Author: Thomas Payton, MD, FACEP Reviewer: Esther H Chen, MD

Case Title: Aortoenteric (AE) fistula with hemorrhage

# Target Audience: EM residents; medical students on EM rotation

Primary Learning Objectives: Key learning objectives of the scenario

1. Discuss the common clinical presentation of patients with an aortoenteric fistula

2. Describe the initial management of patients with AE fistula resulting in massive gastrointestinal hemorrhage and hypovolemic shock

Secondary Learning Objectives: detailed technical goals, behavioral goals, didactic points

1. List the risk factors for the development of an AE fistula

2. List the causes of an AE fistula (primary vs. secondary)

3. Discuss other differential diagnoses of patients presenting with massive

gastrointestinal bleeding

4. Discuss the use of blood products in the resuscitation of patients with hemorrhagic

shock

Critical actions checklist – a list to ensure the educational/assessment goals are met:

1. Establish two large bore (16 gauge) peripheral IV access sites and initiate immediate rapid crystalloid fluid infusion.
2. Provide immediate uncrossed, unmatched blood transfusion, and order type and crossed specific blood products in anticipation of massive transfusion.
3. Perform endotracheal intubation using rapid-sequence induction technique.
4. Place nasogastric or orogastric tube, and begin gastric suctioning.
5. Give broad spectrum antibiotics for presumed sepsis secondary to infected aortic graft.
6. Consult vascular surgery and anticipate transfer to operating room.

## Environment: This case can be done as an oral board case or as a Sim Lab case.

1. Room Set Up – Sim Lab with standard manikin.
   1. Ability to intubate manikin, with necessary airway equipment
   2. Ability to place 2 peripheral IV lines; or (optional) – failed peripheral access can lead to placement of a central IV line and/or intraosseous line
   3. Ability to place NG or OG tube.
   4. Props – ECG showing sinus tachycardia, CT scans with image of aortic graft showing IV contrast extravasation into mid-portion of duodenum. US without any blood in the abdomen.
2. Distractors – none necessary.

## Actors (optional):

1. Wife to provide pertinent history.
2. Nursing personnel to carry out orders for IV access, NG/OG tube placement, lab

draws, fluid and blood product resuscitation, etc.

1. Vascular surgery consultant: Required to come in immediately to see patient.

Case could be confounded by vascular surgeon erroneously asking for a GI

consult/endoscopy before seeing the patient.

**For Examiner Only**

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Case Title: Aortoenteric (AE) fistula with hemorrhage

**CASE SUMMARY**

**CORE CONTENT AREA**

Cardiovascular, gastrointestinal

**SYNOPSIS OF HISTORY/ Scenario Background**

Mr. Robert Davidson is a 67 year old male who presents by private vehicle to the Emergency Department, accompanied by his wife.

**Chief Complaint:** Patient has been ill for 2 days. He has had fevers to 101.8 at home, accompanied by anorexia and mid-epigastric abdominal pain. Melenic blood was noted with a bowel movement about 5 hours ago, followed by one episode of hematemesis less than one hour ago at home. He also complains of feeling dizzy and weak. His wife “convinced” him to come to the ED to be checked after the hematemesis; patient was hoping to have his bloody bowel movement checked by his PCP later today or tomorrow.

**Past medical history:** Hypertension, abdominal aortic aneurysm, peripheral vascular disease.

**Surgical history:** AAA repair with endograft 4 years ago, appendectomy.

**Medications:** HCTZ 25 mg daily; clopidogrel 75 mg daily

**Allergies:** None

**Family history:** No significant contributory history

**Social history:** Negative for alcohol; quit smoking 4 years ago after AAA repair; married; retired mail carrier.

**SYNOPSIS OF PHYSICAL**

Vital signs on presentation: Blood pressure 80/48; heart rate 124 and regular; respiratory rate 24 and regular; temperature 39.1 oC, pulse oximetry 98% on room air; weight 80 kg.

Initial scenario conditions:

This is an ill-appearing 67 year old male who is immediately placed into the exam room from triage. He is initially awake, able to follow commands, but looks pale and anxious. Shortly after being placed into the exam room, he vomits a copious amount of bright red blood and becomes less responsive.

Skin: Pale, cool, and diaphoretic. Mottled extremities are present.

