



Evaluation and Management of a Patient with Acute Mesenteric Ischemia

Description of the Activity	<p>Vascular surgeons are often called to evaluate patients with symptoms or diagnostic findings suggestive of acute mesenteric ischemia. These surgeons should have a comprehensive understanding of the presenting signs and symptoms, diagnostic techniques, and management of this disease process. This includes criteria for intervention, selection of interventional or surgical approach, urgency of intervention, and collaboration with consultants. Additionally, surgeons should understand perioperative management, including recognition and treatment of complications of surgical intervention, needed follow-up, and surveillance strategies.</p>
Functions	<ul style="list-style-type: none">❖ Nonoperative/Preoperative<ul style="list-style-type: none">➤ Synthesize essential information from a patient's referring providers, records, history, physical examination, and initial diagnostic evaluation to develop a differential diagnosis.➤ Perform an evidence-based diagnostic evaluation.➤ Initiate medical management.➤ Determine whether intervention is indicated.➤ Communicate the diagnosis and potential treatment options to the patient/caregiver(s) and consultants.➤ Select a surgical approach consistent with a patient's underlying etiology, anatomy, and comorbidities.➤ Obtain informed consent. Describe the indications, risks, benefits, alternatives, and potential complications of the planned operation, and ensure patient/caregiver understanding.➤ Synthesize an operative plan that demonstrates understanding of the anatomy, physiology, indications, contraindications, risks, benefits, alternatives, and potential complications of:<ul style="list-style-type: none">▪ Antegrade and retrograde bypass▪ Antegrade and retrograde stenting▪ Open thrombectomy▪ Percutaneous thrombectomy➤ Coordinate preoperative consultation with other surgical teams (general surgery) if suspicion for necrotic bowel is high.❖ Intraoperative<ul style="list-style-type: none">➤ Perform the procedures required to manage acute mesenteric ischemia.<ul style="list-style-type: none">▪ Antegrade and retrograde bypass▪ Antegrade and retrograde stenting▪ Open thrombectomy▪ Percutaneous thrombectomy➤ Coordinate care delivery with other surgical teams.➤ Integrate new information discovered intraoperatively to modify the surgical plan or technique as necessary, such as:<ul style="list-style-type: none">▪ Aortic or iliac calcification precluding clamp application▪ Enteric perforation and contamination▪ Inability to pass thrombectomy balloon catheter▪ Inability to perform endovascular revascularization▪ Necrotic bowel



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	<ul style="list-style-type: none">▪ Portal vein injury➤ Work with anesthesia staff, nursing staff, and other perioperative health care professionals to create and maintain an intraoperative environment that promotes patient-centered care.❖ Postoperative<ul style="list-style-type: none">➤ Oversee postoperative care in conjunction with other medical and surgical services, including resuscitation, monitoring, prescribing medical therapy, follow-up imaging, and postoperative disposition.➤ Communicate with a patient/caregiver(s) and members of the health care team to ensure understanding of postprocedure instructions and the patient's ability to carry out the resultant plan within the context of their life (eg, transportation, living situation, insurance, access to a pharmacy).➤ Recognize, evaluate, and manage early and late complications following mesenteric revascularization, including:<ul style="list-style-type: none">▪ Arterial dissection▪ Arterial embolization▪ Bowel ischemia▪ Graft/stent thrombosis▪ Hemorrhage▪ Ischemia/reperfusion injury▪ Multiple organ failure▪ Stent dislodgment➤ Identify a surveillance plan and indications for reintervention.
Scope	<ul style="list-style-type: none">❖ In scope<ul style="list-style-type: none">➤ Acute in situ thrombosis of a chronically diseased visceral vessel➤ Acute visceral thromboembolic event➤ Mesenteric artery dissection with associated malperfusion❖ Out of scope<ul style="list-style-type: none">➤ Aortic dissection with associated mesenteric malperfusion➤ Arteritis with associated occlusive disease➤ Mesenteric venous thrombosis➤ Nonocclusive mesenteric ischemia (NOMI)➤ Pediatric mesenteric ischemia➤ Visceral aneurysm



