Chapter

Vaginal Delivery

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Abstract

Vaginal delivery refers to the birth of offspring in mammals or babies in humans, through the vagina, also known as the "birth canal". It is the natural method of birth for most mammals excluding those which lay eggs. For women who deliver vaginally, childbirth progresses in three stages: labor, delivery of the baby and delivery of the placenta. There are two types of vaginal delivery: Unassisted vaginal delivery and assisted vaginal delivery. In the later, this assistance can vary from use of medicines to emergency delivery procedures. The following types of vaginal delivery have been noted; (a) Spontaneous vaginal delivery (SVD) (b) Assisted vaginal delivery (AVD), also called instrumental vaginal delivery (c) Induced vaginal delivery and (d) Normal vaginal delivery (NVD), usually used in statistics or studies to contrast with a delivery by cesarean section. Delivery of a full-term newborn occurs at a gestational age of 37–42 weeks, usually determined by the last menstrual period or ultrasonographic dating and evaluation. Nearly 80% of newborns are delivered at full term while approximately 10% of singleton pregnancies are delivered preterm and 10% of all deliveries are post-term.

Keywords: cervical dilatation, uterine contraction, episiotomy, placental delivery

1. Definitions: vaginal delivery

Vaginal delivery is defined as a natural birth process which does not usually require significant medical intervention [1]. It is the birth of offspring in mammals or babies in humans, through the vagina, also known as the "birth canal". Improvement of normal vaginal delivery can be made through proper management of normal labour, guided by current knowledge [1]. Most women deliver vaginally although the percentage of operative deliveries has increased from 21 percent in 1996 to 30 percent in 2005 respectively [1]. In the year 2013, out of the nearly four million births in the United States, there were approximately three million were vaginal deliveries [2]. In Australia in 2009, 70 percent of women delivered vaginally, of which 58.1% had spontaneous vaginal delivery [3]. In anticipating complications and preparing for vaginal delivery, accurate pregnancy dating is very essential [1]. There are relatively few absolute contraindications to vaginal delivery, meaning that most women deliver vaginally.

Most health experts, including World Health Organization (WHO), do recommend vaginal delivery for women whose babies have reached full term. In comparison to other methods of childbirth, vaginal delivery is the simplest process of delivery [4].

2. Types of vaginal delivery

There are different types of vaginal deliveries [5]; these are:

a. **Spontaneous vaginal delivery** (**SVD**) is one which occurs when a pregnant woman goes into labor without the use of drugs or other techniques to induce labor and she delivers her baby through the vagina (birth canal) without forceps, vacuum extraction or a cesarean section. Out of the about four million deliveries occurring in the United States each year, most of them are spontaneous vaginal deliveries. However, it should be noted that spontaneous vaginal deliveries are not advised for all mothers or pregnant women [4], as we shall see later. Of all women delivering in Australia in 2009, 58.1% had a spontaneous vaginal delivery [3].

b. **Assisted vaginal delivery** (**AVD**) also called **instrumental vaginal delivery or operative vaginal delivery** [6] occurs when a pregnant woman goes into labor, with or without the use of drugs or other techniques to induce labor and then delivers vaginally but with the use of special instruments such as forceps or a vacuum extractor. Assisted vaginal delivery is sometimes called operative vaginal delivery. Now days, assisted vaginal delivery is done in about 3% of vaginal deliveries in the United States [7]. Of all deliveries in Australia in 2009, 3.5% were delivered using forceps while 7.2% required vacuum extractions [3].

c. **Induced vaginal delivery** is a delivery which involves labor induction, where drugs or manual techniques are applied to initiate the process of labor.

d. **Normal vaginal delivery** (**NVD**) is a vaginal delivery, whether or not assisted or induced, usually used in statistics or studies to contrast with a delivery by cesarean section. In the year 2013, out of the nearly four million births in the United States, there were approximately three million were vaginal deliveries [2]. In Australia in 2009, 70 percent of women delivered vaginally [3].

3. Operative vaginal deliveries

3.1 Types of operative vaginal deliveries

As seen earlier (section 2b), Assisted vaginal delivery (AVD), also called instrumental vaginal delivery or operative vaginal delivery occurs when a pregnant woman goes into labor, with or without the use of drugs or other techniques to induce labor and then delivers vaginally but with the use of special instruments such as forceps or a vacuum extractor.

