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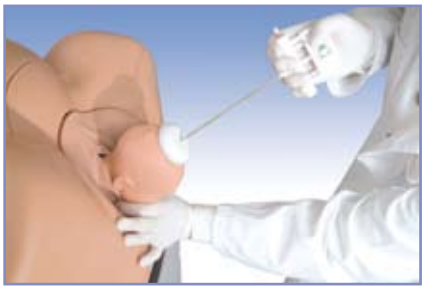

Obstetrical medicine background

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Illustrations Holger Vanselow 2008

Table of Contents

1 The physiological course of birth

A normally-progressing birth proceeds spontaneously and is subject to a complex interplay of actions.

The physiological course of birth can be classified in three stages:

1. Dilatative stage
2. Expulsive stage
3. Placental stage

Dilatative stage
The dilatative stage commences with the first labor contractions and concludes with complete dilation of the os uteri. It is divided into a latent phase and an active phase. The latent phase comprises the time of the continuous shortening of the cervix during the absence of, or only minimal, opening of the os uteri. The active phase comprises the complete opening of the os uteri, with increasing contractile activity.

Expulsive stage
The expulsive stage commences with complete opening of the os uteri (approx. 10 cm) and concludes with the birth of the infant. It is divided into an early expulsive stage and a pushing stage.

Placental stage
The placental stage comprises the detachment and expulsion of the placenta

1.1 The birth mechanism in the occipito-anterior position

The birth mechanism in the occipito-anterior position is comprised of the following phases:

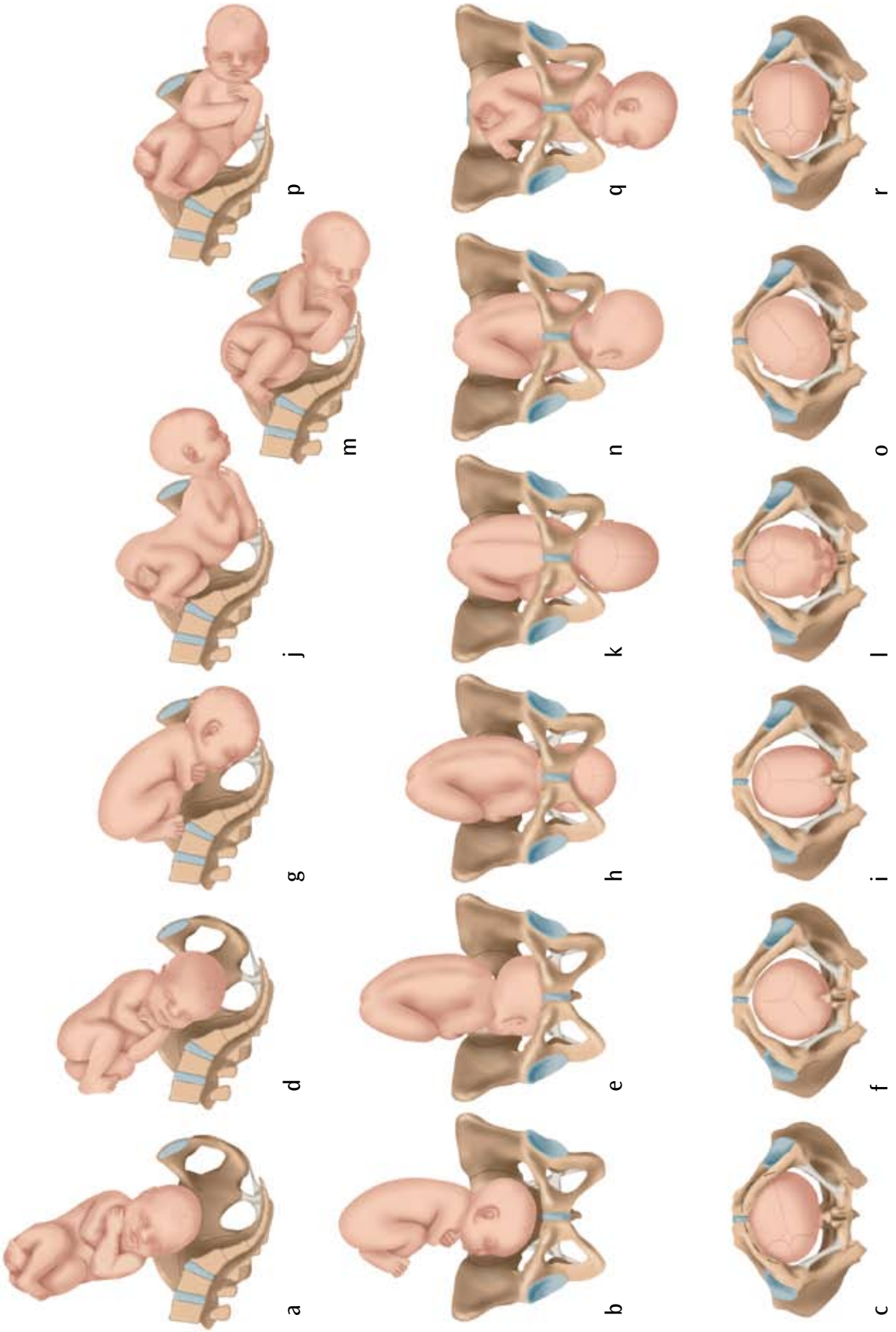
- Commencement mechanism
- Progression mechanism
- Expulsion mechanism
- External rotation

During the birth, the fetal head goes through a range of motions (presentation and positional changes):

- 1. Turning = Flexion
- 2. Turning = Rotation
- 3. Turning = Deflexion
- 4. Turning = Rotation

As the body part of the fetus proceeds to increasingly lower parts of the birth canal, it must adapt to the variable anatomy of the female pelvis.
For this reason, during the commencement mechanism, a head that is located in the occipito-anterior position with flexion must move to a transverse presentation in the transverse oval pelvic entrance: with the sagittal plane proceeding transversely or in a somewhat slanted direction (Ill. 1a – c).
During the progression mechanism, the head moves deeper (progression) into the pelvic cavity. In order to adapt to the round transverse oval pelvic inlet, the head bends. Thus the 1st turn (= flexion) is completed. In this phase, the small fontanel is at the deepest point of the anterior portion, the so-called central presentation (Ill. 1d – f).
When the head reaches the pelvic floor, the 2nd turn (= rotation) follows: the head turns 90° and the anterior occiput turns forward (towards the symphysis). Now the sagittal plane is in a straight diameter (Ill. 1g – i).

