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Mesenteric Ischemia

Concepts of Care for the Bedside Nurse

ABSTRACT

Bedside nurses require excellent observational and assessment skills. Being knowledgeable about common diseases that often affect the population is essential; however, it is often more challenging to be informed about life-threatening conditions that rarely develop. Such is the case with mesenteric ischemia, a rare but complicated condition, which is difficult to diagnose, carries a degree of mortality of about 40%–70%, and is more common in people older than 50 years. Mesenteric ischemia requires that nurses be aware of the different etiologies and presentations of this uncommon disease to alert physicians of changes in a patient's condition and detect clues that may assist with an accurate and prompt diagnosis. Being educated about the diagnostic procedures, possible outcomes, and anticipated care and needs of patients affected by this medical complication is imperative to maintain the health status and well-being of these patients and their families.

Mesenteric ischemia, a rare but complicated condition, is difficult to diagnose, carries a degree of mortality of about 40%–70%, and is more common in people older than 50 years (Eris et al., 2013). The condition requires that nurses be aware of the different etiologies and presentations of this uncommon disease to alert physicians of changes in patient's condition and detect clues that may assist with an accurate and prompt diagnosis.

The main blood supply for the gastrointestinal system is the superior mesenteric artery (SMA), celiac artery or trunk (CA), and inferior mesenteric artery (IMA). These three together are called the mesenteric arteries. According to McCutcheon (2012), ischemia occurs when blood cannot flow freely through these arteries to its target organs, the intestines and mesenterics, resulting in compromised oxygen delivery. Predominate damage occurs to the small intestine, but the large intestine and stomach can also be affected. In addition, McCutcheon (2012) asserts that ischemia produces severe abdominal pain, which is usually out of proportion to the physical findings; this is a main feature of the disease.

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Background of Mesenteric Ischemia

Mesenteric ischemia is a rare event. It accounts for about 2% of the gastrointestinal diseases, but has a 40%–70% mortality rate (Eris et al., 2013). The majority of occlusions, about 70%–80%, occur in the SMA and with less frequency in the CA and IMA; this occurs because of the less acute angle of the SMA when leaving the aorta (Bayrak, Bektas, Duzcoylu, Guneyi, & Cakar, 2014). Mesenteric ischemia is associated with conditions that impede blood flow to the mesenterics such as atherosclerotic disease, aortic aneurism, dissection, cardiac emboli, congestive heart failure, and shock. Comorbid conditions that have shown association with mesenteric ischemia are renal and liver diseases and pancreatitis. Vasospastic and hypercoagulability conditions such as those caused by medications (estrogens and birth control) and medical conditions (lupus and thrombophlebitis) can also increase the risk for developing the disease (McCutcheon, 2012). In addition, a correlation exists between cigarette smoking, a vasoconstriction throughout the body, and the development of mesenteric ischemia (Acosta & Nilsson, 2012).

Chronic Ischemia Versus Acute Ischemia

Mesenteric ischemia can be chronic or acute. Chronic conditions are mainly associated with atherosclerotic disease and develop over a longer period of time. Acute ischemic conditions are closely associated with emboli and thrombosis and can develop suddenly (Darwood & Smith, 2012). Diagnosis is usually a matter of exclusion after ruling out other possibilities. The main complaints are severe abdominal pain, vomiting, nausea, bloating, and diarrhea (Darwood & Smith, 2012). Differential diagnoses are broad and can include gastric or duodenal ulcer disease, cholelithiasis, pancreatitis, appendicitis, diverticulitis, irritable bowel syndrome, gastritis, and gastroenteritis (Seller & Symons, 2012).

Signs and symptoms may be systemic and/or localized to the abdominal area. Pain is one of the most common symptoms, and may be disproportionate to physical findings. Pain can be mild to severe, constant, diffused, or nonlocalized. The abdomen may be tender to touch, distended, soft, or rigid, and gastrointestinal bleeding may be noted. Signs of sepsis such as tachycardia, hypotension, tachypnea, and elevated temperature may be present (McCutcheon, 2012).

