**Critical Obstetric and Gynecologic Procedures in the Emergency Department**

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**KEYWORDS**
- Labor • Delivery • Episiotomy • Breech presentation • Bartholin abscess

**KEY POINTS**
- The emergency medicine physician should be prepared to manage imminent delivery at any time in the emergency department.
- Malpresentation, shoulder dystocia, or multiple gestation could complicate any delivery in the emergency department. The emergency medicine physician should be familiarized with the different maneuvers, from alleviation of shoulder dystocia to breech delivery maneuvers.
- The emergency department is a dynamic and challenging setting in which time matters; knowledge of and proficiency in the obstetric and gynecology procedures enable physicians to develop strategies to treat patients and the complications.

**OBSTETRICS PROCEDURES**

**Labor**

Active labor is defined by consecutive, rhythmic, involuntary uterine contractions that result in dilation and effacement of the cervix.\(^1,2\) Active labor is divided into 3 stages. The first stage begins when uterine contractions have sufficient frequency, intensity, and duration to result in effacement and progressive dilation of the cervix, and ends when the cervix is fully dilated (10 cm) to allow passage of the fetal head (Fig. 1).\(^3\) The second stage begins when full cervix dilation is achieved, and ends when the fetus is delivered. The third stage begins when the fetus is separated from the mother, and ends with placenta delivery.

**Evaluation**

On arrival of the patient to emergency department, the evaluation begins with an adequate history and physical examination. Pertinent information to obtain includes...
frequency of contractions, vaginal discharge or bleeding, and prenatal history. In addition, a focused physical examination is essential to determine the position and presentation of the fetus (Fig. 2).

Fig. 1. Effacement of the cervix; (A) 0%, (B) 50%, and (C) 100%. (From Romney S, Gray MK, Little AB, et al [eds]: Gynecology and Obstetrics: The Health Care of Women. New York: McGraw-Hill, 1975; with permission.)

Fig. 2. Different presentations of the fetus. (From Lanni SM, Seeds JW. Malpresentations and shoulder dystocia. In: Gabbe SG, ed. Obstetrics: Normal and Problem Pregnancies. Philadelphia, Elsevier Churchill Livingstone, 2007; with permission.)
Presentation
Presentation (presenting part) refers to which part of the fetus is nearest to or foremost in the birth canal. To determine the presenting part, a sterile vaginal examination should be performed. Head, buttocks, or feet could be the presenting part. However, if the fetus is in transverse lie, the presenting part is the shoulder (Table 1).

Next, the position of fetus should be determined, which is identified by the relationship of the presenting part to the birth canal. This evaluation is performed by palpating the abdomen using Leopold maneuvers (Fig. 3).

Vaginal examination
The patient should be examined in a lithotomy position. Unless excessive blood is evident, a manual vaginal examination is indicated. The vulva and perineal area should be prepared for evaluation by cleaning the area with gauze soaked in providone-iodine.4,5 The index and middle fingers of the nonsterile gloved hand should be used to expose the vaginal opening to avoid sterile-gloved fingers touching the labia. The sterile-gloved hand should then be used to examine the cervix.

Effacement, which ranges from 0% through 100%, should be assessed by palpating the cervix (see Fig. 1).5 Cervical dilation is then determined by estimating the average diameter of the cervical os using the examiner fingers. Cervical dilation is expressed in centimeters, with 10 cm indicating full dilatation. Once the cervix is examined, the position of the fetus head with respect to the ischiatic spine should be determined.

Position
Zero station refers to when the infant’s head is located between both ischiatic spines. The station should increase as the head reaches the birth canal, from −3 (head is above ischiatic spines) to +3 (just before crowning). A new station classification based on a scale of −5 through +5 also has been described in more recent literature, as shown in Fig. 4.6

Emergent Vaginal Delivery
Precipitous delivery in the emergency department is uncommon because most patients in active labor are immediately transported to the labor and delivery room for evaluation. However, emergency department physicians may sometimes need to manage an emergent delivery. Once the patient has arrived to the emergency department, the physician should perform the examination as discussed unless evidence of bleeding is present, in which a focused assessment of the vulvar area is strongly recommended. While the patient is being examined, obstetric and pediatric consults should be requested without delay.7 The patient should then be placed in the lithotomy position. If the head is visible in the vaginal outlet or the vulvar area encircles the fetal head (crowning), the physician should prepare for imminent emergent delivery.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Types of presentation</th>
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</thead>
<tbody>
<tr>
<td>Cephalic</td>
<td>Relation of fetal head to the body as fetus flex the neck</td>
</tr>
<tr>
<td>Vertex</td>
<td>Occipital fontanelle is palpated</td>
</tr>
<tr>
<td>Face</td>
<td>Palpate frontal fontanelle</td>
</tr>
<tr>
<td>Breech</td>
<td>Presenting other part than head</td>
</tr>
<tr>
<td>Frank</td>
<td></td>
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<tr>
<td>Complete</td>
<td></td>
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<tr>
<td>Footling</td>
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<td>Incomplete</td>
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Fig. 3. Leopold maneuvers. (A) First palpate the fundus part, (B) then palpate the lateral abdomen to find the fetus back, (C) then palpate the other lateral parts, (D) then palpate the presenting part. (From Desai S, Henderson O, Mallon WK. Labor and delivery and their complications. In: Marx JA, Hockberger RS, Walls RM, et al, editors. Marx: Rosen’s emergency medicine. 7th edition. Elsevier; 2010. p. 2327–47; with permission.)

physician should be aware that an episiotomy cannot be performed in this situation, because it will cause perineum tearing.5,6

Every emergency department should be prepared for emergent vaginal deliveries, including maintaining ready access to the adequate equipment (Box 1). The delivery should be performed using the Ritgen maneuver (Fig. 5). Once the fetus head is crowning and the diameter of introitus is opened more than 5 cm, the gloved hand might be draped with a towel to avoid the fetal face coming in contact with the mother’s anus.5,8 Then, forward pressure should be placed on the fetal chin with one hand, and pressure put over fetal occiput with the other. This maneuver will avoid “popping,” and the physician will maintain control of the delivery. The neck extension is favored, allowing the head delivery to be slow; the occiput passes through the symphysis pubis, and the face and anterior fontanelle pass over the perineum (see Fig. 5).5,7,8
After the head is completely outside the vagina, immediate clearing of nasopharynx should be performed before the rest of the body is delivered\textsuperscript{5,7,8} to prevent aspiration. For clearing the nasopharynx, the physician may use an infant nasogastric tube (5 French) attached to a syringe, or a suction bulb. The infant should be checked for

![Diagram](image)

**Fig. 4.** Station of the fetus. (From Lanni SM, Seeds JW. Malpresentations and shoulder dystocia. In: Gabbe SG, ed. Obstetrics: Normal and Problem Pregnancies. Philadelphia, Elsevier Churchill Livingstone, 2007; with permission.)