Subsequently, during the expulsive mechanism the head must move in an arc around the symphysis. The 3rd turn (= deflexion) follows; that is, the head makes an extending movement, thus changing its presentation. The infant's face is facing the delivery table (Ill. 1j – l).
Immediately after its expulsion from the pelvis, the head makes another 90° turn, the so-called 4th turn (= rotation), so that the sagittal plane is once again transverse, meaning that the infant's face is facing the upper thigh of the mother (Ill. 1m – r).



Ill. 1a – r

Ill. 1a –r The birth mechanism

Using a variety of aspects illustration Ill. 1 shows, from left to right, the behaviour of the infant‘s head as it moves through the birth canal.

Top row: side view
Middle row: frontal view
Bottom row: view from below

The parallel illustrations are shown during the same stage:

Ill. 1a – c
At its entrance into the pelvic cavity, the head proceeds, with a virtually transverse sagittal plane, into the transverse oval pelvic inlet.

Ill. 1d – i
During the progression through the pelvic cavity, the head makes a twisting motion: it proceeds more deeply (change of level), bends (change of position) and turns (change of presentation).

Ill. 1j – l
Upon the head’s exit from the birth canal, the head makes an extending motion (deflexion), thus changing its presentation.

Ill. 1m – r
After the head is born, it makes another outward motion, so that the infant’s face is facing the mother’s thigh. The sagittal plane is once again virtually transverse.

1.2 Level of the fetal head in the maternal pelvis

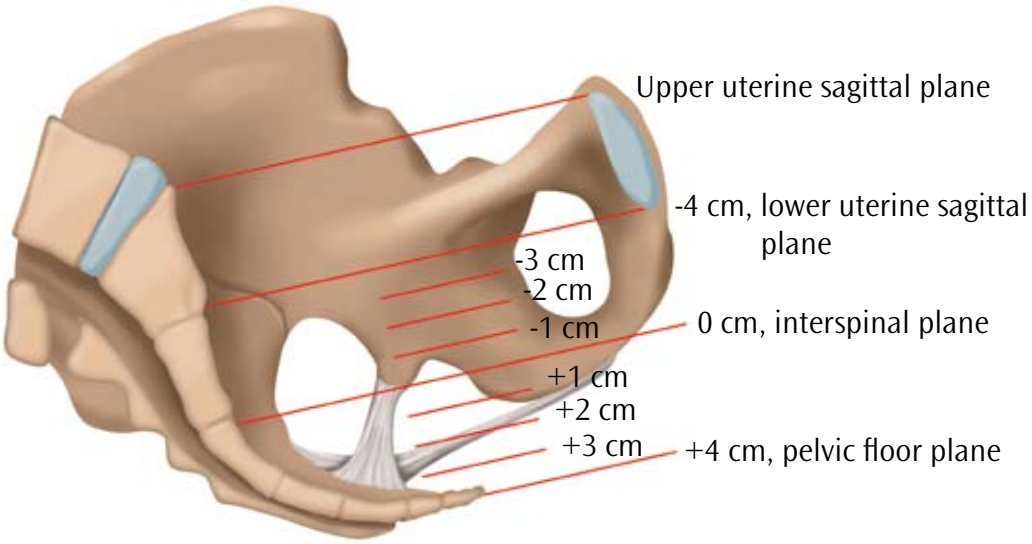
The level of the fetal head within the maternal pelvis is determined by means of external (Leopold and Zangemeister maneuver) and internal (vaginal) examination.

Upon internal examination, the sagittal plane and the fontanel are palpated. The central presentation is assessed by determining centimeters (-4 to +4 cm according to DeLee) above (+) or below (-) the interspinal line (the virtual line between the Ischial Spines). In addition, the interspinal plateau, according to DeLee, also demonstrates the 0-station (= 0 cm). If the anterior occiput has entered the pelvis during anterior-occipital adjustment, the head is in the centre of the pelvis, meaning that the bony central presentation can be palpated between 0 and +3 cm. The infant's head is on the floor of the pelvis when the central presentation is palpable at +4 cm. The plane of passage is then at the level of the interspinal plane (0 cm).

In addition, the level can be determined based on the parallel plane system according to Hodge. The individual parallel planes are 4 cm apart, which are defined as follows, from cranial to caudal:

- The upper uterine sagittal plane, which runs from the upper edge of the symphisis to the sacral promontory.
- The lower uterine sagittal plane, which runs from the lower edge of the symphisis to the sacrum.
- The interspinal plane, the orientation points of which are indicated by the Ischial Spines.
- The pelvic floor plane.

The American College of Obstetricians and Gynecologists has published a classification of the levels, thus defining the interspinal plane at 0 cm and running from 5 to +5 cm. This means that at +5 cm, the fetal head is visible in the vaginal introitus.



Ill. 2 Levels according to DeLee and Hodge

2 Documentation and monitoring of the birth

It is of the utmost importance that the birth be meticulously documented, not only on forensic grounds. This means that an expert third party can be adequately informed by the documentation about the case history, the pregnancy and the course of the birth so that he/she is able to assess the measures taken during the birth, retrospectively.

2.1 Documenting the course of birth

The partogram is used to document the course of birth and determine whether or not it was normal. The partogram involves a graphic representation in which, according to the Friedmann method (1954), the width of the os uteri and the level of the central fetal presentation (ordinates) versus the time (abscissa) are delineated (s. Ill. 3).

Ill. 3 Partogram modified according to Friedmann

The patient's history, details of the present pregnancy, the CTG and, if relevant, the OR reports complete the partogram, yielding a sound documentation of the course and development of the birth.