HEENT, Neck: Unremarkable

CV: Tachycardic, with weak/thready peripheral pulses that are lost after the emesis. Central pulses remain present but are weak and thready.

Respiratory: Slightly tachypneic but otherwise unremarkable lung exam.

Abdomen: Well-healed mid-line surgical scar and second scar over RLQ; soft abdomen, non-rigid, tender to palpation of the mid-epigastrium, moderate voluntary guarding is present, no pulsatile masses are felt.

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**CRITICAL ACTIONS**

**Scenario branch points/ PLAY OF CASE GUIDELINES**

1. **Critical Action: Recognition of hypovolemic/hemorrhagic shock and establishment of two large bore (16 gauge or larger) peripheral IV lines with normal saline (or comparable crystalloid) running wide open.**

Cueing Guidelines:

Failure to immediately establish peripheral IV access: Nurse can state “Doctor, his blood pressure is still very low. Should I do something?” Continued failure to establish IV access leads to PEA arrest.

Failure to start crystalloid fluid resuscitation: “Doctor, I have started the two IV’s as you

asked. His blood pressure is still very low. Should I do something else?” Continued failure to

begin fluid resuscitation leads to PEA arrest.

**Optional:** Scenario can be altered such that peripheral IV placement is unsuccessful. The nurse can report “Doctor, I cannot seem to get any IV lines started.” The next

critical step would then be to establish a central IV line (with or without ultrasound-

guidance), an ultrasound-guided peripheral line, or an intraosseous line.

1. **Critical Action: Endotracheal intubation, required after patient has a witnessed episode of massive hematemesis followed by altered mental status.**

Cueing Guideline: Failure to intubate: Patient will have another episode of vomiting followed by aspiration and hypoxia. Any further delays in intubation result in PEA arrest.

1. **Critical Action: Provide uncrossmatched blood products along with crystalloid fluid resuscitation, and order type-specific blood products with initial lab orders.**

Cueing Guidelines: After initial crystalloid resuscitation (2 liters), patient remains hypotensive and tachycardic. The nurse can report a repeat blood pressure of 78/38 and pulse of 118 if necessary for further cueing after initial crystalloid boluses have been given. Any further delay in initiating blood transfusion results in PEA arrest.

If examinee orders labs without type and cross for additional blood products, the nurse may ask “Doctor, are there any other lab orders you need?”

1. **Critical Action: Placement of nasogastric or orogastric tube after intubation.**

Cueing Guideline: Failure to place NG or OG tube after intubation leads to bright red blood visible in the oropharynx, with the nurse reporting “Doctor, his mouth seems to be full of blood. Should I do something?”

1. **Critical Action: Administration of appropriate broad spectrum antibiotics.**

Cueing Guideline: If examinee does not provide antibiotics for possible sepsis due to graft infection, the nurse can ask: “Doctor, did you notice the patient’s temperature when he arrived?”

1. **Critical Action: Emergent vascular surgery or general surgery consult. After initial resuscitation, examinee should ask for an emergent vascular or general surgery consult before any additional studies or actions.**

Cueing Guidelines:

If examinee orders a CT scan before consulting surgery, the patient will go into a PEA arrest while at radiology.

It is acceptable for a CT scan to be completed after surgery consultation has been requested if the patient stabilizes and while the consultant is en route to the ED (if the examiner wishes the consultant to have a 10-15 minute response time). The point here is that a CT scan is not a critical element in this case. Expeditious notification of the surgeon and disposition to the operating room without unnecessary delay is critical.

**Optional:** Case can be confounded by the surgery consultant asking for a GI consult first. Examinee should voice concern for a massive UGI hemorrhage due to AE fistula, and should point out that the patient is critically ill and unstable for endoscopy.

If examinee orders a GI consult before a surgery consult, the GI consultant will report that they cannot arrive at the hospital for another hour.

It is acceptable for examinee to perform a bedside ultrasound exam of the aorta during the initial assessment (but only after resuscitation, intubation, and placement of NG/OG tube), but the exam will not reveal any evidence of free fluid in the abdomen.

**SCORING GUIDELINES**

(Critical Action No.)

1. Dual large bore IV access: Score down for failure to immediately start peripheral IV access. Case failed if no IV access after cueing from nurse. No points deducted if examinee elects to start a central line first.

