

## **Ruptured Brain Aneurysm – Watch/Read This First! (Transcript Outline)**

I'm Dr. Bellew, The Teachin' Brain Surgeon™.

If you or a loved one have been told you might have a ruptured brain aneurysm, I have tried to summarize the most important things you need to know to help you with decision-making.

### **Objectives:**

I'll start by answering the question, "what is a brain aneurysm?" Then we will focus on...

1. Did the aneurysm rupture?
2. How can the aneurysm be fixed?
3. What else does one need to worry about after a rupture?
4. How long is the hospital stay?
5. What are the chances for recovery?

### **What is a Brain Aneurysm?**

1. Your brain needs a constant supply of energy and oxygen from the blood
2. Your arteries are the plumbing hoses that carry that blood from the heart to the brain
3. Nobody knows for sure why most brain aneurysms develop, but research has suggested they might start with a weak spot in the artery wall. Most of the time, this weak spot is located at a site of artery branching involving the largest arteries at the base of the brain.
4. Just like a garden hose, the weak spot can balloon out over time.
5. When aneurysms form they usually do not cause any symptoms, so most people with an aneurysm don't even know they have one.

### **Did the Aneurysm Rupture?**

1. "Did the aneurysm rupture?" is the most important question to answer because the chance of brain damage or death is extremely high with a ruptured aneurysm. The risk of repeat rupture is about 50/50 over the next 6 months. A patient with a ruptured aneurysm will be admitted to the hospital for treatment. In contrast, unruptured brain aneurysms have a much lower risk, and often the risk is so low that it is much safer to leave them alone.
2. When we say aneurysm "rupture," we really mean temporarily leak. Any time there is brain bleeding, there is a rise in brain pressure. If the brain pressure gets too high, the average blood pressure of 120 over 80 isn't enough to keep the brain alive. As a result, many patients don't survive the initial bleed. For the lucky ones that make it to the hospital, the leaking blood was able to clot and temporarily seal off the site of aneurysm leakage.
3. A water-consistency spinal fluid surrounds the brain and spinal cord to cushion them. This protective fluid buffer between hard bone and delicate nerve cells is called the subarachnoid space. Brain arteries run in this subarachnoid space. When an aneurysm

leaks, blood from inside the artery spills into the spinal fluid space and starts to form a solid clot. The medical term for this is subarachnoid hemorrhage.

4. Clinically, most patients with a ruptured brain aneurysm experience a sudden onset, severe headache at the time of the bleeding.
5. On a CT scan, freshly clotted blood appears white. Almost all aneurysm ruptures can be diagnosed with a head CT if one is done right away.
6. If a patient has a headache worrisome for an aneurysm rupture but the head CT is normal, a spinal tap (also known as a lumbar puncture) can sample the spinal fluid to detect bleeding too small to see on CT. A spinal tap is an invasive procedure with some small but serious risk. Depending on the level of suspicion from the clinical presentation, physicians can counsel patients about risk versus benefit of a spinal tap for each individual case.

### **How can the aneurysm be fixed?**

1. There are 2 major categories of brain aneurysm repair: (1) open surgery cutting through the skull to clamp the bubble from outside the artery or (2) endovascular surgery through the arteries to fill the bubble from the inside.
2. In most open surgical cases, the incision runs just behind the hairline. The scalp is pushed to the side, and we temporarily remove a circle of bone. Under the microscope, we look between the lobes of the brain to close off the bubble with an aneurysm clip.
3. For most endovascular cases, we make a small incision in the groin and pass a catheter through the artery in the leg near the femur. Using x-ray video called fluoroscopy, we guide the catheter with a wire into an artery in the neck. A thinner and longer microcatheter goes through the larger catheter and through the arteries in the brain into the aneurysm bubble. The aneurysm is closed off from the inside with platinum “aneurysm coils”, a “Woven EndoBridge,” or other techniques.
4. While the endovascular procedure seems “minimally invasive,” aneurysm repair is a major brain surgery with substantial risk of stroke and death no matter which treatment approach is taken. Sometimes an open surgery cutting through the skull is the safer or the only option. Other times endovascular treatment through the arteries offers an advantage. The method of treatment is largely guided by an aneurysm’s shape and location.

### **What else does one need to worry about after a rupture?**

1. Unfortunately, the brain trauma caused by an aneurysm rupture can cause brain damage directly as well as create one or more additional life-threatening problems.
2. About a half a liter per day of spinal fluid is made in 4 interconnecting chambers inside the brain called ventricles. This spinal fluid passes through the ventricles to the subarachnoid space where it is reabsorbed in several large veins. As you can imagine, thick, clotted blood in the subarachnoid space can block the flow of spinal fluid causing a backup. The medical term is hydrocephalus, and this spinal fluid backup can cause decreased brain function, coma, and even death. Often this spinal fluid pressure can be released from the body by drilling a small hole in the skull and passing a catheter into a ventricle.

3. Brain trauma as well as brain irritation from blood can cause seizure. Many seizures can be treated with medications, but some are so bad they cause permanent brain damage or death.
4. Blood in the spinal fluid space creates inflammation in the walls of the brain arteries that leads to spasm. Muscles in the artery wall make a circle, and when they contract the artery narrows. This artery narrowing happens in just about every case of subarachnoid hemorrhage, but sometimes this vasospasm is so severe the decrease in blood flow can lead to major stroke and death. Vasospasm usually gets worse during the first 7-14 days; it usually resolves by 21 days and does not return to the best of our knowledge. There are both medical and endovascular catheter-based treatments to try to reverse the vasospasm and decrease its risk.

### **How long is the hospital stay?**

When severe, vasospasm of the brain arteries can cause stroke. If stroke symptoms are treated quickly, the stroke can sometimes be reversed. For a patient under observation in the hospital, stroke symptoms will be recognized more quickly and treated more quickly. A patient at home with stroke symptoms would lose precious time in transport to the hospital and in the re-evaluation / re-admission process. Due to the risk of complications including cerebral vasospasm that can worsen during the first 1-2 weeks, most patients require a minimum of 2-3 weeks of observation.

### **What are the chances for recovery?**

With medical advances mortality from aneurysm rupture has decreased over the past few decades, but a majority of patients still suffer brain damage or don't survive at all.

1. ~35% of patients die from their aneurysm rupture (15% before hospitalization, 20% in the hospital)
2. 45-50% have permanent brain injury
3. 15-20% resume their previous lifestyle after 3-6 months

Older patients, chronic medical problems, large bleeds, and poor neurologic function after the bleed all lessen the chance of a good outcome.

**Summary:**

1. Ruptured aneurysms are deadly, with a roughly 50% chance of rebleeding in 6 months if they are not repaired. In contrast, it is often safer to leave small unruptured aneurysms alone.
2. Aneurysms can be clipped on the outside by cutting through the skull with an open brain surgery or repaired from the inside with x-rays guiding a long catheter through the arteries. Depending on aneurysm shape and location, one option may be better.
3. Patients with ruptured aneurysms can experience backup of spinal fluid (hydrocephalus), seizure, and stroke from spasm of the brain arteries.
4. Patients with ruptured brain aneurysms typically stay in the hospital a minimum of 2-3 weeks for observation through the high-risk period of spasm.
5. Some patients make a full recovery and others suffer severe strokes or don't survive at all. Age, overall health, size of the bleed, and level of function after the bleed all influence the likelihood of return to a good quality of life.

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