2.1.1 Cardiotocography (CTG)

The cardiotocography comprises a continuous record of the fetal heart rate and the pattern of contractions. Patterns of fetal heart rate are documented to reflect both normal and deliterious changes to the fetal environment in utero. The tocogram determines the frequency, duration, form and regularity of the contractions.
In order to be able to interpret the CTG correctly, the delivery assistant must possess a comprehensive knowledge of the subject. Repeated CTG training is required in order to reinforce this knowledge

Fetal heart rate

- Basic rate (basal rate, baseline) in beats per minute [Bpm]:
  This shows the mean value of the fetal heart rate during an extended period.
- Floating line: This shows the long-term mean oscillation trend.
- Normocardia: Normal basic rate.
- Tachycardia: Rise in basic rate > 10 minutes > 150 Bpm1
- Bradycardia: Drop in basic rate > 3 minutes < 100 Bpm1
- Oscillation (variability): Shows the fluctuations in the curve of the fetal heart rate in relation to the basic rate.
- Oscillation amplitude (bandwidth/variability) [Bpm]: This specifies the differences in the fetal heart rate between maximum and minimum fluctuations.
- Oscillation rate: This is the rate of fluctuation around the floating line.
- Accelerations: Rise in fetal heart rate.
- Deceleration: Drop in fetal heart rate.

  - Early decelerations (DIP I): A drop in fetal heart rate begins when a contraction commences and the fetal heart rate reaches its lowest point at the peak of the contraction. At the end of a contraction, the fetal heart rate returns to its basic level.
  - Late decelerations (DIP II): The drop in fetal heart rate does not occur until

[1] Because the reference values vary internationally, applicable guidelines and recommendations should always be followed.

after the peak of the contraction and the fetal heart rate returns to its basic level after the end of a contraction.

- Variable decelerations: These appear in a variety of forms, duration, levels and relationship to contractions in terms of time.
- Atypical variable decelerations: Variable decelerations that demonstrate the following characteristics:

After the end of a contraction, the return to basic rate is gradual.

After a contraction, the basic rate lasts for an extended period.

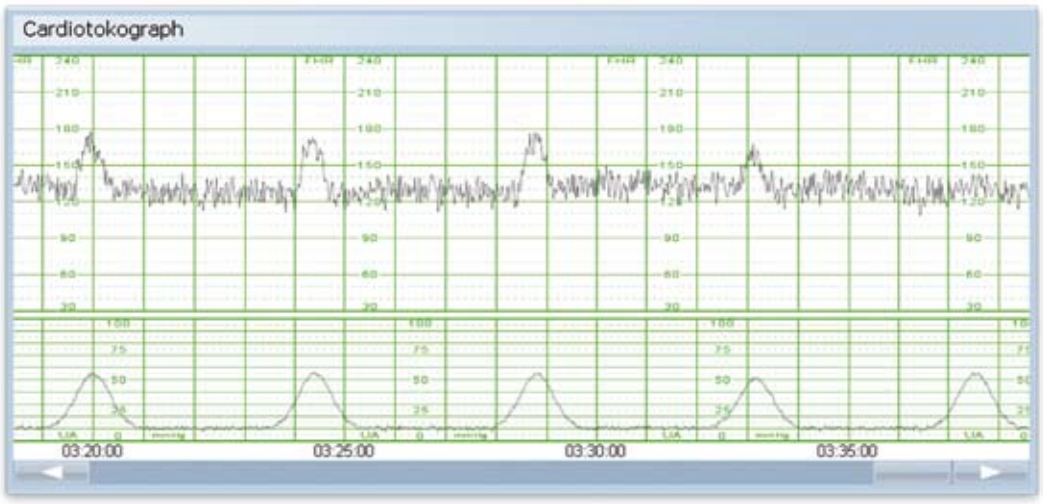
No oscillations are demonstrated during deceleration.

The basic rate remains low.

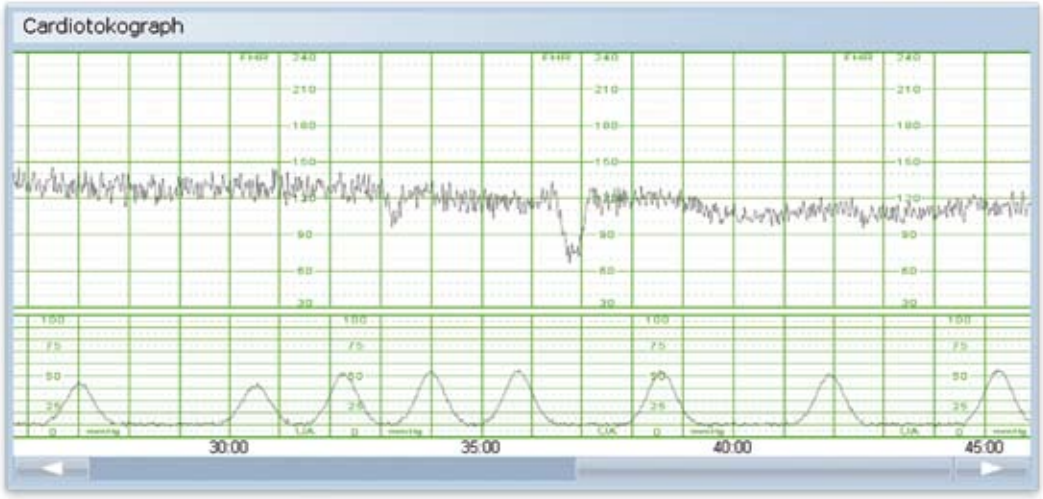
There is no primary or secondary rise in fetal heart rate.

Biphasic deceleration.

- Sinusoidal pattern: The basic rate demonstrates a fluctuation over an extended period, in the form of sinus waves



Ill. 4 Acceleration in the fetal heart rate



Ill. 5 Variable deceleration in the fetal heart rate

2.1.2 Fetal scalp blood analysis (FSBA)

The fetal scalp blood analysis, which is also referred to as a micro-blood evaluation (MBU) is used to monitor the fetus. After disinfection of the external genitalia, depending upon the stage of birth, a few drops of blood are taken from the emerging part of the fetus, either amnioscopically or else with the aid of a speculum. It is required that there is a broken or open amniotic sac and an os uteri that is open at least 2 to 3 cm. In addition to the pH value, the pCO_2, the pO_2, bicarbonate and the base excess can also be determined.

