Cerebral Aneurysm—Treatment and Perioperative Nursing Care

Imelda Wright, RN

It is estimated that annually, 10 million to 15 million Americans are treated for cerebral aneurysms, a weakening and saccular outpouching of a cerebral artery. Each year, approximately 30,000 people in the United States suffer subarachnoid hemorrhage as a result of cerebral aneurysmal rupture. Aneurysmal rupture can cause hemorrhagic stroke, permanent neurological injury, or death. Despite advances in the diagnosis and treatment of cerebral aneurysms, the mortality rate increases from 30% to 60% when a cerebral aneurysm ruptures; approximately 50% of people die within one month of rupture, and 25% of people whose cerebral aneurysms rupture will suffer permanent neurological injury. Treating aneurysms before rupture, therefore, provides the best outcome.

Treatment options include surgical clipping and endovascular coiling. Endovascular coiling is quickly moving to the forefront of treatment options for cerebral aneurysms, offering patients a minimally invasive alternative to a craniotomy and benefits including a shorter hospital stay and recovery time. This article provides perioperative nurses with pertinent information regarding cerebral aneurysms, including treatment options and perioperative nursing care for patients undergoing craniotomy for aneurysm clipping or endovascular coiling.

Anatomy and Pathophysiology

The cerebrum is formed by two cerebral hemispheres, which are divided into lobes. The internal carotid arteries deliver the brain’s blood supply (Figure 1).

An aneurysm rupture usually occurs at the thin-walled dome of the aneurysm, causing blood under high pressure to be forced into the subarachnoid space. Concurrently, intracranial pressure (ICP) increases and cerebral perfusion pressure decreases. These hemodynamic changes are responsible for a distinct change in the person’s level of consciousness. Specific signs and symptoms are dependent on the location of the rupture and the degree of increased ICP. Tissue pressure around the aneurysm halts the hemorrhage. Fibrin, platelets, and fluid form a clot, which seals the rupture site. This clot can occlude the area. The blood irritates the brain tissue, which in turn sets up an inflammatory response, promoting cerebral edema.

Eighty-five percent of cerebral aneurysms are found at the anterior part of the circle of Willis; the other 15% are located in the posterior circulation. Table 1 describes the classification of aneurysms according to their size. Table 2 classifies aneurysms according to their shape and etiology. The most common cerebral

ABSTRACT

• A CEREBRAL ANEURYSM is a weakening and saccular outpouching of a cerebral artery. This life-threatening condition affects approximately 10 million to 15 million Americans annually.

• PERIOPERATIVE NURSES must be aware of the incidence, clinical manifestations, pathophysiology, and treatments for cerebral aneurysm. This article details the perioperative care of patients undergoing craniotomy for surgical clipping or insertion of an endovascular coil.

• ALTHOUGH ENDOVASCULAR COILING is a relatively new procedure with unknown long-term results, this treatment option offers patients a minimally invasive alternative to craniotomy with a shorter hospital stay and decreased recovery time. AORN J 85 (June 2007) 1172-1182. © AORN, Inc, 2007.
aneurysms are saccular, Berry, and fusiform (Figure 2). Diagnosis of cerebral aneurysms is based on history and neurological assessment, computed tomography scan, magnetic resonance imaging, and cerebral angiography.

**Etiology**

The exact etiology of cerebral aneurysms is not known; however, extrinsic, congenital, and genetic factors have been associated with the formation and rupture of cerebral aneurysms. Current research suggests that hemodynamically induced, degenerative vascular disease causes the intima to bulge as a result of weakness, and it is possible that hypertensive individuals are predisposed to aneurysm formation. Cerebral aneurysms are more prevalent in women than in men (ie, a ratio of 3:2). Cerebral aneurysms can occur in people of any age; however, they are most often diagnosed in people between the ages of 35 and 60. By midlife, stress often causes the affected vessel to rupture.

Although theories abound regarding the etiology of most aneurysms, there are some aneurysms for which the etiology is more clear. Bacterial and fungal infections can cause mycotic aneurysms, and head trauma may result in traumatic aneurysms.

**Clinical Manifestations**

The majority of patients with cerebral aneurysms are completely asymptomatic until the aneurysm bleeds. Approximately 40% of people with cerebral aneurysms experience warning signs of an existing aneurysm, but these signs often are attributed to other causes. Some of the warning signs include:

- dilated pupils,
- headache,
- nausea and vomiting,
- neck pain,
- oculomotor nerve palsy, and
- pain above and behind the eye.

