As they left the hospital, Emma Jamison’s family gave each nurse a hug. Three weeks ago, Ms. Jamison had developed a sudden, severe headache. Within minutes, she couldn’t speak clearly. Her family called 911, and she was rushed to the hospital, where she was diagnosed with a subarachnoid hemorrhage (SAH) from a ruptured cerebral aneurysm.

Ms. Jamison’s hospitalization was long and eventful, but it ended well because the nurses who cared for her were well informed about her condition. Read on to find out what you should know about caring for a patient with a cerebral aneurysm rupture.

**Subtle, growing trouble**
The signs and symptoms of a growing aneurysm are subtle. (For more on causes and locations of cerebral aneurysms, see *All about aneurysms.*) Often the first signs and symptoms are a minor headache, intermittent blurred vision, cranial nerve palsy, or dilated pupils. These signs and symptoms may be unnoticed, ignored, or misdiagnosed until the aneurysm ruptures and the patient is diagnosed with an SAH.

In some cases, an aneurysm is discovered during the diagnostic workup for other medical conditions. How to treat these “incidental aneurysms” is somewhat controversial and
An image of a medical scan with the text "rysm rupture" overlaid.
is based primarily on the size and location of the aneurysm.1 Although exact numbers are unknown, an estimated 10% to 40% of patients who experience an aneurysm rupture don’t survive the emergency phase (the first 24 hours).2 For those who do survive, treatment is aimed at preventing secondary brain injury.

Ms. Jamison’s “worst headache of her life” is the classic presentation of a ruptured aneurysm.1 The headache is caused by the sudden increase in intracranial pressure (ICP). Nausea, vomiting, slurred speech, and loss of consciousness may occur within moments of the first headache. When an aneurysm ruptures, the sudden release of blood into the subarachnoid space causes increased ICP, which if left untreated may result in cerebral hypoxia and necrosis of brain tissue. The area of the brain surrounding the necrotic tissue is at greatest risk for secondary brain injury.

When a patient with a suspected SAH arrives at the emergency department, follow advanced cardiac life support guidelines to assess and support the ABCs (airway, breathing, circulation). Provide supplemental oxygen if indicated, establish intravenous [I.V.] access, and take blood samples. Check the patient’s blood glucose level and treat abnormalities as indicated. Perform a neurologic screening assessment and activate the stroke team.

Take a detailed history from the patient or family member (if the patient isn’t responsive), including time of symptom onset and a comprehensive medication history. Find out whether the patient has any allergies.

**Diagnostic testing**

Aneurysms are definitively diagnosed using radiographic imaging.3 A computed tomography (CT) scan of the brain is the fastest way to rule in an SAH. On a brain CT scan without contrast, blood from a ruptured aneurysm shows up as a white image. A cerebral arteriogram lets the radiology team see the aneurysm better. Newer computerized techniques now let neurosurgeons see three-dimensional reconstructions of these images, which helps them make treatment decisions.

If the CT scan is negative but the physician still suspects aneurysm rupture, he may perform a lumbar puncture. The cerebrospinal fluid is assessed for xanthrochromia, a pale yellow substance resulting from blood breakdown and an indicator of aneurysm rupture.

Magnetic resonance imaging (MRI), another imaging option, is a less-sensitive method of detecting subarachnoid blood than the CT scan. However, magnetic resonance angiography (MRA) can produce high-quality images of the cerebral arteries, similar to those in a three-dimensional CT scan. Because MRI and MRA
scans require more time to complete and are more expensive, they’re not routinely ordered for all patients.

**Treatment options**

Cerebral aneurysms can be managed in two ways. A noninterventional approach is preferred when the aneurysm is small and hasn’t ruptured and the dangers of definitive treatment outweigh the dangers of leaving the aneurysm untreated. More than simply a “wait and see” approach, the noninterventional approach is directed at controlling risk factors such as tobacco use and hypertension.4

If the risk of aneurysm rupture outweighs the benefits of monitoring, however, the patient will need an invasive procedure to either clip or coil the aneurysm.

Clipping a cerebral aneurysm requires opening the skull while the patient is under general anesthesia. The risks, which are extensive and serious, include bleeding, infection, stroke, and anesthesia complications.