Henceforth, operative vaginal delivery involves application of forceps or a vacuum extractor to the fetal head to assist during the second stage of labour and facilitate delivery.

In United States of America (USA), assisted vaginal delivery is done in about 3% of all vaginal deliveries as per 2016 report of American College of Obstetricians and Gynecologists [6].

There are two main types of operative vaginal deliveries;

3.1.1 Vacuum extraction

Vacuum-assisted deliveries or vacuum extractions [6] involve attaching a soft cup, which has a handle, to the head of the baby when the baby is in the birth canal or vagina

and a hand-held pump is then used to create suction that will help to facilitate delivery [5]. The doctor or midwife pulls the baby gently with each uterine contraction to facilitate delivery. In other words, a vacuum device is a suction-cup with a handle attached to it. This suction-cup is the one placed in the vagina and applied to the top of the baby's head. The doctor or midwife applies a gentle, well-controlled traction to help guide the baby out of the vagina as the mother keeps pushing with each uterine contraction [6].

The advantage of vacuum-assisted delivery is that this birth option has a lower risk than a Cesarean section in case of prolonged fetal distress.

However, the method carries the risks of minor scalp injuries or trauma and sometimes, bleeding of the scalp.

3.1.2 Forceps delivery

Forceps-assisted deliveries mean that curved instruments are to be used to facilitate delivery progress of the baby in the birth canal or vagina. Forceps which look like two large spoons are inserted into the vagina and are placed around the baby's head. They are then used to apply gentle traction to help guide the baby's head out of the vagina while the mother keeps pushing, with each uterine contraction [6]. Forceps delivery cannot be used if the baby is breech [5]. It can be an option if the mother is too tired or exhausted during pushing or if the baby has to be delivered more speedily than the naturally occurring process.

3.2 Pre-cautions for choice of operative vaginal delivery

The choice of devices used in operative vaginal delivery depends predominantly on the doctors or midwife's preference and experiences and these vary greatly. Operative vaginal deliveries are performed when the station of the fetal head is low, usually two centimeters below the maternal ischial spines [station +2] or lower than that. Minimal traction or rotation is then required to deliver the head [8].

Therefore, before starting an operative vaginal delivery, the doctor or midwife must do the following [9]:

- Confirm that cervical dilation is fully complete
- The doctor or midwife must confirm that there is engagement of fetal vertex at station +2 or lower
- Confirm that the membrane has ruptured
- The doctor or midwife must confirm that fetal position is very compatible with operative vaginal delivery
- Confirm that the maternal bladder is empty or else it must be drained
- Confirm that the maternal pelvis is adequate. This is done by clinically assessing the pelvic dimensions (clinical pelvimetry) in order to ascertain that the pelvis is adequate

The doctor or midwife need obtain informed consent, have adequate support and personnel as well as adequate analgesia or anesthesia. Neonatal care providers or nurses must have been alerted so that they can be ready to manage any neonatal complications that may arise. Anything less of the above requirements is very risky for operative vaginal delivery [9].

3.3 Indications for operative vaginal delivery

Basically, the indications for forceps delivery and vacuum extraction are the same [8]. They are [10];

- Prolonged second stage of labor, that is, from full cervical dilation to delivery of the fetus
- Suspicion of fetal compromise, such as abnormal heart rate pattern
- When there is need to shorten the second stage of labor for maternal benefit. This may be in the following circumstances; maternal cardiac dysfunction (such as left-to-right shunting), maternal exhaustion and neurologic disorders (such as spinal cord trauma). These conditions contraindicate pushing or prevent effective pushing.

3.4 Contraindications for operative vaginal delivery

Operative vaginal delivery is not permitted in some circumstances [8]. Contraindications include unengaged fetal head, unknown fetal position and certain fetal disorders such as hemophilia. In particular, Vacuum extraction is contraindicated in preterm pregnancies of less than 34 weeks of gestation. This is because risk of intra-ventricular hemorrhage is high [10].

3.5 Complications of operative vaginal delivery

Operative vaginal delivery poses some complications both to the mother and the baby [8]. The major complications are maternal injuries, fetal injuries and hemorrhage. These are common in particularly if the doctor or midwife is inexperienced or if the mother is not appropriately chosen. Significant maternal perineal trauma and neonatal bruising are more common with forceps delivery whereas shoulder dystocia, cephalohematoma, jaundice and retinal bleeding are more common with vacuum-assisted delivery.

