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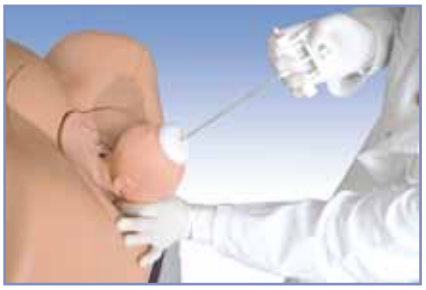

Obstetrical medicine background

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Illustrations Holger Vanselow 2008

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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

First stage - Cervical Dilatation

The first stage commences with regular, painful contractions occurring every 10 minutes or closer and concludes with full dilatation of the cervix. It is divided into latent and active phases. The latent or slow phase comprises a variable time of shortening or effacement of the cervix with minimal dilatation. Once the cervix is fully effaced and 3 cm dilated the active phase of labour begins with increasing frequency and strength of uterine contractions, resulting in full dilatation of the cervix.

Second Stage - Expulsion

The expulsion stage commences with full dilatation of the cervix (approximately. 10 cm) and concludes with the birth of the infant. It is divided into an early expulsive stage and an active pushing stage.

Placental stage

The placental stage comprises the separation and expulsion of the placenta.

1.1 The birth mechanism in the occipito-anterior position

The birth mechanism in the occipito-anterior (normal) position is made up of the following phases:

- Mechanism of onset of labour
- Progression mechanism
- Expulsion mechanism
- External rotation

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

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

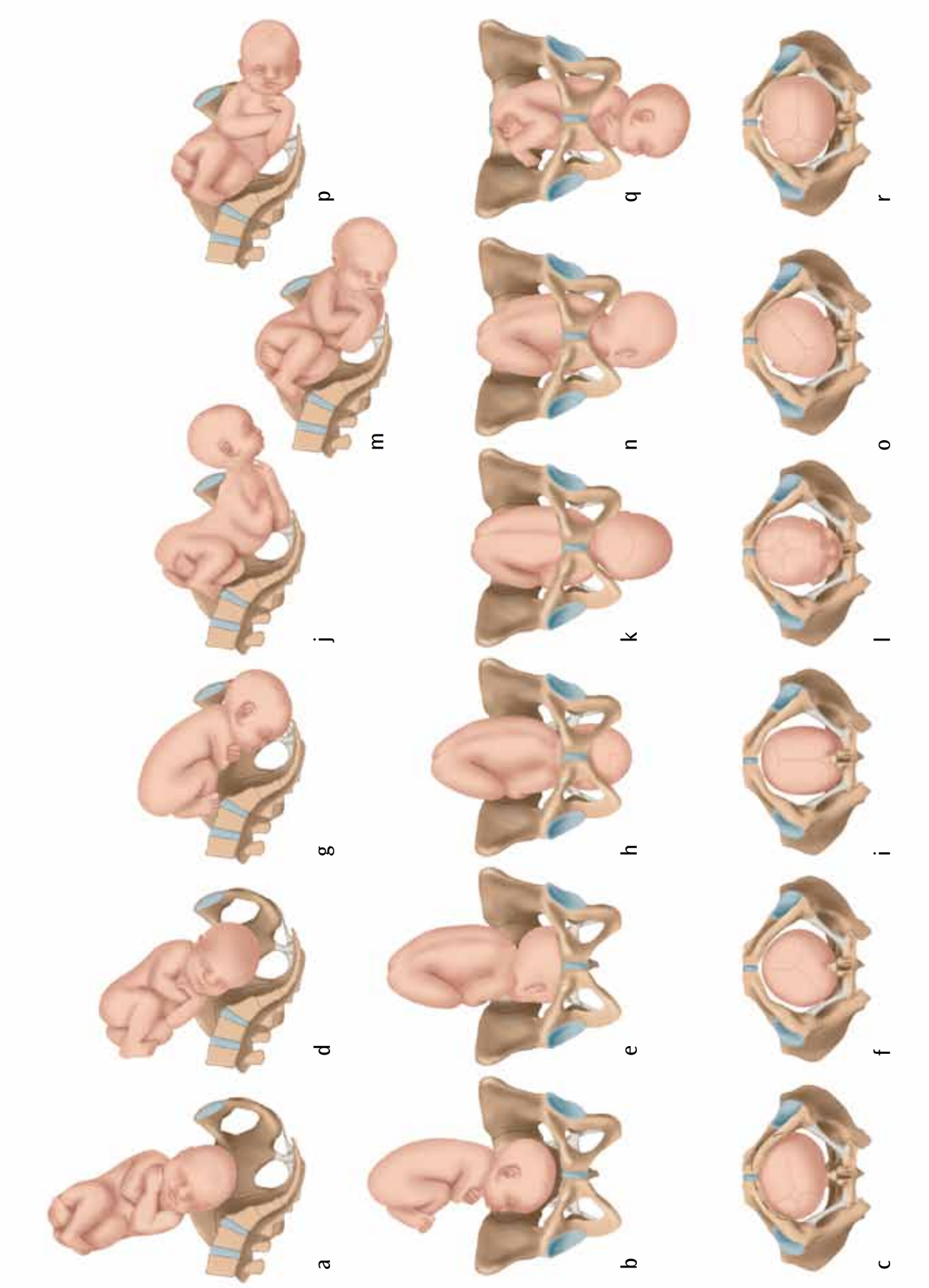
As the fetal head proceeds through the birth canal, it must adapt to the normal anatomy of the female pelvis. For this reason, during the onset of labour a fetal head that is located in the occipito-anterior position with flexion must move to a transverse presentation due to the transverse oval pelvic inlet: with the sagittal plane proceeding transversely or in a somewhat slanted direction (Ill. 1a – c).