Indications for carrying out an FSBA are the following:

- Continued suspicious or pathological CTG pattern
- Extremely protracted course of birth with suspicious CTG pattern
- Green amniotic fluid with suspicious or pathological CTG

Contraindications for carrying out an FSBA are the following:

- A closed or only slightly-open os uteri
- A pathological CTG on the second twin
- Prematurity <34 WOP
- Terminal bradycardia
- Maternal infections such as HIV, HBV, HCV, HGV and HSV
- The first appearing part of the infant is on the pelvic floor
- Fetal coagulation disturbances

3 Vaginal-operative delivery methods

Vaginal-operative delivery methods include vacuum extraction and forceps extraction.

The following conditions must be fulfilled for a vaginal-operative delivery:

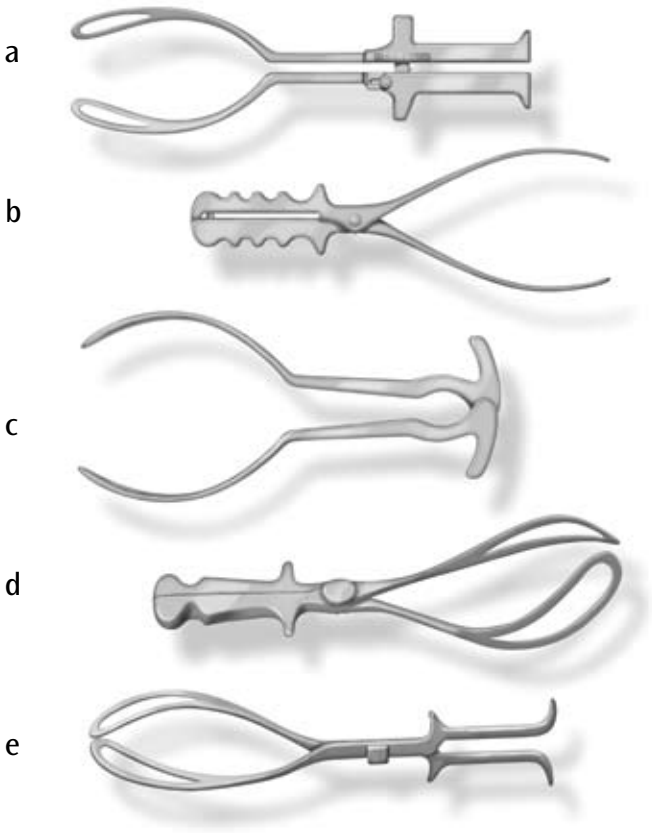
- Complete opening of the os uteri
- Exact determination of the level of the fetal head (in the centre of the pelvis/on the pelvic floor)
- Exact determination of the position and direction of the fetal head
- Broken or open amniotic sac
- Desirable proportions between the fetal head and the maternal pelvis
- The infant must be alive
- The mother must be aware of the situation
- The birth assistant must be an expert in the technique
- Sufficient analgesia and anesthesia

In order to be able to carry out a vaginal-operative delivery, the above-listed conditions must be met and the following are typical indications:

- Fetal emergency situation (hypoxia, asphyxia) = pathological CTG
- Maternal emergency, such as, for example, eclampsia, epileptic attack
- Exhaustion of the mother
- Weak contractions
- Suspension of the birthing progress during the pushing period
- Cardiopulmonary or cerebrovascular illness in the mother

3.1 Forceps

There are various types of obstetric forceps. All consist of two branches that meet either transversely or parallel to the hub



Ill. 7a – e a Shute forceps, b Bamberger forceps, c Laufe forceps, d Naegele forceps, e Kielland forceps

Each branch of the forceps consists of forceps blades, a forceps shank and a forceps handle. The forceps blades consist of two ribs and a point. The blades of the forceps demonstrates the curvature of the head and pelvis. The closure is at the shank of the forceps. The forceps delivery is the classic method for rapidly concluding a delivery.

3.2 Forceps delivery

Once one of the above-mentioned conditions is fulfilled, the following preparations must be made:

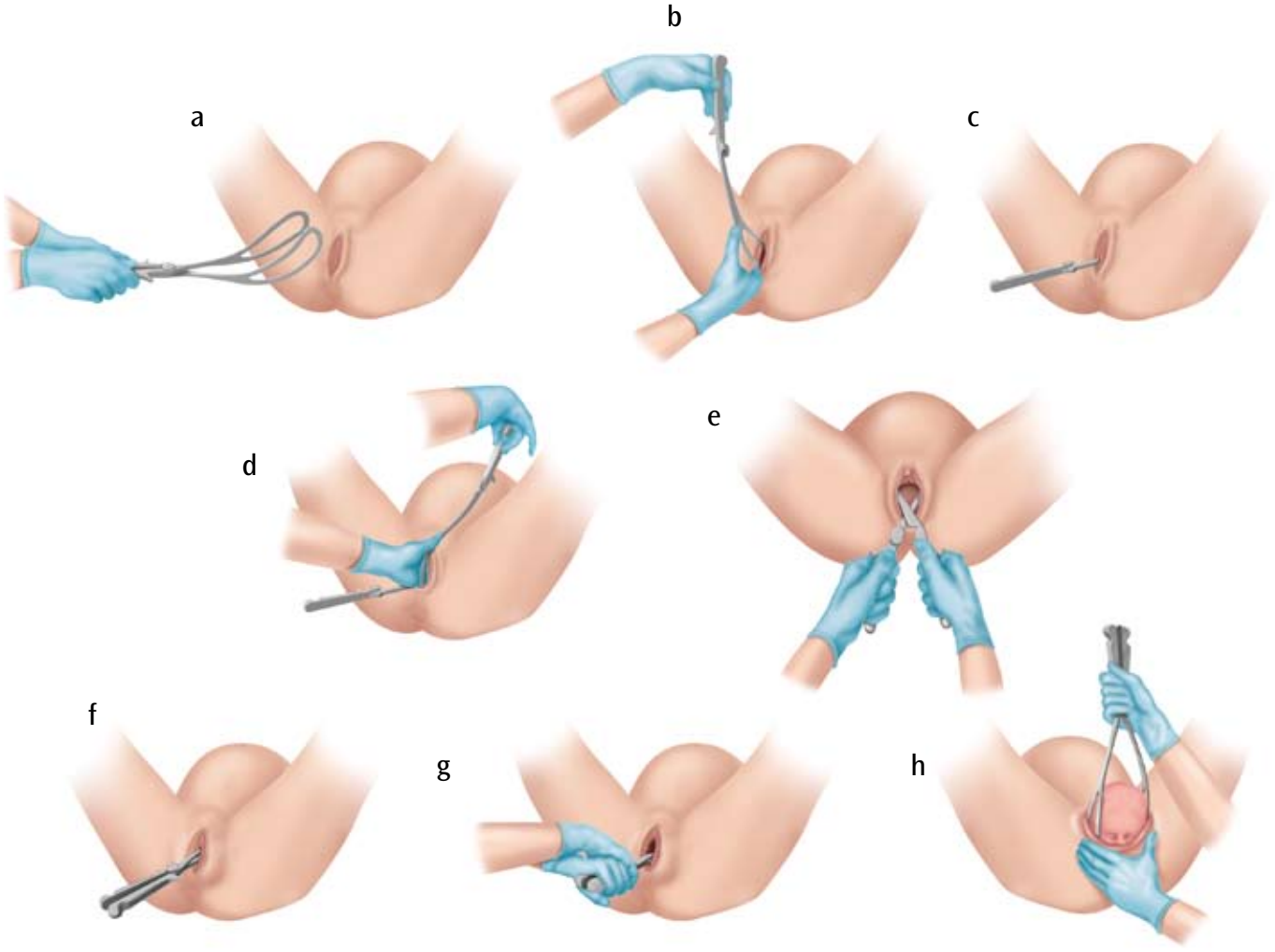
- The mother must be positioned (dorsosacral position)
- Contractions may be stimulated using medication
- The urinary bladder must be emptied
- The surgeon's hands and the vulva must be disinfected
- Vaginal examination: os uteri width, position and presentation of the fetal head
- Analgesia, for example epidural anesthesia or pudendal block
- Episiotomy if necessary

