VACUUM-ASSISTED DELIVERY

Essential Pre-reading for Masterclass in Vacuum Assisted Delivery

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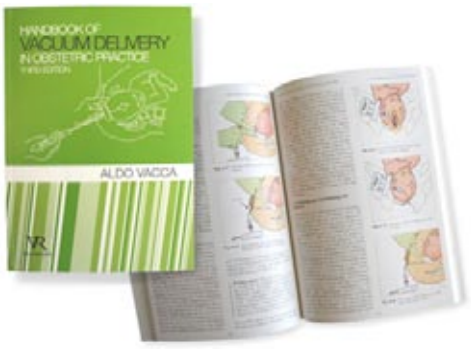
Introduction

This document is available for clinicians from the website www.vaccaresearch.com Participants who register for a Masterclass in Vacuum-assisted Delivery are required to read the document prior to attending the VAD workshop. It is also advisable to read the Handout - Prerequisites and Technique' before attending the workshop.

Additional information may be obtained from the *Handbook of Vacuum Delivery in Obstetric Practice* (HBVD) or the *Choices with Childbirth CD* (CWCB) by using the references that are provided at the end of each section of the document.

Reference Resources:

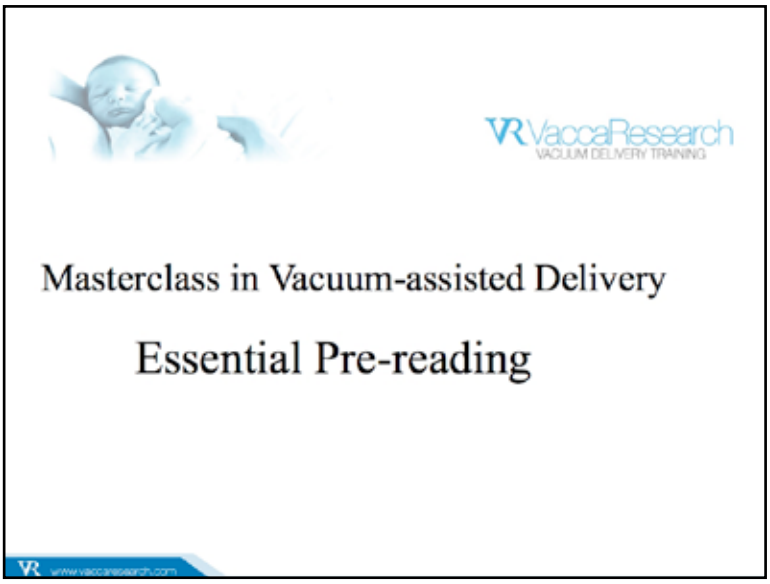


HBVD: Handbook of Vacuum Delivery in Obstetric Practice – 3rd edition

CWCB: Choices with Childbirth (2nd ed.) CD on Vacuum Assisted Delivery

The following resources are also available online at www.vaccaresearch.com through the link Clinician's Resources:

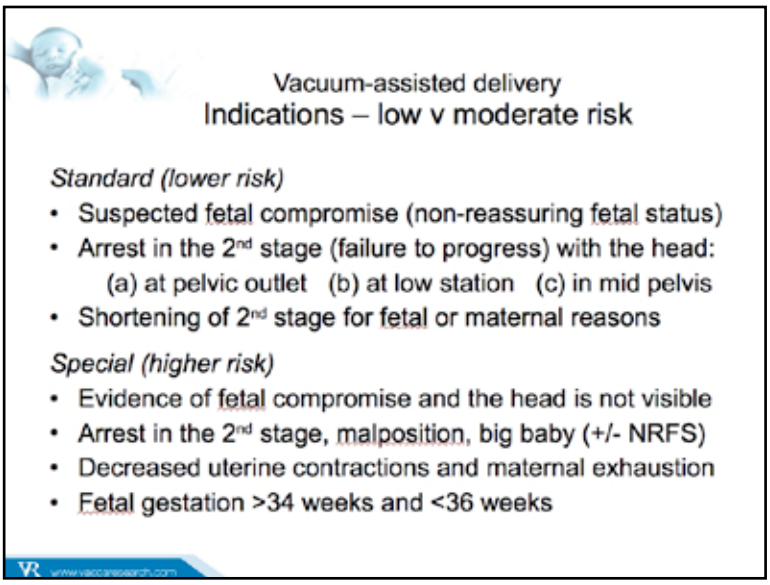
- ESSENTIAL PRE-READING FOR MASTERCLASS IN VAD.pdf
- HANDOUT– Prerequisites and Technique.pdf
- GENERAL KNOWLEDGE MCQ.pdf
- CASE STUDY.pdf
- HANDBOOK REVIEW QUESTIONS.pdf
- THE HISTORY OF VACUUM EXTRACTION –By Professor Tom Baskett.pdf
- A POEM ABOUT VAD –'It's always more posterior than you think'.pdf
- CHOICES WITH CHILDBIRTH GUIDE.pdf



This *Essential Pre-reading* document follows to a large extent the sequence of the *Handout – Prequisites & Technique* presented in the Clinician's Resources. The handout should be consulted for further information on this particular subject.

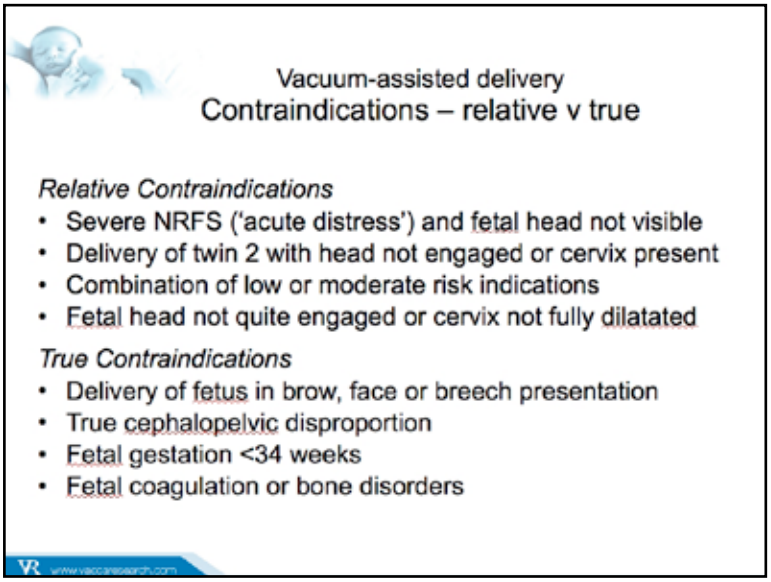
In addition, references are provided for the Handbook of Vacuum Delivery (*HBVD*) and the *Choices with Childbirth* CD ROM (*CWCB*) where the topic is discussed in detail.

Answers to the pre-test questions are included in the comments that are provided in the Clinician's Resource entitled *General Knowledge MCQ*.