### Table 1

**Classification of Aneurysms by Size**

<table>
<thead>
<tr>
<th>Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>Up to 15 mm</td>
</tr>
<tr>
<td>Large</td>
<td>15 mm to 25 mm</td>
</tr>
<tr>
<td>Giant</td>
<td>25 mm to 50 mm</td>
</tr>
<tr>
<td>Super-giant</td>
<td>Greater than 50 mm</td>
</tr>
</tbody>
</table>

---

![Figure 1 • Cerebral anatomy and vasculature.](image)

![anterior cerebral artery](image)

![anterior communicating cerebral artery](image)

![internal carotid artery](image)

![middle cerebral artery](image)

![superior cerebellar artery](image)

![superior communicating artery](image)

![posterior cerebral artery](image)

![posterior communicating artery](image)

![pontine branches](image)

![basilar artery](image)

![vertebral artery](image)

![anterior inferior cerebellar artery](image)

![posterior inferior cerebellar artery](image)
When rupture occurs, blood is forced into the subarachnoid space, which causes the person to experience an excruciating headache. Some people have described it as “the worst headache of my life.”

A decreased level of consciousness or total loss of consciousness may occur, and vomiting is a common manifestation.

**Clipping an Aneurysm Versus Inserting an Endovascular Coil**

Surgical clipping has been employed successfully as a treatment for cerebral aneurysms for many years, and, therefore, its durability has been proven. Depending on the shape and location of the aneurysm, surgical clipping has been a very effective treatment, and typically, aneurysms that have been completely clipped do not recur. Surgical clipping minimizes the necessity for periodic follow-up angiographic studies. In addition, surgical clipping provides controlled access to difficult anatomy and allows for arterial reconstruction when aneurysms have complicated shapes and wide necks; in these cases, endovascular coiling is not an option. Typically, aneurysm clips are made from titanium. The clip has a spring mechanism that allows the jaws of the clip to be placed on the aneurysm neck, thus excluding the aneurysm from the feeding blood vessel.

In 1990, Guido Gugliemi, MD, and colleagues first used electrically detachable platinum coils for the treatment of cerebral aneurysms, and in 1995, the US Food and Drug Administration approved the endovascular coiling technique. Since then, the technique has been moving to the forefront of treatment for cerebral aneurysms. This minimally invasive alternative to craniotomy for aneurysm clipping may be an option for select patients based on the

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Classification of Aneurysms by Shape and Etiology</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Berry</strong></td>
<td>The most common type of aneurysm. It is berry-shaped with a neck or stem.</td>
</tr>
<tr>
<td><strong>Charcot-Bouchard</strong></td>
<td>A microscopic aneurysm associated with hypertension.</td>
</tr>
<tr>
<td><strong>Dissecting</strong></td>
<td>An aneurysm associated with atherosclerosis and inflammation, which causes the intimal layer of the affected artery to separate from the medial layer, forcing blood between the layers.</td>
</tr>
<tr>
<td><strong>Fusiform</strong></td>
<td>An outpouching of an arterial wall that does not have a stem.</td>
</tr>
<tr>
<td><strong>Mycotic</strong></td>
<td>A rare type of aneurysm caused by septic emboli originating from infections.</td>
</tr>
<tr>
<td><strong>Saccular</strong></td>
<td>Any aneurysm that has a saccular outpouching.</td>
</tr>
<tr>
<td><strong>Traumatic</strong></td>
<td>An aneurysm that results from head trauma.</td>
</tr>
</tbody>
</table>

![Figure 2](image_url)
● aneurysm characteristics,
● aneurysm location,
● aneurysm size,
● patient’s age, and
● patient’s hemodynamics. The procedure is minimally invasive, so the patient’s hospital stay and recovery time are shortened.

An endovascular coil consists of soft platinum coils that have a 2 mm to 14 mm preformed helix. When the coils are deployed from the catheter tip, they form loops that are flexible enough to conform to the shape of the aneurysm but prevent trauma to the aneurysm wall. The packed coils and subsequent thrombus formation prevent blood from entering the aneurysm; and therefore, the risk of bleeding or rebleeding is greatly reduced or eliminated.