During the progression phase, 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 posterior fontanelle 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 expulsion phase, 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 backwards (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). This is caused by the fetal shoulders negotiating the pelvis in the same manner as the head.



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 within the maternal pelvis

The level of the foetal head within the maternal pelvis is determined by means of external (Leopold and Zangenmeister manoeuvre) and internal (vaginal) examination.

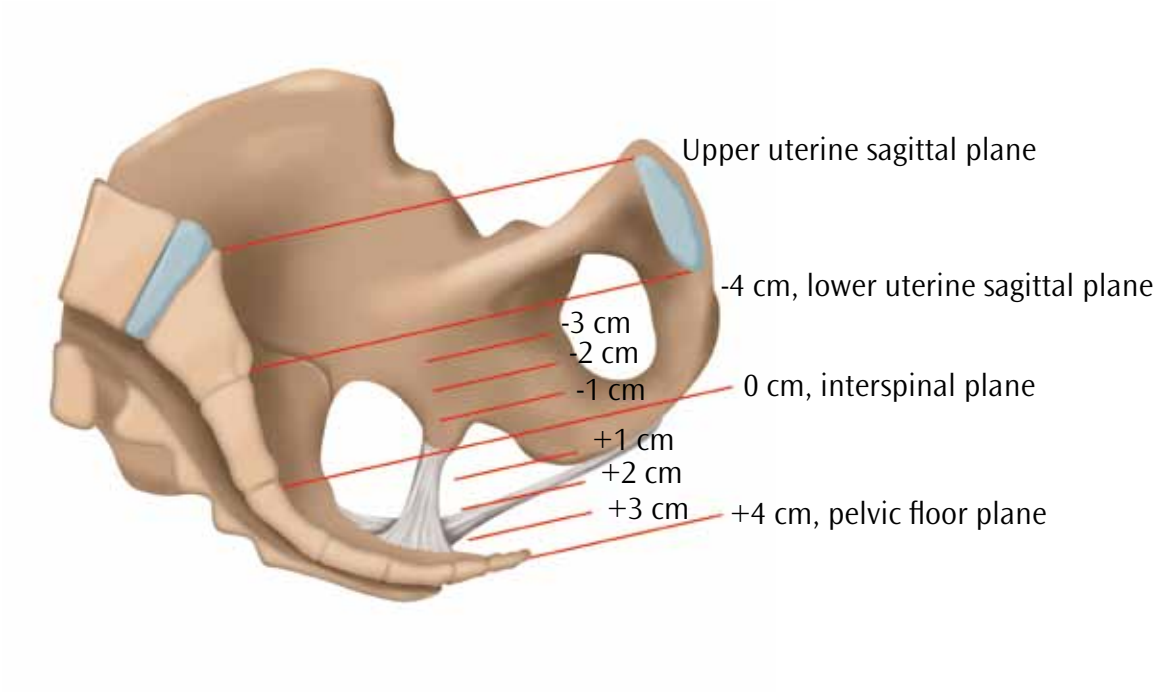
Internal vaginal examination determines the position of the sagittal suture and the fontanelles. The station of the fetal head is assessed by determining the relationship of the presenting part to the ischial spines. The lowest part is assessed in cm -3 to +3 in relation to a notional plane in the mid pelvis at the level of the spines. 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 +3 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 promontorium.
- 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 Ischiadic Spine.
- 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. However this system is not used e.g. in standard UK practice. German speaking countries utilize a range from -4 to +4 cm.

1.2 Level of the fetal head in the maternal pelvis - Station



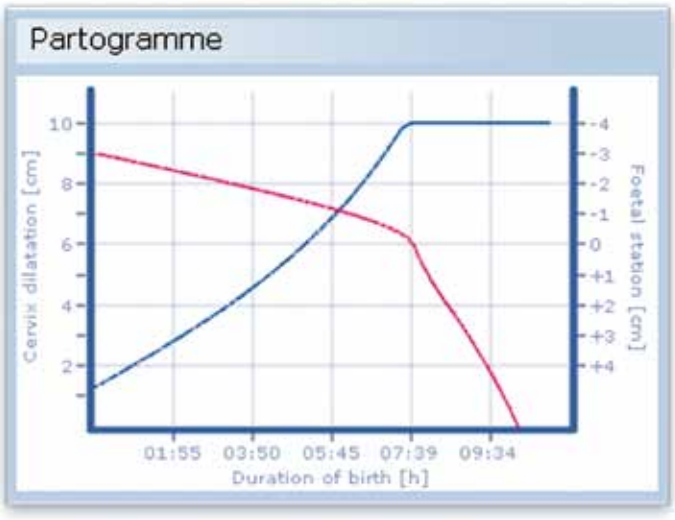
Ill. 2 Station -3cm to +3cm in relationship to the ischial spines

2 Documentation and monitoring of the birth

It is of the utmost importance that the birth is meticulously documented, not only on medico-legal grounds, but for clinical risk review and a full description of the case for audit purposes. This should mean that any expert third party can be fully informed by the records of the case history, the pregnancy and the course of the birth so that they can assess both the events and 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 is normal. The partogram involves a graphic representation in which, according to the Friedmann method (1954), the dilatation of the cervix and the level of the presenting part (ordinates) versus the time (abscissa) are graphically recorded. (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, giving a full record of the progress and important events of the birth.