3.2.1 Technique of forceps delivery, i.e: transverse forceps delivery

- Assembly of the forceps
- Hold the closed forceps in the correct position in front of the vulva as the head of the infant is to be grasped (Ill. 6a).
- With the left hand, introduce the left forceps branch into the left side of the mother (Ill. 6b):
  - Place two to four fingers of the right hand into the space between the vaginal wall and the fetal head to protect the maternal soft tissue. The thumb remains outside.
  - The left forceps branch, held with the left hand, is held hanging perpendicularly in front of the vulva.
  - Place the extended thumb of the right hand on the back rib of the left forceps blade.

  - With the left hand, allow the left forceps spoon to come between the fetal head and the protecting right hand over the right side of the mother and slide it gently into the vagina by allowing the handle to drop downward.
- Now, use the right hand to introduce the right forceps branch into the right side of the mother (Ill. 6d):
  - To protect the maternal soft tissue, introduce two to four fingers of the left hand between the vaginal wall and the fetal head. The thumb remains outside.
  - Hold the right forceps branch, held with the right hand, perpendicularly in front of the vulva.
  - The extended thumb of the left hand lies on the back rib of the right forceps spoon.
  - With the right hand, allow the right forceps blade to come between the fetal head and the protecting left hand over the left side of the mother and slide it gently into the vagina by allowing the handle to drop downward. The right forceps branch lies over the left forceps branch.
- The forceps is now closed (Ill. 6e).
- It is vital that a check is carried out to determine that no maternal soft tissue is being grasped along with the fetal head and to be sure that the forceps is properly positioned on the fetal head. To do this, hold the forceps with one hand while using the other to check the forceps' position in the vagina.
- Then carry out a test pull: With the left hand, grasp the forceps handle from above. In order to prevent excessive pressure on the fetal head, the left index finger can be pushed between the two forceps handles[2]. With the right hand, check the lowering of the fetal head during contraction.

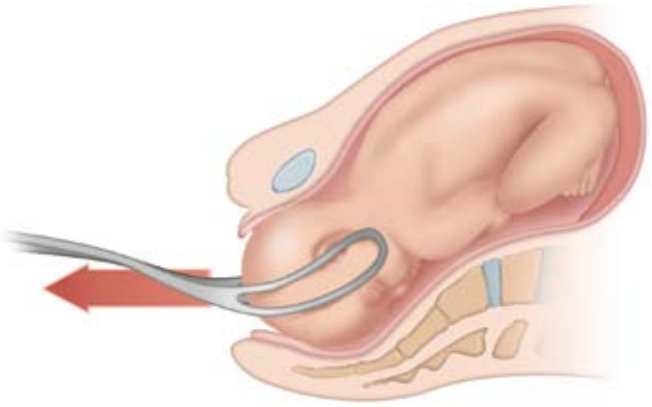
[2] Other methods used in order to prevent excessive pressure on the fetal head include:
- Placing a rolled towel between the two forceps handles or neck parts.
- Placing the middle finger of the right hand between the two neck parts.



Ill. 6a – h Placing the forceps and extraction (using a transverse forceps as an example)

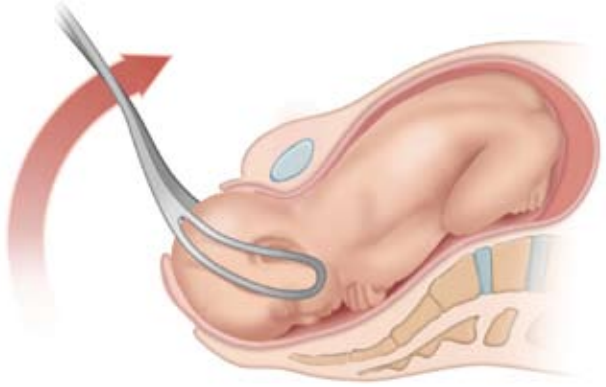
- Holding the forceps (Ill. 6g): With the left hand, hold the forceps handles from above and with the right hand, hold a Busch hook from above. In order to avoid placing excessive pressure on the fetal head, place either a rolled towel or a finger between the handles or the neck of the forceps.
- Pull: Then pull, synchronously with the contraction, in the direction of the

forceps handles (Ill. 7a), until the central position of the vulva is visible. This means that the hypomochlion has arrived at the bottom edge of the pubic bone joint.



