Operative Vaginal Delivery: A Disappearing Art?

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Objectives
- Address some basic issues that keep coming up in bad outcome cases
- Refer to some specific papers that can help you (using an evidence based approach)
- Present some specific procedures and practices that will help avoid bad outcomes with operative vaginal delivery
- Talk about standards of care that you will be held to (if we have time!)

Common Issues
- Damage to baby from OVD:
  - Life threatening: skull fracture, brain bleeds, spinal cord, asphyxia
  - Significant morbidity: lacerations, brachial plexus, eyes, cephalhematoma
- Damage to mother from OVD:
  - Life threatening: ruptured uterus, PPH, infection
  - Significant morbidity: urinary/fecal incontinence, nerve damage, sexual function
Common Areas of Liability
- poor assessment of the case ("rush in and do the delivery")
- no good indication (ACOG Guidelines)
- lack of basic knowledge about anatomy and definitions
- poor preparation of patient/room/anesthesia/ OR/neonatal staff

Common Areas of Liability
- lack of appropriate discussion/consent
- lack of appropriate documentation/late documentation
- failure to examine the patient after a repair
- failure to disclose or follow-up on a complication

Common Issues
- Basic definitions!
- Knowing them well will prevent you from:
  - making mistakes in the clinical sphere
  - appearing ignorant in a medicolegal setting

Know these Definitions well!
- Lie
- Presentation
- Engagement
- Station
- Attitude
- Position
- Asynclitism
- Caput/Cephalhematoma
- Moulding
**Engagement**

- Engagement has occurred once the widest diameter of the presenting part (usually the BPD) is at or below the plane of the maternal pelvic inlet - usually equates with 0 station BUT not always
- Best determined by a combination of **abdominal and vaginal** assessment

**Station**

- Relationship between the leading bony part of the fetal presenting part and the maternal ischial spines
- Usually, but not always, the head is engaged when the skull **bone** (NOT SCALP!) is felt at 0 station
- Most common error is failing to take into account caput succidaneum and severe molding in CPD
- Where severe caput succidaneum prevents accurate diagnosis of the station or head position, OVD should NOT be attempted
  - "There was too much caput for vacuum so I did a forceps"

**ACOG Classification of Station**

- In 1989 station was reclassified by ACOG.
- New classification defines station in terms of the level of the leading bony point of the fetal head in centimeters at or below the level of the maternal ischial spines (0 - 5cm)
- The previously used method of described the birth canal in terms of thirds (0 - 3+)

*ACOG. Obstetric Forceps.1989; Committee Opinion # 71. (Level III)*

**Know the anatomy of the fetal head**
Know the diameters of the fetal head

| Subgaleal Hematoma: incidence |

<table>
<thead>
<tr>
<th>Source</th>
<th>Reported incidence</th>
<th>% incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACOG, 2000 Practice Bulletin 817</td>
<td>25-45/1000</td>
<td>2.5—4.5%</td>
</tr>
<tr>
<td>Benaron DA J Perinatology, 1993</td>
<td>5-16/1000</td>
<td>.5—1.6%</td>
</tr>
<tr>
<td>ACOG, 1998 Comm. Opinion 928</td>
<td>1/45,000</td>
<td>.000022%</td>
</tr>
</tbody>
</table>
**Degrees of Moulding**

- 0+
- 1+
- 2+

**Type of Forceps Delivery**

- Know what type of delivery you are doing
- Be sure you are familiar with the definitions
- Document it as such BEFORE doing it
- Do not attempt a mid pelvic delivery unless you have experience, have an OR/anesthesiologist/pediatrician ready, and have informed the mother of the alternatives

**Indications for vacuum or forceps**

- "Gotta have one....."
- Better to have it BEFORE the procedure too....
- Write it down and discuss it with "everyone" if you have the time

**Indications**

- **Standard Indications:**
  - a) Delayed second stage
  - b) Suspicion of immediate or potential fetal compromise
  - c) Elective shortening of the second stage for maternal or fetal benefit
Delayed Second Stage

Based on parity and anesthesia

1. Nulliparous - lack of continuing progress:
   - 3 hours with regional anesthesia, or
   - 2 hours without regional anesthesia

2. Multiparous - lack of continuing progress:
   - 2 hours with regional anesthesia, or
   - 1 hour without regional anesthesia