4. Contraindications for vaginal delivery

Sometimes, vaginal deliveries may pose health risks for the mother, the baby or even both [4]. In such circumstances, medical experts recommend that pregnant women with the following conditions below must avoid spontaneous vaginal deliveries;

a. Mothers with complete placenta praevia. This is the situation where the baby's placenta fully covers the mother's cervix

b. Mothers with herpes virus having active lesions

c. Sometimes but not always, mothers with untreated HIV infection

d. Mothers who had more than one or two previous cesarean deliveries or uterine surgeries

In the circumstances above, the affected mothers are advised to deliver by Cesarean section. It's the desired alternative for mothers who have any one or more of those conditions.

5. Benefits and disadvantages of vaginal deliveries

5.1 Benefits

Vaginal delivery has the following benefits [5] to the mother and baby

a. Babies born vaginally tend to have fewer respiratory problems at birth and even afterwards.

b. The mother recovers much quicker than in other types of delivery, such as cesarean section.

c. Vaginal delivery has a lower rate of infection [11]. The baby will receive beneficial bacteria, that will help against infection [12]

d. A shorter hospital stay is realized in vaginal delivery than other delivery types, such as cesarean section. The recovery time is much faster in vaginal delivery [11]

e. The mother will be more likely to engage in early breastfeeding. A review of 53 international studies conducted in 2012 found that rates of early breastfeeding are lower after cesarean section than after vaginal delivery.

f. The mother will be less likely to have complications in future pregnancies

g. It is economically less costly compared to cesarean delivery. It has been argued that a Non-profit organization called 'FAIR Health' estimated that the average cesarean section in United States of America will cost about $16,907 whereas the average vaginal delivery costs nearly 30 percent less [11]

5.2 Disadvantages

Vaginal deliveries have the following disadvantages [5];

a. It carries higher risk of perineal tearing of the perineum.

b. Sometimes, a vaginal delivery may not be recommended in some medical conditions (see section 4 above).

6. Management of vaginal delivery

In order to manage normal vaginal delivery, many obstetric facilities tend to use a common labor suit, delivery, recovery and postpartum room. This is to allow the mother, the care giver and the neonate to remain in the same room throughout their stay. This makes it less costly. Some health facilities use a labor room and separate delivery suite, to which the mother is transferred when time for delivery comes. Usually, the mother's partner or any other support person is allowed in to give accompany to the mother [13]. In the delivery room, the perineum is washed and draped, and the neonate is delivered. After delivery, the woman may remain there or be transferred to a postpartum unit or section.

In managing normal vaginal delivery, the doctor or midwife must be well acquainted with the steps in conducting vaginal delivery [14]. See diagrammatic illustrations 1 and 2 below (**Figure 1**).