Ill. 7a A pull synchronously with the contraction in the direction of the handles of the forceps (a transverse forceps is used in the example)

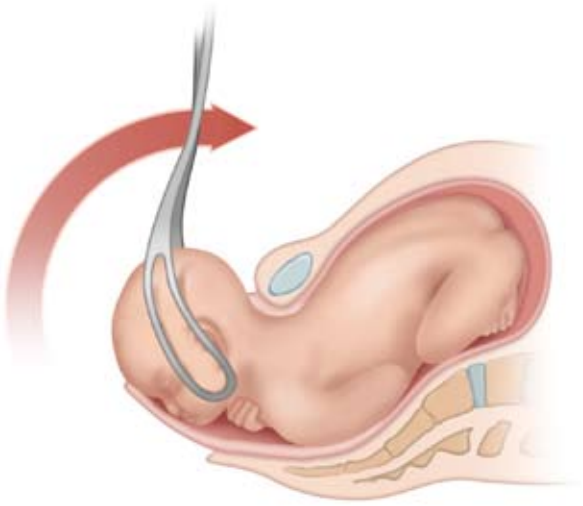
- Lift the forceps handles as the head descends (Ill. 7b). Now the surgeon goes to the left side of the mother and holds the forceps in his/her right hand, transversely over the pubis (Ill. 6h)



Ill. 7b Lifting the forceps handles (a transverse forceps is used in the example)

- If an episiotomy is necessary, this is not carried out until the fetal head is positioned on the pelvic floor.
- Protect the perineum with the left hand

- With the right hand, lift the forceps handle towards the mother in order to lead the head around the pubic bone (Ill. 7c).



Ill. 7c Lifting the forceps handle towards the mother's abdomen
(a transverse forceps is used in the example)

- The forceps may be removed prior to or after the birth of the head. The former may help to diminish perineal trauma. The infant is extracted in the normal manner afterwards.

3.3 Vacuum extractor

There are various types of vacuum extractors: metal vacuum extractors and silicon vacuum extractors, each with different characteristics. The common feature is that the vacuum extractor is placed on the leading fetal part, with various opening diameters: 40 mm, 50 mm and 60 mm.

3.4 Vacuum extraction delivery

Vacuum extraction is an alternative method of speeding up a birth.
Once one of the conditions specified at the beginning of this chapter has been met, the following preparations should be carried out:

- Position the mother (dorsosacral position)
- If necessary, stimulate contractions with medication
- Empty the urinary bladder
- Disinfect the hands of the surgeon and the vulva
- Vaginal examination: os uteri width, position and presentation of the fetal head
- Analgesia, for example epidural anesthesia or pudendal block

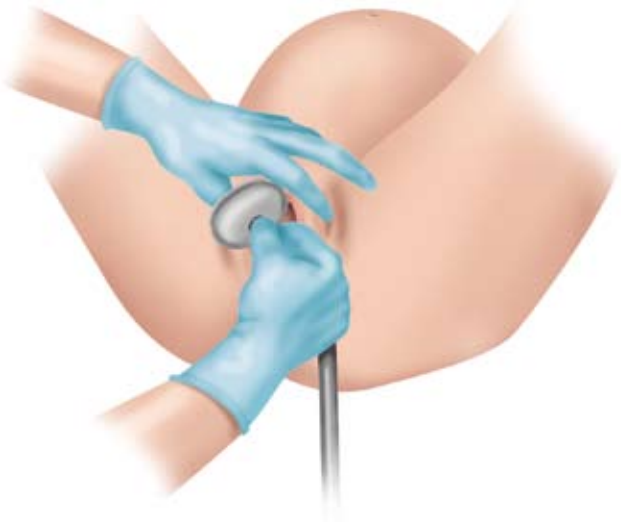
If one of the following situations is observed, vacuum extraction is contraindicated[3]:

- Face or forehead presentation
- Prematurity <34 WOP
- Active bleeding from the FSBA incision site
- Known thrombocytopenia
- Absence of birth progress during pushing

[3] Please also read the user information with regard to conditions and contraindications.

3.4.1 Technique for vacuum extraction

- Spread the labia for presentation of the vaginal introitus
- Choose the largest possible vacuum extractor
- Introduce the vacuum extractor (Ill. 8):
  - Introduce the metal vacuum extractor transversely
  - Compress and introduce the silicon vacuum extractor

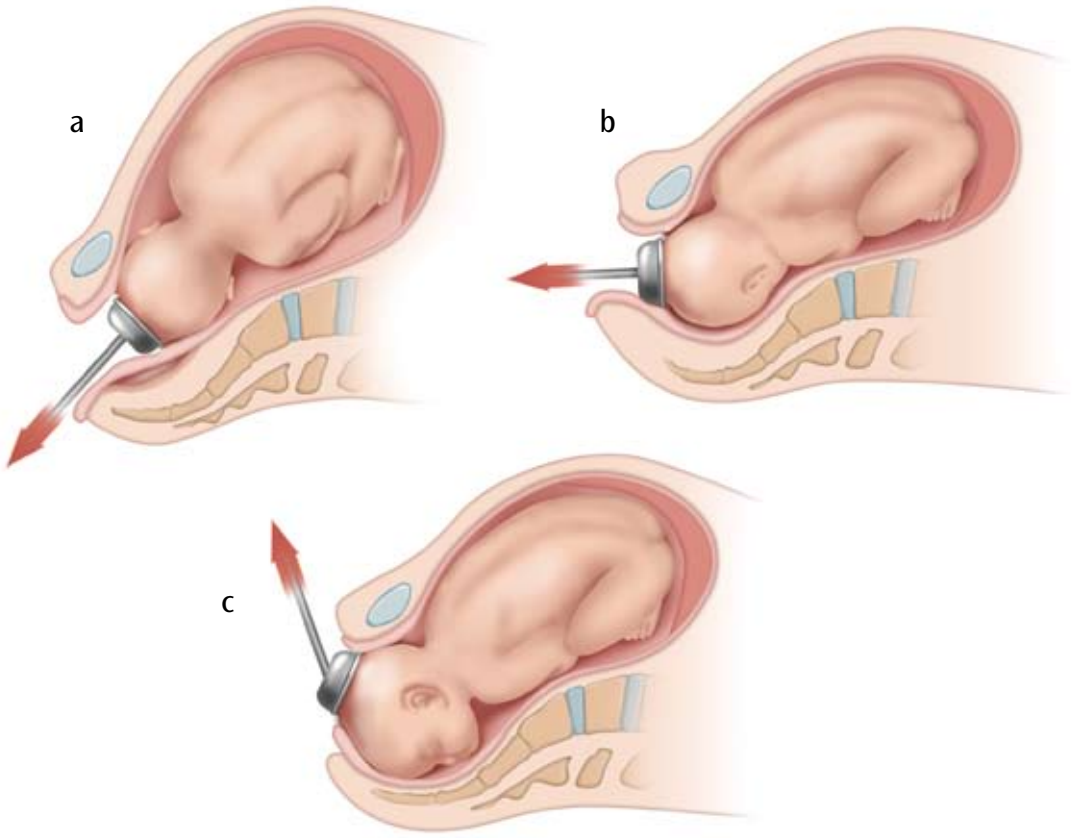


Ill. 8 Introducing a vacuum extractor, with a metal vacuum extractor in the example