Chronic Ischemia

In chronic ischemia, the person usually complains about intense abdominal pain 15–60 minutes after eating and symptoms become worse the longer the person lives with the condition (Bayrak et al., 2014). Blood supply to the intestines during a large meal increases, creating an influx of blood. The narrowed arteries cannot handle the influx of blood, thus becoming ischemic (McCutcheon, 2012). Patients with chronic mesenteric ischemia (CMI) are usually between the ages of 50 and 70 years, and women are more commonly affected than men at a ratio of 2:1 (Darwood & Smith, 2012).

Patients with CMI are typically underweight and look emaciated, although their appetite may be intact. Weight loss is primarily attributed to not eating to avoid pain (Babaev, Lee, & Razzouk, 2014). There is a rich collateral circulation among these arteries; therefore, in the majority of cases, at least two of the three mesenteric arteries need to be occluded for the symptoms to be present (Darwood & Smith, 2012). Darwood and Smith (2012) found that ischemia that develops distally has greater symptomatology than ischemia that develops proximally due to the lack of collateral formation. Usually, repair of only one of the arteries can make the symptoms disappear (Darwood & Smith, 2012).

Darwood and Smith (2012) declared that about 95% of CMI cases are due to atherosclerosis; patients affected are usually heavy smokers, hypertensive, and frequently have other manifestations of atherosclerosis. Darwood and Smith added that, although rare, other causes of CMI include thromboangiitis obliterans, Behcet's disease, Takayasu's disease, Crohn disease, and median arcuate ligament syndrome.

Acute Ischemia

Acute mesenteric ischemia (AMI) develops suddenly due to a sudden decrease or complete blockage of circulating blood to the intestines (Guzel et al., 2014). Patients with AMI are usually older than 60 years, and men are more commonly affected than women at a ratio of 3:1 (Fung & Myers, 2015). According to Darwood and Smith (2012), AMI may occur for a multitude of reasons; among them are myocardial ischemia, circulatory shock and sepsis, hypotension, atherosclerosis, tumor causing venous compression, intra-abdominal infection, surgery, pancreatitis, decompression, arterial embolus or thrombus, venous occlusion, recent surgery, and coagulation problems. This can also occur if CMI is left untreated (McCutcheon, 2012). The etiology is divided between occlusive and nonocclusive reasons. Rapid recognition can reduce mortality rates, especially if treated within 12 hours of the onset of symptoms (McCutcheon, 2012).

Embolic Ischemia

Occlusive ischemia of mainly cardiac origin accounts for 40%–50% of cases of AMI; atrial or flutter fibrillation and valvular disease are the main culprits (Fung & Myers, 2015). This can result in the formation of embolus and obstruction of visceral blood flow. Patients usually complain of sudden and intense pain and, sometimes, nausea and vomiting. According to Bayrak et al. (2014), peritoneal findings such as rigidity do not occur until later when the infarcted bowel has necrotized. Furthermore, Bayrak et al. (2014) state that classic signs of mesenteric ischemia are peritoneal rigidity, bloody stools, and fever. Mesenteric ischemia should be ruled out for patients with a history of hypercholesterolemia and atherosclerosis who complain of abdominal pain and in whom no other cause can be found (Bayrak et al., 2014).

Thrombolic Ischemia

This obstructive ischemia can be arterial or venous in origin and can develop suddenly. Fung and Myers (2015) report that arterial thrombolic ischemia can occur due to an atheromatous plaque, oral contraceptives, surgical accidents, abdominal trauma, or tumors. Venous thrombosis can be related not only to hepatic cirrhosis and portal hypertension, but also to pancreatitis, hypercoagulable states, malignancy, congestive heart failure, and hematological prothrombic conditions such as polycythemia vera and hyperfibrinogenemia

(Fung & Myers, 2015). The list of differential diagnosis for abdominal pain of unknown origin in patients with a history of deep vein thrombosis and coagulability disorders should include the possibility of this being mesenteric ischemia (Kossaify, 2011).