ACOG. Operative Vaginal Delivery.1994 Technical Bulletin #196. (Level III)

Special Indications

- Be very cautious!!
  a) Malposition or asynclitism
     - with correctable disproportion due to the abnormal head position
  b) "Relative" CPD with no access to CS - combined symphysiotomy and VE (NOT IN THE USA!!)
  c) Prolapse of the umbilical cord at complete dilatation

Contraindications

- OVD should not be performed:
  - suspected feto-pelvic disproportion
  - an unwilling or non-cooperative patient
  - live fetus with a known bone demineralization condition (osteogenesis imperfecta) or bleeding diathesis (thrombocytopenia, hemophilia)
  - unengaged fetal head
  - unknown position of the fetal head (need to document)
**Prerequisites**

F = Favorable head position, Fetus (weight/status) (2)

O = Open Os (completely dilated cervix), OR ready (2)

R = Ruptured membranes, Rule of 3's (2)

C = Contractions present, Consent (verbal or written) (2)

E = Engaged head, Empty bladder, Epidural/other anesthesia (3)

P = Pelvis adequate, Prepared for C/S, Pedi, Preop note (4)

S = Stirrups (lithotomy position with bottom over edge of the bed, attention paid to avoiding nerve apraxias) (1)

**Consent**

- **There is no SOC as to consent for OVD:**
  - Verbal versus written?
  - Elective versus emergency

- **Recommendations:**
  - Provide detailed materials during PNC
  - Answer questions and allay fears
  - Inform of alternatives (waiting, cesarean section)
  - Obtain written consent on admission before crisis
  - Document that patient understands that she can change her mind at any time
  - Even in an emergency try to get verbal informed consent and ask a witness (nurse/CNM) to document it

**Consent**

- Retrospective chart review in one University Medical Center (Medical College of Virginia):

- **100 appropriate consecutive OVD cases**
  - 61% had a general consent signed on admission
  - 3% had documentation of maternal risks from OVD
  - 0% had documentation of neonatal risks from OVD
  - 22% documented of an offer of a CS as an alternate
  - For the 5 years before and after 2000 there was no difference in the rate of documentation of maternal or neonatal risks

Nichols CM et al. South Med J 2006;99:1337-9 (Level III)

**Value of a maternal abdominal examination**

- Confirm the lie, presentation, and often position

- Give an idea of where the fetal back is in relation to the uterine midline

- Fetal weight can be assessed and in experienced hands this can be quite accurate (ACOG states that at term it’s as good as an US)

- Assess amount of fetal head above the pelvic brim
**Basovertical Diameter**

- Distance from base of skull to most distant point of the vertex
- Molding can give a false impression of engagement because the basovertical diameter is lengthened
- This can occur without excessive caput
- Thus the lowest part of the skull and scalp descends below the spines **but** the base of the skull may still be high and unengaged


**"Rule of 3's"**

- "In an OA presentation, if the sum of the number of fifths of the fetal head palpated above the pelvic inlet abdominally, and the degree of molding of the fetal head palpated vaginally, equals or exceeds three, then attempted operative vaginal delivery is likely to be unsuccessful and should be avoided"

**Documentation**

- Strongly Recommend:
  - Written or (better) dictated pre-op note
  - Written or (better) dictated post-op note
  - Details of discussion with patient
  - Details of procedure with times, number of pulls, pop-offs, VE suction
  - Details of maternal/neonatal trauma
  - Rationale for decisions at the time

**Failed/Sequential OVD**

- Recent important publications addressing these issues:
  - Towner et al., Gardella et al., Murphy et al.

- The bottom line: It is now been shown that:
  - sequential OVD attempts with multiple instruments,
  - failing with an OVD attempt
  - more than 3 pulls with an OVD attempt
  - more than 3 hours of pushing
  - .................lead to significant increases in:
    - neonatal intracranial bleeds/seizures
    - facial nerve and brachial plexus lesions
    - neonatal trauma and NICU admission
    - maternal trauma
**Intracranial Bleeds**

Incidence of I/C bleeding in the Towner Study:

- 1:860 V/E
- 1:664 forceps
- 1:907 C/S during labor
- 1:2750 C/S without labor
- 1:1900 NSVD
- 1:334 failed V/E/forceps followed by C/S