- Place the vacuum extractor:
  - With the fetal head rotated towards the central position
  - If the positional change is incomplete, place it in what is to be the leading area
- Check to be sure that no maternal soft tissue is being grasped along with the extractor and that the vacuum extractor has been placed properly around the fetal head.
- Gradually increase vacuum[4] force
- After the first stage of the vacuum, check once more to be sure that no maternal soft tissue is being grasped.
- Increase vacuum force gradually until a vacuum of 0.6 – 0.8 kg/cm² has been reached4

[4] Please note the applicable manufacturer's specifications that are enclosed with the pump with regard to the gradual pressure decrease.

- Then carry out a test pull: Hold the handle of the vacuum extractor with one hand and touch the central position with the other, checking to be sure that the infant is following the pull.
- Extraction: Pulling is carried out simultaneously to pushing by the mother, in synchrony with the contractions, with increasing and decreasing force. This allows the fetal head to remain in position without sliding back in when a contraction subsides.
- Pull (Ill. 9a – c): The pulling, synchronous with contractions, follows in accordance with the parabola of the birth (in line with the pelvis).



Ill. 9a – c Pulling direction during vacuum extraction with occipito-anterior position

[4] Please note the applicable manufacturer's specifications that are enclosed with the pump with regard to the gradual pressure decrease

- Possibly a colleague can provide additional assistance by performing a Kristeller's maneuver.
- If necessary, an episiotomy can be carried out once the fetal head is on the pelvic floor.
- One hand protects the perineum.
- After the birth of the head, gradually decrease the vacuum of the vacuum extraction.
- The vacuum extractor can be removed during the delivery of the body.

The head deformation caused by this method (caput succedaneum) will subside within 12 – 24 hours.
The vacuum extractor may only be placed twice. After it has been placed twice, the birth must be terminated with a forceps or, if necessary, by Caesarean section. This is because, on the one hand, the head deformation that has been created makes further fixation of the vacuum extractor more difficult and on the other hand, intracranial pressure fluctuations might lead to cerebral hemorrhage.

4 Amniotomy

Breaking the amniotic sac with an instrument may shorten the latent phase of labor. The delivery assistant or midwife can break the amniotic sac using a sterile amniotic hook, a spiral electrode or surgical forceps

5 Episiotomy

An episiotomy takes the stress off the perineum and may shorten the second stage of labor. It also takes the pressure off the fetal head.

Indications for an episiotomy are the following:

- Extremely taut soft tissue
- Unfavorable presentation of the fetal head (deflexion position, occiput posterior)
- Threatened perineal rupture
- Shortening of the expulsive period due to fetal hypoxia
- Forceps delivery (not imperative)
- Vacuum extraction (not imperative)
- Breech presentation

There are three different types of episiotomy:

1. Mediolateral episiotomy:
   The incision is carried out commencing exactly at the anterior commissure, at an angle of 45° in a lateral direction

2. Median episiotomy:
   Commencing at the posterior commissure, the delivery assistant separates the connective tissue part of the perineum in the centre towards the anus.

3. Lateral episiotomy:
   The incision is carried out 1 – 2 cm beside the midline of the posterior commissure towards the Tuber ossis ischii.

The choice of incision always depends upon the indications. For example, a mediolateral episiotomy is preferred for a vacuum extraction.

6 Caesarean section

An abdomino-operative termination of the pregnancy or birth is indicated in the following cases:

- Possibly in the case of a previous Caesarean section
- On breech presentation in a primipara or multiple pregnancy
- Transverse presentation
- Pelvic deformities
- Suspected disproportion between fetal head and maternal pelvis
- Threatened uterine rupture
- Placental abruption
- Protracted duration of birth
- Threatened fetal hypoxia
- Infections in the mother, such as Herpes genitalis
- Placenta praevia totalis (marginalis)
- Eclampsia
- Amniotic fluid embolism
- Umbilical cord prolapse
- HELLP syndrome

7 Contraction stimulation for inefficient contractions

The medical stimulation of contractions using oxytocin is indicated in situations where a strikingly slow progress of birth or a cessation of progress is observed, caused by weak contractions without indications of a hindrance to the birth.[5]

Situations that would prohibit vaginal birth contraindicate the use of oxytocin. These can be:

- Birth mechanism hindrance
- Pathological anatomy of the pelvis
- Placenta praevia
- Vasa praevia
- Prolapse of umbilical cord
- Status post-myomectomy with transgression of the uterine cavity
- Invasive cervical carcinoma

[5] Because there are various dosing schedules for the application of oxytocin, it is important that the applicable guidelines and recommendations and the manufacturer‘s information be taken into consideration when this medication is used.

8 Inhibition of contractions (tocolysis)

Inhibition of premature contractions using medication is indicated in order to effect the prolongation of a pregnancy if there is a risk of threatened premature birth.
Excessively strong contractions during birth can also be an indication for tocolysis. Intrauterine hyperactivity can result in a worsening of the fetal condition. Sustained contractions leading to an acute oxygen deficit must be corrected by way of emergency tocolysis. Emergency tocolysis is an additional aid in the monitoring of maternal circulatory parameters. Polysystole (excessive contraction rates) also requires intervention.

Based on the minimal half-life time of oxytocin in plasma (approx. 3 min.) and in the uterine tissue (approx. 15 min.), an oxytocin infusion is easy to manage. Should uterine hyperactivity occur during such treatment, the dosage can be decreased.