The International Subarachnoid Aneurysm Trial (ISAT) is the largest and most significant study to date comparing endovascular coiling and surgical clipping in the treatment of ruptured cerebral aneurysms. The trial demonstrated that endovascular coiling led to remarkably better outcomes in patients who were considered equally suited for both procedures. The researchers reported that “the relative risk of significant disability at one year for patients treated with coils was 22.6% lower than in surgically treated patients.” The study showed that the risk of rebleeding in the first year after treatment was 2.4% for the coiling group and 1% for the surgical group. The ISAT began in 1997, however, so complete, long-term data from the trial is not yet available. The Medical Research Council of Great Britain has granted funding to ISAT through 2007, and additional data related to cost-effectiveness, quality of life, and rebleeding rates will be collected and analyzed.

Gavin Britz, MD, MPH, from Harborview Medical Center in Seattle, Wash, raised concern about ISAT, remarking that only 31% of aneurysms were suitable for coiling. He also stated that “each patient and their aneurysm is different and the decision has to be made about what is in the best interest for each patient. Some patients should be clipped and some should be coiled. The ultimate decision is complex, including many variables to ensure the most appropriate care.” In addition, Dr Britz said that there is a direct correlation between the experience of the neurosurgeons and the outcomes after management and that the results of ISAT may not be duplicated in centers with more or less experience in aneurysm treatment.

The Cerebral Aneurysm Rerupture After Treatment (CARAT) study has shown that after the first year “rerupture rates with either procedure is rare.” The duration of follow-up in this study is 9.6 years for patients who underwent surgical clipping and 8.9 years for patients who underwent endovascular coiling. Of the 904 patients who underwent endovascular coiling, one patient had a rerupture 14 months after the procedure. Of the 2,666 patients who underwent surgical clipping, however, none experienced a rerupture during the study.

Setup of the OR
There are many similarities in preparing for aneurysm clipping and endovascular coiling procedures. Both procedures require that preoperative and postoperative cerebral angiography

The packed coils and subsequent thrombus formation prevent blood from entering the aneurysm; therefore, the risk of bleeding or rebleeding is greatly reduced or eliminated.
be performed; so ideally, the surgical procedure is performed in a room that has angiographic capability. No matter which procedure will be performed, one back table is prepared for cerebral angiography. The angiography back table includes

- an angiography pack,
- a gown and gloves for the neurosurgeon,
- a syringe and needle for administering local anesthesia,
- a percutaneous entry needle,
- an arterial pressure monitoring kit,
- a customized kit for delivering heparinized saline,
- extension tubing,
- a femoral-artery introducing sheath,
- a selection of arterial sealing devices,
- angiographic guide wires and catheters, and
- contrast dye and heparinized saline in labeled containers.

**Craniotomy for Aneurysm Clipping Setup.** A second back table is prepared for a craniotomy. The table includes

- a craniotomy instrument set;
- a craniotomy pack;
- a drill with accessories;
- a selection of suction tips;
- aneurysm clips and clip applicers (Figures 3 and 4);
- a micro-Doppler probe;
- monopolar and bipolar electro-surgery unit (ESU) supplies;
- physician-preferred retractors and dissectors; and
- various sizes of cottonoids and hemostatic agents (eg, wax, hemoclips, hemostatic sponges).

The circulating nurse ensures that dura repair supplies and materials are readily available but not opened until they are needed. The circulating nurse aseptically delivers medications into containers that the scrub person has labeled on the back table, including

- the physician’s preferred local anesthesia,
- antibiotic irrigation, and
- thrombin mixed with gelfoam.

The circulating nurse ensures that the following equipment is in the room and functioning properly before the patient is brought into the room:

- a radiolucent OR bed designed for both angiographic and craniotomy procedures;
- a radiolucent, neurosurgical, three-point headrest and table attachment;
- a microscope;
- monopolar and bipolar ESUs; and
- a foot pedal for the drill.

**Endovascular Coiling Setup.** The risk of aneurysm rupture during an endovascular coiling procedure is low; however, the circulating nurse and scrub person should have supplies for a ventriculostomy readily available should a rupture occur. In addition to a cerebral angiography pack, the circulating nurse and scrub person open

- gowns and gloves,
- a femoral artery introducing sheath,
- a percutaneous entry needle, and
- an arterial pressure monitoring kit.