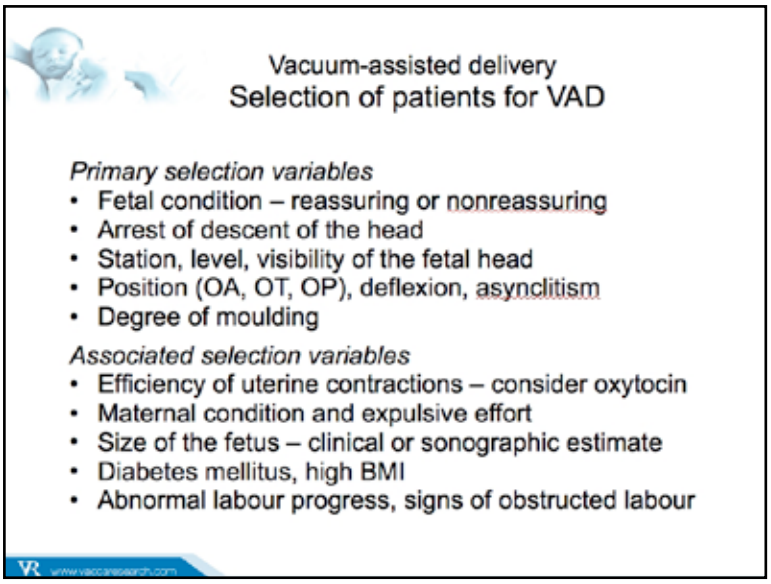
Few indications for VAD are absolute. Nevertheless, an attempt should be made to classify them into Standard (lower risk) and Special (moderate risk or trial) groups according to the operator's expertise and type of practice. In general, VADs for standard indications have a wider safety margin. However, even in this group the risk may vary depending on station, degree of fetal compromise or when multiple factors are present. With few exceptions the same recommendations regarding indications should be applied to VAD as for forceps delivery.

Ref: Handout – Prequisites & Technique: Section 3; HBVD p31; CWCB see Indications and Contraindications



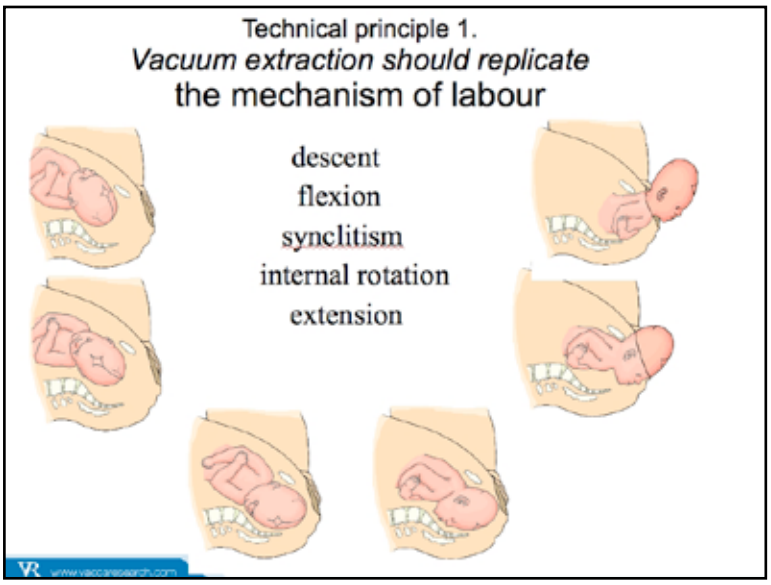
Contraindications should be classified into relative and true groups. VAD in the relative group will be contraindications for all but the most experienced operators. Once again, a combination of obstetric factors will increase the risk. VAD is not contraindicated following fetal scalp blood sampling or scalp electrode application. The same selection criteria should apply to the second twin as for the first twin. If fetal scalp is not visible, the widest diameter of the head has not yet completed its passage through the most resistant part of the birth canal at the pelvic floor level.

Ref: Handout – Prequisites & Technique: Section 3; HBVD p31; CWCB see Indications and Contraindications



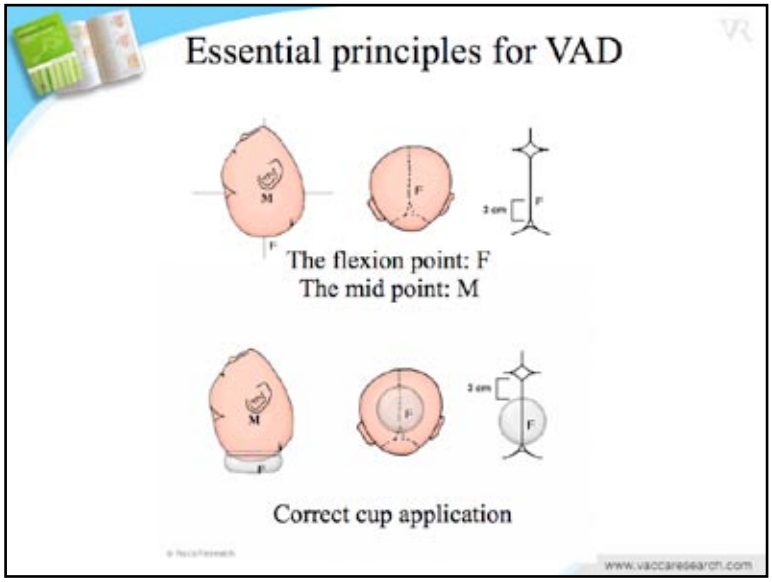
Even when a valid indication for expediting the birth exists, a number of other factors must be considered because they may influence the outcome. The obstetric factors that should be assessed prior to attempting VAD may be classified as '*primary*' and '*associated*'. In general, the associated factors are addressed before the primary variables. The risk will increase when multiple complex or adverse factors are present. By careful evaluation of the information obtained it is possible to select patients who are suitable for VAD and to grade procedures according to the level of risk and operative skill that is required.

Ref: Handout – Prequisites & Technique: Section 4; HBVD p40; CWCB see Selection of patients for vacuum delivery



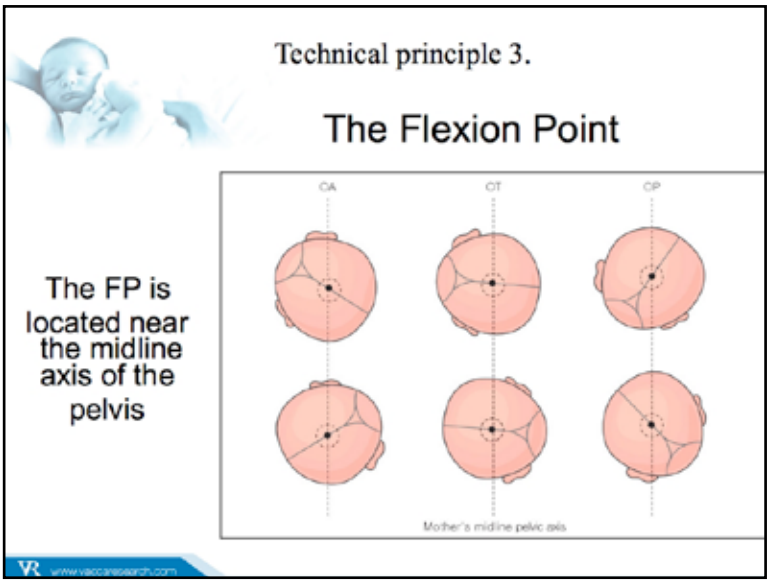
A well-flexed, synclitic fetal head will progress through the birth canal with minimal resistance provided the propulsive forces are effective and there is no CPD. Therefore, if the head is found to be deflexed or asynclitic the operator should know how to correct the attitude of the head with the vacuum extractor to one of flexion and synclitism. Most fetal heads enter the pelvic brim in a non-OA position yet undergo spontaneous internal rotation to OA in nearly all cases. The aim of VAD is to replicate this normal process of labour and not to overcome resistance to descent with excessive traction.