Nonocclusive Ischemia

In conditions where blood flow is low without evidence of being embolic or thrombotic in nature, but a history of hypercholesterolemia exists, the accumulation of plaque in the vessels could be the cause of reduced vascularity to distal organs (Rittenhouse & Chojnacki, 2011). The use of vasopressors, including during resuscitative efforts, as well as the use of inotropics during low cardiac output conditions such as sepsis and heart failure, can disrupt blood perfusion to the mesenterics and cause ischemia when pre-existing conditions of reduced blood flow such as atherosclerosis exist (Auxiliadora-Martins, Alkmin-Teixeira, Feres, Martins-Filho, & Basile-Filho, 2010). According to Rittenhouse and Chojnacki (2011), cocaine also affects the gastrointestinal system by stimulating α-adrenergic receptors and enhancing the influx of calcium across the endothelial membrane resulting in vasoconstriction of the mesenterics. Therefore, Rittenhouse and Chojnacki recommend that young patients presenting with symptoms of mesenteric ischemia, without any other risks factors, should be screened for the use of cocaine as a possible cause of their distress.

Although atherosclerosis is the main cause of nonocclusive mesenteric ischemia (NOMI), impingement of the CA by the diaphragm can also provoke ischemia to the mesenterics (Auxiliadora-Martins et al., 2010). This condition is known as celiac compression syndrome or median arcuate ligament syndrome. This is most common in young females and should be ruled out as one of the differential diagnoses in women complaining of abdominal pain and in whom no other obvious causes can be determined (Auxiliadora-Martins et al., 2010).

Diagnostic Laboratory Tests

Early diagnosis of AMI based on clinical findings can be very difficult due to similitude in characteristics to other more common diagnosis such as cholecystitis, appendicitis, and Crohn disease, among others. Factors such as high suspicion and awareness of the disease are not enough to quickly move forward to a diagnosis and early treatment of the disease. Laboratory results that may be altered are elevated white blood cells and platelets, elevated anion gap, and C-reactive protein (Bayrak et al., 2014). In addition, lactate dehydrogenase, alkaline phosphatase, aspartate transaminase, amylase, and D-dimer tests can give a clue to the underlying diagnosis. However, none of these tests are definitive indicators of the condition and when present may be late findings of AMI (Darwood & Smith, 2012).

Acosta and Nilsson (2012) reported that D-dimer is the most consistent, highly sensitive (96%–100%) marker of early AMI. However, its specificity is low, increasing at higher cutoff levels at the expense of decreasing sensitivity.

According to Kossaify (2011), many clinicians overly rely on L-lactate as a diagnostic method of early AMI. Kossaify relates that L-lactate is not a consistent early marker for this condition, possibly due to the high capacity of the liver for this marker's clearance from the portal and mesenteric circulation (Kossaify, 2011). Instead, moderate elevated levels of this marker are often a late sign of AMI, with extensive transmural intestinal infarction, tissue hypoperfusion, anaerobic metabolism, and death. Caution must be exercised when using this marker because issues such as venous stasis occurring at sampling and erythrocyte production of lactate in vitro reduce even further the reliability of this test (Kossaify, 2011).

New experimental tests offer a renewed hope to find a specific diagnostic tool of early AMI, but they are not yet commonly used in clinical practice. These tests are D-lactate, intestinal fatty acid-binding protein (I-FABP), and glutathione *S*-transferase (Guzel et al., 2014). Both I-FABP and glutathione *S*-transferase originate in the intestinal mucosa; D-lactate originates from bacteria in the intestinal lumen as a by-product of normal bacterial fermentation. Due to the fact that mesenteric ischemia begins in the intestinal mucosa, all of these markers have the potential to provide early warning due to the leakage of damaged erythrocytes at the tip of intestinal villi into the bloodstream (Guzel et al., 2014). In contrast to L-lactate, D-lactate (another isomer of lactate) is metabolized very slowly by the liver and its elevated values may indicate bacterial translocation, intestinal mucosa injury, and mesenteric ischemia (Guzel et al., 2014). Guzel et al. (2014) report I-FABP to be a more reliable test to detect early AMI compared with the D-dimer test.

Diagnostic Imagery

Even with advances in technology, diagnosing AMI continues to be difficult. Its clinical presentation is variable, sometimes presenting with some specific and nonspecific clinical and laboratory findings. Use of imaging technology such as ultrasonography and computed tomography–angiography (CTA), in addition to a combination of findings, is necessary to determine a real ischemic event of the mesenterics and bowel (Eris et al., 2013). Miracle, Behr, Benhamida, Gill, and Yeh (2014) report that more specific findings of gastrointestinal ischemia include accumulation of gas in the bowel, mesenteric vessel occlusion, venous occlusion,

and portal venous gas. Less specific imaging findings are small bowel wall thickening and mesenteric fluid (Miracle et al., 2014). Several small intestine diseases can further complicate the diagnosis of mesenteric ischemia, both clinically and radiologically. Such conditions are inflammatory, infective, and infiltrative processes of the gastrointestinal system (Miracle et al., 2014).