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<p>1</p> <p><u>Limited Participation</u></p> <p>Demonstrates understanding of information and has very basic skills</p> <p><u>Framework:</u> What a learner directly out of medical school should know</p> <p>The attending can show and tell.</p>	<ul style="list-style-type: none"> Elicits a history (acute onset of abdominal pain, AFib) and performs a relevant vascular exam (pain out of proportion), recognizing the critical nature of the presentation of AMI Identifies the need for diagnostic imaging, including duplex, CTA, or other modalities Recognizes the accompanying signs of possible sepsis (acidosis, hypotension) that can accompany AMI Recognizes the need for emergent intervention Communicates basic facts about AMI to a patient/caregiver(s) and other health care teams 	<ul style="list-style-type: none"> Demonstrates understanding of sharps safety, safe use of devices, and surgical field sterility Efficiently performs basic surgical tasks, including suturing and knot-tying Demonstrates basic surgical skills, including making an incision and closure Identifies open surgical options to treat AMI and identifies indications for a selected procedure over alternatives; demonstrates basic understanding of visceral arterial anatomy Identifies crises that could occur during a procedure (clamp injuries, early graft thrombosis, embolization, bowel ischemia) 	<ul style="list-style-type: none"> Uses US to demonstrate anatomy for vascular access; recognizes the importance of maintaining wire position during wire and catheter exchanges Demonstrates basic understanding of the anatomy of the visceral arterial system Identifies endo treatment options and indications for a selected procedure Identifies crises that could occur during a procedure (dissection, thrombosis, embolization, bowel ischemia) 	<ul style="list-style-type: none"> Identifies a basic postop problem (fever, hematoma, wound complication) and initiates management with supervision Communicates with the health care team in a respectful manner

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2 <u>Direct Supervision</u> Demonstrates understanding of the steps of the operation but requires direction through principles and does not know the nuances of a basic case	<ul style="list-style-type: none">• Orders and interprets lab tests (WBC count, lactate) and diagnostic imaging (CTA, MRA)• Independently analyzes preop imaging, recognizing visceral malperfusion, and initiates resuscitation and anticoagulation to prepare for operative intervention	<ul style="list-style-type: none">• Demonstrates respect for tissues (gentle handling of vessels) and developing skill in instrument handling• Creates an arteriotomy for a thromboembolectomy and sutures on a vessel (primary closure or patch) with	<ul style="list-style-type: none">• Uses US to obtain vascular access; demonstrates basic catheter and wire-handling techniques• Identifies most steps of the procedure and the equipment required; requires prompting to	<ul style="list-style-type: none">• Manages a common postop problem (hypotension, ileus, ischemia/reperfusion injury), ordering and interpreting additional tests as needed• Communicates recommendations to the critical care,

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<p>Framework: The learner can use the tools but may not know exactly what, where, or how to do it.</p> <p>The attending gives active help throughout the case to maintain forward progression.</p>	<ul style="list-style-type: none">Ensures necessary imaging, equipment (embolectomy catheters), and basic OR setup are available for an urgent open or endo AMI interventionSynthesizes clinical data (imaging, labs) to choose open or endo revascularization based on patient-specific factors (occlusion vs stenosis, clinical condition of the patient)Synthesizes clinical data to decide on endo (percutaneous suction thrombectomy), open (open thrombectomy, bypass), or hybrid repair (ROMS)Communicates the complexities of AMI and the ramifications of revascularization to a patient and consulting services; recognizes the need for coordinated multidisciplinary care	<p>frequent prompting and assistance</p> <ul style="list-style-type: none">Identifies most steps of the procedure (exposure, inflow/outflow control, endarterectomy or bypass) and the equipment required; requires prompting to advance the procedureRecognizes a crisis (eg, ischemic or marginal viability bowel)Describes complications that can occur during an open surgical approach to AMI (clamp injuries, early graft thrombosis, poor donor/target vessels)	<p>advance the procedure</p> <ul style="list-style-type: none">Identifies complications of percutaneous access and angioplasty during an endo procedure for AMI, including dissection, rupture, embolization, and thrombosis	<p>general surgery, and palliative care teams during patient care discussions</p>