**Failed Operative Delivery**

- Much higher rates of intracranial hemorrhage, convulsions and need for ventilation
- I/C bleeds in 1:334 after failed V/E and/or forceps
  - 5.7 X higher than NSVD
  - 2.6 X higher than V/E alone
  - 2.9 X higher than C/S after labor alone


**Sequential Operative Delivery**

- Compared with SVD, the risk of I/C bleeding was:
  - 2.8 X higher with VE alone
  - 1.4 X higher with forceps alone
  - 7.8 X higher with sequential methods
- Compared with SVD, the risk of Facial Nerve injury was:
  - 1.7 X higher with VE alone
  - 6.8 X higher with forceps alone
  - 13.2 X higher with sequential methods


**Correct Placement – and Terminology!**

Flexion point – relationship of cup to anterior and posterior fontanelles
- edge of cup is 3cm from anterior fontanelle
- edge of cup on edge of posterior fontanelle

NB: BPD to vertex distance about 6 cm

_Vacca A., Handbook of vacuum delivery in obstetric practice, 2nd Ed. 2003_
It’s all about flexing the fetal head

• By inducing the fetal head to flex, vacuum is designed to overcome prolonged second stages of labor where the head is mal-rotated or mal-positioned.

• Flexion of the fetal head causes the chin to tuck downward toward the chest and allows the narrowest diameter (suboccipito-bregmatic) to progress through the pelvis.

  (See last slide for diagram of fetal head diameters)

• A flexed head in combination with correctly directed traction brings the head to the levator ani muscles, where the normal cardinal movements of labor are re-created by autorotation of the fetal head to an OA position with subsequent delivery

The Flexion Point
Identification is important:

• In a non-OA position, the flexion point is not presenting at the introitus...application over the flexion point will allow most non-OA heads to autorotate to an OA position and deliver successfully (91% vs. 29%)

• Non Flexion Point Application
  – more frequent pop-offs with increased risk of subgaleal bleed
  – more frequent lacerations/abrasions
  – Higher failure rates

Cup application: where the vacuum cup is centered, as identified by visual inspection after delivery

• **Flexing Median**: a.k.a. the “Flexion Point”
  – 3 cm in front of the posterior fontanelle (flexing)
  – Centered on the sagittal suture (median)

• **Flexing Paramedian**
  – 3 cm in front of the posterior fontanelle (flexing)
  – > 1 cm lateral to the sagittal suture (paramedian)

• **Deflexing Median**
  – > 1 cm anterior to the Flexion Point (deflexing)
  – Centered on the sagittal suture (median)

• **Deflexing Paramedian**
  – > 1 cm anterior to the Flexion Point (deflexing)
  – > 1 cm lateral to the sagittal suture (paramedian)

Autorotation to OA from OP and OT positions during vacuum delivery

• 74 % of all OP and OT positions will autorotate to OA during vacuum delivery

• 91% of all Flexing applications will autorotate to OA during vacuum delivery
  – 95% of Flexing median will rotate to OA
  – 85% of Flexing paramedian will rotate to OA

• Only 29% of Deflexing applications will autorotate to OA

Vacca, A
Handbook of Vacuum Delivery in Obstetric Practice, 2nd Edition
Vacca Research 2003
Know the diameters of the fetal head

![Diagram of fetal head dimensions]

How Many Pulls?
- Not well defined:
  - Kiwi package insert:
    - 1 or 2 pulls for outlet
    - 2 or 3 pulls for low
    - 3 or 4 pulls for midpelvic delivery
  - 1st pull – flexion of head and some descent
  - 2nd pull – head on pelvic floor
  - 3rd pull – delivery of head should be complete or imminent

Kiwi Instructions:
- do not re-apply vacuum after 2nd pop-off (450-600 mmHg)
- between pop-offs re-examine position and station and inspect scalp for trauma


What is a Pull?
- Not well defined:
  - traction efforts during a single contraction?
  - each traction movement however small?
  - only those traction efforts with obvious strain?
- What about:
  - repositioning if there is leaking?
  - relaxing during a maternal breath?
  - slight direction changes?

