Gynecology and Obstetrics

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Introduction

All surgeons working in remote settings or hospitals with limited resources will encounter pregnant women, obstetric complications, and gynecologic emergencies. As a surgeon, the call might be split between you and the gynecologist, or there might not be a fully trained gynecologist available. A midwife may serve as the obstetric specialist; however, retained products or cesarean deliveries may require a surgeon. Furthermore, secondary to the limited availability of imaging, the cause of an acute abdomen may be unknown until the laparotomy is performed; therefore, surgeons might encounter ruptured ectopic pregnancies, torsed ovaries, or pelvic inflammatory disease with hydrosalpinx. This chapter provides an overview of gynecologic and obstetric procedures that general surgeons should learn in order to provide women and fetuses/neonates with lifesaving care.

Gynecology

Pelvic Abscess

Tubo-ovarian abscesses can result from untreated pelvic inflammatory disease and can generally be treated with broad-spectrum IV antibiotics. Use a second-generation cephalosporin or carbapenem, metronidazole or clindamycin, and

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doxycycline for at least 10–14 days. Patients present with fever and pelvic pain and may have foul-smelling vaginal discharge. If fever doesn't resolve with antibiotic treatment, and the abscess is large, surgical drainage is necessary. Pelvic abscesses may also result from septic abortions, as well as following peritonitis, appendicitis, or untreated tuberculosis. Overall surgical management is limited in these cases and may include salpingectomy or hysterectomy. Anatomic planes may not be clear in the setting of pelvic abscesses, and the woman might lose an ovary or her uterus. Therefore, percutaneous or transvaginal drainage is preferred. A transvaginal approach is appropriate if the abscess can be palpated on rectovaginal exam. While visualizing the posterior fornix, a large-bore needle is placed into the abscess and aspirated. If pus is aspirated, a colpotomy should be made to allow for adequate drainage. An opening is made below the cervicovaginal junction with curved mayo scissors. The abscess can then be drained and loculations can be manually removed. A Malecot drain can be stitched in place to allow for continuous drainage. If the abscess cannot be accessed percutaneously or transvaginally, it may be necessary to perform a laparotomy for source control, with irrigation, salpingectomy, and/or hysterectomy as indicated [1].

Abnormal Uterine Bleeding

The differential diagnosis for abnormal uterine bleeding outside of pregnancy is vast, and for the most part, evaluation can be undertaken as an outpatient workup. Pregnancy should always be excluded prior to treating with the therapies mentioned below. Abnormal bleeding may be controlled with oral contraceptive pills (OCPs), high-dose progestins, or a Mirena intrauterine device (IUD). The associated pain is best treated with nonsteroidal anti-inflammatory drugs such as ibuprofen. Occasionally, hemorrhage can result, which poses an emergency. This can be due to hormonal imbalance, adenomyosis, large fibroids or polyps, cancer, coagulopathy, or infection [1, 2].

Resuscitation should proceed with intravenous (IV) fluids and blood transfusion. Twenty-five milligrams of IV estrogen can also be used every 4 h for 24 h to attempt to slow the bleeding. Oral estrogen may also be used at a dose of 2.5–5 mg PO every 6 h for 24 h [2]. Anti-emetics are indicated for nausea associated with high doses of estrogen treatment. A dilation and curettage, polypectomy, myomectomy (removal of fibroids), or hysterectomy may be needed to control intermittent or monthly bleeding (described below).

Polyps and Fibroids

Polyps are overgrowth of endometrium and can be removed by dilation and curettage (see "Care for Miscarriage" section) or with a polyp forceps (*i.e.,* stone forceps). Fibroids are disorganized fibrotic myometrium which can be calcified and

can cause excessive bleeding due to the inability of the myometrium to contract adequately during menses.

On physical exam it is possible to visualize prolapsing fibroids or polyps. These can be surgically removed under spinal or general anesthesia, using a ring forceps or Allis clamp to grasp the fibroid while twisting until it is released. The twisting is essential as this controls the bleeding from the feeding vessel(s) of the polyp/fibroid.

Submucosal fibroids (fibroids just under the endometrium) require a hysteroscopic myomectomy when they are the source of abnormal uterine bleeding. If a hysteroscope is unavailable, an operative cystoscope can be used instead [1]. Normal saline and suction can be attached to the cystoscope and fibroids can be grasped with forceps inserted into the operative sheath. Caution should be undertaken to maintain uterine pressure below the mean arterial pressure to minimize fluid uptake into the vasculature. Excess fluid uptake (more than 1 liter) can result in hyponatremia and fluid overload leading to pulmonary or cerebral edema [2].

Abdominal Myomectomy

Large fibroids may also be intramural or subserosal. These fibroids usually cause more bulk symptoms than bleeding symptoms, and their mass effect can cause infertility. Abdominal myomectomy can be considered; however, these procedures are elective and frequently require blood transfusions. Therefore, these surgeries should not be performed in a hospital with limited blood supply or by surgeons without experience in this procedure.

A Pfannenstiel incision (see "Cesarean Section" section) is appropriate for a uterus which is enlarged up to ~14 week gestational age size; thereafter, a midline vertical incision should be considered. To minimize blood loss, the woman should receive 400–600 mcg of cytotec rectally. 20 IU of vasopressin should be diluted in 100 ml of normal saline for injection in the uterus over the incision site. Lastly a uterine tourniquet can be used by creating a window in the broad ligament and then stretching a JP drain tube or Foley catheter tightly around the lower uterine segment to tourniquet the uterine vessels [1, 2]. A large mayo clamp can also be used for this purpose. A midline vertical uterine incision is generally preferable to maximize the number of myomas that can be resected with a single incision. Furthermore, incision of the anterior uterus is preferable to minimize adhesion formation. The fibroid can be grasped with a tenaculum and dissected from the myometrium. Ligate any vessels noted to feed the fibroid prior to its excision. If the endometrium is entered, it should be closed with 4–0 or 5–0 delayed-absorbable suture in running fashion. The myometrium is then closed in layers with 0 or 2–0 gauge suture. A running baseball suture with 4–0 or 5–0 delayed-absorbable suture is used for the serosal closure. After a myomectomy, women should avoid labor and instead deliver via cesarean section [1, 2].

Hysterectomy

The Essentials
- *Indications for a hysterectomy include gestational trophoblastic neoplasm, postpartum hemorrhage, abnormal uterine bleeding due to fibroids or adenomyosis, and endometrial cancer* [1, 2].

Indications for a hysterectomy include gestational trophoblastic neoplasm, postpartum hemorrhage, abnormal uterine bleeding due to fibroids or adenomyosis, and endometrial cancer [1, 2]. Hysterectomies can be done vaginally, laparoscopically, and open abdominally. Vaginal surgery is preferred by experienced gynecological surgeons as recovery is faster and fewer resources are needed; however, this is not recommended without appropriate gynecological training. Abdominally, the surgeon has the choice to perform a total or supracervical hysterectomy; however, given the burden of cervical cancer in limited-resource settings, a total hysterectomy is more appropriate in most situations. However, a hysterectomy performed for postpartum hemorrhage might benefit from a supracervical approach as this is quicker and less risky for the ureters. If the ovaries are taken with the hysterectomy, this will lead to surgical menopause and is not advisable before the woman reaches menopause herself, or age 52 (the average age of menopause). Preparations for a hysterectomy include pre-operative antibiotics (second-generation cephalosporin or clindamycin and gentamycin), Foley catheter insertion, and sterile prep of the abdomen and the vagina.

Entry to the pelvis is easily obtained via a Pfannenstiel incision (see "Cesarean Section" section). A similar incision slightly higher that transects the rectus muscle is called a Maylard and will give more access to the pelvis in the setting of a very broad uterus. A midline vertical incision is needed if the fundus of the uterus is higher than the above-mentioned incisions would be placed and gives optimal access to the pelvis as well as the first half of the upper abdomen. A self-retaining retractor should be placed and the bowel packed cranially. The first step of the hysterectomy is the transection of the round ligament (Fig. 17.1a). Use Kelly clamps to secure the fallopian tube and utero-ovarian ligament at the uterus. Place two transfixing sutures in the round ligament using 0 gauge delayed-absorbable suture. Clamp hemostats to these sutures and cut the round ligament in between, also including 1 cm of the broad ligament inferiorly. Repeat on the other side.

The broad ligament can then be opened by grasping with atraumatic forceps, applying tension, and sharply incising anteriorly toward the vesicouterine fold (Fig. 17.1b). Connect the two incisions in the vesicouterine fold. Identify the ureters bilaterally in the medial fold of the broad ligament. Once the ureters are identified, create a window in the posterior broad ligament and widen this with blunt dissection.

When ovaries are to remain, and when quick action is needed, place two clamps medial to where the tube and utero-ovarian ligament will be transected with the tips in the opening of the broad ligament that was previously created. These structures

Fig. 17.1 Hysterectomy
initial steps. (**a**) Transect
the round ligament.
(**b**) Open the broad
ligament
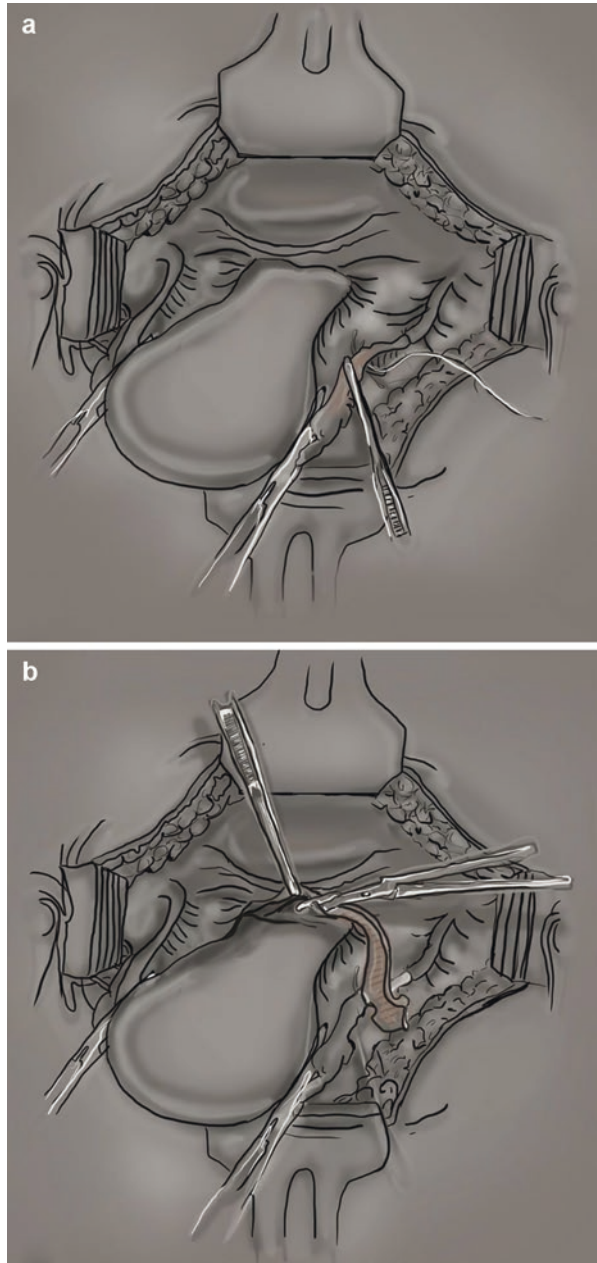
(containing the broad ligament, tube and utero-ovarian ligament) can then be cut between the Kelly clamp placed earlier and the two additional clamps. A 0-gauge delayed-absorbable suture is free-tied around the lateral clamp and the clamp then removed. A transfixing suture is then placed around the remaining lateral clamp, and the clamp removed as it is cinched. The Kelly clamp at the junction with the uterus should remain since backflow from the uterus will lead to severe bleeding. If there is more time, an alternative method would include removal of the tube. Stepwise, clamp and tie the mesosalpinx just below the ovary, moving toward the previously created opening in the broad ligament.

If the ovaries are to be removed, the two clamps are placed on the infundibulopelvic (IP) ligament that contains the ovarian vein and artery. The IP is lateral to the ovary and the tube. One clamp is placed on the IP ligament near the ovary (the most medial clamp), and two others are placed adjacent to one another laterally, while taking care that the ureter is not included. As above, the IP ligament is cut between the medial clamp and the two lateral clamps. The two lateral clamps are removed as a free tie, and transfixing sutures are serially placed at the most lateral clamps.

