ASSISTED VAGINAL DELIVERY

Background

1. Definition: Achieving vaginal delivery during second stage of labor with use of either forceps or vacuum (ventouse) applied to fetus
2. General Information: Second stage of labor can be complicated by fetal distress or failure to deliver with maximal maternal effort
    - Sometimes necessary to perform assisted vaginal delivery as alternative to cesarean section.

Pathophysiology

1. Incidence[1]
    - 2008: 0.7% of births in USA via forceps
    - 2008: 3.2% of births in USA via vacuum
2. Risk Factors
    - Epidural use associated with 2.5x increased risk for operative vaginal delivery (OVD) in nulliparas and 5.9x increased risk in multiparas[2]
    - Nulliparous women requiring OVD have increased risk of both OVD and cesarean delivery in subsequent pregnancies[3]
3. Morbidity / Mortality
    - Maternal
        - Vacuum use associated with less maternal soft tissue trauma than forceps delivery [4] Routine episiotomy with OVD no longer recommended because it is associated with[4,5,7]:
            - higher incidence of postpartum hemorrhage
            - need for moderate or strong analgesia
            - severe perineal trauma
            - perineal infection
        - Mediolateral episiotomy may reduce incidence of severe perineal trauma in OVD
        - Midline episiotomy should be avoided due to risk of sphincter disruption[8, 9]
    - Neonatal
        - Vacuum delivery increases rate of cephalohematoma and retinal hemorrhage compared with forceps[10]
        - Increased rate of hyperbilirubinemia with OVD due to increased rate of cephalohematoma (vacuum) and bruising (head – vacuum; face/head - forceps)
        - When compared to spontaneous vaginal delivery (SVD), neonatal intracerebral hemorrhage rates are[11]:
            - 2x higher in vacuum delivery
            - 7.3x higher in combined vacuum and forceps OVD
            - 8.8x higher in cesarean following failed OVD
        - Screening newborns with x-ray/ultrasound following OVD not recommended
            - Leads to discovery of asymptomatic complications with unknown clinical significance[12]

Diagnostics

1. Indications:
    - Prolonged second stage of labor
    - Non-reassuring fetal heart tones
    - Shortening the second stage needed due to maternal exhaustion or other medical condition (cardiac or neurologic disease rendering valsalva maneuver contraindicated)[4]
2. Prerequisites[4,6,10]
    - Gestational age >34weeks for vacuum use
    - Fetal presentation known
    - Cephalic presentation for vacuum use
    - Fetal head engaged and at +2 station
    - Clinically adequate pelvis
    - Cervix dilated to 10 centimeters
    - Amniotic membranes ruptured
    - Adequate anesthesia of mother
    - Maternal bladder empty
    - Consent of patient
    - Willingness to stop the procedure if not successful
    - Ability to perform cesarean if needed
3. Contraindications[4,10]
    - Cephalopelvic disproportion
    - Fetal head not engaged
    - Gestational age less than 34 weeks (contraindicated for vacuum use only)
    - Known fetal bone mineralization or bleeding disorder
    - Facial presentation (contraindicated for vacuum use only)
4. Mnemonic for vacuum use from ALSO course (used with permission)[13]:
    - A: Address the patient, ask for help, analgesics administered if needed
    - B: Bladder emptied
    - C: Cervix completely dilated
    - D: Determine position of fetal head, think of dystocia
    - E: Equipment ready, extractor mechanism working
    - F: Flexion point should be found, vacuum applied (3cm anterior to posterior fontanelle with sagital suture centered in vacuum), check to ensure no maternal tissue under the cup
    - G: Gentle traction at right angles to plane of cup, rising as head crowns
    - H: Halt traction between contractions; to minimize risk for neonatal injury, halt use after three pop-offs, more than 20 minutes elapses, or three consecutive pulls produce no progress
    - *I: Incision for episiotomy (note this practice increases rate of severe perineal trauma and is no longer recommended for routine practice)
    - J: Jaw-vacuum removed when infant's jaw reachable
5. Mnemonic for forceps use from ALSO course (used with permission)[13]:
    - A: Address the patient, ask for help, analgesics administered if needed
    - B: Bladder emptied
    - C: Cervix completely dilated
    - D: Determine position of fetal head, think of dystocia
    - E: Equipment ready-choose type of forceps depending on availability and ensure the halves match and align properly

- F: Forceps applied properly with fenestrations admitting no more than one fingertip; sagital suture midline
- G: Gentle traction with dominant hand pulling outward horizontally and opposite hand applying downward vertical pressure (Pajot's maneuver)
- H: Handle elevates to follow pelvic curve in large, J-Shaped arc
- *I: Incision for episiotomy (note this practice increases rate of severe perineal trauma and is no longer recommended for routine practice)
- J: Jaw-forceps removed when infant's jaw reachable; removal of forceps prior to complete delivery of the head markedly reduces risk of 3rd and 4th degree perineal laceration from the blades

