SOAP
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Simulation Patient Design (December, 2020)
Case of Fetal Head Entrapment after Breech Vaginal Delivery

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Introduction

Breech presentation complicates 3-4% of term presentations and includes the following presentations[1]:
- Frank breech: lower extremities flexed at hips and extended at knees
- Complete breech: lower extremities flexed at hips and knees
- Incomplete breech: one or both lower extremities extended at hips

The safest method to deliver breech presentations has come into question following publication of the Term Breech Trial in 2000.[2] The randomized trial compared outcomes of vaginal delivery vs. scheduled cesarean delivery (CD) of breech fetuses and was terminated early because of a significantly higher incidence of neonatal morbidity and mortality in the vaginal delivery group.[2] Fetal complications associated with breech vaginal delivery include: cord prolapse; fetal distress; head entrapment; fetal death; and neonatal developmental delay.[1] Despite follow up studies of the children who suffered serious neonatal morbidity who survived and achieved normal milestones, there has been a trend in the United States (US) to deliver a breech fetus via CD.[3] Currently, malpresentation which includes breech presentation, face presentation, transverse lie, and unstable lie, is responsible for 17% of primary CDs in the US.[4]

The shift to delivering breech fetuses via CD has decreased the number of obstetricians who are skilled in breech vaginal delivery, and performing CDs increases maternal risk for abnormal placentation and post-partum hemorrhage in subsequent pregnancies.[5,6,11] In some circumstances an external cephalic version can be performed for breech or shoulder presentation which can reduce the CD rate by 43%.[5] Anesthesiologists, neonatologists and nurses have limited clinical experience with breech vaginal delivery and the associated complications such as head entrapment. However, *unplanned* breech vaginal delivery remains inevitable in situations such as precipitous delivery and breech delivery of twin B. Therefore, to prepare for this rare event, simulation-based training is extremely beneficial.

Recommendations for safe breech vaginal delivery include:[6,7,8]

- Continuous fetal monitoring throughout labor
- Immediate vaginal examination after rupture of membranes to exclude cord prolapse
- An obstetrician skilled in vaginal breech delivery present at delivery
- Avoidance of fetal traction during the 2nd stage of labor
- Staff and resources to perform emergency CD, if indicated
- Staff skilled in neonatal resuscitation in the hospital during the 2nd stage of labor

The anesthesiologist should be prepared to offer labor neuraxial analgesia with possible conversion to surgical anesthesia or general anesthesia for instrumented vaginal or CD. In the case of head entrapment, the anesthesiologist may administer sublingual or IV nitroglycerin in an attempt to relax an incompletely dilated cervix. However, this may be ineffective as smooth muscle represents less than 15% of cervical tissue.[1,9] Maternal complications from breech delivery include perineal trauma and

hemorrhage. When complications arise, procedures such as Dührssen incisions, symphysiotomy, and laparotomy need to be readily performed, when indicated (see Appendix 3 for descriptions).

Educational Rationale: To teach team skills in managing fetal head entrapment after breech vaginal delivery
Target Audiences: Nursing, obstetricians, anesthesiology, operating room personnel
Learning Objectives: As per Accreditation Council for Graduate Medical Education (ACGME) Core Competencies
Upon completion of this simulation (including the debrief) learners will be able to:

- *Medical knowledge*: Describe the steps in management of fetal head entrapment and different maneuvers used to attempt delivery: suprapubic pressure, Mauriceau-Smellie-Veit maneuver, Piper's forceps, Dührssen (cervical) incisions, laparotomy
- *Patient care*: Respect patient autonomy, deliver appropriate informed consent prior to delivery and effectively communicate with the patient during an emergency
- *Practice-based learning and improvement*: Identify the equipment and skills necessary to recognize and medically manage fetal head entrapment after breech vaginal delivery
- *Interpersonal and communication skills*: Designate appropriate team leaders and effectively communicate the situation to team members to safely and expeditiously deliver the infant
- *Professionalism*: Demonstrate mutual respect for the expertise of team members and the patient
- *Systems-based practice*: Identify the location of emergency equipment such has Piper's forceps, and a laparotomy tray, and identify system barriers such as knowledge gaps that need to be addressed to optimize patient outcomes

Questions to Ask After the Scenario:

- What aspects of the scenario did you find most challenging?
- Were any parts of the scenario were unexpected?
- Did each team member have a well-defined and recognized role?
- Were you able to anticipate and prepare for the next step in handling this emergency?
- What information or communication would have better prepared you to navigate this clinical scenario?