Separate the bladder from the lower uterine segment and cervix by bluntly dissecting the connective tissue while applying upward tension on the uterus using the Kelly clamps. Stay in the midline with this dissection as the plane between the bladder and the uterus is avascular; however, the uterine arteries and their branches lie on the sides of the uterus and can bleed heavily. If scar tissue is encountered, sharp dissection may be required. The uterine arteries intersect the uterus where the cervix ends and the uterine body begins (internal os). They are encased in connective tissue that should be dissected off carefully. A Heaney clamp (or two) is placed across the vessels inferior to the transection site, while the uterus is pulled out of the abdomen to prevent clamping the ureters. While placing the clamp, stay 45° to the internal os and slide off the uterus to ensure that the full artery and vein are included. A straight clamp is placed medially to prevent back bleeding from the uterus. The vessels are transected and the uterine arteries are tied with a stitch under the Heaney clamp with the insertion of the stitch at the very tip of the clamp to prevent puncturing the vessels and causing major bleeding. The superior clamp should be left in place. After repeating this on the other side, the medial clamps can be removed since the vasculature to the uterus (uterine vessels and IP or utero-ovarian ligaments bilaterally) should be secured. When performing a supracervical hysterectomy, the uterus can now be amputated from the cervix, and the bleeding from the cervical stump can be controlled with electrocauterization or with figures of eight with absorbable suture.

When performing a total abdominal hysterectomy, the cervix will be removed. The uterine artery has branches along the cervix bilaterally, which much be transected in stepwise fashion. Keep traction on the uterus to increase the distance between it and the ureter. Make sure the bladder is well-dissected off the cervix and place a straight clamp close to the cervix. Next, cut with a knife very close to the cervix, or even slightly into the cervical tissue, and follow with a transfixing stitch. Do this as many times as needed along the cervix; each step provides approximately 1 cm of progress. Place each clamp medial to the prior placed stitches. The last step

Fig. 17.2 Hysterectomy final steps. (**a**) Create the colpotomy. (**b**) Close the vaginal cuff
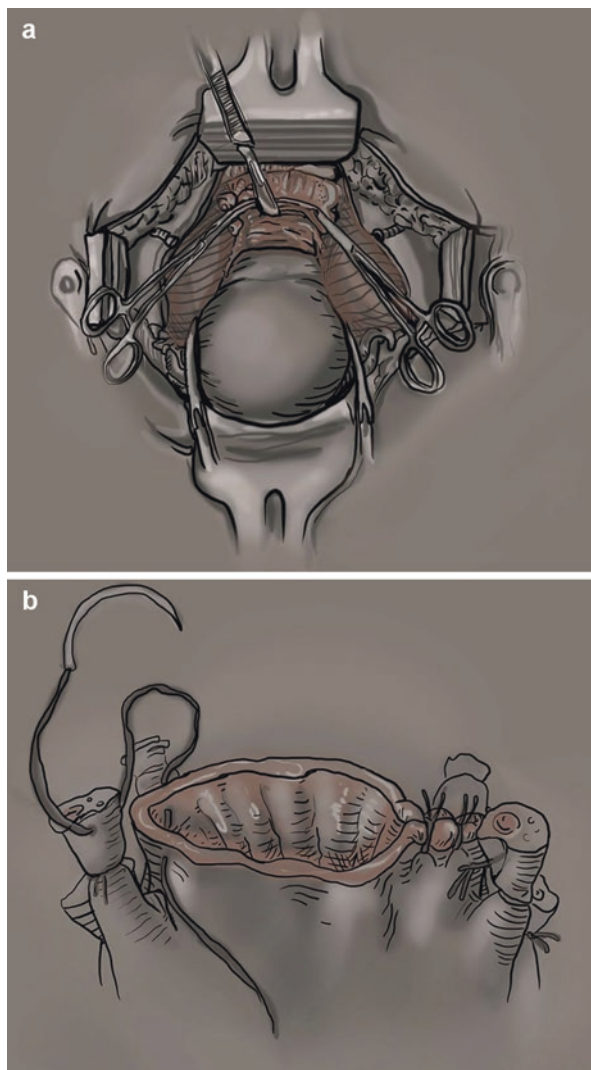
includes the cardinal and uterosacral ligaments, which are best visualized with good traction on the uterus and by exposing the posterior uterus and cervix. They are also clamped, divided, and transfixed.

Heaney clamps are then placed under the cervix. The vaginal tissue is incised (or cut with Jorgenson scissors) superior to the clamps, and transfixing sutures are placed at the clamps prior to their removal (Fig. 17.2a). Keep these stitches long and clamp with hemostats, as traction on these sutures will assist in closure of the vaginal cuff. The uterus and cervix have now been removed and the remainder of the vaginal cuff should be closed with 0-gauge delayed-absorbable sutures with figures of eight for good hemostasis (Fig. 17.2b). Include the posterior peritoneum for hemostasis [2].

Adnexal Surgery

Adnexal surgery refers to surgery performed on the ovaries or tubes. This can be done via laparoscopy; however, for large ovarian masses, exploratory laparotomy may be required. Indications include ovarian torsion, ovarian masses, or pelvic pain related to endometriosis/endometriomas. [1]. Ovarian torsion constitutes an emergency and should be on the differential diagnosis whenever a woman presents with acute onset of pelvic pain. She may have a palpable pelvic mass, peritoneal signs, or nausea and vomiting. The pain can be intermittent or constant.

If a torsed ovary is found early enough, it may be possible to save the ovary by untwisting and restoring blood flow. Consider an oophoropexy of the ovary by shortening the utero-ovarian ligament, suturing the ovary to the pelvic sidewall, or suturing the utero-ovarian ligament to the uterosacral ligament in order to prevent future episodes of torsion [1].

If an oophorectomy is required, it is crucial that the ureter is identified and not included in the transection of the IP ligament. The ureter can be identified through the peritoneum coursing over the bifurcation of the iliac vessels, below the ovarian fossa, and crossing about 2 cm under the uterine arteries. The fallopian tube is held on traction to the midline, while the mesosalpinx is clamped and transected toward the uterus until the utero-ovarian ligament can be transected (Fig. 17.3). At this point the ovary can be placed on traction, and the IP ligament can be skeletonized from the broad ligament. The ureter can be identified at this point before clamping the IP ligament.

When performing an ovarian cystectomy, the ovary is incised around the cyst capsule with a knife or Bovie, taking care not to incise the cyst itself. Allis clamps are placed along the edges of the capsule and the cyst is separated from the ovary with blunt dissection. If necessary, sharp dissection may be employed. Use the Allis clamps to apply traction as needed. Bleeding can be coagulated with a Bovie. The ovary can be closed with 4–0 delayed-absorbable suture in a purse-string fashion. The incision is then closed with a running (sub)cortical stitch [2].
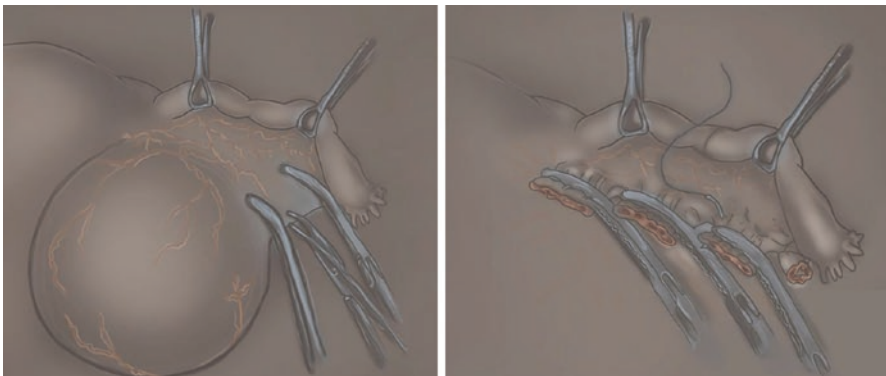

Fig. 17.3 Oophorectomy. Clamp, transect, and ligate the mesosalpinx

Tubal Ligation

A bilateral tubal ligation can be performed postpartum after a cesarean section or with a small infra-umbilical incision after a vaginal delivery. It can also be performed laparoscopically, or via mini-laparotomy. If the procedure is performed outside of pregnancy, a uterine manipulator is advisable to push the uterus to the anterior abdominal wall. A 3–4 cm Pfannenstiel incision (see "Cesarean Section" section) is sufficient for a tubal ligation in a patient with a BMI of less than 25. Once the peritoneum has been entered, the fundus should first be identified and then the insertion of the fallopian tube should be located, posterior to the insertion of the round ligament.

Fig. 17.4 Bilateral tubal ligation. (**a**) Isolate the tube and create a window in an avascular area of the mesosalpinx. (**b**) Ligate the tube and excise a segment in between the sutures
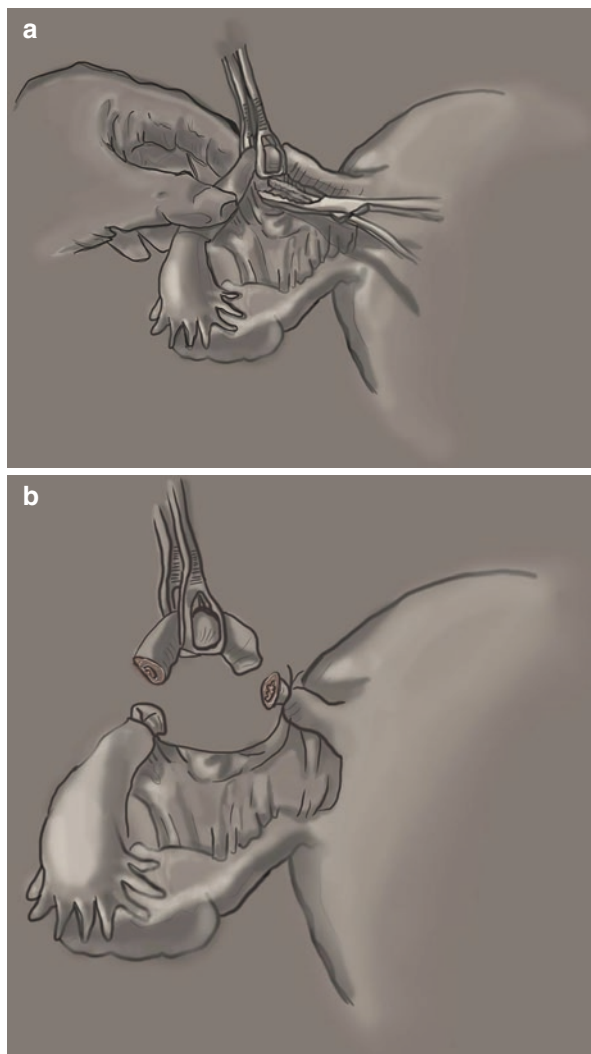
Two Babcocks can be placed around the tube to elevate it into view and serially reclamp it laterally in order to bring the fimbriae into view (Fig. 17.4). An avascular space of the mesosalpinx should be identified near the middle of the tube and dissected so as to create a 2 cm window underneath the segment to be excised. A Babcock is then replaced on the tube and 2–0 chromic or plain catgut suture is passed through the window to ligate the tube twice laterally, then twice medial to the Babcock. Use Metzenbaum scissors to cut the tube between the sutures, obtaining at least a 2 cm segment of excised tube (Fig. 17.4b). The pedicles should be at least 0.5 cm on each side, and they should be inspected to ensure hemostasis. This is repeated on the other side. Depending on the size of the incision, the fascia may require closure with 0 PDS or other delayed-absorbable suture. If the subcutaneous layer is greater than 2 cm, this layer should also be closed [2].

While not technically within the realm of gynecology and obstetrics, a discussion of contraception options would be incomplete without addressing vasectomy. The complication rate of female sterilization is 20-fold higher than that for vasectomies [2]. Additionally, the cost of performing a tubal ligation is five times higher than performing a vasectomy [2]. Therefore, for women in permanent relationships seeking permanent contraception, a discussion with their partners about a vasectomy is desirable.

Gynecological surgeons will also perform surgeries for urinary incontinence including pelvic organ prolapse, fistulas, and malignant diseases from the reproductive tract. These procedures should be performed by appropriately trained gynecological surgeons in order to avoid significant complications, or in case of fistulas, lost opportunities to solve the problem. Fistulas, particularly when identified early in the postpartum or postoperative period, are often best treated with prolonged catheter use and heal by secondary intention.

Pregnancy Determination and Dating

Pregnancy determination and dating is extremely important in order to diagnose pregnancy loss, ectopic pregnancy, preterm contractions, or if a woman is post-dates and at risk for a stillbirth. The possibility of pregnancy should always be considered in a woman of reproductive age. The first day of the last menstrual period (LMP) is used to calculate the current gestational age; however, exact dates might not be known. "It was five moons ago" might be a common answer. Determination that a patient is pregnant can be done with urine beta HCG testing if available. When the pregnancy is over 20 weeks, the woman feels quickening (fetal movement). A physical exam should confirm the intrauterine pregnancy – with a bimanual exam, the uterus will feel globular and enlarged beginning at 6 weeks. If greater than 12 weeks, the uterus can be palpated above the symphysis, and by 20 weeks, the uterus can be palpated at the umbilicus. Thereafter, the gestational age corresponds with the fundal height (±2 weeks), as measured from the symphysis to the fundus.