Ultrasonography

Advances in resolution of commercially available devices have permitted the visualization of the mesenterics transabdominally. Doppler waveform has allowed the analysis of blood flow necessary to determine the stenosis and occlusion of mesenteric vessels. Duplex ultrasonography (DU), which combines B-mode ultrasonography with Doppler waveform, has led to ultrasonography being considered an important tool in the diagnosis of mesenteric ischemia (Kossaify, 2011). Duplex ultrasonography not only allows visualization of the underlying anatomy of the vessels but also permits the clinician to observe flow details, corroborating the findings (Bayrak et al., 2014).

Ouchi et al. (2014) found that this technology has shortcomings due to the fact that AMI is difficult to visualize with DU. However, mesenteric ischemia is unusual in the presence of good flow in the SMA and CA. Nonetheless, DU requires the availability of a skilled radiologist or physician who can produce reliable images and be able to correctly interpret them (Ouchi et al., 2014). Reliability is reduced by obesity, presence of intestinal gas, previous abdominal surgery, and the patient eating within 8 hours before testing (Ouchi et al., 2014). These situations may be impossible to prevent in an emergency. Therefore, the American Heart Association (2011) does not recommend its use in the diagnosis of AMI; it is useful, however, in the diagnosis of CMI.

Computed Tomography–Angiography

This technology represents a fast and accurate diagnostic tool for AMI. Computed tomography–angiography is the gold standard diagnostic test in acute mesenteric artery occlusion, providing anatomical visualization and the opportunity to initiate therapeutic measures if the situation requires the clinician to act quickly, such as when the need to apply vasodilators or thrombolytics arises during the procedure after a cardiac dysfunction (Auxiliadora-Martins et al., 2010). Although findings of vessel occlusion or narrowing may be seen on computed tomography–angiogram, changes associated with the bowel wall more often offer clues to the diagnosis by providing the opportunity to evaluate the bowel at the same time. This can be aided by findings such as wall thickening, dilation, intramural air, portal venous gas, and mucosal enhancement (Minko et al., 2014).

Computed tomography–angiography of the mesenterics can be performed even when nonspecific clinical signs of AMI (e.g., oliguria, unexplained metabolic acidosis, elevated lactate levels, hypoxia, or hypotension) are present, with or without peritoneal signs (Eris et al., 2013). In addition, the American Heart Association (2011) recommends that this test be applied to patients suspected of NOMI, whose condition does not improve with correction of the underlying problem. Furthermore, the American Heart Association recommends that CTA and lateral aortography be performed for patients suspected of having CMI for whom noninvasive imaging is unavailable or indeterminate.

Intervention

Patients who are suspected of having mesenteric ischemia must receive adequate fluid resuscitation because capillary leak in the setting of bowel ischemia can lead to significant fluid shifts. According to Eris et al. (2013), to avoid exacerbation of the ischemia, a preference should be given to β-adrenergic agonists such as dopamine when vasopressors are required. In addition, Eris et al. (2013) recommend the use of prophylactic broad-spectrum antibiotics because ischemia may lead to more frequent translocation of bacteria throughout the intestinal wall. Moreover, anticoagulation therapy with heparin, which can be rapidly reversed with protamine sulfate in case emergent surgery is required, should be implemented to decrease the formation of additional emboli when these are believed to be the cause of the mesenteric ischemia (Eris et al., 2013).

Revascularization

Although major advances in imaging technology have made diagnosis and treatment of mesenteric ischemia more achievable, this has been counterbalanced by the multiple comorbidities commonly seen in affected patients, many of whom are of older age and fragile health (Bayrak et al., 2014). The use of percutaneous transluminal angioplasty (PTA) and stent placement has increased in frequency as the preferred method of revascularization for CMI and AMI because it is a less invasive therapy than laparotomy and enables the physician to proceed immediately from diagnosis to treatment (Ryer et al., 2012). Moreover, the availability of embolic protection devices and low profile stent systems makes it a very useful treatment strategy. Nevertheless, as Ouchi et al. (2014) report, PTA and stent placement do not come without risks of complications, which include mesenteric artery restenosis, distal mesenteric embolization, stent dislodgement,

stent thrombosis, stent fracture, branch perforation, and dissection. Furthermore, about 40% of patients require reintervention due to the aforementioned complications (Ouchi et al., 2014).