2.1.1 Cardiotocography (CTG)/ Electronic Fetal Monitoring (EFM)

The cardiotocography is a graphical record of the fetal heart rate and the pattern of uterine contractions. The pattern of the fetal heart rate can give warning of possible fetal compromise due to oxygen deprivation and allow for intervention to prevent long term damage. The CTG determines the frequency, duration, form and regularity of the fetal heart rate and uterine contractions. In order 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.

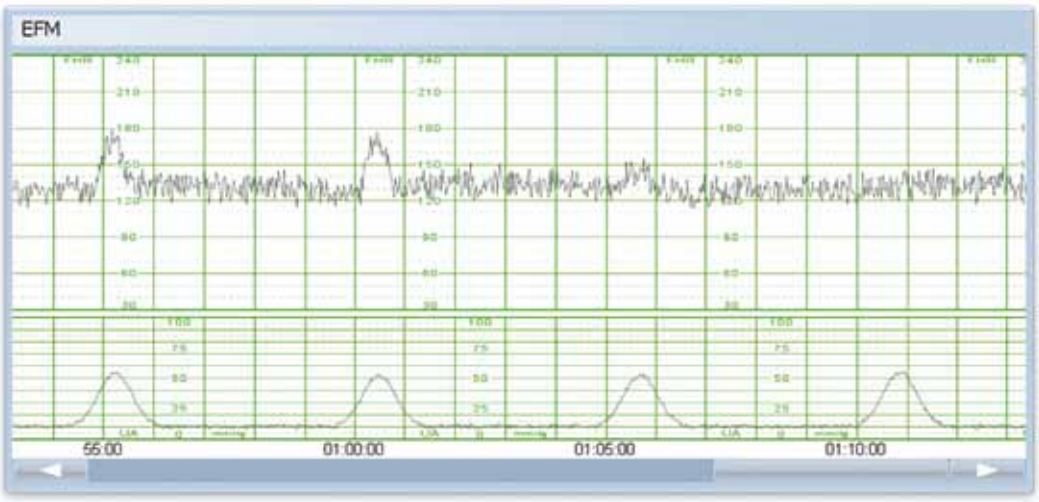
Fetal heart rate

The baseline rate of the fetal heart, baseline variability and any accelerations or decelerations are used to assess the fetal condition.

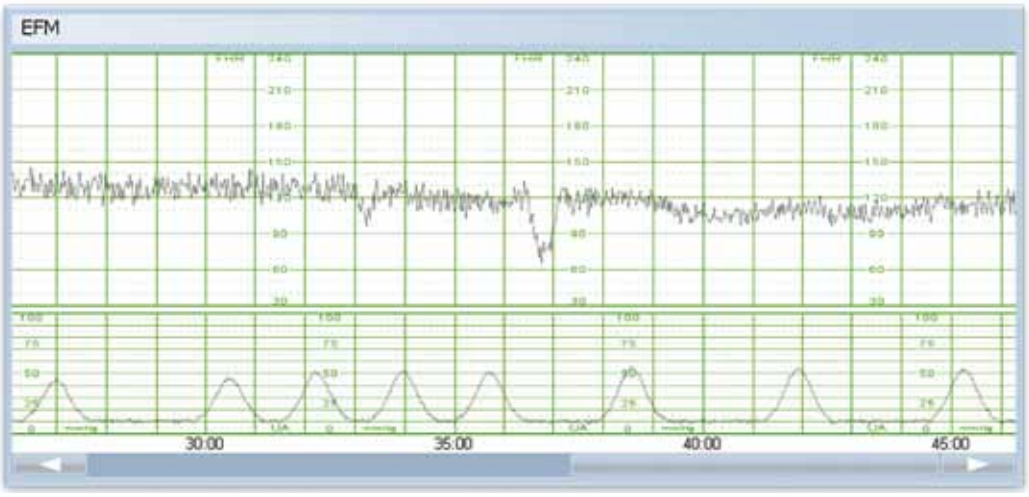
- Baseline rate (basal rate) in beats per minute [Bpm]:
  This shows the mean value of the fetal heart rate during an extended period.
- Baseline variability: Shows the fluctuations in the fetal heart rate in relation to the basic rate. The variation of the baseline is normally more than 5 beats per minute during a 10-minute tracing segment.
- Normocardia: Normal basic rate.
- Tachycardia: Rise in basic rate > 10 minutes > 150 Bpm[1]
- Bradycardia: Drop in basic rate > 3 minutes < 100 Bpm[1]
- Accelerations: A rise in fetal heart rate of more than 15 Bpm.
- Deceleration: A drop in fetal heart rate of more than 15 Bpm.
- Early deceleration: A drop in fetal heart rate coincident with a contraction

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

- Late decelerations: A drop in fetal heart rate occurring after a contraction (nadir > 20 seconds after the acme of the contraction).
- Variable decelerations: These appear in a variety of forms, duration, levels and relationship to contractions in terms of time.
- Atypical variable decelerations are variable. Variable decelerations that demonstrate the following characteristics:
  After the end of a contraction, the return to basic rate is gradual.
  After a contraction, the baseline 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 sine waves pattern for an extended period of time.



Ill. 4 Acceleration in the fetal heart rate



Ill. 5 Variable deceleration in the fetal heart rate

2.1.2 Fetal blood sampling (FBS)

The fetal scalp blood analysis is used to monitor the fetus if there is significant uncertainty about the fetal condition. After washing the vulva a few drops of blood are taken from the fetal head using an amnioscope or occasionally a speculum. The membranes must be ruptured and no other contra-indication such as infection risk should be given. The cervix must be at least 2 to 3 cm dilated.
In addition to the pH value, the pCO2, the pO2, bicarbonate and the base excess can also be determined.