Assessment Instruments:

1. Learner Knowledge Assessment form (Appendix 1)
2. Simulation Activity Evaluation form (Appendix 2)

Equipment Needed and Set-up:
In-situ Operating Room set-up

- Full mannequin in lithotomy position with hidden simulation faculty member as the voice of the patient *or* supine actress with hemipelvis model
- Continuous fetal monitoring in place
- 18 G IV access
- OR monitoring: EKG, BP, pulse oximetry

Simulation Scenario Set-up:

The case

Ms. Billie Jean is a healthy 32-year-old G4P3 at 32 weeks gestation who presents to triage in active preterm labor. Her fetus is found to be complete breech and she is dilated to 6 cm with ruptured membranes. The obstetricians have decided to take her to the operating room for an urgent cesarean delivery.

Simulation Pre-brief

- Consider asking if participants have had prior experience of a traumatic delivery and give them the option to be excused
- Read the scenario and instruct team members on their role during the simulation
- The learners have an opportunity to perform a team huddle prior to entering the OR
- The learners take their places in the OR
- Embedded simulation faculty:
    - OB/Gyn resident who will be performing CD with the OB attending
    - Optional: Actress playing the patient with hemipelvis model instead of mannequin

Vaginal Breech Delivery Scenario

Trigger	Patient Condition	Action	Done	Time	Comments
Preoperative huddle: OB resident announces to the team that the patient is en route to the OR for delivery	Awake, in labor pain	1. Team introduces themselves and roles 2. Team members voice questions and/or the opportunity to ask questions/ concerns 3. NICU availability confirmed 4. Team enters OR and takes positions			
Patient is on the OR table, and the OR is urgently prepared for surgery OB team requests neuraxial block placement in lateral position to allow exam capability	Laying on OR table in labor pain Category I FHR (160 bpm)	1. Team introductions to patient 2. Standard ASA monitors placed on patient 3. Nurse assesses FHR monitor 4. Anesthesiologist administers non-particulate antacid to the patient 5. Patient placed in lateral position for placement of spinal 6. Anesthesiologist performs spinal			
As spinal is being injected, patient announces intense pressure and desire to push	Awake, contraction pain diminishing HR 89 bpm BP 102/73 mm Hg SpO_2 100% on RA	1. OB team announces that the fetus is delivering in breech position (plan changes from CD to breech vaginal delivery) 2. Patient is repositioned in dorsal lithotomy for delivery 3. Anesthesia team checks monitors and			

OB resident examines patient and announces patient is fully dilated and fetal buttocks are delivering OB resident states, "I think we need to delivery this baby vaginally"	FHR 140-160 bpm	assesses level of neuraxial block 4. Team coaches patient through pushing 5. FHR assessed during pushing			
OB resident announces delivery of the buttocks, legs, and trunk to the level of the umbilicus FHR is lost after delivery of trunk OB resident requests OB attending to coach through maneuvers for delivery of chest and arms	Awake, lithotomy, now with T4 spinal block No longer feeling any pain and with very weak motor function of lower extremities HR 94 bpm BP 98/65 mm Hg SpO_2 100% RA	1. OBs perform assisted breech delivery of the chest and arms 2. Loss of FHR tracing noted 3. OB team continues to coach patient to push during contractions			
OB resident announces that the fetal head is not delivering easily and appears to be nervous	Awake, anxious, states that she can no longer feel her contractions or push effectively because of the spinal block HR 91 bpm BP 100/75 mm Hg SpO_2 99% on RA	1. OB applies pressure to the suprapubic area to keep the head flexed for delivery 2. Anesthesiologist assesses spinal block, prepares for possible need for surgical anesthesia			
OB resident requests uterine relaxation from anesthesiologist		1. Anesthesiologist administers either sublingual or IV nitroglycerin and warns patient of possible headache from medication			

OB resident notes no improvement in fetal head entrapment with administration of nitroglycerin	Patient complains of headache and mild nausea HR 127 bpm BP 80/50 mm Hg SpO_2 100% on RA	1. Hypotension is treated with IV phenylephrine 2. OB team discuss additional maneuver			
OB resident announces the cervix is tightly around the fetal head at the level of the fetal chin and occipital bone Patient asks what is happening and if her husband can come in	Awake, lithotomy, progressively becoming more anxious HR 104 bpm BP 97/71 mm Hg SpO_2 100% on RA	1. Patient concerns addressed by various team members 2. If not present, NICU called into the OR 3. Suprapubic pressure maintained during delivery attempts - OB attending directs resident to perform all of the following maneuvers which are all unsuccessful: a. Piper's forceps application b. Mauriceau-Smellie-Veit maneuver c. Dührssen incisions 4. Anesthesiologist a. Assesses blood loss when cervical incisions are made b. Assesses adequacy of pain control			
OB resident palpates fetal pulse in the umbilical cord and announces very slow FHR, limp body, and reports failure of previous methods Estimated blood loss after cervical incisions 200 mL	Awake, pushing as well as she can with spinal block, very anxious HR 99 bpm BP 104/67 mm Hg SpO_2 100% on RA	1. OB attending announces intention to perform either: a. Laparotomy for CD b. Symphysiotomy 2. Anesthesiologist reassesses spinal block and finds it is adequate for surgery			
Team prepares for a surgical delivery	Patient awake, anxious	1. Anesthesiologist explains situation to patient 2. Patient prepped, draped 3. NICU available			
Incision made and patient complains of pain and "feeling it"	Anxious and in pain HR 120 bpm BP 124/78 mm Hg SpO_2 100%	1. Preoxygenation, medications drawn up and airway supplies obtained for RSI 2. Conversion to general anesthesia and uneventful intubation			
End simulation					