They also ensure that a full supply of endovascular wires, catheters, coils, and stents are available. The circulating nurse aseptically delivers medications into containers that the scrub person has labeled on the angiography back table, including

- local anesthesia as requested by the surgeon,
- contrast dye, and
- heparinized saline for irrigation.

The circulating nurse prepares additional heparinized saline for patient systemic heparinization during the procedure. The circulating nurse delivers this additional heparinized saline to the surgical field via tubing that is attached to sterile extension tubing and a delivery kit on the surgical field. The surgeon will administer this systemic heparinized solution via the femoral artery.
After the patient completes the admission process, an admission clerk escorts or directs him or her to the preoperative area. The preoperative nurse greets the patient and instructs him or her to change into a hospital gown. After taking the patient’s vital signs, the preoperative nurse obtains the patient’s health history and verifies his or her NPO status and allergies. After ensuring that appropriate laboratory results are in the patient’s medical record, the nurse performs a baseline neurological assessment and documents any deficits. The nurse notifies the anesthesia care provider and the surgeon about any abnormalities. The preoperative nurse puts thromboembolic disease (TED) stockings and intermittent pneumatic compression (IPC) cuffs on the patient.

The surgeon arrives in the preoperative area and obtains informed consent for cerebral angiography and craniotomy for aneurysm clipping or endovascular coiling, depending on the procedure to be performed. The anesthesia care provider arrives and obtains the patient’s informed consent for anesthesia, including placement of central lines. The preoperative nurse then assists the surgeon or anesthesia care provider during insertion of an arterial line, which allows for accurate intraoperative blood pressure monitoring.

The diagnosis of cerebral aneurysm and the prospect of undergoing a craniotomy are very frightening for patients; therefore, it is important for all perioperative nurses to monitor the emotional state of the patient and his or her family members. The perioperative nurses offer reassurance and support, giving the patient and family members an opportunity to express fears and concerns. The preoperative nurse assesses the patient’s understanding of the procedure and tells the patient what to expect in the immediate postoperative period.

The circulating nurse goes to the preoperative area to interview the patient and review the patient’s medical record. The circulating nurse ensures that the consent forms are signed and dated by
the patient and surgeon or anesthesia care provider and that the preoperative nurse who witnessed the patient’s signature has signed the forms. The circulating nurse ensures that all laboratory results are available and that the surgeon and anesthesia care provider have been notified of any abnormal laboratory test results. The circulating nurse greets the patient and performs a preoperative assessment, after which he or she develops a care plan specific to this patient (Table 3). When the patient and chart are ready, the circulating nurse transports the patient to the OR suite.

**Intraoperative Nursing Care**

After assisting the patient onto the OR bed, the circulating nurse places the safety strap across the patient’s thighs, and secures the patient’s arms to the padded arm boards. After placing padding under the patient’s heels, the circulating nurse assists the anesthesia care provider with applying monitoring devices and ensures that the electrocardiograph leads are placed in a position that will not interfere with fluoroscopic image clarity. The circulating nurse then applies an upper-body, temperature-regulating blanket on the patient and warm blankets on the patient’s lower body. The circulating nurse checks and documents the patient’s bilateral dorsalis pedis and posterior tibial pulses for a baseline measurement. The nurse then connects the IPC tubing to the IPC cuffs and activates the IPC device.

The circulating nurse and scrub person then perform a count of sponges, sharps, and instruments. The circulating nurse ensures that the count is documented properly. When all members of the intraoperative team are present, the circulating nurse initiates a surgical time out. All OR personnel ensure that noise and the activity level in the room are kept to a minimum, particularly during induction of anesthesia. The circulating nurse assists the anesthesia care provider during induction and endotracheal intubation.

The circulating nurse inserts an indwelling urinary catheter. He or she places a monopolar, ESU dispersive pad on one of the patient’s thighs for aneurysm clipping procedures. The circulating nurse pads the patient’s arms and tucks them at the patient’s sides. The nurse evaluates the patient’s position, ensuring that all bony prominences and pressure points are adequately padded. The nurse uses a clippers to remove hair from the patient’s bilateral groin areas and performs a surgical prep of the area in anticipation of the preprocedure cerebral angiogram (Figure 5).