Ref: Handout – Prequisites & Technique: Section 15; HBVD p12; CWCB see Gen Principles-The Mechanism of Labour



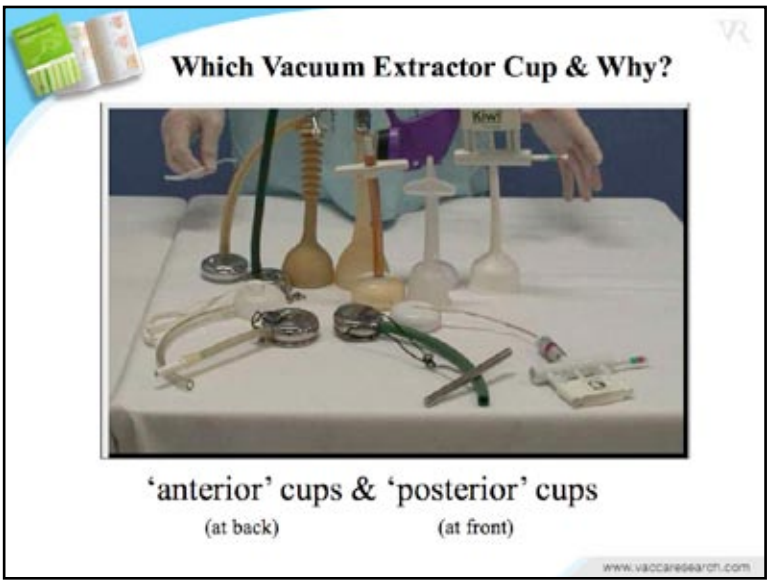
The flexion point (F) is located on the sagittal suture, 3cm from the posterior fontanelle. It marks the spot where the mento-vertical diameter emerges on the vertex. When the flexion point is the presenting part, the optimal head diameters are presenting. Therefore, to achieve the best presenting diameters during VAD, the cup should be placed over the flexion point. However, since the mento-vertical diameter is approximately 13cm in length, the head pivots around an axis at the level of the midpoint (M), about 6cm from the flexion point. Downward traction encourages the midpoint to descend along the axis of the pelvis.

Ref: Handout – Prequisites & Technique: Section 11; HBVD p17&22; CWCB see: Placement of the vacuum cup; The flexion point



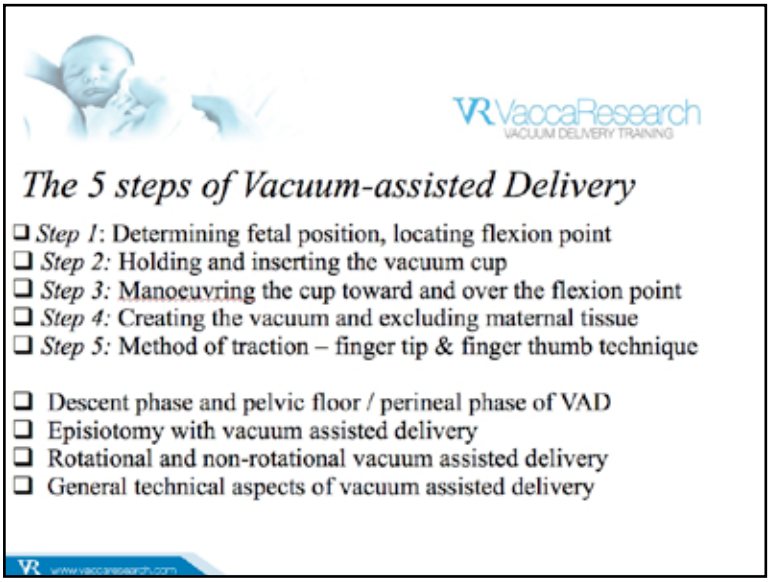
Since the flexion point is located on the fetal head anterior to the posterior fontanelle, it will move through a much smaller arc in the birth canal than that of the posterior fontanelle and therefore will be situated closer to the midline of the mother's birth canal irrespective of position and attitude of the head. However, station, position and attitude will alter the distance of the FP from the introitus. For practical purposes, therefore, the vacuum cup should be inserted the calculated insertion distance along the midline axis of the maternal pelvis without the need for significant lateral movement.

Ref: Handout – Prequisites & Technique: Section 13; HBVD p20; CWCB see: Location of the flexion point



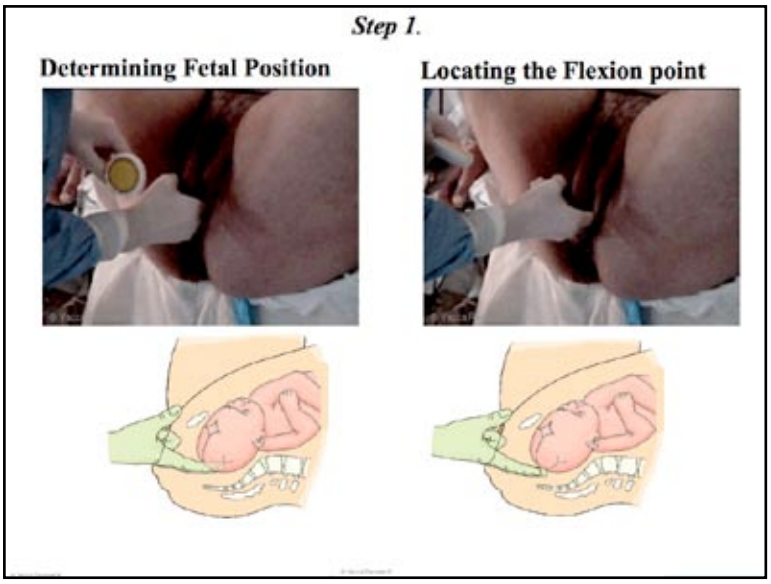
Use of 'anterior' cups should be restricted to non-rotational, low VADs. 'Posterior' cups should be selected for OP & OT rotational deliveries. The dome-attached handles or tubing of the anterior cups limits their manoeuvrability within the lower birth canal making it difficult or impossible for them to reach the flexion point when it is displaced from the introitus in malpositions and deflexed or asynclitic attitudes of the head. On the other hand posterior cups can be manoeuvred towards the FP because the tubing lies in the same plane as the body of the cup and does not impede its inward movement.

Ref: Handout – Prequisites & Technique: Section 12; HBVD p20 & 48; CWCB see: Choice of vacuum cups



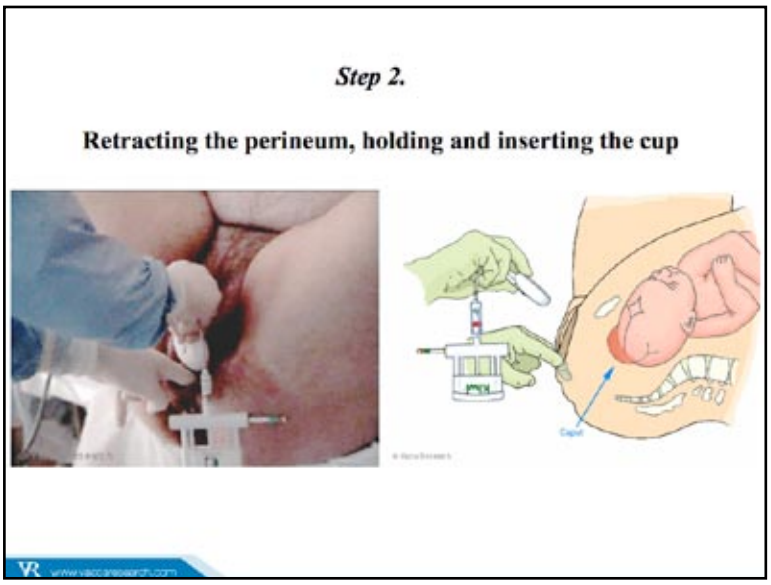
All VADs, non-rotational and rotational are comprised of these five steps with only minor adaptation of technique depending on station and position of the fetal head. Adherence to the 5-step method will allow the operator to standardise the technique and to concentrate on the surrounding clinical circumstances that may also influence the outcome. Since resistance, and hence traction force, is greater when the head is passing through the pelvic floor level, the recommendation is made that a VAD should be divided into descent and pelvic floor phases. In addition, other general and technical issues relating to VAD will be discussed.