When ultrasound is available, dating is easier to confirm. Crown-rump length can be used for dating of pregnancies up to 14 weeks. Measure the maximum length

from the cranium to the caudal end. If this measurement is greater than 8.4 cm, the gestational age is likely greater than 14 weeks [3]. Other measurements should be performed, including the biparietal diameter, head circumference, abdominal circumference, and femur length. The biparietal diameter is measured from the superior outer edge to the inner edge of the skull, across the thalami. The cerebellum and facial structures should not be visible. The head circumference can be measured in the same view. The abdominal circumference is measured when the spine, fetal stomach, and junction of the umbilical and portal veins are in view. Lastly, the femur length is measured from each end of the shaft, not including the distal femoral epiphysis [3].

First or Second Trimester Bleeding

Differential diagnosis of bleeding in the first or second trimester of pregnancy includes miscarriage, ectopic pregnancy, molar pregnancy, and bleeding due to implantation or subchorionic hemorrhage. Non-obstetrical reasons like cervicitis or cervical cancer are also seen.

Care for Miscarriages

Miscarriages are classified as (1) threatened, (2) missed, (3) incomplete, and (4) complete. Threatened, missed, and complete miscarriage all present with bleeding and the cervical os is closed. The differences are otherwise determined by ultrasound findings. Sonography of a threatened miscarriage will show a viable embryo with a heartbeat, a missed will show an empty sac or an embryo without a heartbeat, and a complete will not show any products of conception with an endometrial strip of less than ~1 cm. Observation for these situations is often warranted if the distinction cannot be made. An incomplete miscarriage, or miscarriage with ongoing bleeding, needs intervention to save the woman from severe anemia, sepsis, or death.

Medical management may be carried out for pregnancies up to 9 weeks if the women is stable, the bleeding is limited, and she is able to stay in the hospital or come back in a timely fashion. After 9 weeks, medical management is less effective. Misoprostol 400 mcg may be administered sublingually or 600 mcg may be given PO for an incomplete miscarriage. If the cervical os is closed, a higher dose might be required: 800 mcg vaginally or 600 mcg sublingually. These dosages may be repeated twice, 3 hours apart, if needed [4]. If medical management is not effective, surgical management should be performed.

It is important to treat pain associated with the miscarriage, as well as anemia and any underlying identifiable cause. Malaria, sickle cell disease and sexually transmitted infections may contribute to a miscarriage and should be treated appropriately. If the woman is suspected to have had an unsupervised abortion, tetanus

immunoglobulins should be administered if available [1]. Rhesus (Rh)-negative women should receive Rhogam.

Dilation and manual vacuum aspiration (MVA) is the safest way to evacuate an incomplete or missed miscarriage. Dilation and curettage (D&C) may also be used if MVA is unavailable. Thirty minutes prior to the procedure, a dose of doxycycline or a second-generation cephalosporin will decrease the risk of infection [1]. The procedure can be performed under local anesthesia as described below if the patient is able to tolerate gynecological exams. If the patient is too anxious or the miscarriage is very traumatic for her, sedation is advised. The gestational age should be measured by ultrasound, if available. The size of the cannula chosen for the MVA should correspond to the number of weeks of gestation. If the cervix is closed, it can be dilated with dilators, increasing size cannulas, or misoprostol. Misoprostol should ideally be given 3 h prior to the procedure, but sufficient dilation may be achieved in 90 min. The misoprostol dosage is 400 mcg sublingual or 600 mcg PO for gestational ages up to 14 weeks [1]. The patient should be placed in dorsal lithotomy position. This procedure should be carried out using sterile technique. Anything that will be placed in the uterus should not touch the vaginal walls. A full vaginal prep could also be considered if the surgeon is less familiar with performing a MVA. A sterile speculum is inserted into the vagina and locked in place with the cervix in view. Gauze sponges should be soaked in betadine, or other available (non-alcoholic) antiseptics. The cervix should be cleansed by applying these sponges to the area using ring forceps. One percent lidocaine should be drawn into a syringe attached to a spinal needle. Two milliliters should be injected at the anterior lip of the cervix at the 12 o'clock position, where a tenaculum will be placed in order to apply countertraction. Cervical vessels penetrate the cervix at the 3 and 9 o'clock positions. Therefore, a paracervical block should avoid these areas, aiming instead for 4 and 8 o'clock, at the cervical-vaginal junction (Fig. 17.5). Insert the needle approximately 1.5 cm, aspirate, and then inject approximately 5 ml of
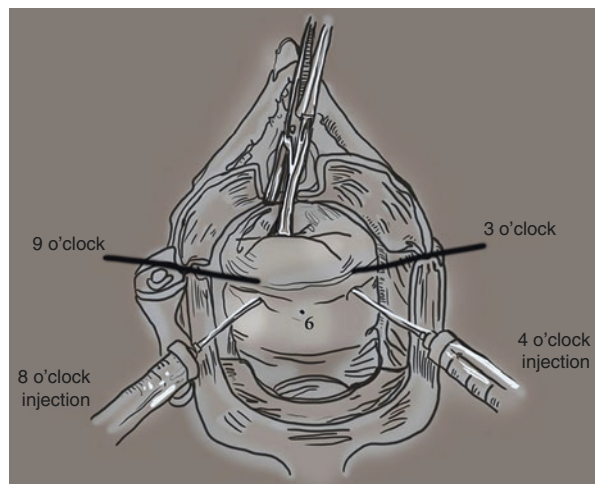

Fig. 17.5 Paracervical block. Inject local anesthetic at the cervicovaginal junction, at the 4:00 and 8:00 positions

lidocaine in each position as the needle is withdrawn. Once the paracervical block has been performed, the evacuation can begin. Dilate the cervix carefully, bracing your hands on the perineum. Excessive force may perforate the uterus so caution should be taken only to pass the dilator through the internal os. Pratt and Hank dilators are measured in French, with the number corresponding to three times the cannula size. Hegar dilators are measured in millimeters, so the size should correspond with the cannula size. If the correct sized cannula can be inserted into the uterus, you may proceed with the MVA. Ultrasound guidance, if available, can assist with the location of the products, but generally, the procedure is done under feel of the operator.

To operate the MVA, place the desired cannula at the end of the aspirator. Carefully insert the cannula while not on vacuum, into the external os and advance to the fundus with caution, so as not to create a false passage or perforate the uterus. Create the vacuum by drawing back the self-locking syringe (Fig. 17.6). Rotate the cannula while slowly withdrawing from the uterus, but do not rotate within the cervical canal. Once the cannula has been removed, undo the vacuum, disconnect the cannula from the syringe, and empty the contents. Reconnect and repeat until all the tissue is removed and only blood is retrieved. At this point, there should be a gritty texture to the uterus when the cannula is scraped against the uterine lining and the uterus should feel to be contracting around the cannula. If an ultrasound is available, it can be used to confirm the presence of an endometrial stripe less than 1 cm and empty uterine cavity. The tenaculum can be removed and the tenaculum sites inspected for signs of bleeding. Bleeding can be controlled by applying direct pressure with gauze or ring forceps, or silver nitrate sticks, if available. The speculum can then be removed once hemostasis is ensured.

If MVA is not available, a dilation and curettage may be performed (Fig. 17.7). Dilation should proceed as described above, generally up to size 25 Pratt dilator in order to accommodate the curette. The curette should be placed gently with the hand braced against the perineum to prevent perforation in the event that the patient moves. The curette is carefully advanced to the fundus and then pressure is applied to the endometrial surface as it is pulled back toward the cervix. It is then carefully advanced again and the process is repeated, rotating the curette to contact each surface of the uterine cavity. The curette is then removed from the uterus and the

Fig. 17.6 Manual Vacuum Aspirator (MVA). Depress the buttons and pull back the syringe to its locked position to prepare the suction device, then press the buttons again to activate suction
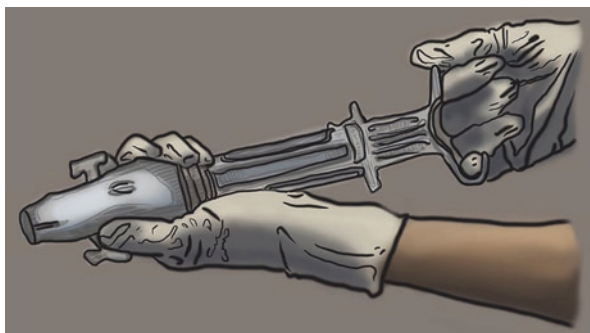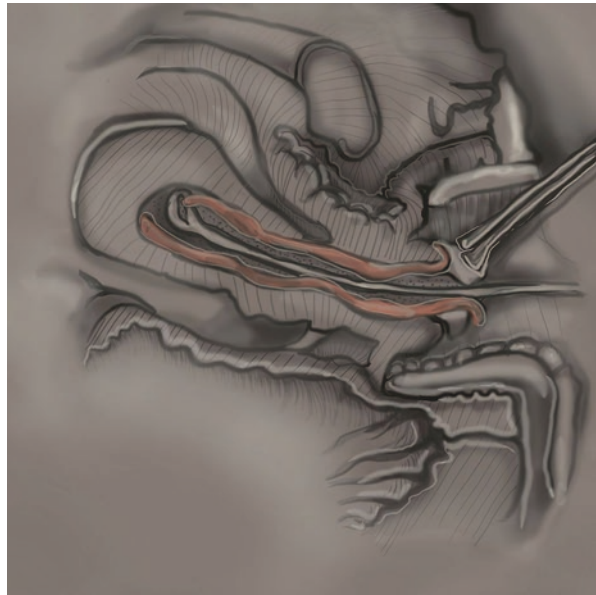
Fig. 17.7 Dilation and curettage. With a tenaculum on the anterior lip of the cervix for stabilization, gently insert the curette to the fundus and pull back to the cervix while applying pressure to the endometrial surface

extracted tissue is saved for examination. Once curetting is finished, the endometrium should have a gritty texture as described above. The tenaculum and speculum are removed, as described above, ensuring hemostasis.

The products of conception should then be evaluated to ensure that the aspiration was adequate. They should be washed gently with saline or water and strained with a strainer or piece of mesh. If placed in a glass container with water or saline, the fetal tissue will appear white and fluffy with an elastic-like film coating it. For visualization, place a light source underneath the glass container. For evacuations after 12 weeks, all fetal parts (e.g., four limbs, thorax, and calvarium) should be identified to ensure none were retained. A dose of doxycycline should also be given at the end of the procedure [1].

It is important to remain vigilant for signs of sepsis, either from long-standing retained fetal tissue (before or after treatment) or a previous unsafe abortion. Septic abortions are responsible for 20% of maternal mortality worldwide [1]. Patients may present with severe anemia, pain and fever, foul discharge or frank pus in the vagina, and signs of hemorrhagic or septic shock. Resuscitation should ensue with IV fluid, blood transfusion (if indicated and available), and broad-spectrum antibiotics. The antibiotic regimen should include a second-generation cephalosporin or carbapenem, metronidazole or clindamycin, and doxycycline, which should be continued for at least 10–14 days. Alternatively, Augmentin 1 g IV every 8 h and gentamycin 5 mg/kg IM daily may be used [1]. Uterine evacuation must be performed with caution, as the infection will soften the myometrium, resulting in a higher risk for perforation. Use ultrasound guidance and MVA, if possible. If the infection was a result of a prior D&C or MVA, the woman may require a laparotomy to evaluate for uterine perforation and associated bowel injury. Hysterectomy may also be necessary in this case (see "Hysterectomy" section).

Ectopic Pregnancy

Women who have an ectopic pregnancy classically present with abdominal pain (often with guarding and rebound tenderness) and vaginal bleeding. Some may have a palpable adnexal mass. History of a syncopal event is also common. In severe cases, women may present with hemodynamic instability or shock. This is unfortunately common in limited-resource settings as women often present after rupture, sometimes unaware of the pregnancy [1]. An acute abdomen with a positive pregnancy test is a ruptured ectopic until proven otherwise.

In hemodynamically stable women, diagnostic testing can be pursued. Transvaginal ultrasound is most sensitive to diagnose the location of the pregnancy and will reveal an empty uterus, possibly with an adnexal mass. Visualizing an adnexal mass or free fluid in the pelvis is strongly suggestive of an ectopic pregnancy. Transabdominal ultrasound on thin patients may give similar results; however, they are sometimes more difficult to interpret. If ultrasound is not available, culdocentesis can be performed by inserting a needle through the posterior fornix of the vagina, into the Pouch of Douglas. The aspiration of bloody fluid is highly suggestive of an ectopic pregnancy [1].