The circulating nurse and anesthesia care provider document procedural events and implantation of coils, if pertinent, and monitor blood loss. The circulating nurse provides updates by telephone to the family during the surgery.

**Craniotomy with Aneurysm Clipping**

The neurosurgeon, circulating nurse, and anesthesia care provider place the patient’s head in the neurosurgical, three-point headrest using sterile technique and sterile head pins. The circulating nurse applies antibiotic ointment around the puncture sites. Good body alignment is vital, and it is particularly important that the patient’s neck is carefully positioned. If the patient’s head is turned far to one side for access to the aneurysm, it may be necessary to place a supportive pad under the affected shoulder to prevent neck strain.²₀

**Good body alignment is vital.**

**If the patient’s head is turned far to one side for surgical access, the circulating nurse places a supportive pad under the affected shoulder to prevent neck strain.**
## Table 3  
### Nursing Care Plan for a Patient Undergoing Surgery for Treatment of Cerebral Aneurysm

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Nursing interventions</th>
<th>Interim outcome criteria</th>
<th>Outcome statement</th>
</tr>
</thead>
</table>
| Risk for decreased cardiac output related to cardiovascular function, anesthesia, and surgical intervention. | - Identifies baseline cardiac and vascular status and reviews diagnostic evaluations (eg, electrocardiogram [ECG], laboratory test results).  
  - Uses monitoring equipment to assess cardiac and vascular status (eg, ECG, arterial line, pulmonary artery catheter, Doppler).  
  - Assesses peripheral pulses, skin pallor, numbness, and tingling of extremities.  
  - Observes for signs and symptoms of hypovolemia in postoperative period related to blood loss.  
  - Evaluates postoperative vascular function.  
  - Assesses skin integrity, sensory impairments, and susceptibility for infection.  
  - Validates that preoperative antibiotic was administered according to facility policy.  
  - Allows sufficient time for surgical prep solution to dry before the patient is draped.  
  - Minimizes length of invasive procedure by planning care and obtaining necessary equipment expeditiously.  
  - Monitors sterile field and perioperative team members to ensure that asepsis is maintained.  
  - Initiates and maintains traffic control.  
  - Classifies surgical wound (eg, class I).  
  - Dresses wound at completion of procedure.  
  - Identifies communication barriers and knowledge level (eg, expected outcomes, surgical risks and complications).  
  - Assesses readiness to learn and coping mechanisms.  
  - Explains sequence of events and reinforces teaching about cerebral aneurysms, surgical treatment options, and recovery.  
  - Provides instruction (ie, oral, written) for surgical procedure and discharge, including signs and symptoms of postoperative hemorrhage.  
  - Evaluates response to instruction.  
  - Identifies physical alterations that may affect procedure-specific positioning.  
  - Places the patient in an anatomically correct position and implements protective measures to prevent tissue injury.  
  - Uses supplies and equipment within safe parameters.  
  - Evaluates for signs and symptoms of skin and tissue injury. | Patient’s cardiovascular function is maintained or improved from baseline levels, ensuring adequate blood flow to the patient's extremities. | Patient demonstrates dry, nonreddened, nontender wound healing by primary intention. |
| Risk for infection related to the surgical procedure. | | Patient verbalizes understanding of the procedure, sequence of events, expected outcomes, and concerns about treatment decisions being discussed and participates in decision making. | Patient demonstrates knowledge of the physiological and psychological responses to the procedure. |
| Risk of anxiety related to knowledge deficit and stress of surgery. | | Patient’s skin remains intact, nonreddened, and free from ecchymosis and the patient maintains circulation, sensation, and function related to surgical positioning. | Patient is free from signs and symptoms of injury related to positioning. |
| Risk for injury related to positioning. | | | |
The neurosurgeon clips the hair from the surgical area of the patient’s head, and the circulating nurse performs the surgical skin prep. While this is occurring, the scrub person drapes the microscope. After the scrub person and surgeon drape the surgical area, the circulating nurse positions and connects the unipolar and bipolar ESUs, foot pedals (eg, bipolar ESU, power drill), and suction devices.