Indications for carrying out an FBS are the following:

- Continued suspicious or pathological CTG pattern
- Protracted course of birth with suspicious CTG pattern
- Meconium stained or absent amniotic fluid with suspicious or pathological CTG

Contraindications for carrying out an FBS 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 (ventouse) and forceps delivery.

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

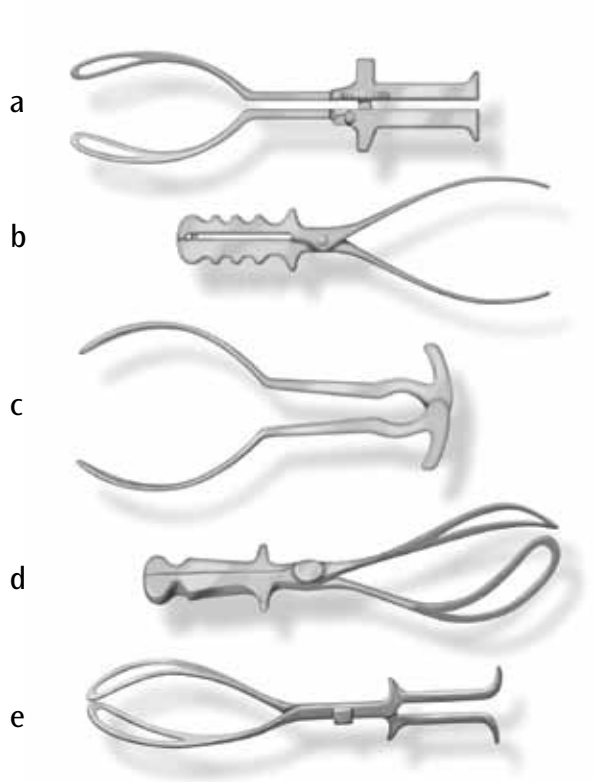
- Full dilatation of the cervix
- Exact determination of the level of the fetal head (in the centre of the pelvis/on the pelvic floor)
- Exact determination of the position and direction of the fetal head
- Ruptured membranes
- Undesirable proportions between the fetal head and the maternal pelvis must be excluded
- 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 anaesthesia to be able to carry out a vaginal-operative delivery

The above-listed conditions must be met and one of the following indications must be confirmed:

- 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[2]. All consist of two blades that meet to create a supportive cradle for the fetal head.



Ill. 7a – e An assortment of types of forceps,

a Shute forceps, b Bamberger forceps, c Laufe forceps, d Naegele forceps, e Kielland forceps

Each branch of the forceps consists of forceps spoons, a forceps neck and a forceps handle. The forceps spoons consist of two ribs and a point. The spoon of the forceps demonstrates the curvature of the head and pelvis. The closure is at the neck of the forceps. The forceps spoons have Busch hooks. The forceps delivery is the classic method for rapidly concluding a delivery.

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

[2]A huge range of forceps types were developed in the past. Therefore different forceps are established in different regions. UK practice tends to use Neville-Barnes and Wrigley forceps for non-rotational and Kiellands for rotational forceps delivery. Further Mc Lean-Tucker and Simpson are common in North America, Tarnier is used in France for instance with Payot forceps for cesarean section. Naegele forceps is prevalent employed in German speaking countries.

3.2 Forceps delivery

- The mother is placed in a lithotomy position with her leg supported
- Contractions may be stimulated using medication (intravenous oxytocin infusion)
- The urinary bladder is emptied by catheterisation
- The obstetrician's hands and the vulva must be cleaned
- Vaginal examination: full dilatation of the cervix, position and presentation of the fetal head, by both abdominal and vaginal assessment
- Analgesia, for example epidural anaesthesia or pudendal block
- Episiotomy if necessary at the time of the delivery of the head

A forceps delivery is contraindicated if the above-mentioned preparations have not been carried out.