To clip an aneurysm, the surgeon retracts layers of the brain until he can see the aneurysm. He then secures a metal surgical clip across the neck of the aneurysm (between the aneurysm and the natural contour of the artery wall), reestablishing the natural shape of the artery wall and cutting the aneurysm off from the...
blood vessel. More than one clip may be needed; clips typically are made of titanium because this substance doesn’t interfere with diagnostic tests such as MRIs.

Endovascular coiling involves embolizing the aneurysm to prevent it from rupturing. Although less invasive than surgery, this procedure also carries substantial risks, including vessel perforation, bleeding, infection, distal thromboembolism, and incomplete embolization.  

For a coiling procedure, the patient is placed supine and a catheter is threaded into the cerebral vasculature via the femoral artery. Contrast media is injected through the catheter to outline the cerebral vasculature and aneurysm on radiographic imaging. This picture is the road map that guides the interventionalist, who guides smaller catheters to the neck of the aneurysm and deposits one or more titanium coils into the aneurysm. The coils fill the aneurysm and trigger clot formation (thrombosis). Large aneurysms may require numerous coils.

**Handling complications**
The greatest complication from any cerebral aneurysm is a rupture that leaks blood into the cranial vault. This is what happened in Ms. Jamison’s case, causing the changes her family observed (headache followed by signs and symptoms of stroke). Monitoring for neurologic changes, especially in level of consciousness, is key after aneurysm rupture.

One cause for deterioration in a patient’s neurologic function is arterial vasospasm, which typically occurs 3 to 14 days after cerebral aneurysm rupture. Vasospasm can be life-threatening if it results in acute ischemic stroke. Vasospasm is presumed to be a response to the toxins released when blood from the cerebral hemorrhage breaks down. A CT scan can rule out other possible causes of change in LOC, such as hydrocephalus or rebleeding.

**Preventing secondary brain injury**
The 2 weeks after aneurysm rupture are critical. Medical and nursing care focuses on preventing secondary brain injury by optimizing blood flow to the brain. The conventional treatment to optimize blood flow is referred to as “triple-H therapy,” consisting of induced hypertension, hypervolemia, and hemodilution. Various interventions may be used to maintain triple-H therapy, but the primary tool is the continuous infusion of I.V. fluid to maintain adequate cerebral perfusion pressure. This is intended to keep cerebral arteries filled with blood during vasospasms.

Monitoring the effectiveness of triple-H therapy includes hemodynamic monitoring and comprehensive serial neurologic exams. Compare the patient’s current neurologic assessment with previous findings to determine how your patient is doing. Report any change in the neurologic exam to the medical team. Thorough documentation and an accurate change-of-shift report help the caregivers identify trends in the patient’s clinical picture.

To manage vasospasm, a patient with SAH may be prescribed nimodipine, a calcium channel blocker, which causes vasodilation and improves cerebral blood flow. Monitor the patient closely for hypotension, a common adverse reaction to nimodipine; decreased blood pressure will compromise cerebral blood flow. Because a patient who’s suffered an SAH is at an increased risk for seizure, she may also be prescribed an anticonvulsant such as phenytoin. If she has no seizure activity over time, the medication is discontinued.

Make sure your patient receives optimal nutritional support and protect her from infections. Skin care, turning, and deep-breathing exercises promote physical stability and independence. Support your patient and her family emotionally and, before discharge, refer them to support groups as appropriate.
Recovery for a patient with SAH can last from a few weeks to several years. Ms. Jamison progressed quickly through her recovery period. She spent 2 weeks in an inpatient rehabilitation unit, where she received physical therapy and occupational therapy twice daily. Because she’d lost a portion of her ability to name objects (anomia), she was enrolled in an extensive speech therapy program. After discharge, Ms. Jamison continued to have some difficulty walking and she may always need a four-prong cane for assistance. Her daughter has moved in with her and takes her to physical therapy three times each week. Ms. Jamison was fortunate. Her family quickly recognized the need for treatment and activated the emergency response system. The nurses who cared for her were vigilant with their assessments, and she received appropriate treatment. By understanding cerebral aneurysm rupture and SAH, you can help patients like Ms. Jamison survive and recover from these potentially devastating disorders.

REFERENCES

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