The location of the surgical incision depends on the location of the cerebral aneurysm. After making the initial incision, the neurosurgeon applies scalp clips to the skin edges. He or she performs soft tissue separation from underlying bone with an elevator and then attaches dura hooks to a separate Mayo stand to secure the scalp flap. After drilling burr holes into the cranium at the four corners of the incision site, the neurosurgeon saws between the burr holes and separates the bone flap from the underlying dura with elevators and dissectors in order to turn the bone flap.

The circulating nurse moves the microscope into position, and the neurosurgeon uses it to locate and carefully isolate the aneurysm and the blood vessels that feed it. Delicate movements are used to prevent disruption of surrounding brain tissue. The neurosurgeon carefully separates the aneurysm from the surrounding tissue and then places one or more small aneurysm clips across the neck of the aneurysm (Figure 6). The neurosurgeon is complete, the neurosurgeon performs a repeat cerebral angiogram to examine the cerebral blood flow. The surgeon seals the femoral artery with an artery sealing device and applies pressure for several minutes before applying a femoral wound dressing.

**Endovascular Coiling Procedure**

The endovascular coiling procedure is performed by an interventional neurosurgeon or neuroradiologist. The neurosurgeon or neuroradiologist inserts an endovascular catheter into the patient’s femoral artery and performs a preprocedure cerebral angiogram to locate the aneurysm. The surgeon or radiologist delivers heparinized saline systemically via the femoral artery during the procedure. Aided by fluoroscopy, the surgeon or radiologist threads the catheter to the aneurysmal site. When the correct position is obtained, he or she introduces a detachable coil into the lumen and uses an electrical impulse to detach the coil from the catheter (Figure 7).

One or more coils may be needed to fill the aneurysm sac. If the neck of the aneurysm is too wide to hold the coils, the surgeon or radiologist may place a stent across the neck of the aneurysm. The stent allows for safe deposition of the coils without allowing a coil mass to protrude into the main artery. The surgeon or radiologist removes the catheter when the coils have been successfully

---

**Figure 5** • A cerebral angiogram is performed preoperatively and postoperatively. Ideally, the procedure is performed in a suite designed for neuroradiography.

then closes the dura and replaces the bone flap with screws and plates. He or she then closes the scalp. The circulating nurse assists the neurosurgeon with removing the neurosurgical, three-point headrest from the patient’s head and applying a cranial wound dressing.
deployed. He or she places an arterial sealing device in the femoral artery puncture site after the procedure is complete and applies pressure to the area for several minutes before applying a femoral wound dressing.

**Postoperative Nursing Care**

As the patient is waking from anesthesia in the OR, the anesthesia care provider reminds the patient not to move the leg in which the angiogram was performed. The surgical team then carefully transfers the patient to a hospital bed. The circulating nurse secures a sheet over the patient’s surgical leg and tucks it under the mattress on both sides of the bed to help prevent unnecessary leg movement. The anesthesia care provider and circulating nurse transport the patient to the postanesthesia care unit (PACU), where both provide a detailed hand-off report to the receiving PACU nurse. The circulating nurse ensures that the PACU nurse is aware of any neurological deficits that the patient may have presented with preoperatively.

The PACU nurse documents the patient’s arrival vital signs and performs a neurological assessment. The nurse checks the cranial and femoral dressings for bleeding and checks the patient’s pedal pulses for evidence of occlusion. The patient remains on bed rest with the affected leg extended for a period of time determined by the surgeon. The PACU nurse remains vigilant and immediately reports any signs and symptoms of a retroperitoneal bleeding (eg, low systolic blood pressure, abdominal pain or discomfort) or evidence of hemorrhage or vasospasm (eg, neurological deterioration).

Typically, a patient who has undergone craniotomy for aneurysm clipping spends two nights in an intensive care unit (ICU) and an additional three nights in a medical-surgical unit before being discharged home. In contrast, a patient who has undergone an endovascular coiling procedure typically spends one night in ICU and one additional night in a medical-surgical unit. Either treatment course may require rehabilitation before the patient is discharged home, depending on how the patient recovers or if he or she experiences complications.
IMPROVING TREATMENT OPTIONS

Cerebral aneurysm is a life-threatening diagnosis. It is important that perioperative nurses be aware of the facts pertaining to the incidence, clinical manifestations, pathophysiology, diagnosis, and treatment options. Surgical clipping remains the leading treatment for cerebral aneurysms because its long-term durability has been proven. Endovascular coiling is a relatively new procedure, so its long-term results are not yet known. This lack of long-term data is a major concern for many surgeons. Additional limitations of coiling include difficult access to wide-necked aneurysms and the necessity for periodic angiographic follow-up care.