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

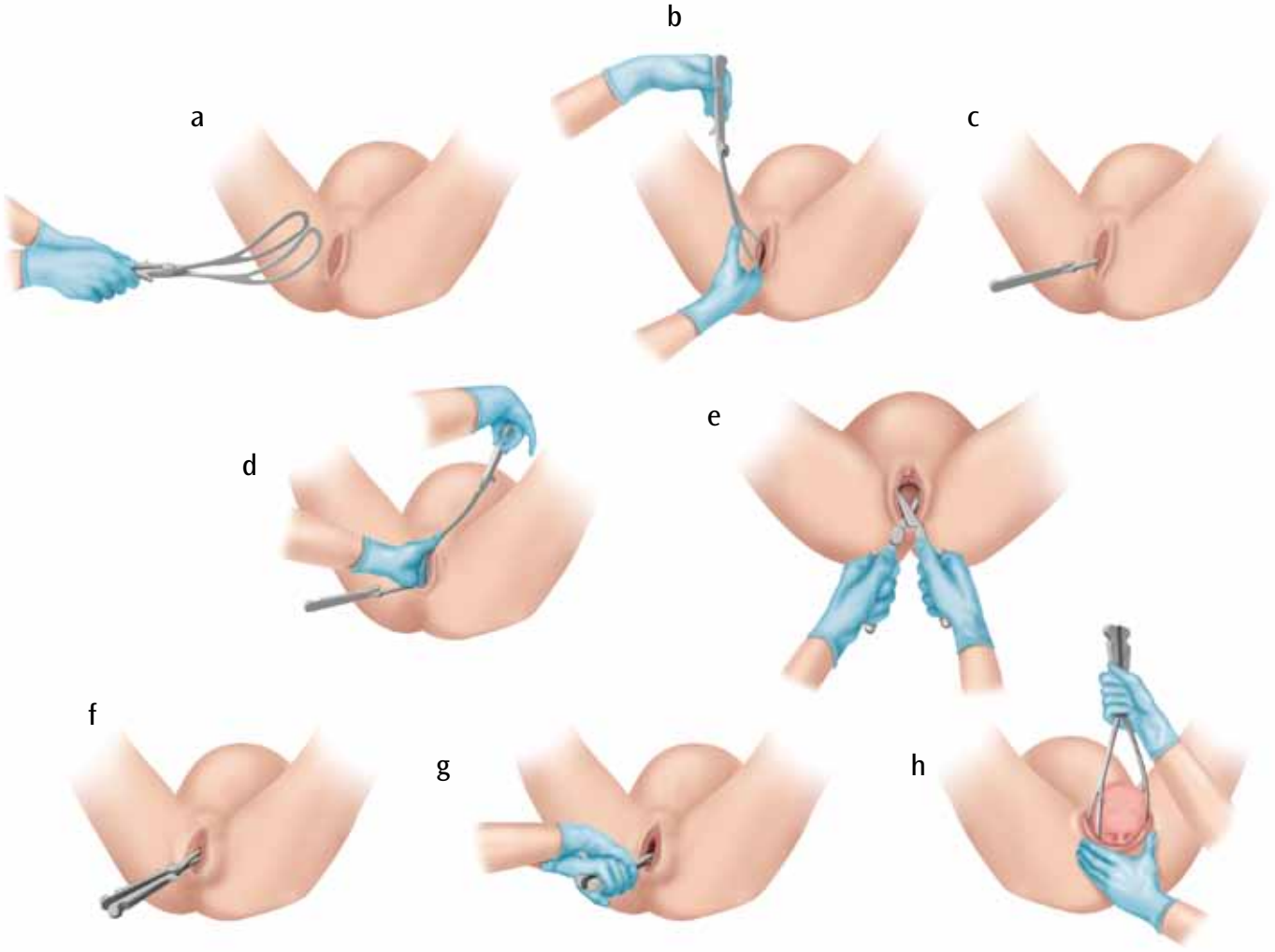
- Assemble the forceps to check they are a pair.
- Hold the closed forceps in the correct position in front of the vulva as the head of the infant is to be grasped (Ill. 6a).
- With the left hand, introduce the left forceps branch into the left side of the mother (Ill. 6b):

- Place two 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 blade, 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 spoon.

- 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 blade 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 spoon 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 blade lies over the left forceps blade.
- The forceps are now closed together and should lock without undue force being applied (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. With the right hand, check the lowering of the fetal head during contraction.

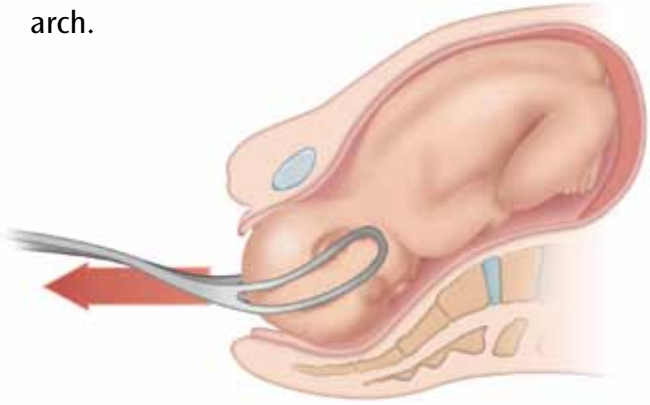
[3] Other methods used in order to prevent excessive pressure on the fetal head include:
- Placing a rolled towel between the two forceps handles or neck parts.
- Placing the middle finger of the right hand between the two neck parts



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

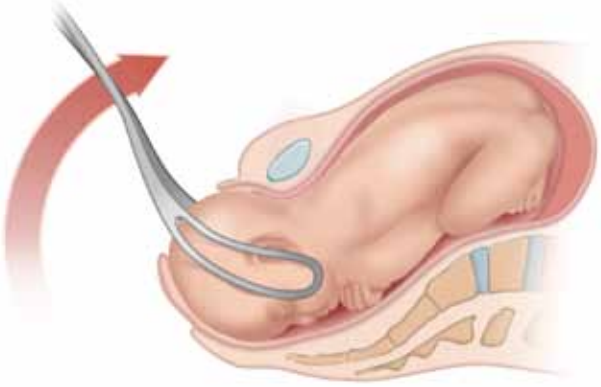
- Holding the forceps (Ill. 6g): With the left hand, hold the forceps handles from above and with the right hand, use the Bush hook for extraction. In order to avoid placing excessive pressure on the fetal head, place either a rolled towel or a finger between the handles or the neck of the forceps.

- Pull: Then pull at the time of the contraction, in the direction of the forceps handles (Ill. 7a). Downward pressure may be applied with the left hand (Paget's manoeuvre) until the posterior fontanelle is felt below the pubic arch.