<table>
<thead>
<tr>
<th>Box 1</th>
<th>Equipment for emergent vaginal delivery</th>
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<tbody>
<tr>
<td></td>
<td>Sterile gloves</td>
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<tr>
<td></td>
<td>Sterile gown</td>
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<tr>
<td></td>
<td>Towels</td>
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<tr>
<td></td>
<td>Hemostats</td>
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<tr>
<td></td>
<td>Placenta basin</td>
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<tr>
<td></td>
<td>Cord clamps\textsuperscript{2}</td>
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<tr>
<td></td>
<td>Surgical scissors</td>
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<tr>
<td></td>
<td>Suction bulb</td>
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<tr>
<td></td>
<td>Infant nasogastric tube</td>
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<tr>
<td></td>
<td>Syringes</td>
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<tr>
<td></td>
<td>Neonatal air bag</td>
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<tr>
<td></td>
<td>Needles</td>
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<td></td>
<td>Gauzes</td>
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<td></td>
<td>Neonatal warmer</td>
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</table>

After the head is completely outside the vagina, immediate clearing of nasopharynx should be performed before the rest of the body is delivered\textsuperscript{5,7,8} to prevent aspiration. For clearing the nasopharynx, the physician may use an infant nasogastric tube (5 French) attached to a syringe, or a suction bulb. The infant should be checked for
meconium aspiration and the amount should be recorded. If meconium is obtained, suction should be established and pediatrics consulted.5

Once the head is delivered and nasopharynx cleared, the physician should use a finger to examine the exterior neck for the umbilical cord (Fig. 6). If the cord is present about the neck, the finger should be placed between the neck and umbilical cord for detangling. The umbilical cord may pass over the infant’s head easily, but sometimes the nuchal cord is too tight. In this case, the umbilical cord should be clamped on 2 sides and cut in between to deliver the infant promptly.5,8

In most cases, the occiput turns to one side of the mother’s thigh. Then, the shoulders begin to appear at the vulva, and in some cases deliver spontaneously. In other cases, a delay may occur and manipulation should be performed for deliver them. The infant’s head should be grasped with both hands and gently pulled downward until anterior shoulder passes under the pubis. With an upward movement, the posterior shoulder is delivered, followed by the anterior shoulder.5,9 The rest of the body usually follows the shoulder, but if not, moderate traction on the infant’s head and pressure on the uterine fundus allow completion of the delivery. If any traction is needed, it should

Fig. 5. Ritgen maneuver. (From Seils A, et al [eds]: Williams Obstetrics, 22nd ed. New York: McGraw-Hill Medical Publishing Division, 2005; with permission.)

Fig. 6. Assessment of umbilical cord entanglement. (From Probst BD. Emergency childbirth. In: Roberts JR, Hedges JR, eds. Clinical Procedures in Emergency Medicine, 5th ed. Philadelphia: Elsevier 2009; with permission.)
be performed in the long axis of the infant’s neck, and placing a finger below the axilla should be avoided because brachial nerve injury may occur. At this time, the second stage of labor ends.

The third stage of labor begins when the umbilical cord is clamped and cut. The clamp may be placed approximately 4 to 5 cm from the infant abdomen. A segment should be reserved for blood gas analysis. Once the umbilical cord is cut, the infant should be placed in a heated unit.

**Placenta delivery**

A gush of blood marks this part of the third stage of labor (Box 2). Bleeding will inevitably occur when the placenta separates from the uterus. This may take up to 5 to 15 minutes after fetal delivery. Once the blood comes out of the vagina, the uterus should be massaged to achieve uterus contraction. The cord may become slack. If the placenta does not descend at this time, manual removal is mandatory.

If the placenta does not descend in more than 5 minutes, the mother will be asked to bear down, cough, or push—maneuvers that increase the intra-abdominal pressure. Meanwhile, the physician should still massage the fundus. Pressure or traction on the umbilical cord should be avoided; the placenta should never be forced to separate. One of the most frightening complications is uterus inversion, which could be caused by forceful placenta separation.

Pressure to the abdomen should be stopped as the placenta is delivered. Careful examination of placenta is mandatory to assess for retained membranes. If any membrane is tearing, it should be grasped with ring forceps and removed with gentle traction.

Oxytocin should be started when the placenta is delivered, which is among the most used agents for myometrium contraction. Its principal indication is myometrium contraction to achieve hemostasis and a well-contracted uterus. Other available agents include ergonovine, methylergonovine. The preferred agent depends on the institution and the timing of administration. Oxytocin infusion should be started after the placenta delivery. Some cases have been reported in which oxytocin was started before delivery because of entrapment of the placenta or because of the possibility that an undiagnosed twin delivery may entrap one of the infants inside the uterus.

The dose for oxytocin is 20 units (2 mL) per liter at a rate of 10 mL/min until the uterus is well contracted and bleeding is well controlled. The infusion rate should be changed to 1 to 2 mL/min until the mother can be transferred to a recovery suite, at which time the infusion should be discontinued. Careful observation should occur through 1 hour after placenta delivery. Bleeding may occur from uterus relaxation; the mother should be examined for vaginal or introitus laceration, which may cause excessive bleeding.

**Episiotomy**

Episiotomy (perineotomy) is an incision on the perineum and the posterior vaginal wall to enlarge the vaginal introitus to facilitate the passage the fetus head. In past

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**Box 2**

**Signs of placental separation**

- Uterus is globular and firmer
- Gush of blood
- Uterus rises in abdomen
- Umbilical cord is slack, farther out of the vagina
decades, it was thought to prevent traumatic vaginal tears during delivery. Among others benefits of the episiotomy procedure, it can minimize compression and fetal head trauma, facilitate the second stage of labor, and remove the resistance of pudendal musculatures.5

Currently, the American College of Obstetrics and Gynecology (ACOG) does not recommend episiotomy as a routine procedure,10 because no evidence shows it enables a better outcome of delivery. Moreover, it is less often performed because of many complications, including bleeding, hematoma formation, third- and fourth-degree lacerations, incontinence, infections, swelling, and dyspareunia.11,12 Thus, the routine episiotomy is no longer recommended, but a selective approach is now encouraged.13 Indications for selective episiotomy14 include breech delivery, preterm labor, and imminent perineal tearing (Box 3).

Two different approaches exist for the incision: midline (median) or mediolateral. Controversy persists regarding which approach is preferable, but mediolateral is still most recommended by the ACOG.10,15 Either way, mediolateral has many disadvantages, including increased blood loss, postpartum discomfort, and dyspareunia. Although median episiotomy has an increase risk of anal sphincter injury, it is reported to have a better healing rate and satisfactory repair in selective cases.11

The median episiotomy can be complicated by traumatic extensions, such as first-, second-, third-, and fourth-degree tears (Fig. 7).