Ref: Handout – Prequisites & Technique: Section 14&15; HBVD p49; CWCB see: Standard procedure for Vacuum Extraction



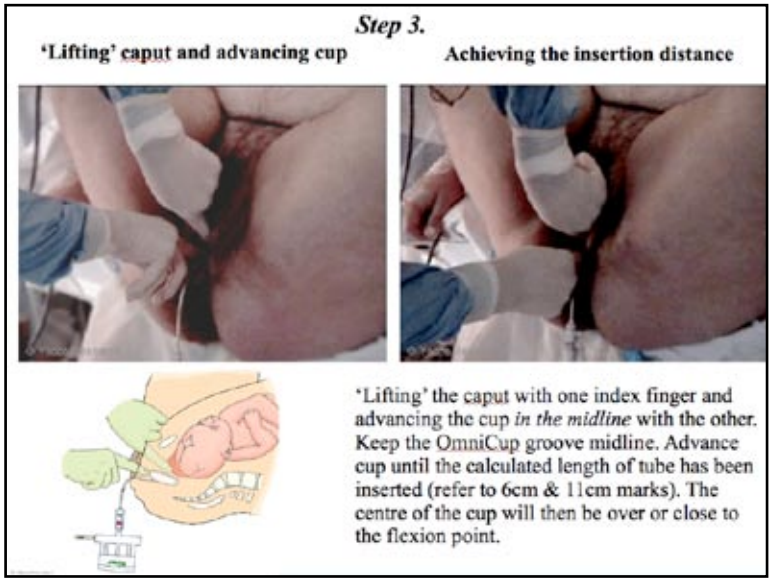
Step 1: Determining fetal position, locating the flexion point and calculating the vacuum cup insertion distance. The FP is located by identifying the posterior fontanelle with the middle finger and moving the finger along the sagittal suture anteriorly an estimated distance of 3cm. Keeping the tip of the finger on the flexion point, it is possible to calculate the cup insertion distance by observing which part of the middle finger is resting on the maternal fourchette of the perineum bearing in mind that the length from the tip to the knuckle of the middle finger is between 10-11cm and to the middle joint of the finger, 5-6cm.

Ref: Handout – Prequisites & Technique: Section 11; HBVD p17&49; CWCB see: Locating the flexion point



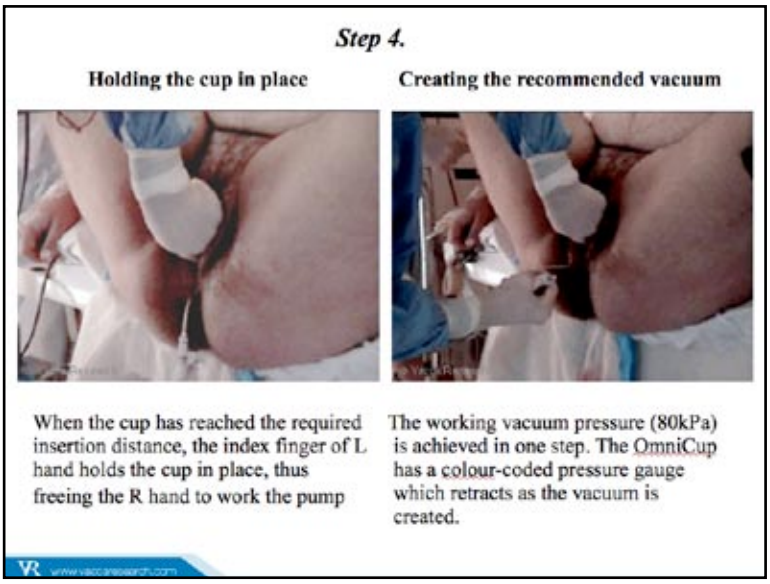
Step 2: Holding and inserting the cup. The operator lightly smears the leading edge of the outside of the cup with obstetric cream then retracts the perineum with two fingers to form a space into which the cup is inserted gently with one movement immediately following a contraction. If the Kiwi OmniCup is being used insert the cup so that the groove on its dome is situated at the '12 O'Clock' position to the mother's pubic arch. The groove serves as a marker of auto-rotation of the head in OP and OT rotational VADs. Because of its light weight, there is no need to manually support the OmniCup.

Ref: Handout – Prequisites & Technique: Section 13; HBVD p49&67; CWCB see: Applying the cup



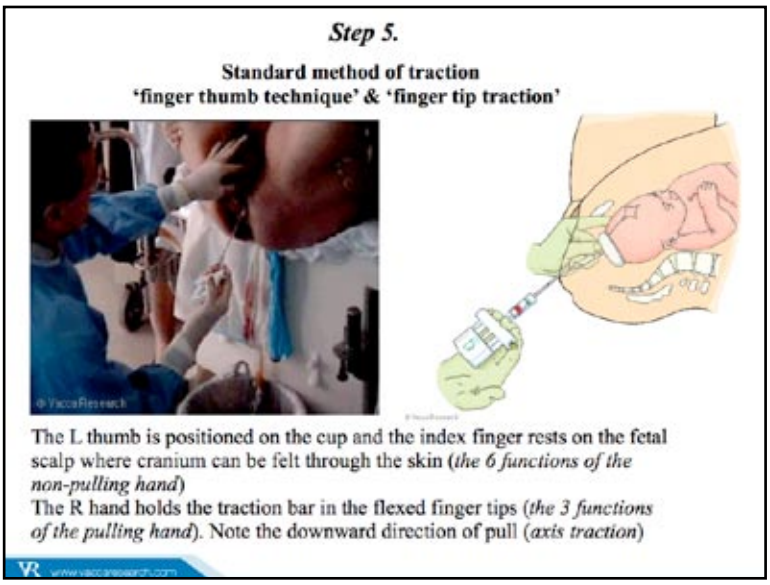
Step 3: The cup is manoeuvred towards the flexion point using the two index fingers only. The operator should twist his/her body such that the left elbow (for right handed people) is pointing to the mother with the left index finger compressing the fetal caput. The index finger of the right hand is placed on the curved rim of the cup nearest the operator and pushes the cup backwards in the midline until the centre of the cup is judged to be over the flexion point. The distance markers on the tube of the OmniCup at 6cm and 11cm assist the operator to know when the centre of the cup has reached the calculated insertion distance.