Ill. 7a A pull synchronously with the contraction in the direction of the handles of the forceps

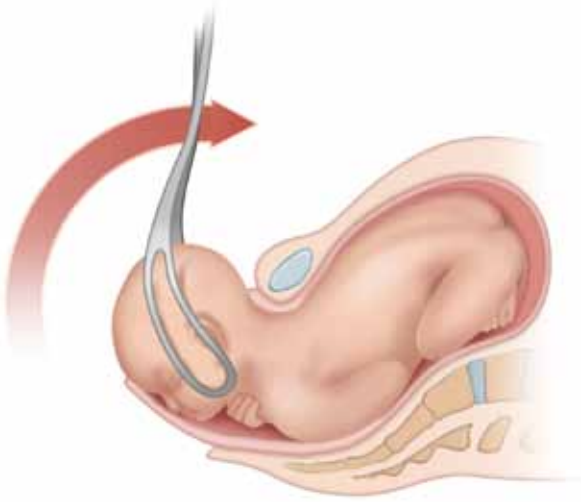
- Lift the forceps handles as the head descends (Ill. 7b) so that the fetal neck is being extended. The surgeon may go to the left side of the mother and hold the forceps in the right hand with the forceps handles being lifted (Ill. 6h).



Ill. 7b Lifting the forceps handles

- If an episiotomy is necessary, this is not carried out until the fetal head is positioned on the pelvic floor. This avoids an unnecessary episiotomy in cases where the attempt at a safe assisted birth fails.
- Protect the perineum with the left hand as the head is being extended by upwards rotation of the forceps.

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



Ill. 7c Lifting the forceps handle towards the mother's abdomen

- After the birth of the head, the forceps blades are removed by sliding them around the fetal head for not widen the vulva additionally. The baby's body is born in the normal way with maternal effort.

3.3 Vacuum extractor

There are various types of vacuum extractor or ventouse: metal, silicon and plastic vacuum extractors have their own individual characteristics and various diameters between 40 and 60mm. The common feature is that the vacuum extractor is placed on the flexion point of the fetal head just in front of the posterior fontanelle.

3.4 Vacuum extraction delivery

Vacuum extraction is a well established method of assisted vaginal birth, but can only be used when the strict conditions set out at the beginning of this chapter have been met. Once the decision for vacuum extraction has been made the following sequence should be followed:

- Position the mother in lithotomy (dorsosacral position)
- If necessary, stimulate contractions by medication
- The surgeon should scrub as for any sterile surgical procedure
- Clean the vulva and cathererise to empty the bladder
- Assess by digital vaginal and bimanual examination: The cervix must be by fully dilated (not felt). The fetal head should be no more than 1 fifth palpable abdominally and the position of the fetal head should be determined.
- Analgesia, for example epidural anaesthesia or pudendal block

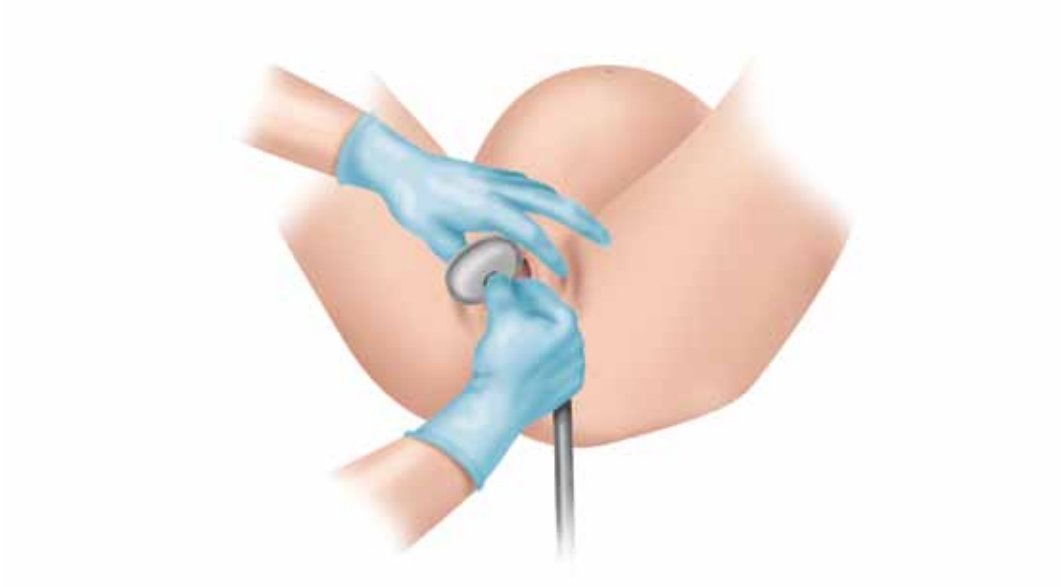
If one of the following situations is observed, vacuum extraction is contraindicated[4]:

- Vertex or Face (mento-anterior only) are suitable
- Prematurity < 34 weeks
- Active bleeding from a fetal blood sample incision site
- Known thrombocytopenia
- Absence of birth progress during pushing

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

3.4.1 Technique for vacuum extraction

- Spread the labia to avoid trauma during insertion
- Choose a suitable vacuum extractor cup (the largest possible)
- Introduce the vacuum extractor (Ill. 8):
- Introduce any hard vacuum extractor (metal or plastic) transversely
- Introduce a flexible silicon vacuum extractor by compressing to an oval shape