**Technique**

In the vertex presentation, the episiotomy should be performed when the fetal head is distending the perineum 3 to 4 cm with every contraction and the caput is seen through the vagina.5 When the fetus is in the breech presentation, episiotomy should be performed just before the delivery.5,6

As the head is descending through vagina canal, the physician’s index and second fingers are placed in the posterior vaginal fourchette, inside the introitus, and in the perineal area. Using Mayo scissors or blades, a midline incision 3 cm in length is made in the posterior fourchette and extended 6 cm into vaginal mucosa, submucosa, and pubococcygeus muscle (Box 4).5,6 For the median episiotomy, the incision extends until the anal sphincter diaphragm. For the mediolateral approach, the incision is directed downward and outward in the direction of the lateral aspect of the anal sphincter either way left or right, and then extended to the lowermost perineal muscles, the pubococcygeus and bulbocavernosus, including the posterior vaginal fourchette, vaginal mucosa, and submucosa.5

<table>
<thead>
<tr>
<th>Box 3</th>
<th>Indications for selective episiotomy</th>
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<tbody>
<tr>
<td>Preterm labor</td>
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<tr>
<td>Breech delivery</td>
<td></td>
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<tr>
<td>Shoulder dystocia</td>
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<tr>
<td>Rigid perineal muscle</td>
<td></td>
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<tr>
<td>Fetal distress/late decelerations</td>
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<tr>
<td>Perineal tear imminent</td>
<td></td>
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<tr>
<td>Fetal macrosomia</td>
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<tr>
<td>Occipitoposterior presentation</td>
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</table>
Repair
The recommended time for repair of the episiotomy is after infant and placenta delivery. The cervix and vaginal canal should be closely inspected to assess for other causes of bleeding. Bleeding from a vaginal or cervix laceration should be corrected before repair of the episiotomy. Hemostasis should be achieved before suturing, with gauze used to pack the vaginal canal. Ligation of vessels is recommended if necessary for hemostasis. The episiotomy can then be repaired. The authorities recommend 2-0 or 3-0 absorbable sutures (eg, chromic gut or polyglycolic acid). The risk of infection is diminished if the site is adequately prepared and cleaned before the incision is made.

POTENTIAL DELIVERY COMPLICATIONS

Obstetric Vaginal Lacerations

Perineal injuries after birth are a major health problem that affects thousands of women and require special attention. A thorough genital examination is needed to identify this injury and avoid its complications. As many as 91% of women report perineal pain, dyspareunia, sexual dysfunction, or bladder or bowel function disturbances 8 weeks after delivery. More than 60% women experience perineal injury after spontaneous vaginal delivery, and approximately 1000 women per day require perineal repair after vaginal birth.

Maternal factors that may contribute to the extent of trauma during childbirth are ethnicity, age, primiparity, fetal weight greater than 4 kg, prolonged second stage of

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**Box 4**

**Equipment for episiotomy**

<table>
<thead>
<tr>
<th>Equipment</th>
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<tbody>
<tr>
<td>Lidocaine 1% or 2%</td>
</tr>
<tr>
<td>Mayo scissors or blade</td>
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<tr>
<td>2-0 or 3-0 absorbable suture</td>
</tr>
</tbody>
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labor, instrumental delivery, direct occipitoposterior fetal head position, and precipitate delivery. Perineal injuries may occur spontaneously during vaginal birth or from surgical incision made to increase the diameter of the vulva outlet to facilitate delivery. These injuries are classified according to extent, allowing differentiation of those to the external anal sphincter, internal anal sphincter, and anal epithelium (Table 2).18

A complete and careful genital examination should be performed to identify the extent of injury. A rectal examination must be completed to assess for anal sphincter integrity. Third- and fourth-degree perineal injuries must be repaired by an experienced gynecologist under general anesthesia, whereas first- and second-degree perineal injuries can be repaired under local anesthesia.

Repair of the perineum requires good lightning and visualization, proper surgical instruments (Box 5), proper suture material, and adequate analgesia. Some studies recommend the nonsuturing practice for first- and second-degree perineal injuries. The Royal College of Obstetrician and Gynecologist do not favor this practice because it is associated with poorer wound healing and no significant differences in short-term discomfort (level of evidence A).18

First-degree injuries are repaired with an absorbable synthetic material (Vicryl) using a continuous subcuticular technique. Vicryl is associated with less perineal pain, analgesic use, dehiscence, and resuturing compared with catgut sutures (level of evidence A).18

Second-degree injuries require approximation of the vaginal tissues, perineal muscles, and skin. An anchoring suture is placed 1 cm above the apex of the laceration. The vaginal mucosa and underlying rectovaginal fascia are closed using a running unlocked 3-0 Vicryl suture. The sutures must include the rectovaginal fascia. The running suture is carried to the hymenal ring and tied proximal to it. The muscles of the perineal body are identified and approximated with transverse interrupted 3-0 Vicryl sutures. A single interrupted 3-0 Vicryl suture is then placed through the bulbocavernous muscle. When the perineal muscles are repaired anatomically, the overlying skin is closed with 4-0 Vicryl suture in a continuous subcuticular fashion.19

When the wound is contaminated with stools, second- or third-generation cephalosporin may be given before the procedure is started. A rectal examination should be performed after the procedure to ensure that suture material was not accidentally inserted through the rectal mucosa.

**Common pitfalls**

The common pitfalls of vaginal laceration repair include (1) poor genital examination, which leads to missed anal sphincter injuries, and (2) use of catgut sutures, which leads to increased perineal pain, dyspareunia, and wound dehiscence.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Perineal injury classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>First-degree</td>
<td>Involving the perineal and vaginal skin</td>
</tr>
<tr>
<td>Second-degree</td>
<td>Perineal skin and muscle involvement, intact anal sphincter</td>
</tr>
<tr>
<td>Third-degree</td>
<td>Perineal skin, muscle, and anal sphincter are torn</td>
</tr>
<tr>
<td>a. &lt;50% of the EAS is torn</td>
<td></td>
</tr>
<tr>
<td>b. &gt;50% of the EAS, intact IAS</td>
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<tr>
<td>c. Both EAS and IAS are torn, intact anal mucosa</td>
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</tr>
<tr>
<td>Fourth-degree</td>
<td>Perineal skin, muscles, anal sphincter, and anal mucosa torn</td>
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</table>

Abbreviations: EAS, external anal sphincter; IAS, internal anal sphincter.
Breech Presentation

Breech is the most common fetal malpresentation. Breech delivery accounts for approximately 3% to 4% of deliveries and is associated with increased perinatal morbidity and mortality. Breech presentation can be classified as frank, complete, or incomplete (Fig. 8). In frank breech, the fetal legs are flexed at the hips and the knees are extended. In complete breech the legs are flexed at the hips and one or both knees are flexed. Incomplete breech differs in that one or both hips are not flexed, resulting in both feet and knees being in the lowest part of the birth canal. Frank breech accounts for most cases.

Breech delivery is often encountered in the delivery of premature infants. It is also associated with congenital and uterine anomalies, prolapsed cord, placenta previa, and multiple gestations.

The 3 methods of breech delivery are spontaneous, partial, and total breech. During spontaneous breech delivery, expulsion of the fetus occurs spontaneously without any intervention other than supporting the neonate after delivery. Incomplete breech delivery refers to spontaneous delivery of the fetus to the level of the umbilicus with subsequent assisted delivery of the remainder of the body. Total breech delivery refers to extraction of the entire body of the fetus by the physician.