How Many Pulls?
- Traditional: “3 pulls and you’re out”

“3 plus 3 Rule”
- based on 2 phase division of the 2nd stage:
  - Descent Phase: birth canal to pelvic floor
  - Perineal Phase: pelvic floor to delivery
- Vacca A. Handbook of Vacuum Delivery in Obstetric Practice. 2003
- O’Driscoll K et al, 1993
- Vacca states that 3 pulls in each phase is acceptable
  - epidural
  - some progress occurs with each pull
  - traction is not excessive
**How Many Pulls?**

- First study to address this issue:
  - prospective cohort study, 1999 - 2000
  - 2 teaching hospitals in England
  - 399 term, singleton, complete dilatation, 3 hour 2nd stage
  - all deliveries performed in the OR ready for CS
  - either had OVD, attempted OVD followed by CS, or CS without any attempt at OVD

- Compared maternal/neonatal outcomes:
  - completed OVD, failed OVD with CS, CS after labor (no OVD)
  - length of 2nd stage, number of pulls, number of instruments used, operator experience

  *Murphy et al. BJOG 2003;100:610-5 (Level II-1)*

**Compared with CS after Labor:**

- Failed OVD:
  - increased maternal trauma: \( OR = 4.1 \) [1 - 17]

- More than 3 pulls with OVD instrument led to significantly increased neonatal trauma:
  - completed OVD: \( OR = 4.2 \) [2 - 10]
  - failed OVD: \( OR = 7.2 \) [2 - 24]

- Failed OVD with more than 3 pulls:
  - increased NICU admission: \( OR = 6.2 \) [2 - 23]

  *Murphy et al. BJOG 2003;100:610-15 (Level II-1)*

**British Cohort Study**

- Use of multiple instruments, compared with CS after labor, led to increased neonatal trauma for:
  - completed OVD: \( OR = 3.1 \) [2 - 7]
  - failed OVD: \( OR = 4.4 \) [1 - 14]

- Excessive number of pulls (52%) and multiple instrument use (45%) were associated with an initial attempt by an inexperienced operator

- Recommend: No more than 3 pulls, less than 3 hours of pushing, no sequential instruments, experienced operator

  *Murphy et al. BJOG 2003;100:610-5 (Level II-1)*
Subdural Hematoma in Obstetrics

- We have no idea of the natural incidence of subdural hematoma in "normal spontaneous vaginal delivery"

- Prospective cohort study of MRI in 111 babies
  - 49 born SVD
  - 25 by CS
  - 13 by VE
  - 18 failed VE with subsequent forceps
  - 1 failed VE with subsequent CS
  - 1 failed forceps with subsequent CS

Subdural Hematoma in Obstetrics
- In NVD’s the duration of 2nd stage did not appear to matter (20, 30 and 65 minutes)
- The type of cup used was not important
- In asymptomatic babies most subdural bleeds were infratentorial (cerebellum), as opposed to non-accidental bleeds which are usually supratentorial
- In asymptomatic subdural bleeds complete resolution occurs within 4 weeks


Spontaneous Subarachnoid and Parenchymal Hemorrhages
- 7 term neonates with leptomeningeal and parenchymal hemorrhage
- All had MRI DWI within 72 hrs of birth (6/7 had CT, and 2/7 had MRI angio, 2/7 had MR venography too)
- All had normal birthweight and high 5 minute Apgars
- All were delivered vaginally (1 forceps, 1 VE)
- No blood dyscrasia
- All presented with apnea and/or seizures < 36 hrs
- Superficial parenchymal or leptomeningeal bleeds
  - 4 anterior-inferior-lateral temporal lobe (pterion)
  - 1 each in parietal, lateral temporal lobe under the squamosal suture
- 4/7 had normal followup – 1 had encephalomalacia

Huang and Robertson. AJNR 2004;25:469-75 (Level III)

FDA Public Health Advisory
- FDA recommendations (1998) are:
  - VE should only be used with a specific indication
  - operator versed in its use and aware of indications, contra-indications and precautions
  - follow manufacturers recommendations as regards cup placement, vacuum strength, cumulative duration of applications, and number of extraction attempts
  - rocking movements or torque should not be applied to the device and only steady traction in the line of the birth canal should be used