Open Surgery

In the setting of arterial insufficiency, whether this is chronic or acute, mesenteric bypass is commonly performed. Artery bypass may be carried out in an antegrade fashion, with inflow from the CA, which is more commonly free of atherosclerotic disease or retrograde from the iliac artery. At exploration, unless the bowel is necrotic, revascularization should be performed before bowel resection. Once revascularized, the bowel can be re-examined after a minimum of 30 minutes to determine whether restoration of flow has reversed the ischemic process. If no signs of viability are seen, resection of the bowel is performed (Gupta, Natarajan, Gupta, Fang, & Fitzgibbons, 2011). A second exploration surgery after 24–48 hours has become the norm to verify that the remaining bowel has not further necrotized (Eris et al., 2013). This second look may further increase the morbidity and mortality associated with open surgical procedures. Changes such as loss of peristalsis, gray-colored bowel, lack of bowel sheen, and/or foul smell indicate the need for emergent resection (Gupta et al., 2011).

If the whole small intestine is resected with sparing only of the proximal jejunum, it is most likely to render the patient dependent on total parental nutrition (TPN) or require a bowel transplant (Darwood & Smith, 2012). A remaining bowel less than 70 cm in length may not be compatible with life. If this is an elderly patient, the surgeon may recommend closing the abdomen and implement palliative measures as the most appropriate option (Darwood & Smith, 2012).

According to Gupta et al. (2011), morbidity and mortality are very high for patients undergoing bowel resection after mesenteric ischemia. Patients at the highest risk for complication include those admitted from a long-term facility, possessing a do-not-resuscitate status, Stage 4 wounds, and cardiopulmonary and renal comorbidities (Gupta et al., 2011). Patients with the highest risk postoperatively are those who undergo an emergent procedure or have complications during the procedure, which prolongs the operative time (Gupta et al., 2011).

Nursing Considerations

Mesenteric ischemia is a rare condition with a high mortality rate. Survivors will need anticoagulants for life (Miracle et al., 2014). This can complicate care or cause other comorbidities such as intestinal bleeding and anemia. Many of these patients require multiple surgical procedures or procedures that increase the risk for bowel obstruction, other coagulopathy problems, persistent pain, or placement of a permanent colostomy, all of which can affect body image, self-esteem, desire to socialize, and overall quality of life.

Improved outcomes are possible for patients who undergo surgery by the use of fast track pathways, consisting of early implementation of mobility, diet, and pain control (Sahoo, Gowda, & Kumar, 2014). These interventions are meant to accelerate recovery and reduce the incidence of postoperative complications (Chappell, 2013). In addition, the increased use of laparoscopy surgery and robot-guided techniques has further decreased the length of hospital stay, blood loss, and medical expenses by being less invasive and thus accelerating the recovery process (Hui, Hyman, Viscomi, & Olser, 2013). This, needless to say, increases patient and family satisfaction. Nurses, together with physicians and anesthesiologists, play a vital part in implementing these fast track clinical strategies preoperatively, intraoperatively, and postoperatively (Kapritsou et al., 2012).

Preoperative Strategies

Preoperative strategies are focused on educating patients about the fast track pathway or early implementation of mobilization, diet, and pain control. This education is more likely to be effective once the patient understands the potential for improved clinical outcomes and reduced length of stay in the hospital (Hui et al., 2013).

Avoidance of bowel preparation in combination with a shorter period of fasting of about 6 hours can potentially reduce the risk of dehydration and electrolyte imbalance during the preoperative phase (Hui et al., 2013). In addition, nutritional support with carbohydrate loading and, if time permits in CMI patients, nutritional optimization with TPN should be implemented because these patients are commonly malnourished because of their fear of experiencing pain associated with eating (Hui et al., 2013). This has the potential to decrease the risks of complication during surgery. Nurses can help these patients reduce their stress by making them aware of the length of time expected before return of bowel movements (Chappell, 2013).