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**Box 5**

Equipment for perineal repair

<table>
<thead>
<tr>
<th>Item</th>
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<tbody>
<tr>
<td>Sterile gloves</td>
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<tr>
<td>Sterile drapes</td>
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<tr>
<td>Irrigation solution</td>
</tr>
<tr>
<td>Needle holder</td>
</tr>
<tr>
<td>Forceps with teeth</td>
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<tr>
<td>Allis clamp</td>
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<tr>
<td>Suture scissors</td>
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<tr>
<td>3-0 Vicryl on a CT-1 needle</td>
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<tr>
<td>4-0 Vicryl on an SH needle</td>
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</tbody>
</table>

**Fig. 8.** Different breech presentations. (From Lanni SM, Seeds JW. Malpresentations and shoulder dystocia. In: Gabbe SG, ed. Obstetrics: Normal and Problem Pregnancies. Philadelphia, Elsevier Churchill Livingstone, 2007; with permission.)
Hannah and colleagues\textsuperscript{24,25} determined that elective cesarean section was safer for the delivery of a breech presentation compared with vaginal delivery. Although, cesarean section might be considered the standard of care\textsuperscript{6}, the emergency medicine physician should be able to perform breech delivery techniques in case of imminent breech delivery.

**Management**

Once a breech presentation is recognized, immediate consultation with an obstetrician, anesthesiologist, and neonatologist should occur. If the breech delivery is progressing spontaneously, it is better for the physician to wait expectantly until the delivery of the fetal umbilicus.\textsuperscript{4} A premature intervention can result in higher maternal and fetal morbidity.\textsuperscript{6} Efforts should be made to transfer the patient to a labor and delivery unit if time allows and the fetal umbilicus has been delivered yet.\textsuperscript{6}

If spontaneous breech delivery is unlikely, the physician must assist the delivery. With the patient in the lithotomy position, episiotomy should be performed (as discussed previously) unless there is considerable perineum relaxation.\textsuperscript{8} As the breech distends the perineum, the posterior hip should be delivered, commonly from the 6 o’clock position. This is followed by the anterior hip and external rotation to a sacrum anterior position (Fig. 9). To deliver the legs, the clinician should splint the medial aspect of each thigh by placing the fingers parallel to each femur, and then apply pressure laterally with the goal of sweeping each leg away from the midline (Fig. 10). Once the legs are delivered, the fetal bony pelvis should be grasped with both hands using a towel to prevent slippage of the fetus. This is accomplished by placing the fingers over the anterior superior iliac crest with the thumbs resting over the sacrum.\textsuperscript{6} Careful placement of the fingers over the bony pelvis will prevent injury to the fetal abdominal soft tissue. Gentle rotational downward traction should be applied in conjunction with maternal bearing down efforts. To deliver the scapula, a 90° rotation is applied to the fetal pelvis, placing the fetal sacrum into the transverse position. A counterclockwise 180° rotation can then be applied to deliver the opposite scapula. Attempts to deliver the shoulder and arms should not occur until one of the axilla becomes visible.\textsuperscript{8}

![Fig. 9. In breech delivery, extraction of the hip should be attempted by pulling downward and rotating the hips. (From Lanni SM, Seeds JW. Malpresentations and shoulder dystocia. In: Gabbe SG, ed. Obstetrics: Normal and Problem Pregnancies. Philadelphia, Elsevier Churchill Livingstone, 2007; with permission.)](image-url)
The shoulders can be delivered by 2 methods. With the scapulas visible, the first method is performed by rotating the trunk so that the anterior shoulder and arm appear at the vulva. Once at the vulva, the anterior shoulder and arm can be delivered with relative ease. Next, the body of the fetus is rotated in the reverse direction to deliver the other shoulder and arm. If trunk rotation is unsuccessful and neither shoulder nor arm is free, the posterior shoulder must be delivered first (see Fig. 10).

For this second method, the clinician will grasp both feet in one hand and apply upward traction over the mother’s groin. With the clinician’s free hand, leverage is applied to the posterior shoulder, which should become free over the mother’s perineum, followed by the arm and hand. The anterior shoulder, arm, and hand are delivered by downward traction of the fetal body. If the arm and hand do not spontaneously deliver after the shoulder, upward traction of the fetal body is continued while 2 fingers of the other hand are used to locate the fetal posterior humerus to the level of the elbow. Once identified, and while using the fingers to splint the humerus, the posterior arm can be delivered by sweeping it downward (Fig. 11). The anterior arm is delivered with downward movement of the fetal body. If this is not sufficient, the anterior arm is splinted using 2 fingers and is delivered by sweeping it down over the thorax.

To deliver the head, the Mauriceau maneuver is performed (Fig. 12). With the fetal body resting on the clinician’s hand and forearm, the index and middle finger are placed over the fetal maxilla to flex the head. The index and middle finger of the other hand are placed on each side of the neck to grasp the shoulders and downward traction is applied until the suboccipital region appears under the pubic symphysis. The fetal body is then elevated upward toward the maternal abdomen, with the rest of the fetal head successfully being delivered. As the head is delivered, suprapubic pressure applied by an assistant is helpful (Fig. 13).

**Postpartum Hemorrhage**

Although controversial because of blood loss underestimation, postpartum hemorrhage can be defined as loss of more than 500 mL of maternal blood during vaginal...
In an urgent setting, in which multiple tasks are occurring simultaneously, the emergency physician should give special attention to the amount of maternal blood loss after delivery. Bleeding may be subtle but constant, and if unnoticed can become life-threatening.

Risk factors for postpartum hemorrhage include prior postpartum hemorrhage, uterus overdistention (multiple fetuses, macrosomia, polyhydramnios), prolonged labor, and coagulopathy among others. The differential diagnosis includes uterine atony, genital tract lacerations (cervix or vagina), retained products of conception, uterine inversion, uterine rupture, and coagulopathies.

The management of postpartum hemorrhage is based on identification of the cause. First, however, the emergency physician should consult an obstetrician and anesthesiologist. Adequate hemodynamic evaluation and initiation of volume-expander fluids and blood products should occur in cases of cardiovascular compromise.

**Uterine Atony**

Uterine atony is considered the most common cause of early postpartum hemorrhage. A hypotonic uterus may result from uterine overdistention, tocolysis,
and prolonged labor.\textsuperscript{8,21} The diagnosis is confirmed by evidence of a soft, boggy uterus in the setting of excessive vaginal bleeding after delivery. Once identified, uterotonics must be started with concurrent suprapubic transabdominal uterine massage.\textsuperscript{6,8,21} Among the uterotonics, oxytocin is the first-line agent. An intravenous infusion can be prepared by adding 10 to 40 units of oxytocin to 1000 mL of crystalloid, with the infusion rate titrated to achieve uterine contraction.\textsuperscript{6,8,21,24} If intravenous access is not available, 10 units of oxytocin can be administered intramuscularly.\textsuperscript{6,8,21,24} If oxytocin fails to improve the hemorrhage, second-line agents such as methylergonovine can be used at an intramuscular dose of 0.2 mg.\textsuperscript{8,24} This ergot derivative should be used with caution in hypertensive and preeclamptic patients because of its effects in raising blood pressure.\textsuperscript{8,21} Other second-line agents to be considered are prostaglandins, such as carboprost (derivative of 15-methyl prostaglandin F\textsubscript{2}-alpha) administered intramuscularly at an initial dose of 0.25 mg. Dose may be repeated every 15 minutes, but should not exceed 8 doses.\textsuperscript{8} Because of the bronchoconstrictive and vasoconstrictive effects, carboprost should be avoided in patients with asthma and hypertension.\textsuperscript{8}