For women who are stable and have equivocal diagnostic results, and if reliable quantitative serum beta HCG and ultrasound are available and follow-up care is feasible, they repeat diagnostic testing in 2 days. Depending on the availability of transportation and proximity to the hospital, the patient can be sent home with strict instructions on when to return [1]. When, after 48 h, the beta HCG is neither doubled, nor rapidly declining fast (as would be the case in a complete miscarriage), ectopic pregnancy is the diagnosis. If methotrexate is available, this should be offered by a gynecologist experienced with the indications and follow-up.

Women who are hemodynamically unstable need emergent resuscitation with large-bore IVs and fluid boluses and possibly a blood transfusion. The surgeon should proceed with an exploratory laparotomy (or laparoscopy if available) and perform a salpingectomy if an ectopic pregnancy is found.

In order to perform a salpingectomy, the laparotomy may be performed via a Pfannenstiel incision (see "Cesarean Section" section); however, if the differential diagnosis includes surgical causes of the hematoperitoneum including a ruptured spleen or liver, a midline vertical incision is advised. Once peritoneal access has been achieved, the hematoperitoneum can be suctioned and the tube can be identified and secured with a Babcock. A Kelly clamp is placed at the border of the tube with the mesosalpinx, beginning with the fimbriated end of the tube. A second Kelly is clamped onto the mesosalpinx closer to the ovary and the mesosalpinx is then transected with scissors (Fig. 17.8). The pedicle is ligated with 2–0 or 3–0 delayed-absorbable suture and the clamp removed. The clamp closest to the tube may remain. This process is repeated until the uterus is reached. At this point, the Kelly clamp should be directed across the fallopian tube, and the tube will be cut between the two clamps where it inserts at the uterus. This pedicle is also ligated with 2–0 or 3–0 delayed-absorbable suture and the tube is removed. The pelvis should then be irrigated prior to closure [2].

Fig. 17.8 Salpingectomy.
Clamp, transect, and ligate
the mesosalpinx
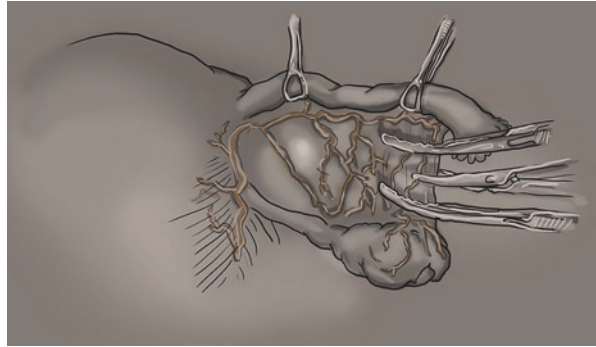
A salpingostomy will save the tube but increases the risk of another ectopic pregnancy and therefore should only be used in limited circumstances. When the tube is not ruptured, the patient has no other functional tube, and the woman will have access to emergency surgery in the future, salpingostomy may be considered. The patient should be counseled regarding her future risk of another ectopic pregnancy. A salpingostomy is made by a 1–2 cm incision into the section of distended tube containing the ectopic pregnancy. The pregnancy can then be dissected from the wall of the tube using high-pressure irrigation or blunt dissection and then removed with forceps. Bleeding can be cauterized and the tube can be left to heal by secondary intention. As above, the pelvis should be irrigated prior to closure to minimize the risk of retained trophoblastic tissue [2].

Rhogam should be administered to women who are Rhesus (Rh) negative, and beta HCG levels should be followed, if possible, to ensure a decrease to undetectable levels. Trophoblastic tissue may persist in the pelvis and may necessitate an additional surgery if identified. If beta HCG levels can be followed, women should be provided contraception so as to prevent a new pregnancy that would obfuscate the monitoring.

Molar Pregnancy

Molar pregnancy and gestational trophoblastic disease (GTD) are abnormally formed pregnancies which need to be treated by removing the products of conceptions and, in some cases, chemotherapy. The typical molar pregnancy is a fast-growing pregnancy, with a very soft uterus and a "snowstorm" appearance on ultrasound. Bleeding can be a presenting symptom, and sometimes the vesicles can be seen in the vaginal discharge. Since beta HCG levels are abnormally high in molar pregnancies, patients can present with hyperemesis. Patients may also be hemodynamically unstable. Treatment is suction of the products out of the uterus. Curettage is discouraged since there is a high chance of perforation (see above).

Intravenous oxytocin should be given at the time of suction to stimulate uterine contraction and minimize the risk of hemorrhage [5]. If the woman is Rh negative, Rhogam should be given. In the event of hemorrhage, a hysterectomy may be required (see "Hysterectomy" section). There are two types of molar pregnancies: (1) complete (no fetal parts are visible) or (2) incomplete (fetal parts or sometimes a fetus is visible). In both cases, the pregnancy needs to be evacuated. The diagnosis of complete vs incomplete molar pregnancy is made on pathological evaluation of the products of conception. Women with complete molar pregnancies are at risk for developing gestational trophoblastic neoplasia, which is a molar pregnancy with the potential to metastasize. Therefore, these women should be referred to gynecologists who can follow them closely after surgery to ensure that beta HCG levels fall to undetectable levels, otherwise chemotherapy is indicated. Contraception should be provided so a developing pregnancy will not affect the beta HCG surveillance.

Obstetric Emergencies

The Essentials
- *More than 75% of maternal deaths in low- and middle-income countries (LMICs) are caused by postpartum hemorrhage, infection, preeclampsia and eclampsia, delivery complications, and unsafe abortion.*

Third Trimester Bleeding

Bleeding in the third trimester is an obstetrical emergency until the status of the mother and fetus is stable and the quantity of the bleeding is determined negligible. Differential diagnosis for bleeding in the third trimester includes preterm labor. However, bleeding could also occur when the placenta is implanted on or near to the cervix (placenta previa), the placenta is separating before delivery of the fetus (placental abruption) or in the event of a ruptured uterus. A placenta that is abnormally attached in the endometrium (placenta accreta) or myometrium (placenta increta/percreta) can also cause third trimester bleeding, but this will be discussed in the "Postpartum Hemorrhage" section).

Placenta Previa

Placenta previa often presents as painless vaginal bleeding in the third trimester. Suspicion of placenta previa should arise when the fetus is palpated high in the uterus, the fetus is malpresenting (e.g., breech or transverse), the woman had a prior cesarean section, or there is a twin gestation. Before performing a digital vaginal

exam on any patient, a placenta previa should always be excluded because catastrophic bleeding may occur. A placenta previa can be diagnosed with an ultrasound or with a speculum examination if there is cervical dilation. The delivery should be performed via a cesarean section, preferably around 36 weeks; however, if there is significant bleeding, an earlier delivery may be necessary. If possible, the patient should receive steroids for fetal lung maturation (see "Preterm Labor" section below).

Placental Abruption

Placental abruption is generally diagnosed clinically by the following common symptoms: sudden onset of severe, continuous abdominal pain, a hardened uterus with no apparent contractions, sudden appearance of vaginal bleeding, shock out of proportion to bleeding, and fetal bradycardia or demise [6]. Placental abruption is more frequently seen in women who have preterm rupture of membranes, hypertension, preeclampsia, cocaine abuse, or abdominal trauma.

After stabilization of the woman, the next step depends on the fetal heart tones. If there has been a fetal demise, one could proceed with an induction of labor and subsequent vaginal delivery as long as the maternal status remains stable. If there are fetal heart tones or the mother is unstable, an emergent cesarean section is indicated.

Uterine Rupture

Uterine rupture is also a clinical diagnosis. During labor, impending rupture presents with maternal agitation, severe persistent abdominal pain, and an hourglass-shaped uterus. Signs of rupture are pain, shock, cessation of contractions, fetal bradycardia or asystole, and palpable fetal parts just under the skin. Risk factors for uterine rupture include prolonged labor, grand multiparity, fetal malpresentation, excessive oxytocin or misoprostol use, and prior uterine surgery [6].

Treatment should include resuscitation with IV fluids and blood products (if available). Insert a Foley catheter into the bladder and proceed with an emergency midline laparotomy and cesarean section if the fetus is undelivered. Hysterectomy may be necessary if hemorrhage cannot be controlled. The tear is usually anterior and inferior, placing the bladder at risk of injury [6]. If hysterectomy is not performed, bilateral tubal ligation should be considered to prevent future pregnancies, as these women will be at high risk for subsequent rupture.

Preterm Labor

Preterm labor is defined as the onset of contractions and cervical change prior to 37 weeks gestation. Common causes are infections of the urinary and reproductive tracts and malaria [6]. If an infection is identified, it should be treated. Preterm labor may be difficult to assess in the setting of limited prenatal care and imaging, but can

be approximated by measuring fundal height (see "Pregnancy Determination and Dating" section). If there are no comorbidities and the fundal height measures less than 34 weeks, it may be appropriate to prolong pregnancy for 48 h in order to administer betamethasone (two doses of 12 mg IM 24 h apart) or dexamethasone (four doses of 6 mg IM 12 h apart) to promote fetal lung maturity [6]. Tocolysis with salbutamol, nifedipine, or magnesium sulfate can be given to prolong pregnancy in order to administer steroids. Nitroglycerin can be used if these are not available, and indomethacin can be used prior to 32 weeks (Table 17.1). However, if the mother has any pregnancy-related or medical comorbidities, imminent delivery may be more appropriate if continued pregnancy will jeopardize her health (e.g., infection, preeclampsia, placental abruption).

Rupture of Membranes

Preterm rupture of membranes (PROM) is defined as rupture of membranes prior to contractions. If this occurs prior to 37 weeks of gestation, it is called premature preterm rupture of membranes (PPROM). Following rupture of membranes, the fetus and mother are at risk for infection, so cervical exams must be minimized to reduce this risk. The infection of membranes is termed chorioamnionitis, and this can result in both neonatal sepsis and maternal endometritis. Chorioamnionitis, which can also occur during labor, is defined as at least two of the following symptoms: maternal fever (>38.0 Celsius), maternal tachycardia, fetal tachycardia, and fundal tenderness. Treatment is broad-spectrum antibiotics (amoxicillin with gentamycin or clindamycin). Additionally, PPROM patients are at risk for preterm labor and placental abruption.

In the event of PROM, the woman should begin labor within 24 h to reduce the risk of infection. If contractions do not occur spontaneously, labor should be induced with oxytocin. Women with PPROM who have achieved at least 34 weeks gestation are generally recommended to deliver, as the risks of prematurity are outweighed by the risks of infection. However, if neonatal care is unavailable, the clinician should use his/her best judgment. In the event of PPROM before 34 weeks of gestational age, a 7-day course of amoxicillin and a single 1 gram dose of azithromycin has been found to help prolong pregnancy, but delivery should be pursued if there are signs of infection or placental abruption. Tocolytics should not be given if there is evidence of preterm labor [5].

Hypertensive Disorders

Pregnancy can be complicated by chronic hypertension or pregnancy-induced hypertension, which both are risk factors for preeclampsia, eclampsia, and HELLP (hemolysis, elevated liver enzymes, and low platelets) syndrome. Chronic hypertension in pregnancy and pregnancy-induced hypertension need close follow-up and treatment for blood pressures >160/110 or if proteinuria (>300 mg/24 h) develops. New-onset proteinuria can establish the diagnosis of preeclampsia. This disease is

Table 17.1 Tocolytic agents for preterm labor

Tocolytic agent	Dosing	Contraindication	Maternal side effects	Fetal side effects
Terbutaline (beta-mimetic)	0.25 mg SQ q20 min	Cardiac arrhythmias	Arrhythmias, pulmonary edema, myocardial ischemia, hypotension, tachycardia	Tachycardia, hyperinsulinemia, myocardial and septal hypertrophy, myocardial ischemia
Magnesium sulfate	4-6 g bolus in 20 min, then 2 g/h	Myasthenia gravis	Flushing, headache, muscle weakness, pulmonary edema	Lethargy, hypotonia, respiratory depression, demineralization with prolonged use
Indomethacin (Prostaglandin synthetase inhibitor)	50–100 mg PO followed by 25–50 mg every 6 h	Significant hepatic or renal disease, pregnancy >32 weeks gestation	Nausea, vomiting	Constriction of the ductus arteriosus, pulmonary hypertension, reversible decrease in renal function with oligohydramnios, intraventricular hemorrhage, hyperbilirubinemia, necrotizing enterocolitis
Nifedipine (calcium channel blocker)	20 mg loading dose, then 10 mg every 4–6 h	Cardiac disease, maternal hypotension, concomitant use of magnesium sulfate	Flushing, headache, dizziness, nausea, transient hypotension	None

characterized by generalized edema and damage to the liver, lungs, and cerebrum, resulting in the common symptoms of severe headache, scotomata, right upper quadrant or epigastric pain, and persistent edema. Preeclampsia is also associated with pulmonary edema, oliguria, and hyperreflexia.