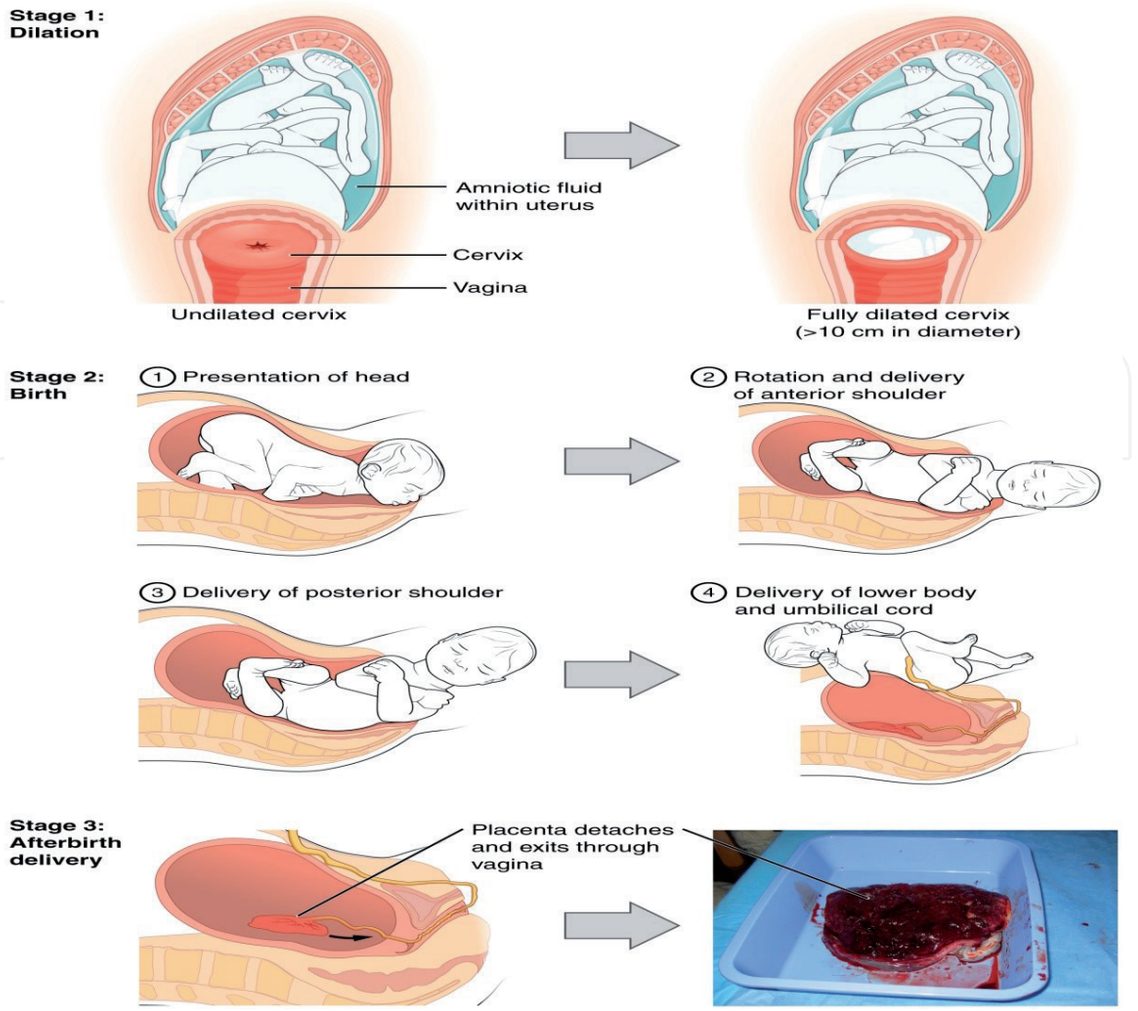

Figure 1.
Stages of vaginal delivery [15].

6.1 Anesthesia

There are many options for anesthesia. These are; local, regional and general anesthesia.

6.1.1 Local anesthesia

Usually, local anesthetics and opioids are frequently used. These medicines pass through the placenta and thus, before delivery, the medicine/drugs should be given in small doses to avoid toxicity in the neonate. The common toxicities related to local anaesthia are; central nervous system [CNS] depression and bradycardia [13].

It must be noted that opioids used alone do not provide adequate analgesia and so are most often used with anesthetics.

In the option for anesthesia, most of the local anesthetic methods used include; pudendal blocks and perineal infiltration as well as para-cervical blocks.

a. **Pudendal block:** Pudendal blocks are used rarely. Instead of this, epidural injections are more preferred. In this, a local anesthetic is injected through the vaginal wall so as to bathe the pudendal nerve as it crosses the ischial spine. In this way, the block anesthetizes the lower vagina, perineum and posterior

vulva. However, the anterior vulva, innervated by lumbar dermatomes, is thus not anesthetized [13]. Usually, pudendal block is considered a safe and simple method for spontaneous vaginal deliveries if the delivery is uncomplicated. It is even more so especially if the mother wishes to bear down and push or when the labor is advanced such that there is no time for epidural injection. It should be noted that pudendal block may have some complications which include intravascular injection of anesthetics, hematoma and infections.

b. **Infiltration of the perineum**: Infiltration of the perineum with an anesthetic is commonly, even if the method is not as effective as a well-administered pudendal block.

c. **Para-cervical block:** This is rarely appropriate for delivery because incidence of fetal bradycardia is >10% [16]. It is used mainly for abortion in the first or early second trimester. The technique involves injecting 5 to 10 mL of 1% lidocaine or chloroprocaine, which has a shorter half-life. Injection is at the 3 and 9 o'clock positions. The analgesic response is usually short-lasting.