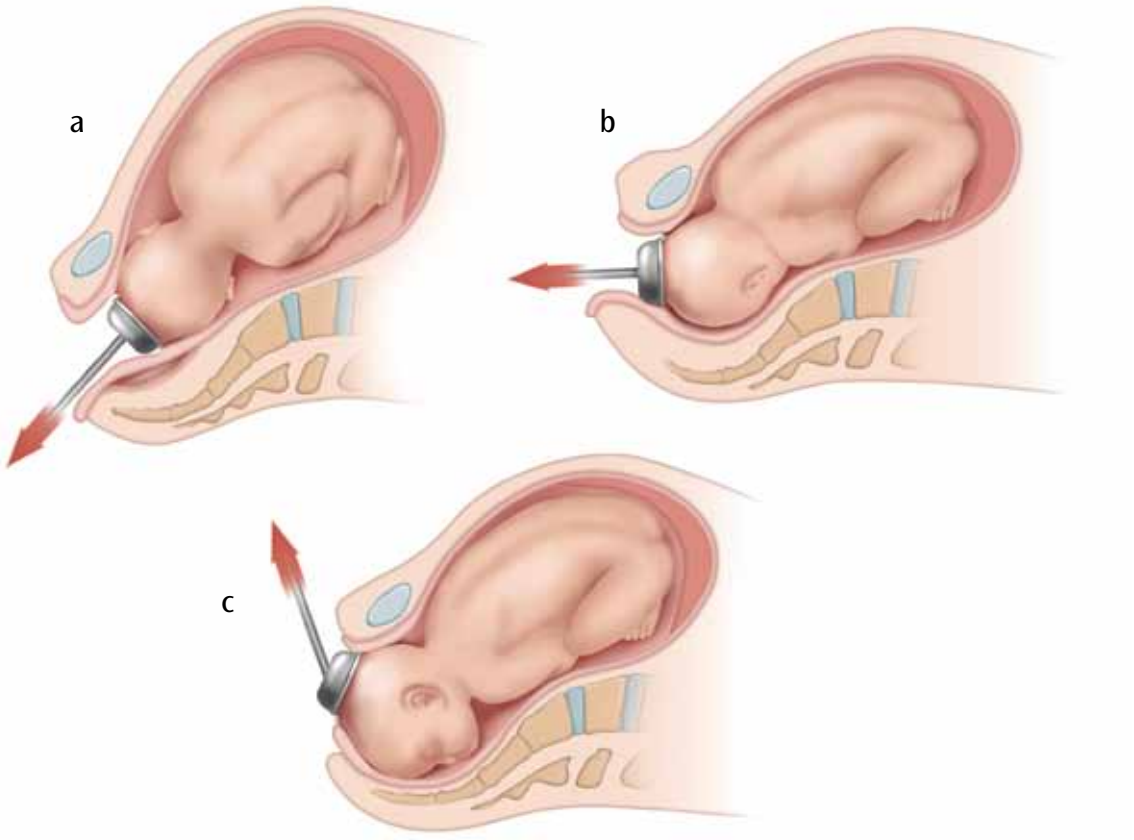


Ill. 8 Introducing a vacuum extractor, with a metal vacuum extractor in the example

- Place the vacuum extractor:
- The vacuum cup must be placed on the flexion point of the fetal head. This is in the midline, immediately in front of, or over the posterior fontanelle.
- Flexion of the head during the birth is a key component of successful delivery. An absent flexion might be the reason for an absent progress in delivery. Supporting the flexion is a main feature of a ventouse compared to forceps.
- Check that no maternal soft tissue is being trapped between the cup and the fetal head and that the ventouse has been placed properly on the fetal head.
- Gradually increase vacuum[5] force

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

- 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 reached[4]
- Then carry out a test pull: Hold the handle of the vacuum extractor in the right hand and feel the cup and fetal head with the left thumb and forefinger, checking to be sure that the head is coming down as the cup descends
- Extraction: Pulling is carried out simultaneously with contractions and active pushing by the mother with steady force. This allows the fetal head to remain in position without sliding back in when a contraction subsides



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

- Pull (Ill. 9a – c): Pulling, synchronous with contractions, follows the normal curve of the birth canal (in line with the pelvis). As the head descends normal rotation and delivery by extension of the neck is seen.
- A colleague can provide additional assistance by performing a Kristeller manoeuvre with care
- If necessary, an episiotomy can be carried out once the fetal head is distending the perineum
- The left hand protects the perineum in exactly the same way as a normal birth.
- After the birth of the head, gradually decrease the vacuum.
- The vacuum extractor can be removed during the delivery of the body.

The soft tissue deformation of the scalp caused by this method (caput succedaneum or chignon) will subside within 12 – 24 hours.

If the cup slips off during the birth it may be replaced. After it has been placed twice, the birth must be completed with forceps or, if necessary, by caesarean section. This is because the head deformation that has been created makes further fixation of the vacuum extractor more difficult; intracranial pressure fluctuations might lead to cerebral haemorrhage and a failure to move smoothly towards an assisted vaginal birth suggests that genuine cephalopelvic disproportion is present.

4 Amniotomy - artificial rupture of membranes (ARM)

Rupture of the membranes (amnion and chorion which are fused) release amniotic fluid and can either induce labour or accelerate spontaneous birth. The midwife or obstetrician can rupture the membranes using a sterile amniotic hook, a spiral electrode or surgical forceps.

A digital vaginal examination is mandatory with the aim of assessing the presenting part is cephalic, and is fixed in the pelvis. In rare cases the placenta may be low lying (placenta praevia) in which case the tissue can be felt in front of the presenting part. This should be diagnosed by antenatal ultrasound making a check of the patient records a useful reassurance. The examiner should also be aware of the possibility of fetal vessels running within the membranes (vasa praevia). Attempts at amniotomy, in these circumstances, could be disastrous.

Rupture of membranes may also be complicated by malpresentation; with the fetal head failing to settle into the pelvis. Rapid appreciation of the problem may give an opportunity to correct by external cephalic stabilisiation, but if the fetus adopts a transverse position, with the membranes ruptured, there is no other recourse but to a caesarean section.

