy of Rosanne M Kho, MD.

Graphic 87620 Version 1.0

Trocar positions for robotic pelvic surgery



Robotic trocar positions for da Vinci Si. A: umbilical incision for the robotic camera; B, C, and D: lateral 8 mm ports for robotic trocars; E: 10 mm accessory port for the bedside assistant. For the da Vinci Xi, the trocars are placed in a linear fashion at the level of the umbilicus.

Graphic 87621 Version 4.0

Surgical complications of trachelectomy

Complication	Percent	95% CI
Overall	38.1	31.8-44.5
Bleeding	25.7	20.0-31.4
Transfusion	15.2	10.5-20.0
Anemia	15.3	10.6-19.9
Hemorrhage	4.3	1.7-7.1
Gastrointestinal	8.3	4.7-12.0
Ileus	7	3.7-10.4
Infectious	6.4	3.1-9.6
Pulmonary	6.1	3.0-9.3
Other	5.3	2.3-8.2
Cardiac and thromboembolism	4.4	1.7-7.1
Anesthesia	NR	

CI: confidence interval; NR: none reported.

From: McHale MP, Smith AJ, Fader AN, Wethington SL. Outcomes of Women Undergoing Excision of the Retained Cervix After Supracervical Hysterectomy. Obstet Gynecol 2021; 137:831. DOI: 10.1097/AOG.0000000000004360.

Graphic 131313 Version 1.0

Contributor Disclosures

Rosanne M Kho, MD No relevant financial relationship(s) with ineligible companies to disclose. **Javier F Magrina, MD** No relevant financial relationship(s) with ineligible companies to disclose. **Howard T Sharp, MD** No relevant financial relationship(s) with ineligible companies to disclose. **Kristen Eckler, MD, FACOG** No relevant financial relationship(s) with ineligible companies to disclose.

Contributor disclosures are reviewed for conflicts of interest by the editorial group. When found, these are addressed by vetting through a multi-level review process, and through requirements for references to be provided to support the content. Appropriately referenced content is required of all authors and must conform to UpToDate standards of evidence.

Conflict of interest policy

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