Ref: Handout – Prequisites & Technique: Section 13; HBVD p50&68; CWCB see: Application of the cup



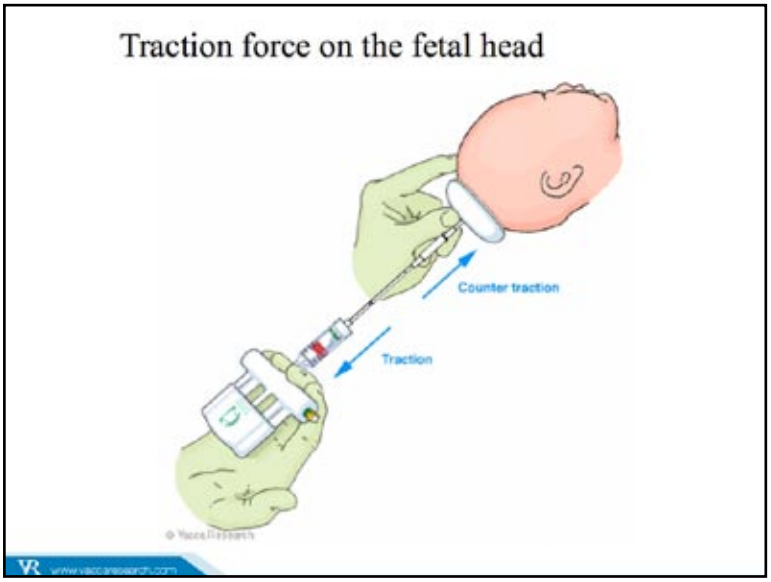
Step 4: Inducing and maintaining the vacuum. The cup should be held in place over the flexion point with the left index finger while the vacuum is created otherwise it may slip outwards towards the introitus. The recommended vacuum pressure of 60-80kPa (450-600mmHg) may be achieved rapidly in one step. The early recommendation that the vacuum should be created slowly over several minutes should no longer be practised since it has been shown that the rapid method is just as effective, does not harm the baby and shortens the duration of the procedure.

Ref: Handout – Prequisites & Technique: Section 14; HBVD p50; CWCB see: Inducing and maintaining the vacuum



Step 5: Standard method of traction: Traction for VAD is a two-handed exercise, one hand providing the traction, the other monitoring descent and controlling the force applied to the fetal head. The non-pulling hand has *6 functions*: to check maternal expulsive forces; to monitor progress; to control applied traction force; to prevent complete detachment; to assist with axis traction; to act as a rotary point in auto-rotation. The pulling hand has *3 functions*: to provide the required traction using fingertips only; to direct traction along the axis of the pelvis and to pull only with contractions and maternal expulsive effort.

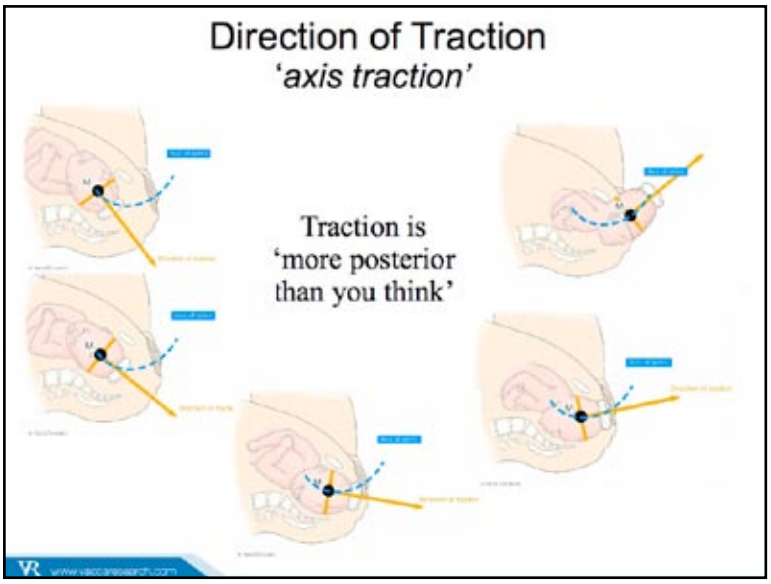
Ref: Handout – Prequisites & Technique: Section 15; HBVD p51&52; CWCB see: Method of traction



The '*finger-tip*' position of the pulling hand: Vacuum devices that incorporate a traction bar should be held with the bar cradled in the distal interphalangeal joints of the fingers. Sufficient traction for delivery of the baby can be generated in most cases simply by flexing the fingers.

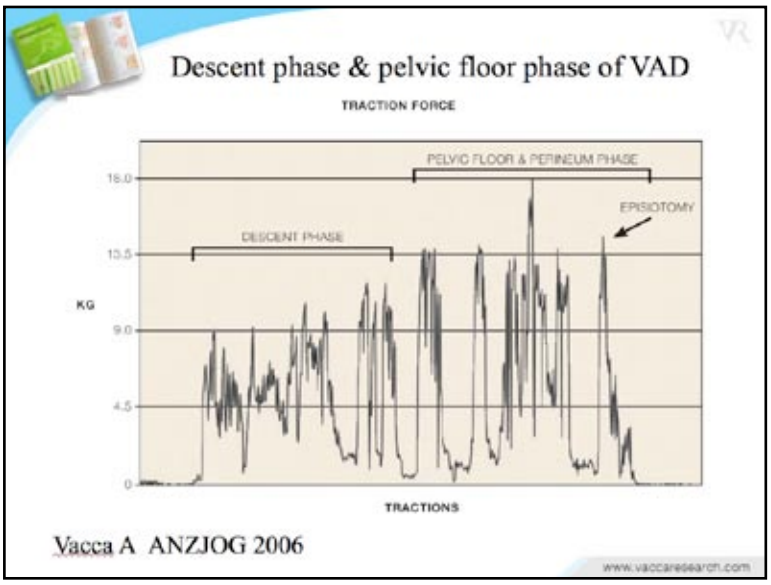
The '*finger-thumb*' position of the non-pulling hand: The thumb of the non-pulling hand should be placed on the dome of the cup to provide counter-pressure when required and the index finger should rest on the scalp to monitor progress and control descent.

Ref: Handout – Prequisites & Technique: Section 15; HBVD p51&70; CWCB see: Method of traction



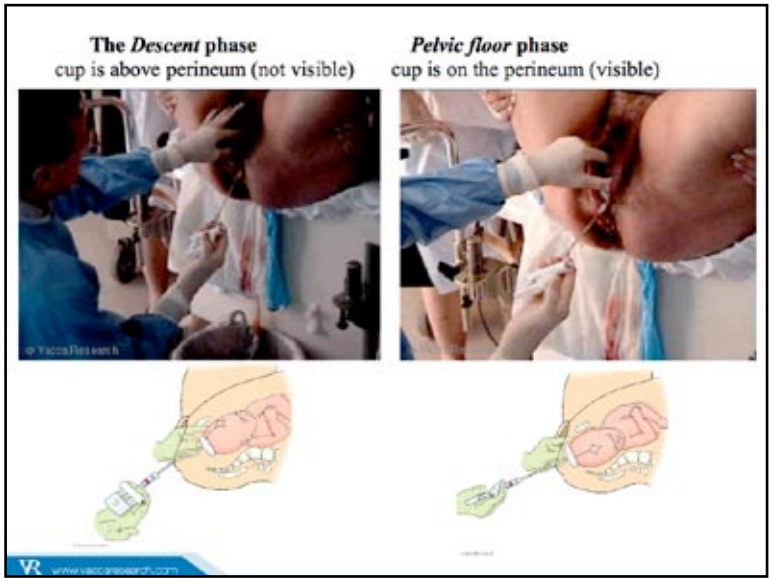
The axis of the pelvis forms a curve that bends through 90° from inlet to outlet. For practical purposes optimal diameters of the head will be presenting during vacuum extraction when the flexion point descends slightly behind the axis of the pelvis to keep the mid-point of the mento-vertical diameter aligned with the axis. For this reason, traction should be directed more posteriorly (towards the floor) to achieve the best fit of the head within the cavity of the pelvis at any given level. As the head descends, the direction of pull gradually moves upwards until the mid-point of the head emerges from beneath the symphysis at crowning.