2. Fluid resuscitation: Score down for failure to begin crystalloid resuscitation immediately. At least 2 liters of crystalloid should be given. Score down if examinee fails to give uncrossed, unmatched blood after initial crystalloid boluses are ineffective at improving vital signs. Case failed if no fluid resuscitation after cueing from nurse.

3. Endotracheal intubation: Score down for failure to intubate immediately after IV access is established and fluids are running. Case failed if patient goes on to have another episode of hematemesis before intubating. Deduct points if ETT confirmation is not obtained (waveform EtCO2, auscultation of lung sounds, CXR, etc.)

4. OG/NG tube placement: Score down for failure to place NG/OG tube after intubation.

5. Broad spectrum antibiotics: Score down for failure to give broad spectrum antibiotics along with initial resuscitation.

6. Emergent vascular surgery (or surgery) consultation: Case failed if patient is admitted to ICU without a surgical consult. Deduct points if examinee allows surgical consultant to recommend a GI consult first. Deduct points if examinee elects to obtain a GI consult prior to surgery consult.

7. No additional points or deductions if examinee gives treatments for other causes of upper GI bleeding (such as IV proton pump inhibitors or octreotide). However, deduct points if these measures are given before the more critical elements above (fluid resuscitation, blood products, and broad spectrum antibiotics).

**For Examiner Only**

**HISTORY**

**Onset of Symptoms:** Patient has been ill for 2 days. He has had intermittent fevers to 101.8 oF at home, and has had anorexia and mid-epigastric abdominal pain. About 5 hours ago, he had a melenic bowel movement. He intended to wait to see his PCP, but one hour ago, he had an episode of hematemesis and began to feel dizzy and weak.

**Background Info:** Melenic blood noted with a bowel movement about 5 hours ago, followed by one episode of hematemesis less than one hour ago at home. He also complains of feeling dizzy and weak. His wife “convinced” him to come to the ED to be checked after the hematemesis; patient was hoping to have his bloody bowel movement checked by his PCP later today or tomorrow.

**Chief Complaint: “**I feel weak and dizzy. I vomited blood at home about an hour ago, and I had a dark bowel movement before that.”

**Past Medical Hx:** Hypertension, abdominal aortic aneurysm, peripheral vascular disease.

**Medications:** HCTZ 25 mg daily; clopidogrel 75 mg daily

**Allergies:** None

**Past Surgical Hx:** AAA repair with endograft 4 years ago, appendectomy.

**Habits:** Smoking: Quit 4 years ago; had a 100 pack year history.

ETOH: Rarely, less than one beer a month.

Drugs: Never

**Family Medical Hx:** No significant contributory history

**Social Hx:** Marital Status: Married 40 years.

Children: Two grown children.

Education: College degree.

Employment: Retired mail carrier.

**ROS:** Pertinent positives: intermittent fever for 2 days, anorexia, weak, dizzy, fatigue

Negatives: no syncope, chest pain, SOB, hematuria, no other

bleeding symptoms

**For Examiner Only**

**PHYSICAL EXAM**

**Patient Name:** Robert Davidson **Age & Sex:** 67 year old male

**General Appearance:** Well-developed, well-nourished male lying supine on the exam bed, in moderate distress, appears pale and anxious.

**Vital Signs:** Blood pressure 80/48; heart rate 124 and regular; respiratory rate 24 and regular; temperature 39.1 oC, pulse oximetry 98% on room air; weight 80 kg.

**Skin:** Cool, pale, diaphoretic. Mottling is present in the peripheral extremities. No jaundice. No rashes. No ecchymoses.

**Head:** Atraumatic, normocephalic, no lesions.

**Eyes:** PERRL, EOMI, sclerae anicteric, conjunctivae clear.

**Ears:** External canals are patent, TMs are unremarkable.

**Mouth:** Dried blood noted around lips, dry mucosa, good dentition, no lesions.

**Neck:** Supple, trachea midline, no JVD, no lymphadenopathy.

**Chest:** Atraumatic, equal chest expansion with respirations.

**Lungs:** Slightly tachypneic, clear breath sounds bilaterally.

**Heart:** Tachycardic rate, regular rhythm, no murmurs, rubs, or gallops.

**Back:** No midline tenderness or deformities, no CVAT.

**Abdomen:** Well-healed mid-line surgical scar and second scar over RLQ; hypoactive bowel sounds, soft abdomen, nondistended, tender to palpation of the mid-epigastrium, voluntary guarding is present. No pulsatile masses are felt.