Intraoperative Strategies

Preventing intraoperative complications enhances the chances of an uncomplicated, complete recovery. These strategies include fluid management, anesthesia selection, maintaining normothermia (include balancing fluid management to prevent fluid overload), epidural instead of inhaled anesthesia, short-acting inhaled anesthesia instead of the total intravenous approach, individualized analgesia, proactive normothermia in the operating room, and administration of alvimopan

(Entereg) or methylnaltrexone (Relistor) prior to the start of the operation to help counteract the effects of opioids used during surgery and to reduce the possibility of an ileus (Rodriguez, 2014).

Postoperative Strategies

Thorough postoperative care is very important to ensure optimal recovery for patients who undergo major surgery. Skilled and careful assessment is needed to prevent complications and restore the patient back to health. The extent of the postoperative care required is based on the original health status of the patient and the type of surgery (Sahoo et al., 2014). Postsurgery strategies include the removal of the nasogastric tube and indwelling urinary catheter on postsurgical Day 1 (Sahoo et al., 2014). Alvimopan (Entereg) should be continued twice daily, not to exceed 15 doses in 7 days, to decrease the possibility of an ileus (Ehrlich et al., 2014).

Fast track pathways provide the guidance for optimal postoperative care. Nurses should encourage clear liquid nutrition on the first operative day and, if the patient tolerates, advance to solid food the next day (Kapritsou et al., 2012). Nurses are also responsible for early mobilization of the patient, which can include getting out of bed and ambulating for short periods of time to prevent ileus, respiratory problems, and promote diet intake, digestion, and return of bowel function (McCutcheon, 2012). Laxatives, antiemetics, and deep vein thrombosis prophylaxis are also implemented the same day as surgery. In addition, opioid-sparing techniques including short-acting inhaled anesthesia and nonsteroidal anti-inflammatory medications are important adjuncts to minimize the use of opioids in the immediate postoperative phase and thus decrease the potential for ileus and other complications (Kapritsou et al., 2012).

Psychosocial Aspect

One of the most important, although often underestimated, factors is the impact a disease has on social functioning, role limitations, and emotional well-being of the patient (Kapritsou et al., 2012). Understanding the impact of chronic illness on patients contributes to an improvement in their quality of life. By appreciating patients' perspective concerning an illness, nurses can better educate the patients in all aspects of the disease process. To properly care for these patients, the aforementioned three psychosocial aspects of the patient's care should be addressed (Kapritsou et al., 2012). Nursing care should incorporate aspects of physiological and psychological changes such as colostomy care, physiological changes such as altered body image, emotional changes such as anxiety and depression, and social issues such as having to deal with embarrassment of colostomy bag mishaps in public (Kapritsou et al., 2012).

Despite these advances and because of the complexities associated with diagnosis and treatment of mesenteric ischemia, for many, death is the ultimate result. Patients and their loved ones need to be aware of the possibility and prepare accordingly.

These patients and their families could also benefit from information and psychosocial support from support groups and bereavement groups to aid in the grieving process. Providing holistic patient and family care will assist in allaying their anxiety and address their concerns. Finally, information regarding consent for durable power of attorney, including wishes for end-of-life care, in addition to addressing financial or social concerns, should be considered. The latter two issues would benefit from a social service consult.

Conclusion

Mesenteric ischemia can be a devastating disease that carries a high risk of mortality if it is not diagnosed early and reversed in a timely manner. Being knowledgeable of this rare disease presentation, its complications, possible etiologies, diagnostic measures, and desired outcomes allows nurses to detect, contribute, and collaborate with the medical team to attain the best physical and psychosocial outcomes for patients. ✪

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- There is only one correct answer for each question. A passing score for this test is 13 correct answers. If you pass, you can print your certificate of earned contact hours and the answer key. If you fail, you have the option of taking the test again at no additional cost.
- For questions, contact Lippincott Professional Development: 1-800-787-8985.

Registration Deadline: June 5, 2020

Disclosure Statement:

The authors and planners have disclosed that they have no financial relationships related to this article.

Provider Accreditation:

Lippincott Professional Development will award 1.5 contact hours for this continuing nursing education activity.

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Payment:

- The registration fee for this test is $10.50 for members; $15.00 for nonmembers.

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