6.1.2 Regional anesthesia

There are several methods are available for regional anesthesia;

a. **Lumbar epidural injection:** Lumbar epidural injection of a local anesthetic is the most commonly preferred method. Epidural analgesia is being increasingly used for delivery, including in cesarean delivery. It has basically replaced pudendal and para-cervical blocks. Note that the drugs can be titrated as needed during the course of labor when epidural analgesia is used. Bupivacaine, the local anesthetics often used for epidural injection has a longer duration of action and slower onset than those used for pudendal block. In pudendal block, lidocaine is used, instead.

b. **Spinal injection:** Spinal injection into the para-spinal sub-arachnoid space may be used. However, this is predominantly for cesarean delivery but less often for vaginal deliveries. This is because it is short-lasting, preventing its use during labor, and it has a small risk of spinal headache afterward. Patients must be constantly attended to when spinal injections are used and vital signs must be monitored every 5 minutes to detect and treat possible hypotension.

6.1.3 General anesthesia

General anesthesia is not recommended for routine delivery because potent and volatile inhalation drugs, such as isoflurane, can cause marked depression in the fetus [16].

Again, on rarely basis, during vaginal delivery, 40% nitrous oxide, with oxygen can be used for analgesia. This is so, as long as verbal contact with the mother is well maintained [13].

However, for induction of general anesthesia during cesarean section, thiopental, which is a sedative-hypnotic, is predominantly given intravenously with other drugs such as; succinylcholine and nitrous oxide plus oxygen. When thiopental is used alone, it provides inadequate analgesia and yet with it (thiopental), induction is more rapid and recovery is very prompt. Thiopental may become concentrated in

the fetal liver and this prevents its levels from becoming high in the central nervous system (CNS). High levels of thiopental in the CNS may cause neonatal depression, a situation very detrimental to desired outcome of delivery.

6.2 Analgesia

In other studies, analgesia is recommended [17]. In this case, an attempt with a peridural approach or with the use of short-acting narcotics is advisable. Platelet counts more than 50,000/mL for cesarean delivery, more than 20,000/mL for vaginal delivery, more than 75,000/mL for epidural anesthesia, and more than 50,000/mL for spinal anesthesia in that order are considered safe for delivery.

6.3 Delivery of the fetus

In order to fully comprehend the delivery of fetus, one needs to know the mechanism of labour well. It involves the passive movement the fetus must undertake in order to negotiate through the maternal bony pelvis. Thus labour can be broken down into the following respective stages; descent, engagement, neck flexion, internal rotation, crowning, extension of the presenting part, restitution, internal rotation and lateral flexion. The readers are advised to read other chapter of this book, where labour was discussed in details. Knowledge of pelvic anatomy and perimetry becomes vital, which is lacking in this section.

Thus, in delivering the fetus, a vaginal examination is done to ascertain the position and station of the fetal head. The head is usually the presenting part of the fetus, bu. rarely the buttock [13]. If effacement is completed and the cervix is fully dilated, then the mother is asked to bear down and strain with each uterine contraction. This helps to move the head through the pelvis and progressively dilate the vaginal introitus so that more and more of the head comes out. The moment about 3 or 4 cm of the head is visible during a uterine contraction in nulliparas, the following maneuvers can then facilitate vaginal delivery and reduce risk of perineal tear;

- The doctor or midwife, if he or she is right-handed, will place the left palm over the fetus's head during a contraction to control progress.
- Concurrently, the doctor or midwife should place his or her curved fingers of the right hand against the dilating perineum, through which the infant's brow or chin is felt. See **Figure 2** above.
- In order to advance the head, the doctor or midwife should wrap his or her hand in a towel and then with the curved fingers, he or she should apply pressure against the underside of the brow or chin. This maneuver is known as 'modified Ritgen's maneuver' [13].

An **episiotomy** many be performed as necessary. However, episiotomy is not commonly desired for most normal vaginal deliveries. It should be considered only and only if the perineum does not stretch adequately, so that it is obstructing delivery of the baby. In this case, consider infiltrating a local anesthetic if epidural analgesia seems inadequate. Episiotomy relieves excessive stretching and possible irregular tear of the perineal tissues, including anterior tears, which could ensue in it absence. The recommended episiotomy incision which should be preferred is one that extends only through the skin and perineal body without disrupting the anal sphincter muscles (2nd -degree episiotomy). This is because it is easier to repair than a perineal tear. See **Figure 3** below for possible sites of episiotomy.