Ref: Handout – Prequisites & Technique: Section 15; HBVD p28&70; CWCB see: Axis traction



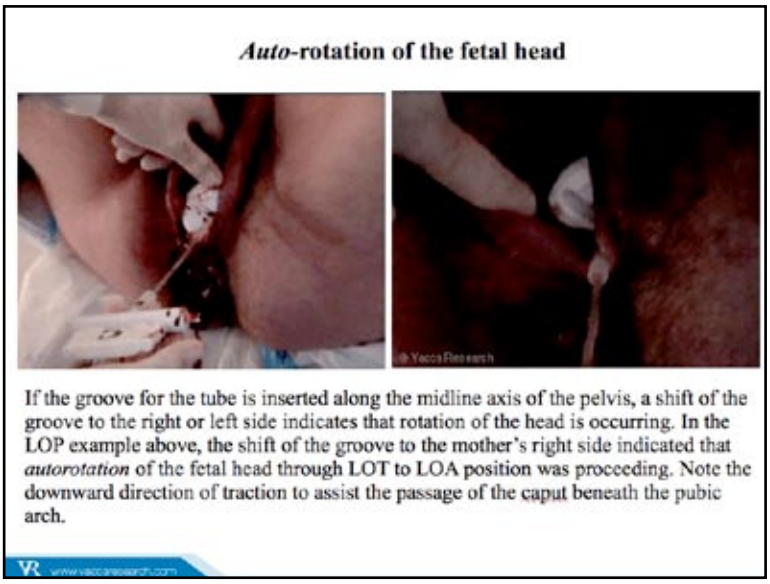
In a prospective study of vacuum delivery in nulliparous mothers using a vacuum device that incorporated a traction force indicator, higher levels of traction force and a greater number of pulls were recorded in the majority of cases during the pelvic floor and perineal phase of the procedure than during the descent phase. The explanation may be that at this level the widest part of the fetal head is negotiating the narrowest and most resistant part of the birth canal. For this reason a vacuum delivery should be considered as a two-phase procedure, namely, a '*descent*' phase and a '*pelvic floor & perineal phase*'.

Ref: Handout – Prequisites & Technique: Section 15; HBVD p84; CWCB see: Number of pulls



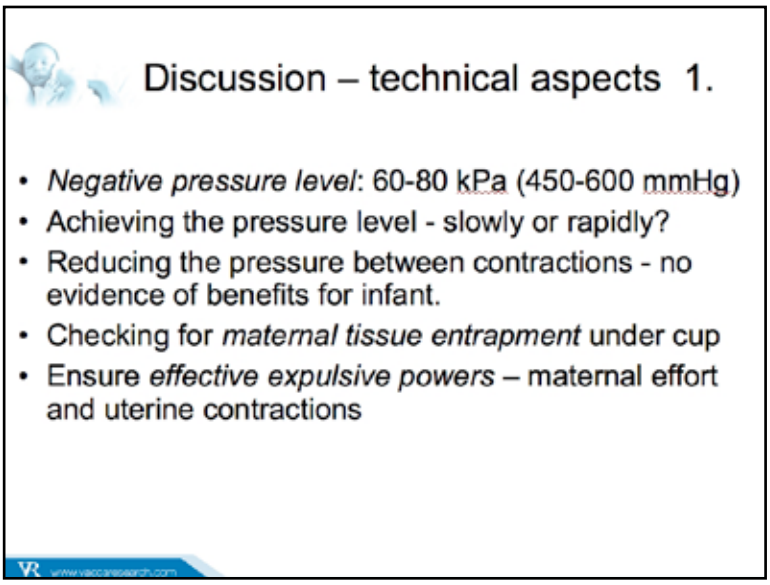
The *descent* phase is that part of a VAD from the time of cup application until the widest diameters of the head descend to the pelvic floor. At this stage, the cup will be visible in or near the introitus. The *pelvic floor & perineal phase* is that part of a VAD from the time the cup is visible in the introitus to complete delivery of the fetal head. The author recommends that 3 pulls for the descent phase and 3 pulls for the pelvic floor and perineal phase should be considered acceptable in a nulliparous woman with epidural analgesia provided that some progress is observed with each pull and traction is not excessive – the *'3 + 3 pulls' rule*.

Ref: Handout – Prequisites & Technique: Section 15; HBVD p86&88; CWCB see: Number of pulls



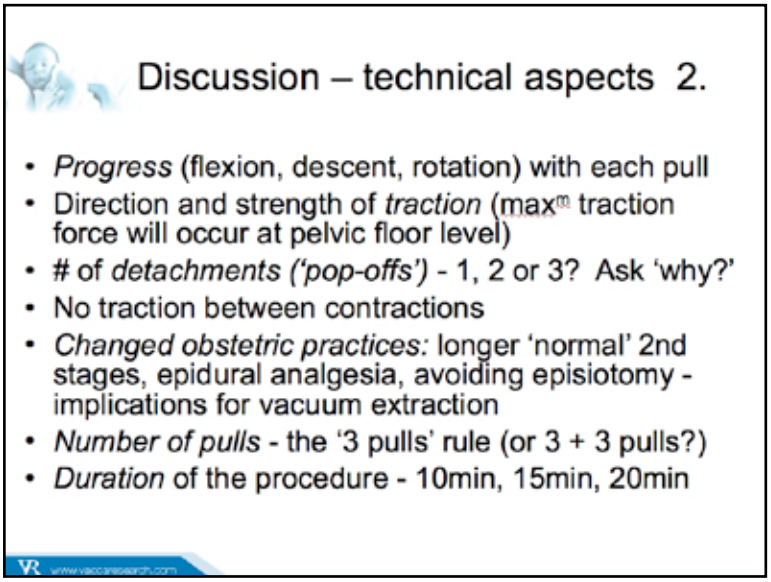
Bird demonstrated that, in OP and OT positions of the fetus, if the cup was applied over the flexion point and if axis traction was applied rotation to OA will occur in about 90% of VADs. The rotation is an *auto-rotation* and occurs independently of the operator just as internal rotation occurs spontaneously during the process of normal labour. However, to achieve correct cup applications in malpositions of the head the operator must use and know how to use one of the more manoeuvrable posterior cups. Failed rotations, like difficult or failed VADs are often the result of incorrect applications of the cup.

Ref: Handout – Prequisites & Technique: Section 12; HBVD p78; CWCB see: Auto-rotation of the fetal head



Technical aspects 1: There is no evidence that the vacuum pressure per se is injurious to the fetal scalp but the recommended range is shown here. The working level of vacuum should be achieved rapidly as there are no benefits to a slow reduction of negative pressure. The practice of decreasing the pressure level between contractions has been shown to be of no benefit for the infant, nor is leaving it up harmful. A check for maternal tissue entrapment should always be made; and while this is easily performed when the head is low, it is usually impossible to palpate around the complete perimeter of the cup in OP & OT positions.