For surgeons, the ultimate decision to clip or to coil aneurysms is complex. Many variables are involved in the decision, such as patient age and health status and the size and location of the aneurysm; however, endovascular coiling is a treatment option that offers patients a minimally invasive alternative to a craniotomy and benefits including a shorter hospital stay and recovery time.

Imelda Wright, RN, is a perioperative RN at Baptist Hospital East, Louisville, Ky.

The author thanks Barbara Watkins, RN, neurosurgery coordinator; Teresa Vanderhoff, RN, OR staff nurse; Felicia Bogar, OR technologist; Betty Stoll, endovascular radiology technologist; Sandra Smith, RN, BSN, CNOR, perioperative educational coordinator; and Jonathan Hodes, MD, neurosurgeon; Baptist Hospital East, Louisville, Ky, for their support, advice, and encouragement in the process of developing this manuscript.

REFERENCES

Examination

Cerebral Aneurysm—Treatment and Perioperative Nursing Care

PURPOSE/GOAL
To educate perioperative nurses about caring for patients undergoing treatment for cerebral aneurysms.

BEHAVIORAL OBJECTIVES
After reading and studying the article on cerebral aneurysms, nurses will be able to
1. describe the effects of aneurysmal rupture,
2. identify common clinical methods used to diagnose the presence of a cerebral aneurysm,
3. discuss causes of cerebral aneurysms,
4. compare craniotomy for surgical aneurysm clipping to insertion of an endovascular coil as treatment options for a cerebral aneurysm, and
5. discuss nursing care of a patient undergoing treatment for cerebral aneurysm.

QUESTIONS
2.6

1. Despite advances in the diagnosis and treatment of cerebral aneurysms, when a cerebral aneurysm ruptures, the mortality rate increases from 30% to ________.
   a. 60%
   b. 70%
   c. 80%

2. When an aneurysm rupture occurs,  
   1. blood is forced under high pressure into the subarachnoid space.
   2. intracranial pressure decreases and cerebral perfusion pressure increases.
   3. tissue pressure around the aneurysm halts the hemorrhage.
   4. fibrin, platelets, and fluid form a clot, which seals the rupture site but can occlude the area.
   5. the blood irritates the brain tissue, which consequently promotes cerebral edema.
   a. 1 and 3
   b. 2 and 4
   c. 1, 3, 4, and 5
   d. 1, 2, 3, 4, and 5

3. Diagnosis of cerebral aneurysms is based on  
   1. the patient’s history and neurological assessment.
   2. a computed tomography scan.
   3. magnetic resonance imaging.
   4. cerebral angiography.
   a. 1 and 2
   b. 3 and 4
   c. 2, 3, and 4
   d. 1, 2, 3, and 4

4. Although theories abound regarding the etiology of most aneurysms, mycotic aneurysms are caused by  
   a. bacterial and fungal infections.
   b. excessively high blood pressure.
c. genetic factors.
d. trauma.

5. Aneurysms that have been completely clipped often reoccur.
a. true  
b. false

6. Performing an aneurysm clipping procedure
1. minimizes the necessity for periodic follow-up angiographic studies.
2. provides controlled access to difficult anatomy.
3. allows for arterial reconstruction when aneurysms have complicated shapes and wide necks.
a. 1  
b. 3  
c. 2 and 3  
d. 1, 2, and 3

7. The risk of bleeding or rebleeding is greatly reduced or eliminated when an endovascular coil is used because the
a. aneurysm sac is completely removed during the procedure.
b. packed coils and subsequent thrombus formation prevent blood from entering the aneurysm.
c. white blood cells surround and destroy the aneurysm sac.
d. the endovascular coil is secured tightly around the neck of the aneurysm.