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<p style="text-align: center; font-weight: bold;">3</p> <p style="text-align: center; font-weight: bold; text-decoration: underline;">Indirect Supervision</p> <p>Can do a basic operation but will not recognize abnormalities and does not understand the nuances of an advanced case</p> <p style="text-align: center; font-weight: bold; text-decoration: underline;">Framework:</p> <p>The learner can perform the operation in straightforward circumstances.</p> <p>The attending gives passive help. This help may be given while scrubbed for more complex cases or during a check-in for more routine cases.</p>	<ul style="list-style-type: none"> ● Synthesizes exam (pain out of proportion to exam), lab (WBC count, lactate), and imaging (CTA) results as well as the acuity of the patient's condition to formulate a plan for endo or open intervention for AMI ● Independently analyzes imaging to predict how a plan may change; ensures all necessary equipment is available for the planned intervention (open or endo) ● Develops a specific open surgical plan for the clinical situation and demonstrates understanding of alternative treatment options ● Develops a specific endo plan (percutaneous or hybrid) based on patient anatomy and device instructions ● Actively listens to a patient and consulting services and adapts communication regarding a complex presentation of AMI; considers general surgery input in care coordination and planning 	<ul style="list-style-type: none"> ● Performs an exploratory laparotomy in a virgin abdomen ● Demonstrates efficient instrument handling and safe exposure, dissection, and control of vessels ● Performs a complete endarterectomy, anastomosis, and patch with minimal prompting and passive assistance ● Identifies all critical steps of the procedure and the equipment required; advances the procedure with minimal prompting ● Recognizes a crisis (ischemic bowel, inability to perform thrombectomy) and describes the change in plan required to ensure visceral revascularization ● Describes the appropriate response to crises that occur 	<ul style="list-style-type: none"> ● Performs an aortogram and visceral angiogram with stenting in an intermediate-complexity lesion ● Describes the appropriate response to complications of percutaneous access and angioplasty during an endo procedure for AMI, including dissection and thrombosis 	<ul style="list-style-type: none"> ● Recognizes and manages a complex immediate postop complication (target lesion/graft occlusion, hypotension, acidosis, MI, renal failure, delayed bowel ischemia), including the need to return to the OR ● Listens to input from the consult services and implements it for patient care

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4		during open surgical approaches to AMI, including clamp injuries, early graft thrombosis, and poor donor/target vessels		
<p>Practice Ready</p> <p>Can manage more complex patient presentations and operations and take care of most cases</p> <p>Framework:</p> <p>The learner can treat all straightforward AMI cases and has a strong understanding of surgical options and techniques for less common scenarios.</p> <p>The attending is available at the request of the learner but is not routinely needed for</p>	<ul style="list-style-type: none"> • Synthesizes patient data, including the acuity of a patient's condition (shock, need for bowel resection, second look) and formulates a plan for endo or operative intervention for AMI, including all relevant details • Develops an evidence-based operative plan for the etiology of AMI involving an open, endo, or hybrid approach and ensures that all necessary supplies, instrumentation, and implants are available • Adapts the management plan for a changing clinical situation • Adapts the management plan based on a change in the patient's condition (eg, acute abdomen), including from endo to open • Coordinates a goals-of-care discussion with a patient with 	<ul style="list-style-type: none"> • Proficiently handles instruments and equipment, uses assistants, guides the conduct of the operation, and makes independent intraop decisions, anticipating when assistance is needed • Identifies all critical steps of the procedure and the equipment required; advances the procedure without prompting and demonstrates understanding of critical decision points • Anticipates a crisis (ischemic bowel, inability to perform embolectomy or clamp inflow vessels) and converts to an alternate 	<ul style="list-style-type: none"> • Identifies all critical steps of the procedure and the equipment required in a complex lesion; advances the procedure without prompting and demonstrates understanding of critical decision points (eg, conversion to open) • Anticipates a crisis that occurs during an endo procedure for AMI, including dissection and inability to cross the lesion, and quickly changes the operative approach when necessary • Recognizes the potential need to examine the bowel at 	<ul style="list-style-type: none"> • Leads the team and provides supervision in managing a postop complication (target lesion/graft occlusion, hypotension, acidosis, MI, renal failure) • Coordinates input from consult services to optimize patient care

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common presentations, though input may be needed for more complex presentations.	complex comorbidities and a complex presentation of AMI, their caregiver(s), and other health care teams; leads preop planning and management between consulting teams such as general surgery	revascularization procedure when necessary <ul style="list-style-type: none">Anticipates treatment for a crisis during open intervention for AMI (eg, inability to clamp inflow/outflow)Recognizes the potential need to examine the bowel at the time of surgery or as a second look	the time of intervention or as a second look	