Ref: Handout – Prequisites & Technique: Section 13; HBVD p106; CWCB see: Effects of vacuum extraction

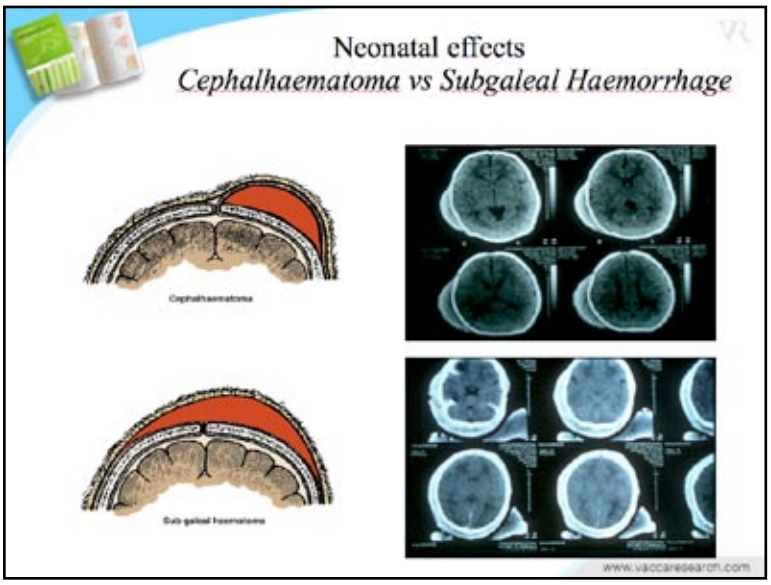


Technical aspects 2: Some progress should occur with each pull. Initially, in malpositions, flexion of the head is observed followed by some rotation and descent. For reasons already discussed, the pull should be directed posteriorly to achieve axis traction. Since the greatest resistance to descent will be encountered at the pelvic floor level, cup detachments usually occur here. Detachments are injurious to the fetal scalp and should be limited to two. Correct traction technique will prevent most cup detachments. Limit the number of pulls (see 3 + 3 pulls rule) and the duration of the procedure (10min for multiparae and 20min for nulliparae).

Ref: Handout – Prequisites & Technique: Section 13; HBVD p86&88; CWCB see: Vacuum extraction procedure

The practice of VAD and attitudes to its use are largely determined by the effects on the newborn. For this reason neonatal outcomes should be classified according to their clinical significance. Most effects are *cosmetic or transient injuries* that have no long term consequences (marking, superficial abrasion, cephalhaematoma); *clinically significant injuries* (subgaleal - SGH & intracranial haemorrhage); and *coincidental effects* (brachial plexus injury, fractures). Such a classification can assist clinicians to counsel parents in a non-emotive way which should help to lessen the anxiety that parents may feel.

Ref: Handout – Prequisites & Technique: Section 16; HBVD p97&99; CWCB see: Effects of vacuum extraction on the infant

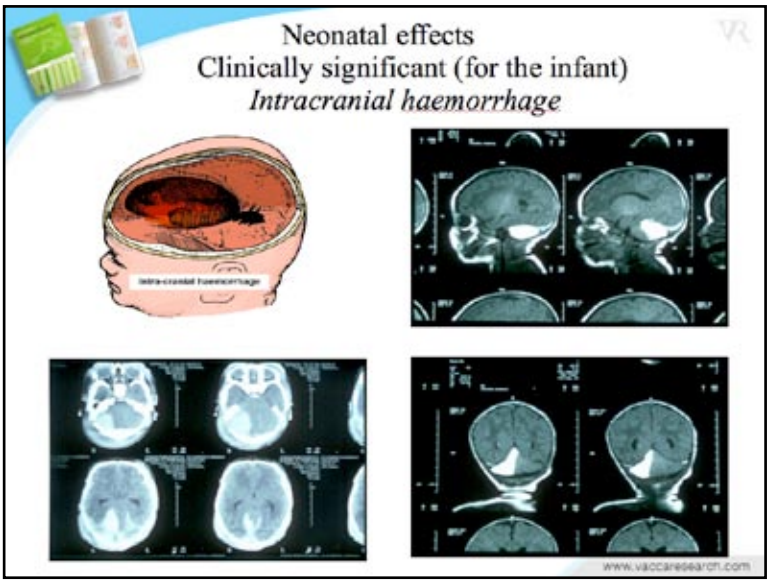


Cephalhaematomas are benign collections of blood that accumulate under the periosteum of skull bones, usually the parietal. They occur in about 6% of babies born by VAD and may not become obvious for some days following delivery. Because they do not cross suture lines bleeding is limited and babies are not haemodynamically compromised. The condition should be distinguished from the more serious SGH that occur under the scalp aponeurosis and may extend over the whole cranium resulting in haemodynamic shock syndrome. SGH occur in about 1% of VADs, can be diagnosed early after the birth and are largely avoidable.

Ref: Handout – Prequisites & Technique: Section 16; HBVD p98&99; CWCB see: Cephalhaematoma

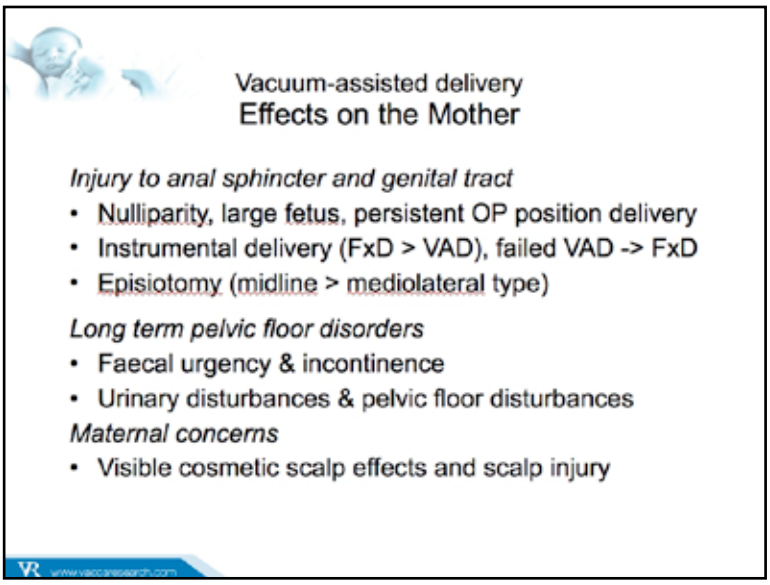
Clinically significant SGH is almost always preceded by a difficult VAD characterised by deflexing and paramedian cup applications, excessive traction force, cup detachments and failure of VAD with sequential forceps delivery. Early diagnosis is possible shortly after birth and if treated promptly and adequately with appropriate fluid replacement neonatal morbidity should be lessened and mortality prevented provided no other injury was sustained by the neonate. For this reason, all babies' heads should be examined as soon as possible after VAD especially if the extraction was difficult to exclude subgaleal bleeding.