General contraindications for tocolysis are the following:

- Fetal maturity
- Fetal indications for termination of the pregnancy
- Maternal indications for termination of the pregnancy
- Intrauterine infections
- Intrauterine fetal death

Medications that inhibit contractions (tocolytics) are:

- ß-sympathomimetics, such as phenoterol
- Magnesium, such as magnesium sulphate
- Prostaglandin synthesis inhibitors such as Indomethacin
- Calcium antagonists such as nifedipin
- Oxytocin antagonists
- NO-donators such as nitroglycerin

The choice of tocolytic depends, first of all, upon what is licensed in a given country and secondly the indications and contraindications of a given medication.

9 Analgesia and anesthesia during delivery

Analgesia and anesthesia control pain, resulting in a relaxation of the pelvic floor muscles and thus making the delivery more tolerable.
Medical treatment for the pain of birth is effected by means of systemic analgesia and regional anesthesia.

In addition to analgesics such as opiates and opioids, which are used for systemic analgesia for the alleviation of pain, spasmolytics and sometimes nitrous oxide are used.
Other types of treatment for pain include acupuncture, transcutaneous electrical nerve stimulation (TENS), homeopathic medications and the practice of relaxation techniques.

The type of regional anesthesia, as listed below, used to control the pain of birth depends upon the indication, meaning the birth assistance situation and the reason for the pain.

- **Epidural anesthesia (EA, peridural anesthesia):**
  For epidural anesthesia, either the single-injection technique or the catheter technique is used to administer a local anesthetic and/or opioid into the epidural cavity at the level of the intervertebral space L2/3 or L3/4.

- **Spinal anesthesia:**
  For spinal anesthesia, either the single-injection technique or the catheter technique is used to inject a local anesthetic and/or opioid into the epidural cavity at the level of the intervertebral space L2/3 or L3/4 into the subarachnoid space.

- **Combined spinal-epidural anesthesia:**
  This procedure involves a combination of spinal anesthesia (using the single-injection technique) and epidural or epidural anesthesia (using the catheter technique). After puncturing the epidural cavity at the level of the intervertebral space L2/3 or L3/4, a spinal needle is introduced through the cannula and the subarachnoid space is punctured. After the injection of a local anesthetic and/or opioids and the removal of the spinal needle, the anesthetist places and fixes the epidural catheter in the epidural cavity.

- **Pudendal block:**
  For the control of perineal dilation pain and to relax the pelvic floor muscles, the pudendal nerve and its branches are blocked by the injection of a local anesthetic from the vagina on both sides of the pudendal nerve region.

10 Assessment of the newborn

Virginia Apgar developed a system that entailed the standardization of the assessment of newborns.

The so-called APGAR score is comprised of the following five components:

1. Heart rate
2. Breathing
3. Reflexes
4. Muscle tone
5. Skin color

Each component is rated after 1, 5 and 10 minutes by way of a points system (0 to 2 points): a healthy newborn infant should score between 7 and 10 points. If the APGAR score is between 3 and 6, the infant indicates a mild to moderate depressive state. An APGAR score of 0 to 2 indicates a serious depressive state.

At the same time, this indicates the need for measures that can be taken in order to support the newborn in adapting to its new circumstances after birth.

Criterion	0 points	1 point	2 points
Heart rate	none	<100 Bpm	>100 Bpm
Breathing	none	slow, irregular	regular, crying
Reflex response and sucking reflex	none	decreased	crying
Muscle tone	limp	sluggish flexion	active movement
Skin color	pale, blue	trunk rosy, extremities blue	rosy

Tab. 1 APGAR score

11 Bibliography

The following literature sources were used in the preparation of this handbook:

- American College of Obstetricians and Gynecologists: Intrapartum fetal heart rate monitoring. ACOG Technical Bulletin No 132. Washington, DC (1989)

- Cunningham FG, Leveno KJ, Bloom SL, Hauth JC, Gilstrap III LC, Wenstrom KD: Williams Obstetrics, 22nd edition, McGraw-Hill (2005)

- Diedrich K, Holzgreve W, Jonat W, Schneider KTM, Weiss JM: Gynäkologie und Geburtshilfe, Springer-Verlag, Berlin, Heidelberg (2000)

- Dudenhausen JW, Pschyrembel W: Praktische Geburtshilfe mit geburtshilflichen Operationen, 19., fully revised edition, Walter de Gruyter, Berlin, New York (2001)

- Goerke K, Steller J, Valet A: Klinikleitfaden Gynäkologie, Geburtshilfe, 6. Auflage, Urban & Fischer Verlag, München, Jena (2003)

- Halle H: Mit Unterdruck oder mit Zange? Gynäkologie und Geburtshilfe 4, 18-20 (2006)

- Leitlinie der Deutschen Gesellschaft für Gynäkologie und Geburtshilfe: Absolute und relative Indikationen zur Sectio caesarea und zur Frage der sogenannten Sectio auf Wunsch. AWMF Register-Nr. 015/024 (2006)

- Leitlinie der Deutschen Gesellschaft für Gynäkologie und Geburtshilfe: Vaginal-operative Entbindungen. AWMF Register-Nr. 015/023 (2007)

- Leitlinie der Deutschen Gesellschaft für Gynäkologie und Geburtshilfe:

Anwendung des CTG während Schwangerschaft und Geburt.
AWMF Register-Nr. 015/036 (2007)

- Maeda K. FIGO News: Report of the FIGO Study Group on the Assessment of New Technology. Evaluation and standardisation of fetal monitoring. Int J Gynaecol Obstet 59, 169–173 (1997)

- NICHD (National Institute of Child Health and Human Development). Electronic fetal heart rate monitoring: Research guidelines for interpretation. Research Planning Workshop. Am J Gynaecol Obstet 177, 1385–1390 (1997)

- Rooth G, Huch A, Huch R. FIGO News: Guidelines for the use of fetal monitoring. Int J Gynaecol Obstet 25, 159–167 (1987)

- Royal College of Obstetricians and Gynaecologists: The Use of Electronic Fetal Monitoring. Evidence-based Clinical Guideline Number 8 (2001)

- Schneider H, Husslein P, Schneider KTM: Die Geburtshilfe, 3. Auflg., Springer-Verlag, Berlin, Heidelberg (2007)

Notes

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