If hemorrhage persists despite these measures, a 2-handed uterine compression massage may be performed.\textsuperscript{6,8,21} For this technique, 1 hand should apply pressure to the posterior aspect of the uterine fundus through the abdominal wall, while the other is made into a fist, introduced into the vagina, and firm pressure applied to the anterior aspect of the uterus.\textsuperscript{6,8,21} If this technique fails to stop the bleeding, alternative causes of hemorrhage should be sought. A thorough inspection of the genital tract may reveal lacerations, and manual examination of the uterine cavity may show retained segments of placenta. Lacerations can be initially managed with direct pressure and the use of nonabsorbable sutures for control of bleeding.\textsuperscript{6} Further management of the laceration is better left to the expertise of an obstetrician. Postpartum hemorrhage that continues despite these techniques and measures indicates the need for more invasive procedures, such as embolization or surgery.\textsuperscript{27}
**Uterine Inversion**

Uterine inversion usually occurs after forceful traction of the umbilical cord during delivery of the placenta. Although uncommon, uterine inversion can be life-threatening and may lead to shock if left untreated. The patient commonly complains of severe abdominal pain associated with excessive vaginal bleeding. Physical examination varies according to the degree of inversion, but generally will reveal absence of a palpable uterus on transabdominal examination and visualization of a protruding mass during vaginal examination. Once patient stabilization has been initiated, immediate reposition of the uterus must occur. For reposition, the clinician’s hand is placed into the vagina with the palm of the hand grasping the uterus and the fingertips placed at the uterocervical junction. Digital upward pressure should be applied to the edges of the uterus in the direction of the umbilicus. If unsuccessful, tocolytics such as terbutaline, ritodrine, and magnesium sulfide can be used to relax the uterus to facilitate uterine reposition. Once repositioned, manual uterine pressure should continue while tocolytics are stopped and oxytocin started. General anesthesia and surgery may be required if these measures fail.

**Shoulder Dystocia**

Shoulder dystocia refers to the inability to deliver the fetal shoulders after delivery of the fetal head in the vertex presentation (Fig. 14). Most commonly, the anterior fetal shoulder becomes impacted in the pubic symphysis. Shoulder dystocia is considered a true obstetric emergency because of the potential traumatic and hypoxic events on the fetus. According to the ACOG, shoulder dystocia occurs in approximately 0.6% to 1.4% of vaginal deliveries. Risk factors for shoulder dystocia include fetal macrosomia, postterm pregnancy, and diabetes among others.

**Management**

General measures that should not be overlooked are emptying of the patient’s bladder, consideration of episiotomy, and placing the patient in the lithotomy position. Although some of the different techniques to relieve shoulder dystocia can be undertaken simultaneously, no universal consensus exists on a particular order. The most common initial techniques performed after calling for help are the McRoberts maneuver and suprapubic pressure. These techniques are initially preferred because

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**Fig. 14.** Shoulder dystocia maneuver: Rubin and reverse Woods screw. (A) place two fingers in the posterior vaginal to identify the posterior fetal shoulder. (B) a 180° rotational force is applied then the posterior shoulder is more oblique in position resulting in adduction and oblique position that allow the delivery. (From Probst BD. Emergency childbirth. In: Roberts JR, Hedges JR, eds. Clinical Procedures in Emergency Medicine, 5th ed. Philadelphia: Elsevier 2009; with permission.)
they are noninvasive and can be performed with relative ease. The McRoberts maneuver consists of placing the mother in the extreme lithotomy position with the hips completely flexed, allowing the knees to fall on the mothers chest, the so-called knee–chest position.\textsuperscript{6,31} This maneuver causes straightening of the sacrum in relation with the lumbar spine, which slides the pubic symphysis cephalad over the fetal shoulder. If the McRoberts maneuver fails to disengage the fetal shoulder, supra-pubic pressure can apply by an assistant while the patient remains in the extreme lithotomy position. Some studies have shown that delivery of the posterior shoulder results in resolution of shoulder dystocia.\textsuperscript{5} Delivery of the posterior shoulder is performed by placing a sterile gloved hand into the posterior aspect of the vagina and localizing the posterior shoulder of the fetus (Fig. 15). Once the posterior shoulder is identified, the clinician should slide a hand down the fetus arm until reaching the elbow. Pressure can then be applied on the antecubital fossa to cause flexion of the fetus forearm. If forearm flexion does not occur, the clinician can gently grasp the forearm and attempt to flex it. The forearm should be flexed over the fetus chest and delivered over the mother’s perineum, allowing delivery of the anterior shoulder under the pubic symphysis. Another maneuver that can be performed is known as the Rubin or reverse Woods corkscrew maneuver (see Fig. 14).\textsuperscript{6} To perform this maneuver, the clinician introduces 2 fingers posteriorly into the vagina to identify the posterior aspect of the posterior shoulder. A 180\textdegree rotational force is then applied, causing anterior movement of the posterior shoulder into a more oblique position within the pelvic outlet. The resulting adduction and oblique position of the shoulders may cause complete delivery of the fetus. If the shoulder dystocia persists despite attempting all of the described techniques, the clinician may attempt the Zavanelli maneuver to replace the fetal head into the uterine cavity with subsequent cesarean delivery.

\textit{Umbilical Cord Prolapse}

Umbilical cord prolapse (UCP) transforms an emergency delivery in a real emergency. UCP complicates labor in approximately 0.5\% of deliveries.\textsuperscript{6} The most accepted presentation of this condition is when the fetal presenting part does not fill enough the pelvis fully.

\textbf{Fig. 15.} Shoulder dystocia delivery. (From Lanni SM, Seeds JW. Malpresentations and shoulder dystocia. In: Gabbe SG, ed. Obstetrics: Normal and Problem Pregnancies. Philadelphia, Elsevier Churchill Livingstone, 2007; with permission.)
of the lower uterine segment during active labor. Low birth weight, multiparity, fetal malpresentation are the most common risks factors related to UCP. Some studies suggest that premature rupture of membranes (amniotomy) and polyhydramnios increase the risk of UCP.

When a pregnant patient arrives at the emergency department, a history and physical examination should be performed. The history may not be contributory to the diagnosis of UCP. To diagnose UCP, careful pelvic examination should be performed with sterile gloves. If a pulsatile structure can be felt once the examiner reaches the oz, UCP can be diagnosed.

Once UCP is diagnosed, the preferred management is emergent cesarean section. While the operating room is being prepared, some maneuvers may be performed. First, the examiner who diagnosed the UCP should keep a finger inside the cervix to continue lifting the presenting part and minimize cord compression. With this maneuver some authors recommend filling the bladder with 500 to 700 mL of saline to maintain cord decompression, after which the examiner can remove the hand from the vagina very carefully. The mother should be placed in knee–chest position and encouraged not to push, cough, or move in any way that will increase the intra-abdominal pressure.

The prognosis is based on the time of compression. If more than 10 minutes elapses from the door to cesarean section, the prognosis decreases and more fetal complications might be expected. The emergency physician should be prepared to resuscitate the newborn.

When surgery cannot be performed promptly, funic reduction can be performed. This maneuver involves manual replacement of the cord into the uterus, but immediate vaginal delivery should be attempted.