Ref: Handout – Prequisites & Technique: Section 16; HBVD p99&100; CWCB see: Subgaleal (subaponeurotic) haemorrhage



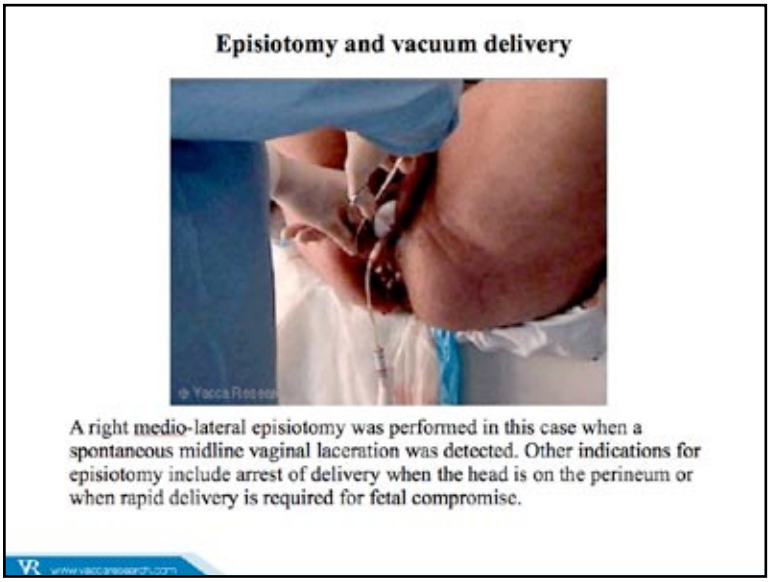
The falx cerebri and the tentorium cerebelli are accompanied by venous sinuses which under normal circumstances are capable of withstanding the forces of moulding and compression of labour. Uncomplicated VAD is not associated with more intracranial injury than forceps delivery or caesarean section performed during labour. However, damage to these venous sinuses may occur when VAD is attempted in the presence of excessive head compression and moulding. Intracranial haemorrhage should always be considered if the baby exhibits abnormal neurological behaviour after a difficult vacuum delivery.

Ref: Handout – Prequisites & Technique: Section 16; HBVD p101; CWCB see: Intracranial haemorrhage.



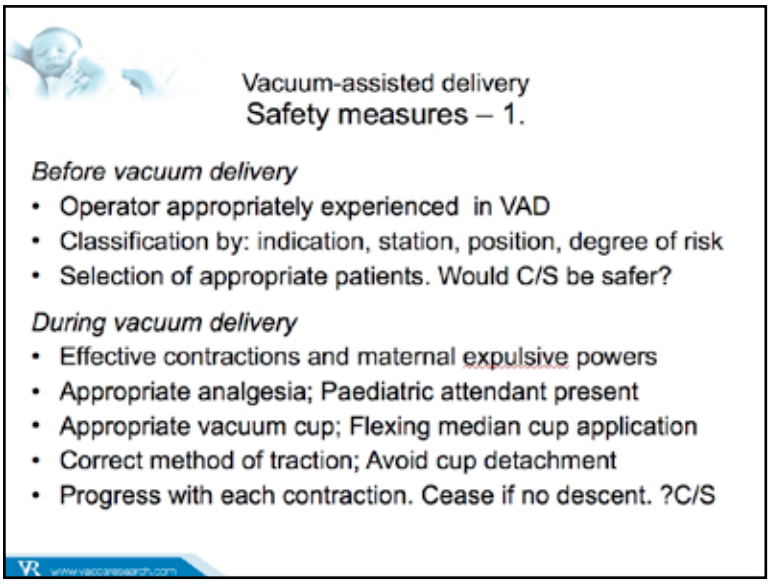
Vacuum extraction is associated with less anal sphincter damage and ano-rectal injury than forceps delivery. However, the risk of damage to the sphincters is compounded if failure of VAD is followed by attempted forceps delivery. Damage of the sphincter muscles during childbirth is regarded as a major predisposing factor for the later development of faecal incontinence but comparative long term studies of women delivered by either forceps or vacuum extraction reported no significant differences between the instruments in terms of either bowel or urinary dysfunction.

Ref: Handout – Prequisites & Technique: Section 17; HBVD p105; CWCB see: Effects of vacuum extraction on the mother



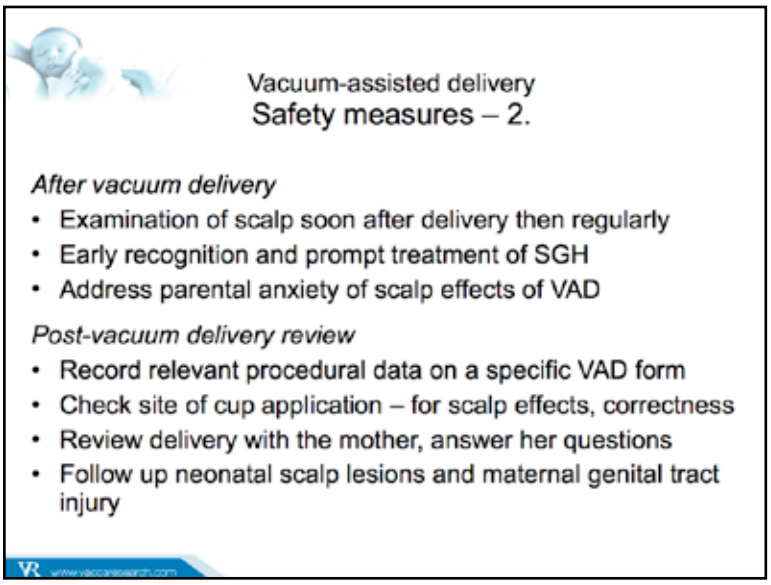
In spontaneous delivery a restrictive policy for the use of episiotomy is now being advocated but for operative vaginal delivery it is not clear whether episiotomy is preferable to perineal lacerations that may otherwise be incurred. Midline episiotomy has been significantly associated with higher rates of severe perineal trauma compared to medio-lateral episiotomy. On the other hand, if vacuum delivery is attempted without episiotomy one or two additional tractions should be allowed for the resistant perineum to stretch over the advancing fetal head as it descends through the vaginal introitus.

Ref: Handout – Prequisites & Technique: Section 17; HBVD p104; CWCB see: Effects of vacuum extraction on the mother



The operator is a major determinant of the outcome of a vacuum delivery and adverse results are often caused by the user's unfamiliarity with either the instrument or the basic rules governing its use. For safe vacuum delivery practitioners need to acquire a number of technical skills and the ability to address the clinical variables that may influence the outcome of VAD such as those listed in the slide. A method of assessing the relative risks of a procedure and avoiding difficult vacuum extractions and prolonged traction are simple and effective methods of preventing serious injury associated with vacuum delivery.

Ref: Handout – Prequisites & Technique: Section 18&19; HBVD p109&111; CWCB see: Safety measures and training



Subgaleal bleeding may continue over several hours following a VAD. Early diagnosis and prompt treatment are the key elements for reducing morbidity and preventing mortality. Early diagnosis is possible shortly after birth by examining the baby's scalp for the presence of a small fluid collection at the cup application site. Neonatal attendants should inspect the scalp periodically. Lesser scalp effects such as cup marking, cephalhaematoma and superficial abrasions will eventually resolve without trace and parents should be reassured of this to allay their anxiety. Follow-up should be arranged for babies who sustain an injury.

Ref: Handout – Prequisites & Technique: Section 18; HBVD p111&112; CWCB see: Safety measures and training

Individuals should learn to grade instrumental procedures according to the technical skill that is required and attempt only those vacuum deliveries that fall within their own level of expertise. Operators who are not familiar with the vacuum extractor, whatever their seniority or skill with the forceps, should begin with a program of straightforward cases such as outlet and nonrotational VADs before attempting the more complex mid pelvic and rotational procedures. Outcomes will be suboptimal and confidence in the technique will not be acquired if operators begin with the more challenging procedures prematurely.

Ref: Handout – Prequisites & Technique: Section 18; HBVD p110; CWCB see: Safety measures and training

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