The Essentials
- *Symptoms of preeclampsia: headache, scotomata, right upper quadrant pain, epigastric pain, nausea or vomiting*
- *Physical exam: elevated blood pressures; facial, bilateral leg, or hand edema; pulmonary edema; diminished urine output; hyperreflexia*
- *Laboratory findings: proteinuria (3+ on dipstick), elevated creatinine, transaminitis, hemolysis, thrombocytopenia*

When the patient is term (>37 weeks of gestation), labor should be induced since delivery will resolve preeclampsia. If the patient is less than 37 weeks, she should receive steroids (see "Preterm Labor" section) for fetal lung maturation prior to induction. However, if the symptoms described above are persistent, blood pressures are persistently >160/110, or she has significant laboratory evidence of kidney failure, liver failure, or hemolysis, then she should be delivered to avoid maternal complications regardless of the gestational age [7]. High blood pressures should be treated with PO or IV labetalol, nifedipine, or hydralazine [5]. An induction of labor could be attempted; however, if maternal status worsens, a delivery via cesarean section might be indicated. Magnesium sulfate should be administered to prevent seizures throughout labor and the first 24 h postpartum. Start with a bolus of 4–6 g given over 10–20 min followed by 2 g/h. If a drip is unavailable, you may use 5 g of IM magnesium in each buttock followed by 5 g IM every 4 h in alternating buttocks. One gram of calcium gluconate IV is the antidote to magnesium toxicity and should be readily available for each patient who is given magnesium therapy.

Seizures in the setting of pregnancy are diagnostic for eclampsia until proven otherwise. Treatment is prompt administration of magnesium as described above, to continue until 24 h postpartum. If this does not stop the seizure, the bolus can be repeated or administer lorazepam 0.1 mg/kg IV. If this also fails, phenytoin 1,000–1,500 mg should be given. Monitor vitals, reflexes, and urine output. Delivery within 24 h of the seizure is warranted, and if the patient can be induced in that timeframe, vaginal delivery is preferable [5]. Of note, the differential diagnosis for seizures in pregnancy also includes epilepsy or generalized seizure disorder, cerebral malaria, and meningitis [6].

Cord Prolapse

Cord prolapse is an obstetric emergency for the fetus. It is suspected when membranes are ruptured and suddenly no fetal heart tones are heard, or when a cord-like

structure is felt on cervical exam. Immediately place the patient in Trendelenburg or knee-chest position with her chest low and sacrum high [6]. Push the presenting part cranially to keep pressure off the cord in order to maintain blood flow through the cord. If pulsations are felt in the cord after the presenting part is pushed up, a cesarean section is indicated. The person who is pushing the presenting part up should stay in that position until the fetus is delivered via cesarean section. If no pulsations can be felt in the cord and no fetal heart tones can be heard, a fetal demise has occurred, and you should proceed with vaginal delivery [6].

Intrauterine Fetal Death

When an intrauterine fetal death (IUFD) is diagnosed, the woman should be delivered. A vaginal delivery should be prioritized, and induction of labor is generally successful with misoprostol followed by oxytocin. In general, IUFDs can be delivered vaginally without the need for operative intervention; however, sometimes a vacuum-assisted delivery is indicated. Forceps should not be attempted on IUFDs since there is a high likelihood of true cephalopelvic disproportion (CPD), which would place the mother at more risk for extensive tears and associated bleeding. After delivery of an IUFD, the uterine cavity should be manually explored to make sure that there is no occult uterine rupture or retained products.

Situations of fetal death which require operative management include women who are fully dilated and the fetus is not coming with prolonged pushing (>3 h) or breech presentation and head entrapment [6]. The latter occurs specifically with hydrocephalus. These situations should not occur in the hospital, but are sometimes encountered by women who tried to deliver at home. Medically, a fetal craniotomy is preferred to avoid the maternal morbidity and mortality associated with the alternative of a cesarean section in the second stage of labor [6]. However, this should not be attempted without involvement of local hospital staff. Confirm fetal death with several key members of the hospital staff and discuss potential cultural or legal objections of a craniotomy with the staff and the woman.

A craniotomy should be performed in the operating room, as profound bleeding or septic shock may ensue. General anesthesia is preferred; however, light sedation with spinal anesthesia or pudendal block are reasonable alternatives (Fig. 17.9). The patient should be placed in dorsal lithotomy position, prepped and draped in a sterile fashion, and broad-spectrum antibiotics should be given. If the patient cannot be catheterized to drain the bladder, a suprapubic puncture is required [6].

A craniotomy is performed by perforating a fontanel and allowing brain matter and CSF to flow out. The cranial bones can then be grasped with Kocher clamps circumferentially and pulled. Caution should be taken to avoid injury to oneself, as well as to the vaginal walls. If the fetus is partially delivered in breech position (often seen with hydrocephalus), it should be rotated such that the spine is facing up. Identify and penetrate the foramen magnum and allow fluids and tissues to flow out. Transverse presentations have an increased risk of uterine rupture during craniotomy and should therefore be avoided. A manual inspection of the uterus is required to ensure no uterine rupture has occurred and all products have been removed.

Fig. 17.9 Pudendal block. Locate the ischial spine and advance needle until the resistance of the sacrospinous ligament is felt. Inject local anesthetic at this location prior to advancing through the ligament, just until the point when resistance is no longer felt, and inject anesthetic at this location as well. Take caution to aspirate so as not to inject intravascularly
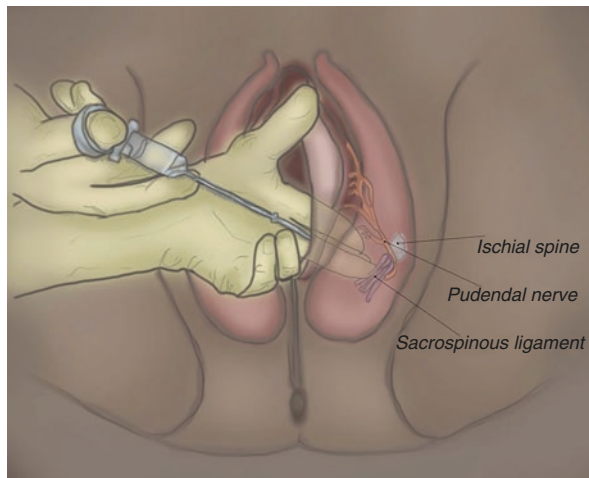
Lacerations should be repaired as described below (see "Laceration Repair" section). A Foley catheter should be placed for at least 3 days to prevent fistula formation in the case of prolonged obstructed labor, and a methylene blue test can be performed if damage to the urinary system is suspected [6].

Delivery of a Neonate

Normal Vaginal Delivery

If available, prepare for delivery by wearing eye protection, boots, and a gown. Clean hands with antiseptic or soap and water, and put on sterile gloves. If possible, place a sterile drape underneath the woman's buttocks and have a sterile towel available for delivering the fetus. Prepare the instruments, which should include four clamps, bandage scissors, suture scissors, needle driver, either 2–0 or 3–0 vicryl or polysorb suture, 4–0 vicryl or polysorb suture, ring forceps, and tissue forceps.

To deliver the fetus, place two fingers on the head to maintain flexion and control the speed of delivery. Use the other hand to place pressure on the perineum to help mitigate tears. As the head delivers, allow extension and restitution (external rotation of the head) to occur naturally before palpating around the neonate's neck for the presence of a cord. If there is cord around the neck (nuchal cord), first attempt to reduce it: gently pull it away from the neck, over the head, and in front of the baby. If the cord can only be loosened, this should enable you to deliver by pushing the cord over the shoulders as the fetus is delivered. In the case of a very tight nuchal cord, it should be clamped and divided.

Following external rotation of the head, hands should be placed laterally on each side of the head and gentle downward traction applied until the anterior shoulder delivers. Once this has occurred, the head and trunk can be pulled upward to facilitate delivery of the posterior shoulder. Support the head with one hand and use the other to

contain the neonate's arms and legs so as to minimize trauma to the birth canal and perineum. If the neonate has good muscle tone, color, and is breathing, s/he can be given directly to the mother. The umbilical cord should be doubly clamped and divided.

Give the mother 10 IU oxytocin intramuscular or per IV-drip to allow the uterus to contract well after the delivery. Misoprostol can be given buccally or rectally (600 mcg) if oxytocin is unavailable [6]. The uterus can be stimulated to contract by rubbing the uterus abdominally. To deliver the placenta, clamp the cord close to the perineum and apply gentle downward traction while placing a hand just above the pubic symphysis to provide resistance against inversion of the uterus. Maintain constant pressure and reclamp close to the perineum as lengthening occurs. When the placenta is visible at the introitus, use both hands to twist the placenta to allow the membranes to deliver intact. Apply fundal massage to aid with contraction. If the fundus is not firm, bimanual massage can be performed by placing one hand in the vagina and massaging the uterus between the abdominal and vaginal hands (Fig. 17.10). Inspect the cervix, vagina, and perineum for lacerations and repair as necessary to provide tissue reapproximation and hemostasis (see "Laceration Repair" section). After the uterus has contracted, the placenta should be inspected to ensure that the maternal side of the placenta has no missing parts that may lead to a delayed postpartum hemorrhage.

Breech Delivery

Local midwifes are often experts at vaginal breech deliveries and extractions. The difference between a vaginal breech delivery and a breech extraction is that a breech delivery occurs with as little touching as possible, while an extraction requires that the feet of the fetus are grabbed and pulled down. Extractions are often used to
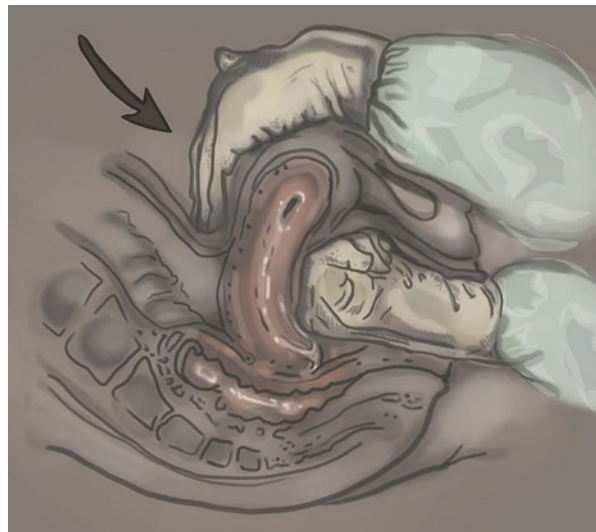

Fig. 17.10 Bimanual massage. Place an abdominal hand at the fundus and one hand vaginally. Aggressively massage the uterus between the two hands to improve uterine tone

quickly deliver a second twin in breech presentation. The surgeon might be involved in breech deliveries when done via cesarean section, which requires the same maneuvers through the hysterotomy. Indications for cesarean section versus vaginal breech delivery attempt depend on the patient's parity, pelvis shape, and fetal size, as well as the progress of labor – judgment that is not easily acquired by reading a textbook. In both situations, gentle traction can be applied at the hips or the shoulders, but never around the abdomen or chest. Three other essential keys to elegant delivery of the fetus are the following: (1) keep the sacrum anterior; (2) when the scapula are seen, swipe the arms anteriorly and downward by sliding your fingers along the scapula, shoulder, and humerus to pull only when the elbow is reached; and (3) to deliver the head, apply suprapubic pressure (or, for a cesarean section, pressure above the hysterotomy), rather than traction on the fetal body (Fig. 17.11) [5].