**Umbilical Cord Entanglement**

The incidence of true umbilical cords knots is 0.3% to 2.1%. The umbilical cord can tangle by itself or during pregnancy with fetal movements. Long umbilical cords are associated with entanglement. Some authors remark that a higher incidence occurs during early pregnancy rather than late, suggesting that it is part of normal pregnancy. Usually it is diagnosed during labor when the presenting part has an umbilical cord loop. Fetal heart rate (FHR) monitoring is a valuable tool for evaluation in this setting. Variable or prolonged decelerations are the most common finding of cord entanglement during FHR monitoring. This variable deceleration is related to increased incidence of fetal distress in labor, low APGAR scores, neonatal intensive care unit admission, and nuchal cord involvement, as reported by some studies.

The entanglement should be reduced promptly during delivery to preserve blood flow and oxygenation. Some of the loops disentangle without manipulation. If spontaneous disentanglement does not occur, the loops should be slipped over the extremities or forward over the head (see Fig. 6). In some instances the loops are too tight to disentangle, and the physician should be aware and prepared to cut the cord and immediately deliver the fetus to avoid hypoxia.

**PERIMORTEM CESAREAN SECTION**

Perimortem cesarean section, one of the oldest and most dramatic emergency surgical procedures, has long been used as an attempt to preserve the life of the fetus. Since the 1980s, some case reports have shown that the mother could recover after perimortem cesarean section. Thus, emergency physician must be familiar and comfortable with this procedure.
**Indications**

Survival of the infant is directly related to the elapsed time from death of the mother to delivery, the maturity of the fetus, the performance of cardiopulmonary resuscitation (CPR) on the mother, and the availability of neonatal intensive care facilities. Although, the lower limit of fetal viability varies among institutions, in general, performing the procedure before the point of fetal viability at approximately 24 weeks is not indicated. If the duration of gestation is not known from the history, fetal maturity may be quickly estimated by calculating gestational age based on the date of the mother’s last normal menstrual period or measuring the height of the uterine fundus. Between 18 and 30 weeks’ gestation, the age of the fetus in weeks will correspond to the distance in centimeters from the uterine fundus to the symphysis pubis (e.g., at 28 weeks’ gestation the fundus is approximately 28 cm above the symphysis pubis or halfway between the umbilicus and the costal margin). Criteria for intervention should be established prospectively at each institution and be in accordance with the institution’s general neonatal policies.

The potential for infant survival decreases and the chance of neurologic damage increases as the time from maternal death (cessation of circulation) to cesarean section increases ([Fig. 16](#)). Because even in optimal conditions CPR results in a cardiac output of 30% to 40% of normal output and placental perfusion may be severely compromised, every attempt should be made to begin cesarean delivery within 4 minutes of the cardiopulmonary arrest, completing the procedure within 5 minutes of arrest.40 Fetal prognosis is generally better after the sudden death of a previously healthy mother than after the death of a mother with a prolonged and debilitating illness.

CPR should be initiated immediately on cardiac arrest of the mother and be continued until after the infant is delivered. The pregnant state produces certain physiologic changes that adversely affect the adequacy of standard CPR.41 Vena cava occlusion by the gravid uterus hampers venous return and thus compromises maternal cardiac output. A decreased functional residual capacity of the lungs may impede ventilation. An assistant may attempt manual displacement of the uterus away from the inferior vena cava. However, perimortem cesarean delivery in itself may be the most important variable in a successful maternal resuscitation.

**Legal and ethical considerations**

Because no standard of care exists for emergency clinicians performing a perimortem cesarean delivery, each case must be individualized. Limited resources often place the clinician in the difficult position of deciding whether to continue efforts to resuscitate the mother or to attempt to deliver the fetus in a difficult situation in less-than-ideal conditions. In the absence of obstetric backup immediately at hand, it is reasonable for the emergency clinician to proceed with delivering the child if the mother cannot be resuscitated. Prolonged attempts to resuscitate the mother are unlikely to benefit either the mother or the fetus.5

**Technique**

The most experienced person, preferably an obstetrician, should perform perimortem cesarean section. But, in the emergency setting, the emergency physician should be prepared to do so. When possible, a neonatologist should be in attendance; however, arrival should not delay the procedure. CPR on the mother should be initiated at cardiac arrest and continued throughout the procedure. Although, it is helpful if fetal heart tones are present premortem, time should not be wasted searching for them or attempting to evaluate fetal viability with abdominal ultrasonography.

Because neonatal survival is enhanced as the time from maternal death to delivery decreases (although the irreversible nature of maternal cardiac arrest becomes more...
apparent as resuscitative efforts progress), the decision to perform a perimortem cesarean section may be one of the most difficult an emergency clinician must makes. When time matters, the emergency physician should be familiar with the minimum equipment necessary to perform this procedure (Box 6).

Rapid extraction of the infant while avoiding fetal and maternal injury is the goal of the procedure. Hence, time should not be wasted preparing a sterile operating

Fig. 16. Perimortem cesarean section technique. (A), Make a vertical incision in ventral aspect of the abdomen. (B) place retractors and identify the bladder, place a bladder retractor. (C) make a vertical incision with the scalpel in the uterus. (D) with a scissors to extend the incision inferiorly. (E) extract the fetus head, suction the pharynx and deliver the fetus completely. (From Pearlman M, Tintinallly JE. Emergency care of the woman. New York: McGraw-Hill 1998; with permission).
field or transporting the patient to an operating suite outside the emergency department.42

Using a large (eg, No. 10) scalpel, a midline vertical incision should be made through the abdominal wall extending from the symphysis pubis to the umbilicus and carried through all abdominal layers to the peritoneal cavity. In most gravid women, the hyperpigmented linea nigra is apparent and may serve as a guide for the incision (see Fig. 12).21 If available, retractors should be placed in the abdominal wound and drawn laterally to expose the anterior surface of the uterus. The bladder should be reflected inferiorly; if it is full, it may be aspirated to evacuate it and permit better access to the uterus. While avoiding injury to fetal parts, a small (≈ 5 cm) vertical incision should be made through the lower uterine segment until amniotic fluid is obtained or until the uterine cavity is clearly entered. The index and middle fingers should then be inserted into the incision and used to lift the uterine wall away from the fetus.21,41 Bandage scissors should be used to extend the incision vertically to the fundus until a wide exposure is obtained. The infant should then be delivered gently, the mouth and nose suctioned, and the umbilical cord clamped and cut. Because the incision is high in the uterus, the infant’s head may not be readily accessible to the clinician, in which case the infant’s feet should be grasped that the infant delivered using maneuvers similar to those for a breech delivery.6 Neonatal resuscitation should be performed as necessary. The incision should be repaired if spontaneous recovery of circulation is achieved by the mother.7

Potential complications
Bladder injury is common. Therefore, if a full bladder obstructs the view of the uterus, it should be decompressed with a puncture incision and deflated with either pressure or suction. Bladder repair may be performed later if the mother recovers spontaneous circulation. Other complications include bowel injury, fetal laceration and injuries, neonatal neurologic deficits or demise, maternal bleeding and infection, and maternal mortality.6 Cases of maternal survival have been reported, hence the importance of checking maternal pulses, performing continuous CPR, and relieving aortocaval compression by the uterus to improve maternal hemodynamics.5