8. Which of the following nursing interventions would be most applicable for the nursing diagnosis “Risk for decreased cardiac output related to cardiovascular function, anesthesia, and surgical intervention?”
   1. Assesses peripheral pulses, skin pallor, numbness, and tingling of extremities.
   2. Assesses skin integrity, sensory impairments, and susceptibility for infection.
   3. Evaluates for signs and symptoms of skin and tissue injury.
   4. Evaluates postoperative vascular function.
   5. Observes for signs and symptoms of hypovolemia in postoperative period related to blood loss.
a. 1 and 3  
b. 2 and 4  
c. 1, 4, and 5  
d. 1, 2, 3, 4, and 5

9. If the neck of the aneurysm is too wide to hold the coils during an endovascular coiling procedure, the surgeon or radiologist may
a. apply an aneurysm clip across the neck of the aneurysm.
b. use bipolar electrocautery to cauterize the aneurysm sac.
c. place a stent across the neck of the aneurysm.
d. opt to use the surgical clipping procedure.

10. The postanesthesia care unit nurse watches for signs and symptoms of a retroperitoneal bleeding, which may include
1. abdominal pain or discomfort.
2. excessive agitation.
3. loss of peripheral pulses.
4. low systolic blood pressure.
a. 1 and 4  
b. 2 and 3  
c. 1, 3, and 4  
d. 1, 2, 3, and 4

The behavioral objectives and examination for this program were prepared by Rebecca Holm, RN, MSN, CNOR, clinical editor, with consultation from Susan Bakewell, RN, MS, BC, director, Center for Perioperative Education.
Answer Sheet

Cerebral Aneurysm—Treatment and Perioperative Nursing Care

Please fill out the application and answer form on this page and the evaluation form on the back of this page. Tear the page out of the Journal or make photocopies and mail with appropriate fee to:

AORN Customer Service
c/o AORN Journal Continuing Education
2170 S Parker Rd, Suite 300
Denver, CO 80231-5711
or fax with credit card information to (303) 750-3212.

Additionally, please verify by signature that you have reviewed the objectives and read the article, or you will not receive credit.

Signature __________________________

1. Record your AORN member identification number in the appropriate section below. (See your member card.)
2. Completely darken the spaces that indicate your answers to examination questions one through 10. Use blue or black ink only.
3. Our accrediting body requires that we verify the time you needed to complete this 2.6 continuing education contact hour (156-minute) program _______ minutes.
4. Enclose fee if information is mailed.

AORN (ID) # __________________________
Name ___________________________________
Address __________________________________
City ___________________ State ________ Zip ______
Phone number ____________________________
RN license # _____________________________
State ________________________________
Fee enclosed
or bill the credit card indicated □ MC □ Visa □ American Express □ Discover
Card # ____________________________ Expiration date _______

Signature __________________________ (for credit card authorization)

Event #07033
Session #8456
Continuing education contact hours: 2.6

Fee:
Members $13.00
Nonmembers $26.00

Program offered
June 2007

The deadline for this program is
June 30, 2010

A score of 70% correct on the examination is required for credit.

Participants receive feedback on incorrect answers.

Each applicant who successfully completes this program will receive a certificate of completion.
Learner Evaluation

Cerebral Aneurysm—Treatment and Perioperative Nursing Care

Objectives
To what extent were the following objectives of this continuing education program achieved?

1. Describe the effects of aneurysmal rupture.
2. Identify common clinical methods used to diagnose the presence of a cerebral aneurysm.
3. Discuss causes of cerebral aneurysms.
4. Compare craniotomy for surgical aneurysm clipping to insertion of an endovascular coil as treatment options for a cerebral aneurysm.
5. Discuss nursing care of a patient undergoing treatment for cerebral aneurysm.

Content
To what extent did this article increase your knowledge of the subject matter?
6. was the content clear and organized?
7. did this article facilitate learning?
8. were your individual objectives met?
9. did the objectives relate to the overall purpose/goal?

Test Questions/Answers
To what extent
10. were they reflective of the content?
11. were they easy to understand?
12. did they address important points?

Learner Input
13. Will you be able to use the information from this article in your work setting?
a. yes b. no
14. I learned of this article via
a. the Journal I receive as an AORN member.
b. a Journal I obtained elsewhere.
c. the AORN Journal web site.
15. What factor most affects whether you take an AORN Journal continuing education examination?
a. need for continuing education contact hours
b. price
c. subject matter relevant to current position
d. number of continuing education contact hours offered
16. What other topics would you like to see addressed in a future continuing education article? Would you be interested or do you know someone who would be interested in writing an article on this topic?
Topic(s): __________________________

Author names and addresses: ________

© AORN, Inc, 2007