Shoulder Dystocia

During a vaginal delivery, if the body does not easily follow delivery of the head, impaction of the shoulder behind the symphysis or sacral promontorium has likely
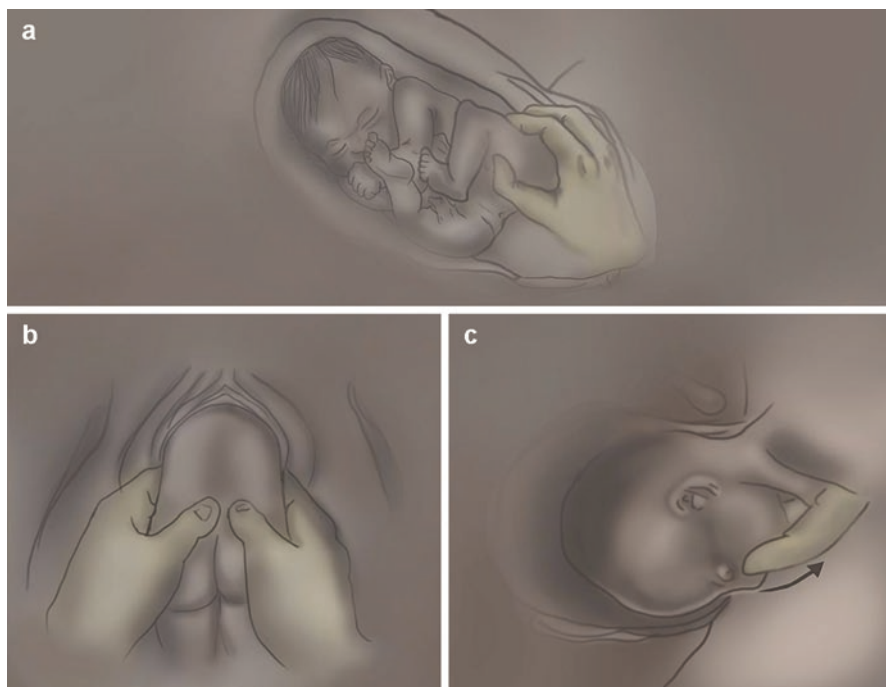

Fig. 17.11 Breech delivery. (**a**) Grasp fetal thigh and apply pressure to popliteal surface to flex knee and deliver leg. (**b**) Place thumbs on the sacrum and fingers along the iliac crest and apply gentle downward traction until scapulae can be seen. (**c**) Place index and middle finger on the maxilla to flex the head and avoid hyperextension injury
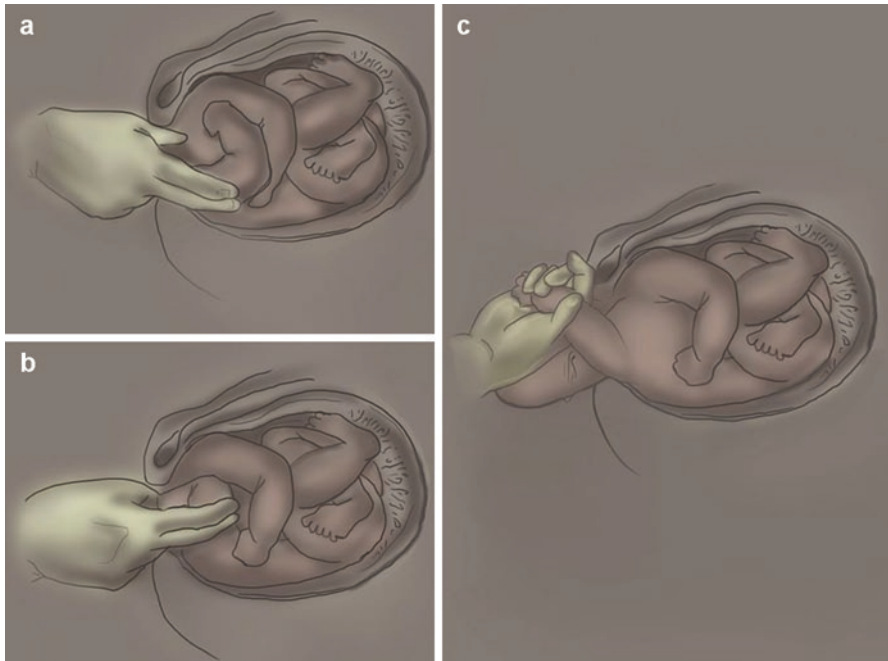
Fig. 17.12 Shoulder dystocia maneuvers: delivering the posterior arm. (**a**) Identify the posterior arm with two fingers. (**b**) Flex the elbow and apply pressure toward midline. (**c**) Deliver posterior arm through vagina

occurred. A dystocia should be anticipated if there is retraction of the head after crowning has occurred. Ensure that the mother's bladder is empty. Let her stop pushing and first, attempt the McRoberts position by flexing the mother's thighs in a cephalad direction. Apply suprapubic pressure directly above the pubic symphysis, onto the posterior aspect of the anterior shoulder to rotate it beneath the pubic bone. If this does not work, any of the following techniques may be used at the provider's discretion [5]: (1) Deliver the posterior arm: Insert two fingers along the posterior arm to locate the elbow. Flex the elbow and sweep the forearm across the chest to bring the arm through the vagina. (2) Rubin: Grasp either shoulder posteriorly and rotate it toward the chest. (3) Woods corkscrew: Grasp the posterior shoulder anteriorly and rotate it 180° so it becomes the anterior shoulder. (4) Gaskins: While the patient is on her hands and knees, apply gentle downward pressure to deliver the posterior shoulder. (5) If none of the above work, the same things can be done again, as they may be effective upon second attempt. (6) Clavicle fracture: Pull the clavicle of the anterior shoulder outward from the chest. Although this method sounds horrible, unintended clavicular fractures during birth are common and no further management is indicated, even when the fracture is displaced (Fig. 17.12). (7) A last resort is the Zavanelli: The fetal head is pushed back into the pelvis following the cardinal movements in reverse order so that the fetus can be delivered via cesarean section. The reversed cardinal movements include (1) external rotation

back to occiput anterior (OA), (2) flexion (bring the chin of the baby to the sternum), and (3) internal rotation to replace the occiput in line with the fetal back.

Vaginal Delivery of Multiples

A multiple gestation should be suspected when the uterus is abnormally large, when multiple heads are felt on palpation, or when multiple fetal heartbeats are heard by doppler. The diagnosis can be confirmed with ultrasound.

Place an IV when the woman presents in labor. If the first twin is in breech presentation, deliver by cesarean delivery. After delivering the first twin, ensure that a clamp remains on the placental side of the umbilical cord and do not try to deliver the placenta as this will compromise the second twin. If the second twin descends with the head first, delivery can continue as previously described for a normal vaginal delivery. Oxytocin infusion can be titrated up if contractions have not resumed 15 min after the first delivery. If the second twin is transverse or breech, then a breech extraction can be performed by grasping both feet of the fetus and delivering the neonate with the maneuvers described above (see "Breech Delivery" section) [5].

Operative Delivery

The term "operative delivery" indicates assistance of the delivery with a vacuum or forceps. Indications for operative delivery include prolonged second stage of labor (pushing more than 2 h), fetal distress, and difficulty with extraction during cesarean section [8]. Contraindications to an operative delivery generally include malpresentation (transverse, face, chin posterior, or brow presentation), head not engaged (head station higher than −2 cm from the ischial spines), cervix not fully dilated, and prematurity. (Expert providers may use forceps to deliver a premature neonate [5].) The key to operative deliveries is the knowledge of the position of the fetal head (occiput anterior or posterior and not more than 45% angled to transverse) and an estimation of whether this fetus will be able to fit through the pelvis or not.

Before use of a vacuum, ensure the mother's bladder is empty. The technique is similar with a reusable metal vacuum or a disposable handheld Kiwi ® vacuum. Apply the suction cup to the fetal scalp, with the center of the cup placed 3 cm from the posterior fontanelle. Ensure that no vaginal or cervical tissue is under the cup. Pump to a pressure of 0.2 kg/cm^2 (the pressure will be indicated on the device), check again for entrapped maternal tissue, then resume pumping to reach a maximal pressure of 0.8 kg/cm^2. Traction should be applied during a contraction while the woman is pushing. The vector of traction is perpendicular to the plane of the cup, so initially there should be downward traction to allow the fetal head to come through the pelvic outlet, and as the fetal head extends, traction becomes more horizontal. Do not attempt more than three trials of traction (during three contractions), and do not apply suction for more than 30 min. If the vacuum fails, perform a cesarean section [8].
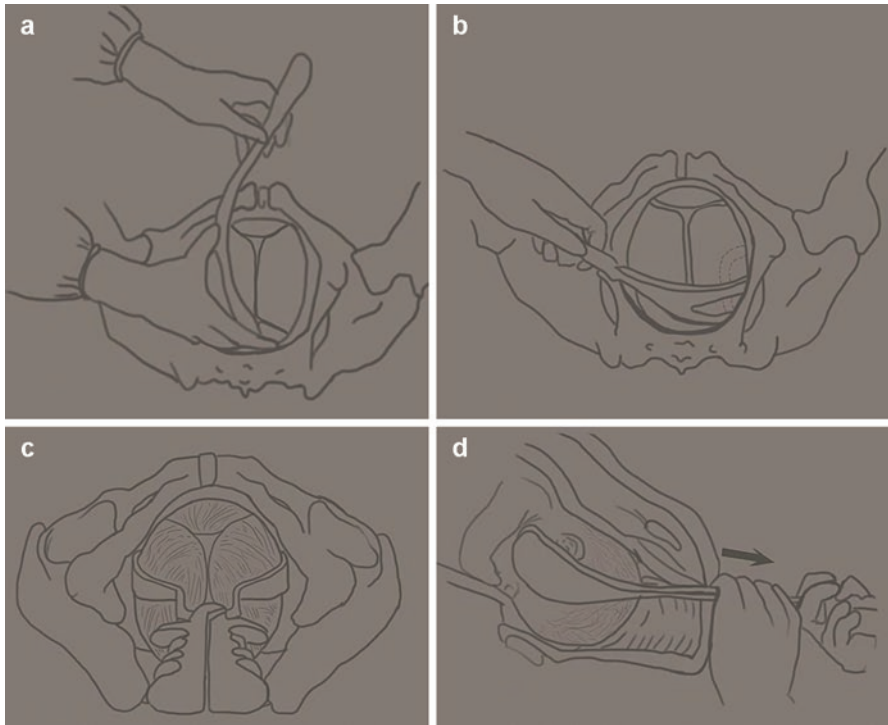
Fig. 17.13 Forceps delivery. (**a**) Place the blade posteriorly while protecting maternal tissue. (**b**) Rotate the blade along the fetal scalp such that the shank is in the same plane as the sagittal suture. (**c**) Once placement of both blades is correct, the shanks should interlock in the same plane as the sagittal suture, with the blades perpendicular to the sagittal suture. (**d**) Apply traction downward as the pelvic outlet is navigated, then horizontally as the head extends

Forceps delivery is associated with more maternal morbidity, including fourth-degree lacerations. There is more technique required to place the blades than there is to perform a vacuum delivery. Further, there are several kinds of forceps and specific instruments are preferable for certain clinical presentations. All forceps have three parts: (1) the blades, (2) the joint or lock, and (3) the shank. Practice the placement first to make sure you understand how the joint comes together (e.g., locking or sliding). Before use of forceps, ensure the mother's bladder is empty. Understand the position of the fetus, as the blades are placed parallel to the sagittal suture of the fetal head (occiput can be anterior or posterior). Place the forceps blades while protecting the maternal vaginal tissue by placing the entire hand on the maternal sidewall as the blade is placed. The blade should slide easily without resistance. The first blade is placed and then held by an assistant. The second blade is placed in a similar manner and the shanks should then be perpendicular to the sagittal suture with the posterior fontanelle centered between the blades [6] (Fig. 17.13). Thereafter, similar traction techniques apply to the forceps as to the vacuum. If the fetal head is not descending after three contractions with traction and pushing, a cesarean section should be performed.

Episiotomy

While generations of midwives and doctors have been trained to perform an episiotomy for every nulliparous woman, the current standard is to avoid this, since a tear is less painful and results in less pelvic organ prolapse in the long term. However, an episiotomy is useful if a tight perineum is impeding delivery and the fetal heart tones indicate fetal distress.

Anesthetize the area with 1% lidocaine. While the fetal head is visible during a contraction, place two fingers in the vagina between the head and perineum. Use scissors to make a single incision between your fingers. Incisions should be either 2–3 cm posteriorly at the 6 o'clock position (midline episiotomy), or 3–4 cm mediolaterally, toward the ischial tuberosity. The midline episiotomy allows for better healing, but has a greater risk of extension into the external anal sphincter or rectal mucosa, which causes more long-term maternal morbidity. The mediolateral incision will give more space and has less risk of extension toward the rectum, but is more difficult to repair and may be more painful. Pressure should be applied to the episiotomy between contractions to minimize bleeding. The repair is similar to that of a laceration repair (see "Laceration Repair" section below). Compared to repairing a natural tear, the episiotomy may have more clearly delineated tissue planes; however, it is associated with more bleeding [5].

Laceration Repair

Lacerations of the birth canal can be seen at the cervix, vaginal walls, labia, or the perineum. Repair is indicated for both hemostasis and cosmesis. Cervical lacerations often do not require repair unless bleeding is present. The most difficult aspect of the cervical tear repair is adequate visualization, and therefore this repair sometimes requires an operating room and sedation or spinal anesthesia. During transit to the operating room, a ring forceps can be placed on the laceration to maintain hemostasis. To accomplish the repair, use vaginal retractors to assist with visualization and provide traction with ring forceps on each side of the tear and Sew with an absorbable suture from above the apex of the tear toward the distal end of the cervix using locking sutures [5].