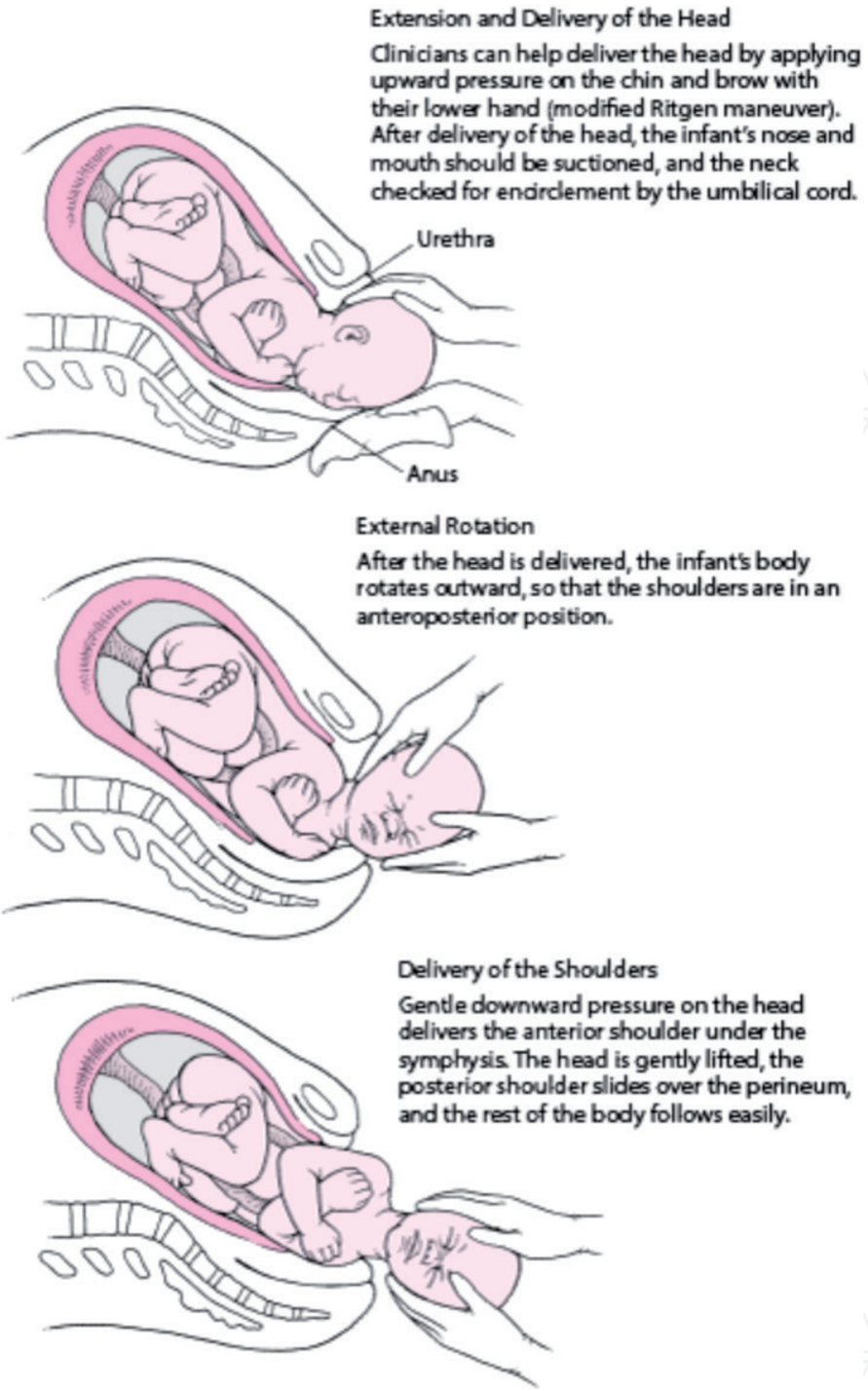

Figure 2.
Steps in conducting vaginal delivery [13].

6.4 Delivery of the placenta

It is common knowledge that active management of the 3rd stage of labour reduces the risk of postpartum hemorrhage. Active management of 3rd stage of labour includes giving the mother a uterotonic drug such as oxytocin as immediate as the fetus is delivered. This uterotonic drug helps the uterus to contract effectively and decrease bleeding due to uterine atony.

Oxytocin, given as 10 units intramuscularly or infusion of 20 units/1000 mL of normal saline at 125 mL/hour is considered. It should not be given as an intravenous bolus in order to minimize the risk of cardiac arrhythmia which might otherwise occur.