GYNECOLOGIC PROCEDURES
Bartholin Abscess
Bartholin glands are a pair of glands localized in the labia minora in the 4 and 8 o’clock positions. Each gland secretes mucus into the Bartholin ducts, a 2.5-cm duct that

<table>
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<td><strong>Equipment for perimortem cesarean delivery</strong></td>
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<tr>
<td>Retractors</td>
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<tr>
<td>Clamps</td>
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<tr>
<td>Vascular clamps or hemostats</td>
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<tr>
<td>Neonatal resuscitation kit: neonatal air bag, intubation tray, suction bulb</td>
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<tr>
<td>Warmer</td>
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<tr>
<td>Curved scissors</td>
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<tr>
<td>Blades #10</td>
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<td>Blood gas syringe</td>
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<td>Sutures</td>
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emerges into the vestibule at either site of the vagina to aid in lubrication. Generally, these glands are nonpalpable, except in the presence of obstruction or infection. For many years, Bartholin abscesses were thought to be the result of sexually transmitted diseases (STDs). Today, Bartholin gland abscesses are widely known to be polymicrobial in origin, with anaerobes the most common pathogens. In women with risks factors for STDs, colonization with Neisseria gonorrhea and Chlamydia trachomatis should be highly considered.

Incision and drainage is a simple procedure that provides immediate relief in symptomatic patients. A Worth catheter, a small rubber catheter with an inflatable balloon tip, is left in place for continuous drainage for approximately 6 to 8 weeks. If it is not available, an 8-French Foley catheter may be used. Patients must be informed that abscess may recur after incision and drainage, and they should be referred for follow-up in 48 hours with a gynecologist. Oral analgesics should be prescribed. Sitz baths 3 times daily may aid with drainage. If any signs of cellulitis are present, a broad-spectrum antibiotic should be started. In patients at high risk for STDs, coverage should be provided, with cephalexin and metronidazole appropriate treatment choices.

Some complications are associated with this procedure. For some patients the procedure can be very painful despite adequate local anesthesia, and adjunctive pain medications or procedural sedation should be considered. Another complication is when the catheter falls out because of a large incision. Instead of a very large incision, a 5-mm incision should be made so that the catheter will stay in place.

**GENITAL TRAUMA**

**Vulvar Hematoma**

Nonobstetric vulvar hematomas are essentially a rare condition. They are often the result of straddle injuries, traumatic sexual intercourse, or physical assault. Obstetric vulvar hematomas are more common than nonobstetric vulvar hematoma with an incidence of 1:300 to 1:1500 deliveries. Nulliparity, preeclampsia, episiotomy, multiple gestations, and operative vaginal deliveries have been associated with an increased incidence of hematoma formation in the obstetric population.

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**Box 7**

**Equipment for Bartholin abscess**

- Sterile gloves
- Iodine solution
- Lidocaine 1% or 2%
- Sterile gauzes
- Small needle holder
- Small hemostat forceps
- No. 11 scalpel
- 5-mL syringe for lidocaine injection
- 3-mL syringe for inflating balloon
- Worth catheter

[228] Mercado et al

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The female genitalia is highly vascular, with loose subcutaneous tissues. The vascular supply of the female perineum is derived from the branches of the internal pudendal artery. The accompanying perineal veins are valveless and have free anastomoses with the intrapelvic venous plexuses. Massive vulvar hematomas can form because the loose connective tissue affords little resistance until the mass is large enough to cause tamponade of the bleeding vessels. Although bleeding is most commonly of venous origin, some reported cases have involved the internal iliac artery, in which embolization was required.

A thorough physical examination of the genitalia and abdomen should be performed to rule out any intra-abdominal injury. The examiner must perform a complete vulvar, vaginal, and rectal examination to assess the size and extension of the hematoma. Abdominal ultrasound and/or abdominopelvic CT may be ordered to assess for extension into the peritoneum.

Conservative and surgical management are the treatment options for vulvar hematoma. Conservative management consists of external compression and ice pack for 24 hours. Because local swelling may be sufficient to impair voluntary voiding, a Foley catheter should be inserted and left in place. Adequate analgesia is an essential part of the treatment. Narcotics and nonsteroidal anti-inflammatory drugs are equally recommended. Patients who are treated conservatively should be followed up with frequent examination and serial cell blood cell count.

If a vulvar hematoma is continuing to expand despite external pressure or is presenting acutely with a size greater than 10 cm, or the patient is presenting with shock and/or anemia, prompt evacuation of the hematoma is mandatory. To avoid the risk of wound infection, this procedure should be performed in a sterile room. A large incision is made, followed by ligation of bleeding vessels and packing to secure hemostasis. Drainage should be left in place. Hematoma evacuation can be a very painful and uncomfortable procedure; procedural sedation or general anesthesia should be considered. For emergency physicians, a safe approach is to make a small elliptical incision and place a Worth catheter for continuous drainage (see Bartholin abscess section for Worth catheter placement instructions). Sitz baths are recommended to aid with drainage.

Infection, anemia, and shock are the most common complications of conservative management. In a retrospective review, Propst and colleagues found that 4 of 10 non-obstetric vulvar hematomas required intravenous antibiotics and subsequent operative procedure. In another retrospective review, Benrubi and colleagues reported increases in intravenous antibiotics, transfusion, readmission, subsequent operative procedures, and length of hospitalization in patients managed conservatively.

**Common pitfalls**

Poor physical examination of genitalia may cause the extension of the hematoma to be missed.

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**Box 8**

**Technique for incision and drainage of Bartholin abscesses**

1. Clean the affected area with iodine solution.
2. Apply anesthesia with lidocaine 1% or 2%.
3. Make a small elliptical, vertical incision along the vaginal mucosal surface.
4. Apply gentle pressure.
5. Insert a small hemostat and break any adhesions.
6. Insert tip of word catheter, inflate balloon with saline solution.
Vulvar and Vaginal Laceration

Vulvar trauma can cause significant bleeding because the area is highly vascular. Straddle injuries and consensual and nonconsensual coitus are the most common causes of vulvar lacerations. Most lacerations are superficial and can be left open if no active bleeding is identified.

Nonobstetric vaginal lacerations can range from minor simple lacerations to life-threatening events. Most cases resolve without medical intervention, but severe lacerations may require emergent surgical repair. Lacerations are usually 3 to 5 cm long and are commonly localized in the posterior fornix.50

The most common mechanism of nonobstetric vaginal injury is consensual coitus. Other common factors are first coitus, disproportion of male and female genitalia, female in dorsal decubitus position, hyperflexion of the thighs and setting intercourse may result in vaginal laceration as well.51 Among other factors are tissue friability,

Fig. 17. Bartholin abscess drainage. (A) Identify the mucosal border of the vulva and make 5-mm incision. (B) Open the incision with the hemostat. (C) After drainage occur place a Worth catheter or indwelling Foley catheter # 8 French. (Courtesy of Dr Mercado, UPR Hospital Carolina, PR.)
foreign bodies, previous surgeries, atrophic vagina in postmenopausal women, rough or nonconsensual coitus, and pelvic radiation therapy.