Vaginal tears need repair for hemostasis. Infiltrate the area in need of repair with 1% lidocaine. Start just above the apex for good hemostasis and use an absorbable suture with a running-locking suture technique. Ensure that the repair does not leave a potential space that can lead to a vaginal hematoma, which can easily accumulate 1 liter before being noticed. A vaginal hematoma should be suspected if the woman complains of rectal pressure. Perform a rectal exam to ensure no sutures have penetrated the rectum during the repair. If this has occurred, they will need to be removed to prevent fistula formation [5].

Labial lacerations need repair if they are causing bleeding or if the tissue does not naturally reapproximate. Infiltrate the area with 1% lidocaine. Use a smaller suture, preferably a 3–0 or 4–0 with a small needle. Interrupted sutures are often preferred as postpartum swelling may occur.

Perineal tears are vaginal tears that extend into the perineum. These three-dimensional tears can be difficult to repair if unfamiliar with the anatomy. First- and second-degree perineal tears do not involve the anus or rectum and can be closed with 2–0 absorbable sutures. Place the first stitch at the apex and suture the vagina to the hymenal ring in a running locked fashion, ensuring that the deep tissue is included to avoid vaginal hematomas (Fig. 17.14a). Place a stitch to reorient the plane of the repair such that the new plane is perpendicular to the previous plane. The perineum can then be closed in running fashion or with individual stitches thrown in the horizontal plane (Fig. 17.14b). Caution should be undertaken so as not
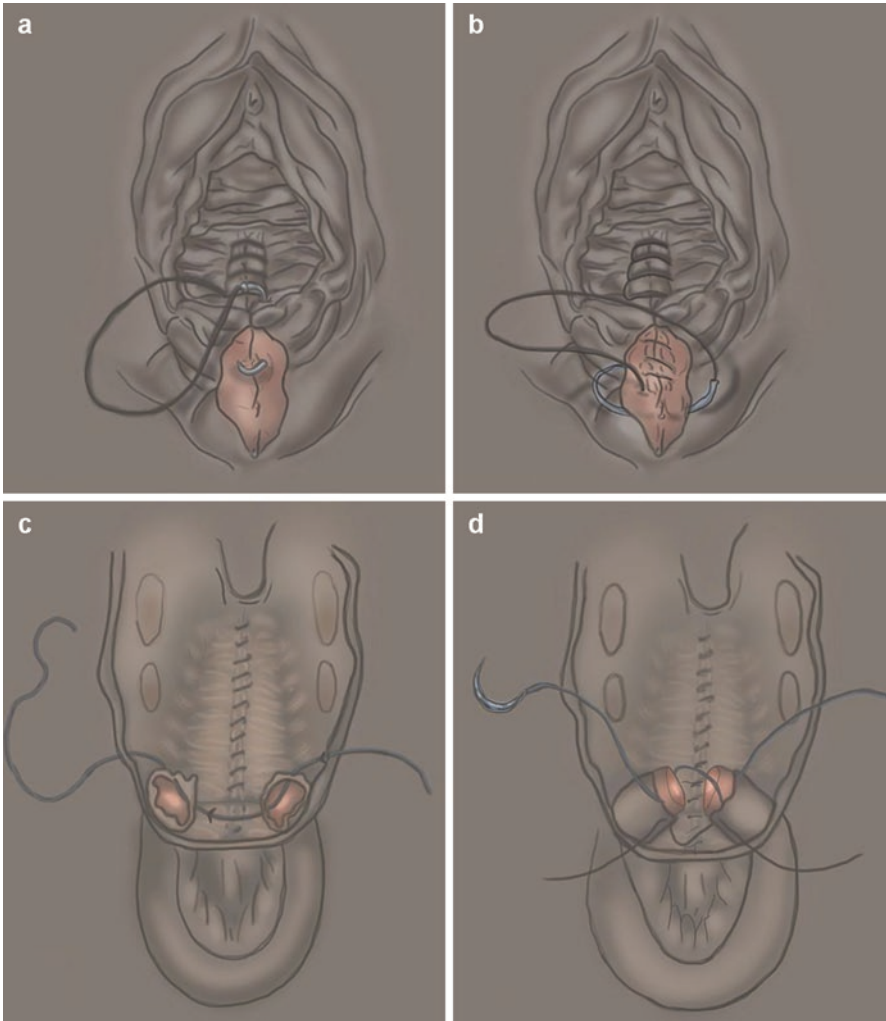

Fig. 17.14 Laceration repair. (**a**) Stitch in running, locked fashion along the vaginal plane to the hymen, then throw a stitch to switch to the perpendicular plane. (**b**) Stitch the perineum in running fashion. (**c**, **d**) For third-degree lacerations, identify the ends of the sphincter and ligate them together with interrupted sutures placed posteriorly, then inferiorly, superiorly, and, finally, anteriorly

to penetrate the rectum. Finally, the skin of the perineum can be closed using a running subcuticular stitch.

Third-degree perineal tears involve the anal sphincter (which is red and fleshy and results in deformation of the anus). The ends of the sphincter muscle can be grasped with Allis clamps and interrupted sutures should be placed at 3, 6, 9, and 12 o'clock positions through the capsule. The simplest repair is accomplished by reapproximating the sphincter muscle fibers together in the following order: posterior, inferior, superior, and finally, anterior (Fig. 17.14c, d). Fourth-degree perineal lacerations also involve the rectal mucosa (smooth and white), which should be repaired with a fine (4–0) suture in running or locking fashion. This is followed by repair of the anal sphincter. The technique for the remainder of the third and fourth degree tears is similar to that performed for a second-degree tear.

> *The Essentials*
> *Absolute indications for a cesarean section include:*
> - *Fetal malpresentation (transverse lie, large infant in breech, first twin breech)*
> - *Cephalopelvic disproportion*
> - *Placenta previa*
> - *Failed operative delivery*
> - *Arrest of dilation*
> - *Prior vertical uterine scar (from myomectomy or classical cesarean delivery), three or more low segment transverse cesarean sections*
> - *Severe antepartum bleeding with signs of shock*
> - *Uterine rupture*
> *Relative indications include:*
> - *Arrest of labor*
> - *Abnormal fetal heart rate*
> - *Multiple gestation*

Cesarean Section

> **The Essentials**
> - *In limited-resource settings where family planning and surgical resources are scarce, it is important to avoid incisions in the active segment of the uterus unless absolutely necessary.*

To perform a cesarean section, enter the abdomen with either an infraumbilical midline vertical or Pfannenstiel incision. A midline vertical incision is preferable if the case is emergent, more operating space is needed, or access to the upper abdomen might be indicated. A Pfannenstiel incision is a 10–12 cm incision 2–3 cm above the pubic symphysis, with the lateral edges of the incision curving slightly superiorly. Using a Bovie or blade, extend the incision deeply through the

subcutaneous layer until the fascia is visible. Incise the fascia at the midline with the knife or Bovie and extend with scissors transversely on both sides. Clamp two Kocher clamps to the superior edge of the fascia on either side of midline and apply traction so the fascia can be bluntly dissected from the rectus muscle and the midline can be separated with mayo scissors; repeat this on the inferior side of the fascia. The muscle can then be bluntly separated at the midline and the peritoneum identified. Peritoneal entry can be achieved bluntly or by elevating it with hemostats and incising with a knife or Metzenbaum scissors. The peritoneum can then be stretched laterally to allow better access. When performing a Pfannenstiel for uterine or adnexal surgery, use a self-retaining retractor and pack the bowel cranially. When using a Pfannenstiel for a cesarean section, use a bladder blade to retract the bladder from the site where the hysterotomy needs to be made.

The uterus should be incised transversely in the lower uterine segment, if possible. The lower uterine segment is a layer of thinner muscle fibers, abundant elastic tissue, and fewer large blood vessels. Therefore, it carries a lower risk of intraoperative bleeding, is easy to repair, and is less likely to result in uterine rupture during a subsequent vaginal delivery. An incision in the active uterine segment is prone to bleeding and requires a multilayer closure of the thicker tissue. Further, the woman will have up to a 10% chance of uterine rupture during a subsequent delivery. Therefore, in limited-resource settings where family planning and surgical resources are scarce, it is important to avoid incisions in the active segment unless absolutely necessary. Extension to the active segment may be required if an incision in the lower segment cannot accommodate delivery of a neonate. A classical incision is a vertical incision that starts inferiorly and may reach the fundus or beyond. It may be indicated for a bladder adherent to the lower uterine segment, fibroids, abnormal placentation, or preterm cesarean sections for small fetuses [5].

Before making the hysterotomy, identify the lower segment by palpation, noting the difference in texture as described above. The peritoneum overlying the lower uterine segment can be easily lifted, whereas, at the active segment, the peritoneum is more adherent to the uterus. A "bladder flap" can be created by incising the loose peritoneum transversely with scissors and then bluntly releasing it from the lower uterine segment. A bladder blade can then be used to retract the bladder out of the operative field. (The bladder blade can also be inserted without first creating a bladder flap.) A transverse uterine incision should be made with a scalpel without too much pressure so as not to injure the neonate. Upon entering the uterine cavity, membranes or amniotic fluid will be apparent. Remove the scalpel from the field and extend the incision laterally with cephalocaudad traction. Bandage scissors may also be used to extend the incision superolaterally while carefully holding your fingers under the scissors to avoid cutting the fetus. Extending the incision too much superiorly will enter the active segment, while lateral extension risks lacerating the uterine vessels.

To deliver the infant, a hand should be placed between the head and the lower uterine segment under the pubic symphysis. Then push the head up and flex it toward the hysterotomy. While fundal pressure is applied, the head is guided through the incision. Twenty units of oxytocin should then be given at 10 ml/min to help the uterus contract. After clamping and cutting the umbilical cord, hand the baby to the

nurse. Fundal massage is applied intra-abdominally, while gentle traction is applied to the cord to help detach the placenta and deliver it through the uterine incision. The uterine cavity should then be inspected and either wiped with sponges or suctioned to ensure all products of conception and membranes have been removed. Ring forceps can assist in identification of the edges of the hysterotomy and help tamponade bleeding.

The hysterotomy is closed with 0- or 1–0 absorbable or delayed-absorbable sutures in running-locking fashion, starting just lateral to the hysterotomy and ensuring the entire myometrium is included. Vertical uterine incisions can be closed with running stitches using 0- or 1–0 chromic catgut or vicryl in two or three myometrial layers and a serosal layer run with 2–0 chromic catgut [5]. If there was meconium or chorioamnionitis, copiously irrigate and suction the cul-de-sac and paracolic gutters. After inspecting carefully for hemostasis, the fascia can be closed in customary fashion with 0 PDS or 0 vicryl. The subcutaneous layer can be reapproximated with interrupted sutures using 3–0 vicryl; do this for subcutaneous layers >2 cm to prevent seroma formation or for cosmesis. The skin can then be closed with subcuticular stitches using 4–0 monocryl or staples.

Postpartum Hemorrhage

Postpartum hemorrhage is defined as blood loss greater than 500 cc for vaginal delivery and greater than 1 L for a cesarean section. It is one of the most common causes of maternal death in limited-resource settings. A large proportion of hemorrhages can be prevented by standard administration of postpartum IV or IM oxytocin. The differential diagnosis of postpartum hemorrhage includes (1) uterine atony, (2) retained placenta, membranes or clots, (3) cervical laceration, and (4) vaginal lacerations/episiotomy.

Uterine Atony

Uterine atony and subsequent bleeding should be expected if a uterus is largely distended prior to delivery (e.g., twin gestation, polyhydramnios, large fetus), there is either a prolonged or very quick delivery, or there are retained products of conception. Bladder distention can also cause uterine atony [5].

To manage atony, place a Foley to drain the bladder, apply fundal massage through the abdomen, or perform bimanual massage (see "Normal Vaginal Delivery" section). If the uterus still does not firm up, the following additional uterotonics can be given in addition to the standard 10 unites of oxytocin: (1) Methergine 0.2 mg IM (contraindicated if hypertension or prior to delivery of the placenta); (2) misoprostol, up to 1,000 mcg rectally or buccally; (3) Hemabate 250 mg IM or IV; and (4) oxytocin drip (30 U in 1 L to run for 2 h, followed by 30 U in 1 L to run for another 12–20 h, if needed) (Table 17.2). These medications can be given successively if needed. The uterus can also be tamponaded with packing, a Foley bulb, or Bakri

Table 17.2 Uterotonics to treat postpartum hemorrhage

Medication	Dosage	Administration	Dose frequency	Contraindications	Side effects
Oxytocin (Pitocin)	10–80 IU	IV drip in 1 L of LR; IM as bolus	Continuous drip	None	Hyponatremia
Methylergonovine (Methergine)	0.2 mg	IM; intrauterine; PO	Every 2 h	Hypertension, (pre)eclampsia	Hypertension
15-methyl prostaglandin F2α (Hemabate)	0.25 mg	IM; intrauterine	Every 15 min (maximum of 8 doses)	Active cardiac, pulmonary (asthma) or hepatic/renal disease	Diarrhea, nausea
Misoprostol (Cytotec)	600–1,000 mcg	PR; buccal	Single dose	None	Fever, nausea

balloon inflated in the uterine cavity [6]. The placenta should always be assessed for missing parts, and if retained products are suspected, a manual swipe through the uterus may reveal and remove them. A curettage (see "Care for Miscarriages" section) is indicated if attempts at manual extraction are unsuccessful.