Appendix 1

Learner Self-Assessment

Labor and Delivery Multidisciplinary Team Simulation

Name of simulation: _____ Date: _____

OB Nursing Anes

Each item has two components. The "Before the simulation" column (left side) examines your perspective at the beginning of the simulation. The "End of Simulation" column (right side) is to evaluate your perspective at the completion of the simulation.

1. How would you rate your knowledge of the complications associated with breech vaginal deliveries?

BEFORE THE SIMULATION	END OF SIMULATION
1 2 3 4 5 6 7 Little/none Knowledgeable	1 2 3 4 5 6 7 Little/none Knowledgeable

2. How would you rate your knowledge of obstetrical maneuvers for breech vaginal delivery?

BEFORE THE SIMULATION	END OF SIMULATION
1 2 3 4 5 6 7 Little/none Knowledgeable	1 2 3 4 5 6 7 Little/none Knowledgeable

3. How would you rate your team communication skills?

BEFORE THE SIMULATION	END OF SIMULATION
1 2 3 4 5 6 7 Little/none Knowledgeable	1 2 3 4 5 6 7 Little/none Knowledgeable

4. How would you rate your ability to communicate with the patient/spouse?

BEFORE THE SIMULATION	END OF SIMULATION
1 2 3 4 5 6 7 Little/none Knowledgeable	1 2 3 4 5 6 7 Little/none Knowledgeable

5. How would you rate your overall comfort in managing a similar scenario in the future?

BEFORE THE SIMULATION	END OF SIMULATION
1 2 3 4 5 6 7 Little/none Knowledgeable	1 2 3 4 5 6 7 Little/none Knowledgeable

Appendix 2

Simulation Activity Evaluation

DATE OF SIMULATION: _____

OCCUPATION: Consultant PG Yr 1 2 3 4 STUDENT NURSE MIDWIFE OTHER

SPECIALTY:_____ YEARS IN PRACTICE: _____

Please rate the following aspects of this training program using the scale listed below:

1 = Poor 2 = Suboptimal 3 = Adequate 4 = Good 5 = Excellent

Use "N/A" if you did not experience or otherwise cannot rate an item

INTRODUCTORY MATERIALS						
Orientation to the simulator	1	2	3	4	5	N/A
PHYSICAL SPACE						
Realism of the simulator space	1	2	3	4	5	N/A
EQUIPMENT						
Satisfaction with the mannequin	1	2	3	4	5	N/A
SCENARIOS						
Realism of the scenarios	1	2	3	4	5	N/A
Ability of the scenarios to test technical skills	1	2	3	4	5	N/A
Ability of the scenarios to test behavioral skills	1	2	3	4	5	N/A
Overall quality of the debriefings	1	2	3	4	5	N/A
DID YOU FIND THIS USEFUL?						
To improve your clinical practice?	1	2	3	4	5	N/A
To improve your teamwork skills?	1	2	3	4	5	N/A
To improve your VERBAL communication?	1	2	3	4	5	N/A
To improve your NONVERBAL communication?	1	2	3	4	5	N/A
FACULTY						
Quality of instructors	1	2	3	4	5	N/A
Simulation as a teaching method	1	2	3	4	5	N/A

COMMENTS/SUGGESTIONS:

Appendix 3[1,10]

Mauriceau-Smellie-Veit maneuver:
Avoidance of hyperextension of the fetal head is critical to minimize the risk of neurological injury. This may be accomplished with the application of suprapubic pressure after delivery of the fetal body and before delivery of the fetal head. Additional fetal neck flexion may also be accomplished by the operator by applying pressure with the index and middle fingers on the fetal maxilla while applying gentle traction in the direction of the fetal pelvis.

Piper's forceps may be applied to assist in delivery of the fetal head.

Dührssen incisions:
Two or 3 radial incisions in the cervix at the 2-, 6-, or 10-o'clock positions. Blood loss may be substantial and concealed as it may occur within the peritoneal cavity.

Muscle relaxation:
Relaxation of the smooth muscle of the cervix and skeletal muscle of the perineum may be attempted, although smooth muscle comprises less than 15% of cervical tissue. Sublingual or intravenous nitroglycerin may be administered for rapid and transient uterine relaxation.

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