**Rectal:** Grossly positive for melenic blood per rectum. No external lesions or hemorrhoids.

**GU:** Circumcised male, normal scrotum and testes, no masses palpable.

**Extremities:** Full range of motion, no clubbing or edema. Extremities appear mottled and are cool to palpation. Peripheral pulses are weak and thready.

**Neurological:** Awake, follows commands appropriately. No cranial nerve deficits. No motor weakness. No sensory defects. No cerebellar defects.

**Mental Status:** Awake, follows commands appropriately. Becomes lethargic and unable to follow commands shortly after copious emesis.

**For Examiner Only**

**STIMULUS INVENTORY**

#1 Emergency Admitting Form

#2 CBC

#3 BMP

#4 Coagulation panel

#5 Blood type and screen report

#6 U/A

#7 ABG

#8 Cardiac Enzymes

#9 CXR (post intubation)

#10 CT abdomen and pelvis

**For Examiner Only**

**LAB DATA & IMAGING RESULTS**

**Stimulus #2 Stimulus #6**

**Complete Blood Count (CBC) Urinalysis**

WBC 17.2/mm3 Color yellow

Hgb 8.7g/dL Sp gravity 1.010

Hct 24.1% Glucose neg

Platelets 236/mm3 Protein neg

Differential Ketone neg

Segs 81% Leuk. Est. neg

Bands 8% Nitrite neg

Lymphs 7% WBC 0-1

Monos 3% RBC 0-1

Eos 1%

**Stimulus #7**

**Stimulus #3 Arterial Blood Gas**

**Basic Metabolic Profile (BMP)** pH 7.365

Na+ 138 mEq/L pCO2 36.4 mm Hg

K+ 4.0 mEq/L pO2 173.0 mm Hg

CO2 17 mEq/L O2 Sat99.5 %

Cl- 104 mEq/L lactate 3.5 mmol/L

Glucose 92 mg/dL **Stimulus #8**

BUN 48 mg/dL **Cardiac Enzymes**

Creatinine 1.2 mg/dL CK 90 u/L

MB fraction 4.3 ng/mL

**Stimulus #4** Index 2.8 %

**Coagulation Panel** Troponin T < 0.01 ng/ml

PT 13.8 seconds **Stimulus #9**

INR 1.03 **CXR:** Endotracheal tube in

APTT 28 seconds adequate position, no other

abnormal findings.

**Stimulus #5**

**Type and Screen Report Stimulus #10**

ABO/RH(D): O POSITIVE **Contrast computed tomogram (CT) scan**

Antibody Screen: Negative of the abdomen reveals an inflammatory

soft tissue mass anterior to an infra-renal

aortic graft with pockets of gas and leakage

of contrast into it. These findings are

suggestive of an aortoenteric fistula.

**Learner Stimulus #1**

**ABEM General Hospital**

**Emergency Admitting Form**

Name: Robert Davidson

Age: 67 years

Sex: Male

Method of Transportation: Private car

Person giving information: Patient’s wife

Presenting complaint: Weak and dizzy after vomiting blood and having a bloody

bowel movement.

**Background:** Patient has been ill for 2 days, with intermittent fevers to 101.8 F and anorexia and mid-epigastric pain. Melenic blood was noted with a bowel movement about 5 hours ago, followed by one episode of hematemesis less than one hour ago at home. He also complains of feeling dizzy and weak. His wife “convinced” him to come to the ED to be checked after the hematemesis; patient was hoping to have his bloody bowel movement checked by his PCP later today or tomorrow.