In the event that the entire placenta cannot be delivered, manual removal might be required. The surgeon will need a long glove (preferably up to the elbow) and should then insert the whole hand up to the fundus, guided by the umbilical cord. When the placenta is reached, find an edge of it and then dislodge the placenta by sweeping behind it. Manual removal will increase the risk of infection, so prophylactic broad-spectrum antibiotics should be given. If the uterus has already clamped down around the placenta, nitroglycerine (sublingual or IV 50–100 μg) can be given. It has a profound relaxing effect on the uterus and its onset of action is very quick (30–90 s), while the half-life is short (approximately 3 min). If nitroglycerine is unavailable, tocolytics might be given (Table 17.1); however, these are associated with a greater risk of hemorrhage. While the uterus relaxes, the placenta can quickly be removed and uterotonics can then be given to prevent further postpartum hemorrhage (Table 17.2) [5, 6].

In rare instances, controlling postpartum hemorrhage requires surgical maneuvers. If the bleeding is profound, compression of the abdominal aorta should be attempted at the bedside while preparing for an exploratory laparotomy [6] (Fig. 17.15). If the bleeding is emanating from the uterine vessels, an O'Leary stitch can be placed. An O'Leary stitch goes through the broad ligament and the uterus to ligate the uterine artery (Fig. 17.16). This can be attempted at multiple locations along the artery with care not to sever the venous vessels, which are large and friable in pregnancy and the immediate postpartum period. If this is unsuccessful, hypogastric artery ligation may also be attempted [5].

If hemorrhage is due to severe atony and not responding to the above measures, a B-Lynch stitch can be performed with a large needle and #2 chromic or vicryl suture (Fig. 17.17) [5, 6]. Pierce the myometrium below the hysterotomy and enter the uterine cavity, exiting above the hysterotomy. Travel around the fundus and pierce the posterior myometrium in a transverse direction. Then, come back over the fundus and enter the uterine cavity from above the hysterotomy and exit below. Finally, bleeding that cannot be controlled with any of the above techniques

Fig. 17.15 Aortic
compression. Apply firm,
direct pressure to the aorta
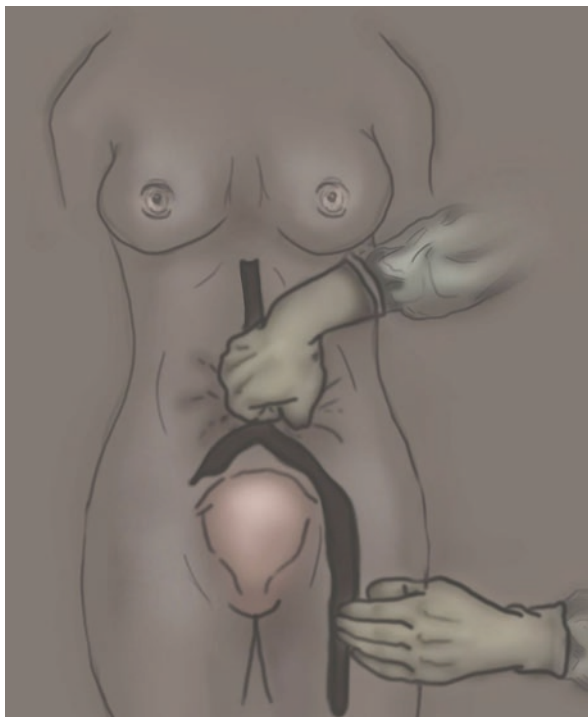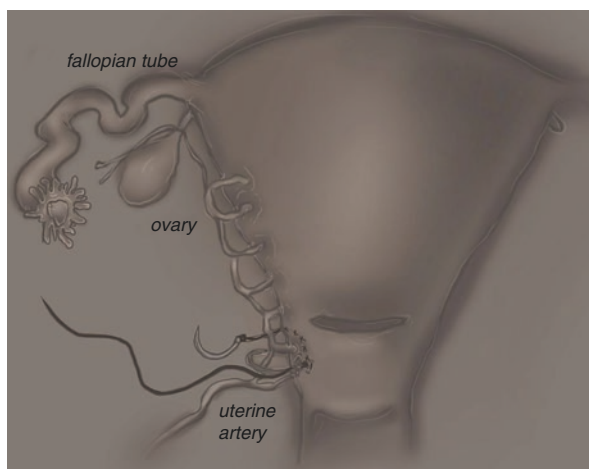until exploratory
laparotomy can be
performed

Fig. 17.16 O'Leary stitch.
Place a stitch through the
broad ligament and uterus
to ligate the uterine artery

warrants a hysterectomy (see "Hysterectomy" section). A postpartum hysterectomy may be especially difficult secondary to the increased vascularity, and consideration should be given to a supracervical hysterectomy for speed of the procedure and less risk of injuring the ureters. The ureters are difficult to identify during an emergency hysterectomy with potential ongoing bleeding [5].

Fig. 17.17 B-Lynch
stitch. Place a stitch
through the myometrium
from below the
hysterotomy, exiting above
it. Then travel around the
fundus, traverse
horizontally on the
posterior surface, and bring
the stitch around the
fundus again, entering the
cavity above the
hysterotomy and exiting
below it to complete the
stitch
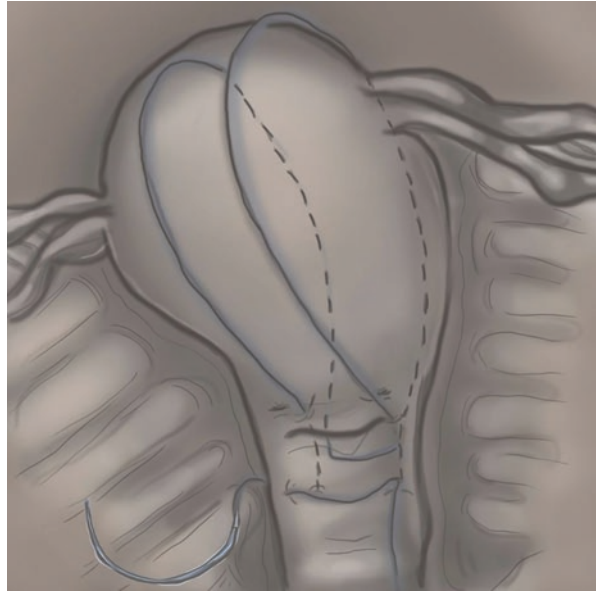
Uterine Inversion

Uterine inversion is an obstetric emergency that should be identified when the fundus
is no longer palpable in the expected location. It may be palpable in the lower uterine
segment or cervix, or it may be visible in the vagina or introitus. The woman may
have profuse bleeding or become quickly unresponsive secondary to shock or pain.

To treat inversion, stop uterotonics (i.e., oxytocin) and attempt rapid replacement
of the uterus by pushing the inverted uterus back into place. If contractions render
this impossible, give terbutaline 0.25 mg IM and/or magnesium sulfate (6 g IV
bolus). If the lower uterine segment is contracting, try nitroglycerin 50–100 μg
IV. In the meantime, administer IV fluids and order blood, since the patient might
experience profound uterine atony [6]. Uterine inversion is often encountered with
a placenta accreta-percreta – in this case, don't try to remove the placenta as this
will increase bleeding. Be ready to perform a laparotomy if the uterus is not able to
be restored, if profound bleeding occurs, or if a placenta accreta-percreta is present.
Once the uterus has been replaced, start uterotonics (Table 17.2).

Placenta Accreta-Percreta

Placenta accreta, increta, and percreta represent a spectrum of progressively severe
invasion of the placenta into the endometrium, myometrium, or beyond the uterus
into adjacent pelvic structures. You should suspect these disorders in the setting of

a placenta previa, prior uterine surgery (e.g., cesarean sections, myomectomies), or a pregnancy presenting with a hemoperitoneum. Placenta accreta may also be suspected from ultrasound imaging when there is sonographic absence of a hypoechoic retroplacental space, when the placenta is contiguous with myometrium, or when placental lakes are prominent and hypervascularity is noted [9].

The placenta will not separate from the uterus in a normal fashion and may therefore require a (partial) hysterectomy. Ideally, delivery should therefore proceed via cesarean section and the placenta should be left in place after delivery of the fetus while a hysterectomy is pursued. However, if anatomical planes are severely distorted, it is wise to leave (part of) the placenta in place if bleeding is controlled and treat the woman postoperatively with methotrexate and oxytocin to allow the placenta to regress secondarily [6, 9].

Most likely, however, placenta accreta-percreta will be encountered during labor when the placenta will not deliver and postpartum hemorrhage is encountered. In this case, the patient should be taken to the operating room immediately for a hysterectomy. Life-threatening hemorrhage is not uncommon (even with advanced surgical planning), as well as disseminated intravascular coagulation and acute respiratory distress [6, 9].

Infections in Obstetrics

Although multiple infections can occur and impact pregnancy, this section will focus on common infections that are important to recognize and treat in a timely manner.

Human Immunodeficiency Virus

Local treatment options and guidelines should be followed when available. The chances of vertical transmission of HIV from mother to child can be reduced significantly by the interventions below. For patients living with HIV who are not on antiviral therapy, 2 mg/kg IV AZT should be administered over 1 h at the time of presentation, followed by 1 mg/kg/h dosing until delivery [10]. Avoid artificial rupture of membranes, operative delivery, and episiotomy if possible. When formula and safe water is available, breastfeeding is not recommended. Otherwise, exclusive breastfeeding for 6 months with abrupt weaning is advised. If antiretrovirals are available, the mother should be referred to a program to ensure compliance with therapy while breastfeeding and availability of prophylactic treatment for the neonate as indicated. A cesarean section could be offered in the setting of a known high viral load; however, this is not 100% protective and must be weighed carefully with the disadvantages of a uterine scar (see "Cesarean Section" section) [6, 8, 10].

Chorioamnionitis

Chorioamnionitis is characterized by fetal or maternal tachycardia during delivery, maternal fever, fundal tenderness, and foul-smelling vaginal discharge. It is treated with ampicillin 2 g IV every 6 h and an initial 2 mg/kg dose of gentamycin followed by 1.5 mg/kg every 8 h [5]. Vaginal delivery is preferred to reduce the risk of endometritis; however, a cesarean section may be considered for worsening maternal or fetal status remote from delivery. Maternal fever should be treated with Tylenol, and IV fluid should be given to account for insensible losses. After expulsion of the placenta and membranes, the infection resolves and there is no need to continue antibiotics unless there is a postpartum fever or the woman delivered via cesarean section. In these instances, antibiotics should be continued for 24–48 h after the last fever or after cesarean section, whichever came last [5].

Endometritis

Endometritis is a polymicrobial infection of the endometrium and is diagnosed postpartum by fever, fundal tenderness, and foul-smelling lochia. The treatment is ampicillin 2 g IV every 6 h, gentamycin 5–7 mg/kg every 24 h, and clindamycin 600–900 mg IV every 8 h (or flagyl 500 mg IV every 8 h) until the patient is afebrile for 24–48 h [5, 6].

Mastitis

Mastitis should be suspected when a hard, red, tender area develops in one breast. Nonsteroidal anti-inflammatory drugs, heat packs, and continued breastfeeding are beneficial. Treatment should cover staphylococcus and may consist of 7–10 days of dicloxacillin 500 mg four times daily, Keflex 500 mg four times daily, Augmentin 875 mg twice daily, or 10–14 days of clindamycin 600 mg four times daily [11]. If there is no clinical response to antibiotics, suspect an abscess, which requires drainage. Pain control is very important in order to continue breastfeeding.

Conclusion

Knowing when and how to perform basic procedures and surgeries in gynecology and obstetrics is critical for any surgical provider in limited-resource settings. The topics discussed in this chapter represent the bread and butter of emergency obstetric and gynecologic care and encompass the most prevalent causes of maternal morbidity and mortality worldwide. While many of the condi-

tions described require the expertise of a trained surgeon, experienced midwives and obstetric nurses are also invaluable resources as you learn how to provide obstetric care in limited-resource settings. It is important to know where the referral center is and recognize the need for appropriate and timely referral. Nonetheless, with some training and practice, non-obstetric surgeons can become competent at many obstetric and gynecologic procedures, enabling them to provide women and fetuses/neonates with lifesaving care.

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