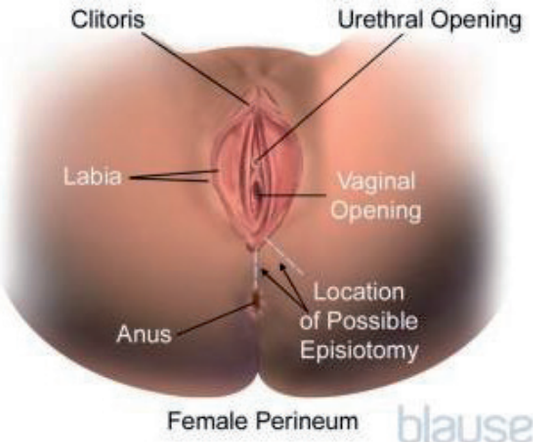

Figure 3.
Possible sites of episiotomy in vaginal delivery [13].

Upon successful delivery of the baby and administration of oxytocin, the doctor or midwife should gently and controllably pull the cord and place his or her hand gently on the mother's abdomen over the uterine fundus. This is to detect contractions [13]. Note that separation of placenta from uterus usually occurs during the 1st or 2nd contraction. This often occurs with a gush of blood from behind the separating placenta. The mother can help to deliver the placenta by bearing down. In case the mother cannot bear down and substantial bleeding occurs, the placenta should be evacuated by the doctor or midwife placing his or her hand on the abdomen and then exerting firm downward (caudal) pressure on the uterus. This kind of procedure must be done only on condition that the uterus feels firm, otherwise, pressure on a flaccid uterus can cause the uterus to invert, thus worsening the problem.

7. The Do's and Don'ts when conducting vaginal delivery

7.1 The Do's

For successful vaginal delivery, the doctor or midwife may have to consider the following things to be done;

- Be prepared and knowledgeable on conduction of vaginal delivery and equipments to use
- Seek consent for vaginal delivery from the mother or next-of-kin
- Allay mother's anxiety
- Wait for labour to progress spontaneously, while monitoring contraction, cervical dilation, fetal descent and heart rate
- Have your equipments, also called delivery set, placed at the proper position in labour suit near the mother
- Have your oxytocics ready and placed in proper position
- Put on your sterile gloves

- Do attentive waiting on the mother
- Conduct vaginal delivery as labour progresses and the baby comes out
- Call for help where appropriate
- Have neonatal resuscitation equipments ready and functional

7.2 The Don'ts

- In vaginal delivery, take care that you do not do the following;
- Do not fail to seek consent for delivery from the mother or next-of-kin
- Do not fear to call for help whenever it is required
- Do not use unsterile equipments
- Do not conduct vaginal delivery without ascertaining the availability of an assistant or a senior midwife or doctor
- Do not conduct vaginal delivery without preparing your delivery set
- Do not conduct vaginal delivery without ascertaining the availability of oxytocics
- Do not conduct vaginal delivery without ascertaining availability neonatal resuscitation equipments
- Do not conduct vaginal delivery without ascertaining the functionality of your neonatal resuscitation equipments
- Do not be absent minded

8. Conclusion

For a full-term newborn, vaginal delivery means to deliver the baby at a gestational age of 37–42 weeks, from the mother's first day of the last menstrual period. This is determined by an accurate history taking from the mother or by ultrasonographic dating and evaluation. Some mothers, for one reason or another, may not adequately know their first day of the last normal menstrual period. In this case, reliance on history from the mother may be misleading. However, the Naegel rule is the use of a commonly known formula to predict the expected date of devilery. The formula is based on the date of the first day of the last normal menstrual period of the mother. The rule assumes a menstrual cycle of 28 days and mid-cycle ovulation, at 14 day from the first normal menstrual day. This means that the formula may not be applicable for women whose cycles are either less than 28 days or more than 28 days and whose ovulation may occur before or after day 14. In this case, however, ultrasonographic dating can be much more accurate, especially if it is done in early pregnancy, before 12 weeks of gestation. Ultrasonographic dating done earlier than 12 weeks are more accurate than those done at 12 weeks or above 12 weeks. Again, this might depend on the level of experience and knowledge of the user of the ultrasound

machine. Vaginally, approximately 11% of singleton pregnancies are delivered pre-term whereas 10% of all deliveries are post-term. Good knowledge of normal vaginal deliveries thus, forms the basis for management of complicated deliveries.

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Conflict of interest

The author declares no conflict of interest.

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