**Initial Vital Signs**

BP: 80/48

P: 124

R: 24

T : 39.1 oC(tympanic)

**Learner Stimulus #2**

**Complete Blood Count (CBC)**

WBC 17.2 /mm3

Hgb 8.7 g/dL

Hct 24.1 %

Platelets 236 /mm3

Differential

Segs 81 %

Bands 8 %

Lymphs 7 %

Monos 3 %

Eos 1 %

**Learner Stimulus #3**

**Basic Metabolic Profile (BMP)**

Na+ 138 mEq/L

K+ 4.0 mEq/L

CO2 17 mEq/L

Cl- 104 mEq/L

Glucose 92 mg/dL

BUN 48 mg/dL

Creatinine 1.2 mg/dL

**Learner Stimulus #4**

**Coagulation Panel**

PT 13.8 seconds

INR 1.03

APTT 28 seconds

**Learner Stimulus #5**

**Type and Screen Report**

ABO/RH(D): O POSITIVE

Antibody Screen: Negative

**Learner Stimulus #6**

**Urinalysis**

Color yellow

Sp gravity 1.010

Glucose neg

Protein neg

Ketone neg

Leuk. Est. neg

Nitrite neg

WBC 0-1

RBC 0-1

**Learner Stimulus #7**

**Arterial Blood Gas**

pH 7.365

pCO2 36.4 mm Hg

pO2 173.0 mm Hg

O2 Sat99.5 %

Lactate 3.5 mmol/L**Learner Stimulus #8**

**Cardiac Enzymes**

CK 90 u/L

MB fraction 4.3 ng/mL

Index 2.8 %

Troponin T < 0.01 ng/ml

**Learner Stimulus #9**

CXR: Endotracheal tube in adequate position, no other abnormal findings.

**Learner Stimulus #10**

**CT Report (Abdomen and Pelvis with IV contrast only):**

Contrast computed tomogram (CT) scan of the abdomen reveals an inflammatory soft tissue mass anterior to an infra-renal aortic graft with pockets of gas and leakage of contrast into it. These findings are suggestive of an aortoenteric fistula. **For Examiner**

Date: Examiner: Examinee(s):

Scoring: In accordance with the Standardized Direct Observational Tool (SDOT)

The learner should be scored (based on level of training) for each item above with one of the following:

NI = Needs Improvement ME = Meets Expectations

AE = Above Expectations NA= Not Assessed

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Critical Actions** | **NI** | **ME** | **AE** | **NA** | **Category** |
| Establish two large-bore intravenous access sites (or acceptable alternative IV access) |  |  |  |  | PC, MK, PBL |
| Provide adequate crystalloid fluid resuscitation (minimum 2 L) |  |  |  |  | PC, MK |
| Order uncrossmatched blood products during initial resuscitation |  |  |  |  | PC, MK, PBL |
| Obtain appropriate laboratory studies including type and cross |  |  |  |  | PC, MK, PBL |
| Perform endotracheal intubation with RSI, and confirm correct ETT placement |  |  |  |  | PC, MK, PBL, SBP |
| Place NG or OG tube and begin gastric suctioning |  |  |  |  | PC, MK, PBL,  SBP |
| Provide appropriate broad spectrum antibiotics |  |  |  |  | PC, MK, PBL, SBP |
| Recognize suspected AE fistula, likely from infected aortic graft |  |  |  |  | MK, PBL |
| Obtain immediate vascular surgery consultation |  |  |  |  | PC, MK, ICS, SBP |
| Demonstrate / utilize effective communication techniques such as specifying order details and closed loop communication |  |  |  |  | MK, ICS |

The score sheet may be used for a variety of learners. For example, in using the case for 4th year medical students, the key teaching points of the case may be the recognition of shock and treatment with appropriate fluid resuscitation. Other items may be marked N/A= not assessed.

ACGME Core Competencies as defined in the SDOT

PC= Patient Care

Compassionate, appropriate, and effective for the treatment of health problems and the promotion of health

MK= Medical Knowledge

Residents are expected to formulate an appropriate differential diagnosis with special attention to life-threatening conditions, demonstrate the ability to utilize available medical resources effectively, and apply this knowledge to clinical decision making

PBL= Practice Based Learning & Improvement

Involves investigation and evaluation of their own patient care, appraisal and assimilation of scientific evidence, and improvements in patient care

ICS= Interpersonal Communication Skills

Results in effective information exchange and teaming with patients, their families, and other health professionals

P= Professionalism

Manifested through a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse patient population

SBP= Systems Based Practice

Manifested by actions that demonstrate an awareness of and responsiveness to the larger context and system of health care and the ability to effectively call on system resources to provide care that is of optimal value

**Keywords for future searching functions**

Aortoenteric fistula; secondary aortoenteric fistula; gastrointestinal hemorrhage

**References**

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