Simulation Patient Design (April, 2023)

Case of vasa previa complicated by rupture of membranes

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Vasa previa is a relatively rare but potentially devastating condition that affects approximately 1 in 2500 deliveries.[1] Fortunately, a recent systemic review found that vasa previa is readily diagnosed via routine ultrasound with a median detection rate of 93%.[2] Early identification and thoughtful management are important to ensure positive outcomes for pregnancies affected by vasa previa. Fetal outcomes vary widely depending on time of diagnosis with survival rates of approximately 97% when diagnosed prenatally, versus approximately 43% when diagnosed intrapartum or postnatally.[3] Knowledge of risk factors, delivery management recommendations, and potential complications is critical in effectively managing parturients with both recognized and unrecognized vasa previa in order to reduce fetal morbidity and mortality.

Vasa previa is characterized by the presence of unprotected fetal blood vessels within the amniotic membranes either directly overlying or near the cervix.[3] These unprotected vessels can potentially rupture, especially at the time of rupture of membranes, which can quickly lead to fetal hemorrhage and potentially death.[4] Risk factors for vasa previa include velamentous cord insertion, bilobed placenta, succenturiate lobed placenta, in-vitro fertilization, and multiple gestations.[5]

Recommendations for management of pregnancies complicated by vasa previa are largely focused on appropriately timed cesarean delivery to avoid rupture of membranes or labor. The Society for Maternal -Fetal Medicine (SMFM) recommends planned cesarean delivery for a pregnancy with known vasa previa between 34-37 weeks gestational age, and cesarean delivery for viable pregnancies with vasa previa in the setting of rupture of membranes or labor.[5]

Anesthetic management of parturients with a diagnosis of vasa previa ranges from scheduled cesarean utilizing neuraxial anesthesia as appropriate to emergent cesarean under general anesthesia in the setting of rupture of membranes or labor with a non-reassuring fetal heart tracing. The obstetric anesthesia team should maintain situational awareness for parturients with vasa previa through pre-operative evaluation in a high-risk maternal clinic and be prepared to adapt quickly to clinical changes in order to minimize fetal morbidity and mortality from fetal exsanguination.

Educational Rationale: To teach team skills in managing vasa previa in the setting of rupture of membranes.
Target Audiences: L&D nursing, Obstetric team, Obstetric anesthesiology team, and OR 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*: Review definition, risks, and management of vasa previa
- *Patient care*: Recognize need for cesarean delivery in a patient with vasa previa and rupture of membranes
- *Practice-based learning and improvement*: Discuss the importance of identifying pregnancy complications and relevant management strategies
- *Interpersonal and communication skills*: Highlight the importance of interdisciplinary communication in the management of vasa previa
- *Professionalism*: Demonstrate respect and apply open communication with multidisciplinary care team
- *Systems-based practice:* Understand institutional protocols for escalation of care in urgent and emergent scenarios

Questions to ask after the scenario:

1. What is vasa previa and why is it clinically significant?
2. How is vasa previa diagnosed?
3. What are the delivery recommendations for patients with vasa previa?
4. How does the delivery plan change in a patient with vasa previa in the setting of rupture of membranes?
5. Did you identify any issues with communication/team work?

Assessment Instruments:

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

Equipment Needed and Set-up:
In-situ set-up
Location: L&D Triage and L&D OR
Personel: Simulated patient/Mannequin, labor and delivery nurse, obstetrician, obstetric anesthesiologist, L&D OR staff, NICU team
Equipment:

- Monitors: NIBP, EKG, pulse oximetry, fetal heart rate monitors
- IV: lab draw and IV start kits
- Standard induction medications in OR

Simulation Scenario Set-up:
The case

38 yo G5P3113 parturient at 39w1d presents to L&D triage with a chief complaint of leakage of a large amount of clear fluid 3 hours prior with continued leakage of fluid and

regular, painful contractions occurring every 5-7 minutes. Monitoring shows a category II tracing and contractions every 4-5 minutes that appear to be painful. Her last oral intake was a heavy meal approximately 30 min prior to arrival in triage.
She is visiting from out of town and no prenatal records are available, but she reports that her pregnancy has been uncomplicated and all of her past deliveries were uncomplicated vaginal deliveries. She also reports an ultrasound earlier in pregnancy that showed vasa previa, but she did not return for follow-up visits and states that she is doing well with no issues so far.