FDA Public Health Advisory
- FDA recommendations are: (Contd.)
  - alert the neonatal care providers that a vacuum has been used
  - neonatal staff should be educated about the specific complications associated with vacuum devices
  - and that adverse events and complications associated with vacuum assisted devices should be reported to the FDA under the auspices of the Safe Medical Devices Act of 1990
OVD and Macrosomia?
- 2924 macrosomic infants (> 4000g) vs. 16 711 controls (3000 - 3999g)
- Macrosomic infants had a 6X (600% higher) risk of significant injury relative to controls (RR = 6.7, CI 6.5 - 69)
- Forceps had a 4X risk of clinically persistent CNS problems vs. NSVD or C/S
- The overall incidence of persistent cases low (0.3%)
  - 258 elective C/S to prevent 1 case of persistent injury.
- Advice: Don’t knowingly attempt the OVD of a macrosomic baby


SOC you will be held to
List of SOC issues that seem to come up time and again in legal suits

SOC you will be held to

- Have an appropriate/justifiable indication
- Have adequate training, experience, privileges, and credentials
- Check the prerequisites
- Consent the patient (and document the offering of CS as an alternative if appropriate)
- Intervene at an appropriate time (no more than 3 hours of pushing)

SOC you will be held to

- Intervene earlier when it is obvious that delivery will not occur with further pushing (Deep Transverse Arrest, Deflexed OP, Face) and DOCUMENT the reason
- Select the correct instrument
- Position the patient correctly
- Monitor the baby before and during the delivery if possible
- Have adequate anesthesia
- Perform the procedure correctly
**Operative Vaginal Delivery (OVD) Checklist: To be completed prior to beginning procedure.**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Standard of Care</th>
<th>Check</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fetal Status</td>
<td>Appropriate for operative vaginal delivery</td>
<td></td>
</tr>
<tr>
<td>Indication</td>
<td>Mark appropriate indication</td>
<td></td>
</tr>
<tr>
<td>Cervix completely dilated</td>
<td>Complete</td>
<td></td>
</tr>
<tr>
<td>Maternal Pelvis</td>
<td>Adequate midpelvis and outlet</td>
<td></td>
</tr>
<tr>
<td>Maternal Contractions: present</td>
<td>Correct</td>
<td></td>
</tr>
<tr>
<td>Maternal Weight</td>
<td>(kg)</td>
<td></td>
</tr>
<tr>
<td>Fetal Estimated Weight</td>
<td>(&lt; 4500g)</td>
<td></td>
</tr>
<tr>
<td>Fetal Head Position</td>
<td>Appropriate for either forceps application or vacuum application (Fischer's test)</td>
<td></td>
</tr>
<tr>
<td>Station</td>
<td>0 = skin to ischial spine, 1+ = sutures opposed, no overlap, 2+ = overlap that can be reduced, 3+ = overlap that cannot be reduced</td>
<td></td>
</tr>
<tr>
<td>Degree of caput</td>
<td>Severe caput suggests CPD</td>
<td></td>
</tr>
<tr>
<td>Rule of 3's</td>
<td>Degree of molding + five tenths of head above symphysis</td>
<td>(F+V)</td>
</tr>
<tr>
<td>Adequate Anesthesia</td>
<td>Adequate</td>
<td></td>
</tr>
<tr>
<td>Bladder catheterized</td>
<td>Bladder catheterized</td>
<td></td>
</tr>
<tr>
<td>OR ready and all equipment checked</td>
<td>OR ready and all equipment checked</td>
<td></td>
</tr>
<tr>
<td>Informed consent/assent obtained</td>
<td>Informed consent/assent obtained</td>
<td></td>
</tr>
<tr>
<td>Maternal positioning</td>
<td>Correct</td>
<td></td>
</tr>
<tr>
<td>Total heart rate monitoring</td>
<td>Essential</td>
<td></td>
</tr>
<tr>
<td>Preop Note</td>
<td>Written or checklist checked off and signed</td>
<td></td>
</tr>
</tbody>
</table>

**SOC you will be held to**

- Better than 50% chance of success - be sure it will work
- Know the position, station, molding and caput
- Know the fetal condition preop (look at the strip)
- If you are Attending in a University Hospital setting make sure you are there for the entire procedure and allow one reasonable pull by the resident then take over for one attempt by yourself
- If called after an un-witnessed failed OVD attempt proceed to CS
- Have neonatology aware and immediately available (preferably in the room) at the time of the procedure
- No more than 3 pulls with 3 contractions
- No more than 2 popoffs
- No sequential instrument use
- Document with preop and postop notes
- Describe the repair of any episiotomy/laceration
- Perform/document complete vaginal, cervical and rectal exam after the repair (fistula, retained sponge)
Thank You