In pediatric and adolescent population, hymenal disruption at the 3 to 9 o’clock positions should raise concern about sexual abuse. A detailed history and physical examination should be performed to rule out sexual abuse. Normal-appearing genitalia is not evidence enough to exclude the possibility of abuse.

Physical examination is an important tool in diagnosis and management. A thorough examination of the external and internal genitalia should be performed. If excessive bleeding obscures examination, the vagina should be packed with sterile gauze and the patient taken to the operating room for evaluation and bleeding control. Urethral catheterization must be performed to assess for bladder and urethral injury. Digital rectal examination should be performed to determine sphincter tone, assess mucosal integrity, and evaluate for posterior vaginal injuries.

Lacerations that are superficial, clean, and less than 6 hours old can be closed with a fine absorbable suture. Deeper lacerations should be explored for foreign bodies and the patient assessed for rectal, urethral, or periclitoral injuries. Wounds located near the urethra or clitoris may cause severe postrepair pain. If no significant bleeding is identified, these injuries may be left to heal by secondary intention. Infected wounds should not be closed. Wound debridement is encouraged. Wounds should be packed with saline-moistened gauzes and allowed to close by secondary intention. Vulvar lacerations are very painful, and urinary retention can be a complication. In these

Fig. 18. Preparation of the cervix area for culdocentesis. (A) after speculum introduction the cervix is identified, fix the speculum and with a tenaculum elevate the cervix. (B) the posterior cervix area exposed. (Adapted from Webb MJ. Culdocentesis. Journal of the American College of Emergency Physicians 1978;7:452; with permission.)
cases, a Foley catheter should be inserted and left in place. Patients should have a follow-up examination with a gynecologist.

Patients presenting with signs and symptoms of shock should immediately be resuscitated with isotonic fluids. A complete blood cell count and a type and cross for 2 units of packed red blood cells should be ordered. These patients need emergent gynecologist consult for pelvic examination under general anesthesia.

Any patient presenting with vaginal bleeding and abdominal pain should be evaluated for injuries extending into the peritoneal cavity. Upright abdominal radiographs may show free air under the diaphragm. Abdominopelvic CT may show injury to hollow or solid organs and/or bone.

Superficial vaginal lacerations limited to the mucosal and submucosal tissues can be approximated with a fine absorbable suture under local anesthesia. Catgut may increase postrepair pain. Deep or complicated vaginal lacerations are best repaired in an operating room under general anesthesia. The proximity of the bladder, small bowel, rectum, ureters, and uterine vessels place them at high risk of injury during the procedure. Laparoscopy or exploratory laparotomy may be needed for assessment of a deep vaginal laceration that extends into the peritoneal cavity. A gynecologist or general surgeon should repair injuries extending into the rectum.

Prophylactic antibiotics are not usually required. In sexual abuse victims, prophylaxis for STDs is adequate.

In general, adequate and extensive physical examination should be performed to avoid missing deep vaginal lacerations or rectal injuries. The physician should be careful in choosing the appropriate sutures to avoid poor cosmetic results.

**Culdocentesis**

Culdocentesis is a procedure performed in women to assess for the presence of intra-abdominal fluid. It requires peritoneal fluid to be aspirated transvaginally from the rectouterine pouch to reveal the nature of the fluid. The procedure can help the physician assess for a certain number of conditions, such as ruptured viscous (ectopic pregnancy, or corpus luteum cyst) and pelvic inflammatory disease, abdominal infections, intra-abdominal injuries to liver and spleen and ruptured aortic aneurysms. Although, the sensitivity and specificity of culdocentesis are low compared with ultrasonography.

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<th>Box 9</th>
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<td>Adjustable examination table</td>
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<td></td>
<td>Bivalve vaginal speculum</td>
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<td></td>
<td>Uterine cervical tenaculum</td>
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<td></td>
<td>19-guage butterfly needle or 18-guage spinal needle</td>
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<td></td>
<td>25-guage needle (local anesthesia)</td>
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<td>Ring sponge forceps</td>
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<td>Syringes (20 mL)</td>
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<td>Surgical preparation solution</td>
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<td>Sterile water, cotton balls, 4 x 4 gauzes</td>
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<td>Lidocaine (1%) with epinephrine</td>
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<td>Culture media or test tube without anticoagulation</td>
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<td>Written/verbal consent</td>
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(66% and 80% respectively), this procedure could be beneficial when ultrasound is not available or in patients too unstable to leave the emergency department.

Before performing a culdocentesis, a bimanual examination is recommended to assess for possible contraindications. Contraindications include an uncooperative patient, a pelvic mass detected on bimanual pelvic examination, a nonmobile retroverted uterus, and coagulopathies. Pelvic masses include tubo-ovarian abscesses, appendiceal abscesses, ovarian masses, and pelvic kidneys. The major risk with the procedure is rupturing an unsuspected tubo-ovarian abscess into the peritoneal cavity, which can be avoided with careful bimanual examination.

Culdocentesis is an invasive procedure that requires written/verbal consent by the patient. Once obtained, the patient is placed in the lithotomy position with the head slightly elevated to allow intraperitoneal fluid to settle in the rectouterine pouch. A bimanual examination should be performed to rule out presence of a pelvic mass. Examination with a vaginal speculum is performed and the lithotomy position is maintained for the procedure. The posterior tip of the cervix is grasped with a uterine cervical tenaculum and used to elevate the cervix (Fig. 18). This maneuver exposes
the puncture site and stabilizes the posterior wall during the procedure. After this is achieved, the vaginal wall in the area of the rectouterine pouch should be cleaned with surgical preparation and a small amount of sterile water. Local anesthesia may be administered at this point using a separate 25- to 27-gauge needle. Both needles used for local anesthesia and culdocentesis (spinal needle) should be attached to a 20-mL syringe for better control (Box 9). Once anesthesia is obtained, the spinal needle is introduced parallel to the lower blade of the speculum. Using 2 to 3 mL of sterile saline in the syringe may help expel tissue, which can clog the needle, and also helps confirm that the needle tip is in place. The needle should penetrate a total of 2 to 2.5 cm into the midline (Fig. 19). Gentle suction is then applied with the syringe as the needle is withdrawn. If no fluid is aspirated, the needle should be reintroduced and directed only slightly to the left or right of the midline. Directing it too far laterally may result in puncture of mesenteric or pelvic vessels. The aspirated fluid may be old, nonclotting blood, bright red blood, pus, exudates, or serous depending on the cause of the intraperitoneal fluid. Other fluid than blood should be submitted for cytology and bacterial culture.

The most serious complication is rupture of a tubo-ovarian abscess. Among others are perforation of bowel and uterine wall and bleeding from the puncture site in patients with clotting disorders. Bowel and uterine wall punctures are common, and occasionally air or fecal matter can be aspirated, confirming inadvertent puncture of the rectum. Even though this could be disconcerting, it is seldom of serious clinical concern and requires no immediate change in therapy. Although common, bowel and uterine wall punctures usually do not result in serious morbidity requiring immediate therapy.

SUMMARY

Emergency department visits for obstetric and gynecologic complaints continue to increase, and therefore emergency physicians must be proficient in diagnosing and managing these common conditions, which include emergent delivery and potential complications. In addition, the successful management of many gynecologic conditions depends on a good differential diagnosis to minimize morbidity and mortality.

REFERENCES