6. Post Delivery Care[4]
    - Examine mother for cervical, sulcal, perineal and anal sphincter damage
    - Examine neonate for signs of scalp and head trauma
    - Discuss with mother her perceptions regarding need for OVD and how the delivery went
7. Documentation for OVD[4]
    - Indication for intervention
    - Position and station of fetal head prior to application of vacuum/forceps
    - Amount of molding and caput present prior to application of vacuum/forceps
    - Assessment of maternal pelvis, fetal heart rate, and quality of contractions
    - Informed consent: discussion regarding risks, benefits, and alternatives
    - Type of instrument, ease of application of instrument, number of attempts/pulls/detachments
    - Duration of traction and force used
    - Description of maternal and neonatal injuries
    - Outcome of delivery

Therapeutics

1. Vacuum:
    - Type of cup:
        - Rigid (plastic or metal) or soft (silastic) plastic: less scalp injury and cephalohematoma with soft cup but higher failure to achieve vaginal delivery than with metal cup; otherwise outcomes similar for other neonatal and maternal complications[14]
        - Discoid shape or anterior cup-discoid cup with non-fixed shaft (e.g. Kiwi Omnicup) may be easier to maneuver and place in occiput posterior presentation and aid in flexion of fetal head to achieve descent
    - Type of suction:
        - Suction integrated into handle versus electrical motor/pump: less neonatal jaundice in handheld vacuum use[14]
    - Limitations: vacuum use only after 34 weeks gestation, fetal head must be engaged in pelvis and may not be used in facial presentation

2. Forceps
    - Specific instrument selection varies based on user preference/training, neonatal presentation, and intended use of forceps
    - Pros of forceps over vacuum include ability to rotate neonate within pelvis, ability to deliver after coming head in breech deliveries, able to use in preterm birth, and ability to correct asynclitism
    - Types of Forceps Deliveries[6]:
        - Outlet Forceps: fetal scalp visible at introitus without manually separating labia, fetal skull at pelvic floor, sagital suture is at anteroposterior diameter or right or left occiput anterior or occiput posterior position, rotation does not exceed 45 degrees, fetal head at or on perineum
        - Low Forceps: leading point of fetal skull at +2cm (-5cm to +5cm scale) and not on pelvic floor yet, rotation is 45 degrees or more
        - Midforceps: station is above +2cm, but head engaged
3. Most FP's do not have privileges to perform mid forceps deliveries unless they have received specific training due to high risk of dystocia and subsequent need for urgent/emergent C-section
4. Further Management (24 hrs)
    - Monitor mother for signs of perineal trauma, periurethral injury and/or inability to urinate, perineal hematoma
    - Monitor neonate for signs of CNS injury and initiate workup for possible head trauma only if indicated (ultrasound/x-ray first line if subgaleal hemorrhage and/or skull fracture suspected, cranial CT second line)[11,12]
    - Neonates with cephalohematoma should be monitored for jaundice and treated according to American Academy of Pediatrics (AAP) guidelines
5. Long-Term Care
    - Maternal care guided by injuries sustained during delivery
    - Neonatal follow-up routine unless otherwise indicated by identified injury sustained during birth process
6. Recommendation
    - Vacuum delivery with soft cup associated with less neonatal scalp injury than rigid cup but higher failure rate[4] (SOR:A)
    - Vacuum delivery with proper application and use (limited use to 20 minutes, three pulls, and no more than three pop-offs) can minimize complications[4] (SOR:B)
    - Operators must minimize duration of vacuum application; injury more likely with longer vacuum use[10] (SOR:B)
    - OVD with sequential vacuum and forceps use associated with worse neonatal outcomes than single instrument alone[4] (SOR:B)

Follow-Up

1. Return to Office
    - Time frame for maternal return visit after OVD guided by injuries/perineal trauma sustained during birth; otherwise similar to that for SVD follow up
    - Recommendations for earlier follow-up if fourth degree laceration repair

2. Refer to Specialist
    - Obstetrical back up should be available in the event of failed OVD requiring cesarean if OVD provider not able to perform cesarean
    - Refer to obstetrical back up if repair of fourth degree perineal injury following successful OVD beyond scope of practice for OVD provider
    - Referral to Uro-Gynecology warranted if persistent urinary incontinence, fecal incontinence, or other chronic complication

Prognosis

1. OVD with vacuum can be less traumatic for mother than forceps but can have increased rate of neonatal cephalohematoma, retinal hemorrhage, and jaundice[4,10] (SOR:A)
2. Episiotomy in OVD no longer recommended due to increase risk of severe perineal injury[4] (SOR:B)
3. Incidence of intracranial hemorrhage is highest among infants delivered by cesarean after failed operative delivery; combination of vacuum and forceps had similar incidence of intracranial hemorrhage, therefore, an operative vaginal delivery should not be attempted when probability of success is low[10] (SOR:B)
4. OVD not contraindicated in suspected macrosomia or prolonged labor but use caution due to increased risk of shoulder dystocia[10] (SOR:C)

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