Physical exam details
Weight 116 kg, Height 1.65 meters, BMI 42.6
Access: None
Labs: No labs available
HEENT/Airway: MP3, small mouth opening, full neck ROM, large teeth
CV: RRR; no murmur
Resp: CTAB
Abdomen: gravid, soft, non-tender
Neuro: alert and oriented, no focal deficits

Simulation Pre-brief

- Read the scenario and instruct team members on their role during the simulation
- Encourage learners to briefly discuss an action plan and describe any equipment they will need
- Learners take their places

Scenario Details

Trigger	**Patient Condition**	**Action**		**Time**	**Comments**
Patient in L&D triage contracting painfully every 4-5 minutes.	Patient awake and responsive HR 98 bpm BP 117/84 mmHg SpO_2 99% (air) Resp 16/min Temp 37.1^{o}C	1. L&D triage nurse calls OB resident to room 2. Informs resident of suspected ROM & contractions 3. Informs resident that no history available in chart 4. Informs resident that multiple attempts at IV access unsuccessful			

Non-reassuring fetal heart tracing (baseline FHR 170 bpm, minimal variability) Painful contractions every 4-5 min	Uncomfortable, but excited for baby	1. OB resident obtains H&P 2. OB resident informs OB team of history of vasa previa 3. L&D triage nurse pages IV access team or anesthesia team for assistance. Calls for ultrasound for access assistance. 4. OB team decides to proceed with cesarean delivery due to concern for ROM in setting of vasa previa and notifies anesthesia team of patient.			
Patient informed of need for cesarean delivery due to vasa previa	Patient upset after being informed of need for cesarean and wants thorough explanation of risks of vaginal delivery	1. IV obtained by L&D triage nurse, labs sent 2. OB team pages NICU team to meet and counsel patient 3. OB team provides detailed counseling regarding risks of vasa previa			
While OB team counseling patient, L&D triage nurse notices vaginal bleeding	Blood on sheets Maternal vitals: HR 124 bpm BP 100/64 mmHg SpO_2 99% (air) Resp 24/min Temp 37.1^{0}C Sinusoidal tracing on fetal heart rate monitor	1. OB team evaluates vaginal bleeding and fetal heart tracing change and makes decision to proceed with emergent cesarean 2. Obstetric emergency code activated 3. Patient transported immediately to OR			

Nurses quickly prepare patient in triage for emergent cesarean	Patient crying HR 129 bpm BP 96/65 mm Hg SpO_2 99% (air) Resp 26/min Temp 36.8^{0}C	1. Anesthesia team obtains brief history and informs patient of need for general anesthesia.			
Patient in OR being preoxygenated	Patient crying as she goes under anesthesia. After intubation: HR 138 bpm BP 78/45 mm Hg SpO_2 98% (intubated) Temp 36.6^{0}C Labs pending.	1. General anesthesia induced with RSI with propofol and succinylcholine. Patient intubated with 6.5 ETT. OG tube placed with gastric contents. 2. NICU team arrives in OR 3. Delivery via emergent cesarean 4. Oxytocin started after delivery- confirm adequacy of uterine tone with obstetricians 5. IV fluids on pressure bag 6. Communicate with circulator RN about quantitative blood loss 7. Attempt additional IV access if needed			
Patient under general anesthesia. Surgeons are closing.	HR 98 bpm BP 114/62 mm Hg SpO_2 98% (intubated) Temp 36.9^0 C QBL=600 ml	1. Baby HR 58 bpm, required chest compressions per NRP protocol. Baby to NICU. 2. Discuss maternal post-operative pain management. Consider TAP blocks at end of case.			

Appendix 1

Learner Knowledge 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 risk factors for vasa previa?

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 risk to fetus associated with vasa previa?

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 knowledge of delivery planning for a patient with vasa previa?

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 knowledge of delivery planning for vasa previa with ROM and suspected labor?

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 confidence when confronted with emergent cesarean for vasa previa?

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

COMMENTS/SUGGESTIONS:

References:

1. Oyelese KO, Turner M, Lees C, Campbell S. Vasa previa: an avoidable obstetric tragedy. *Obstet Gynecol Surv.* 1999; 54:138-45.
2. Ruiter L, Kok N, Limpens J, Derks JB, de Graaf IM, Mol BWJ, Pajkrt E. Systematic review of accuracy of ultrasound in the diagnosis of vasa previa. *Ultrasound Obstet Gynecol*. 2015 May; 45(5): 516-22.
3. Oyelse Y, Smulian JC. Placenta Previa, Placenta Accreta, and Vasa Previa. Placenta previa, placenta accreta, and vasa previa. *Obstet Gynecol.* 2006 Apr; 107(4): 927-41.
4. Robert JA, Sepulveda W. Fetal exsanguination from ruptured vasa previa: still a catastrophic event in modern obstetrics. *J Obstet Gynaecol.* 2003 Sep; 23(5):574.
5. Sinkey RG, Odibo AO, Dashe JS. Society for Maternal-Fetal Medicine (SMFM) Consult Serioes #37: Diagnosis and management of vasa previa. *Am J Obstet.* 2015 Nov; 213(5): 615-9.