Amniotomy may occasionally be complicated by cord prolapse, and this can sometimes be unrecognised by the examiner. Amniotomy for induction of labour, or with the head not engaged should be undertaken in a hospital setting with theatre facilities available. Amniotomy under these circumstances should be followed by a cardiotocograph (CTG) to ensure any problems caused by the procedure are immediately brought to light and acted upon before adverse consequences follow.

5 Episiotomy

Episiotomy is the surgical incision of the perineum, including the muscles. Insertion into the perineal body may be necessary to allow a vaginal birth.

Indications for an episiotomy are the following:

- Extremely taut soft tissue
- Unfavourable presentation of the fetal head (occipito-posterior deflexed position)
- Threatened perineal rupture
- Shortening of the expulsive period due to fetal distress (prolonged bradycardia)
- Forceps delivery (not imperative)
- Vacuum extraction (not imperative)
- Breech presentation (not imperative)

There are three different types of episiotomy:

1. Mediolateral episiotomy:
   The incision is carried out commencing in either a right or left posterio-lateral at the posterior commissure, at an angle of 45° in a right posterio-lateral direction.
2. Median episiotomy:
   Commencing at the posterior commissure, the left hand or delivery assistant separates the perineum from the fetal head in the midline towards the anus.
3. Lateral episiotomy:
   The incision is carried out 1 – 2 cm beside the midline of the posterior commissure towards the ischial spines.

The choice of incision depends upon the practice of the operator. Except for the important issue of third- and fourth-degree extensions, midline episiotomy is superior. Proper selection of cases can minimise this one disadvantage.

6 Caesarean section

Problems with vaginal birth can be due to the Pelvis (passage), the powers (contractions) or the fetus (Passenger). Reasons to undertake a caesarean section include:

- Previous 2 or more Caesareans, or a single caesarean with other factors
- Prolonged labour with failure to progress towards vaginal birth
- In breech presentation or transverse/oblique lie
- Fetal distress in labour
- Pelvic deformities
- Suspected disproportion between fetal head and maternal pelvis
- Threatened uterine rupture
- Premature placental rupture
- Threatened fetal hypoxia, or fetal distress
- Infections in the mother, such as Herpes genitalis or HIV with high viral loads
- Major placenta praevia
- Eclampsia
- Amniotic infection
- Umbilical cord prolapse
- HELLP syndrome

The balance between induction of labour and elective caesarean section will depend on individual circumstances once a decision to end the pregnancy has been made by an experienced obstetrician.

7 Stimulation of contractions – Augmentation of labour

The medical stimulation of contractions using oxytocin is indicated in situations where a progress towards vaginal birth, as judged by cervical dilatation, is slow.[6]

The use of oxytocin is contraindicated if:

- There is a high risk of uterine rupture – Caution with previous caesarean section, and multiparous patients failing to progress in labour
- Known pathological anatomy of the pelvis
- Placenta praevia
- Vasa praevia
- Prolapse of umbilical cord
- Status post-myomectomy with dilation of the uterine cavity
- Invasive cervical carcinoma

[6] 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)

Tocolysis is indicated if there is a risk of threatened premature birth and the mother has not been given steroids.

Excessively strong or frequent contractions during birth can also be an indication for tocolysis. Hyperactivity or hyperstimulation will result in fetal hypoxia and should not be allowed to continue for more than 3 minutes without urgent review. Sustained contraction leading to an acute oxygen deficit must be corrected by way of emergency tocolysis. Polysystole (contraction rate > 5/10 min. or 7/15 min.) also requires similar 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 or the infusion stopped.

General contraindications for tocolysis are the following:

- Fetal maturity
- Fetal indications for ending the pregnancy
- Maternal indications for ending 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 nifedipine
- Oxytocin antagonists such as atosiban
- NO-donators such as nitroglyceride

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. E.g. at present in the UK the only licenced product is Atosiban, and this is generally favoured for cases requiring steroids to be given. In addition Terbutaline is widely used as a single shot agent (250ug s/c) in suitable cases with hyperstimulation.

9 Analgesia and anaesthesia during delivery

Painless childbirth has been a longstanding dream in obstetrics. Analgesia is the relief of pain. Anaesthesia includes in addition muscle relaxation and the condition of coma. Pain relief in labour should follow a step-wise approach with many women requiring very little if adequately prepared. Medical treatment for the pain of childbirth can be considered as systemic analgesia and block anaesthesia.

In addition to analgesics such as opiates and opoids, which are used for systemic analgesia for the alleviation of pain, spasmolytics and frequently 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 block anaesthesia, 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 anaesthesia (EA, peridural anaesthesia):**
  For epidural anaesthesia the catheter technique is used to administer a local anaesthetic and/or opioid into the epidural cavity at the level of the intervertebral space L2/3 or L3/4. The epidural can be topped-up as required to effect good analgesia for labour.

- **Spinal anaesthesia:**
  For spinal anaesthesia a single-injection technique is used to inject a local anaesthetic and/or opioid into the Cerebrospinal fluid (CSF) at the level of the intervertebral space L2/3 or L3/4 into the subarachnoid space.

- **Combined spinal-epidural anaesthesia:**
  This procedure involves a combination of spinal anaesthesia (using the single-injection technique) and epidural or epidural anaesthesia (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 anaesthetic and/or opioids and the removal of the spinal needle, the anaesthetist 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 anaesthetic from the vagina on both sides of the pudendal nerve region.

10 Assessment of the newborn

Virginia Apgar developed a system that standardises 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 colour

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 colour	Pale, blue	trunk rosy, extremities blue	rosy

Tab. 1 APGAR score

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Notes

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