

Section Editors
David C. Spencer, MD
Steven Karceski, MD

The state of the art of medicine: Deciding on preventive screening tests after bleeding in the brain

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Doctors and medical researchers have made great strides in “evidence-based medicine.” Evidence-based medicine means that doctors should use the best research that is available to determine the best way to treat patients. Currently, we don’t have all the necessary facts to know the best way to treat patients in every situation. Also, we need to know more about how to apply the findings from research because everyone is different. In an article published in this issue of *Neurology*[®], the authors look at the facts about **aneurysms** (see below) and the dangers of bleeding in the brain.¹ They examine the pros and cons of “screening.” Screening refers to a test or tests that are done to see whether a patient might have or might get a disease in the future. They then think about how the decision to screen or not screen might affect patients’ quality of life.

WHAT IS A SUBARACHNOID HEMORRHAGE (SAH), AND WHAT IS AN ANEURYSM?

A subarachnoid hemorrhage (SAH) is a serious medical emergency. It occurs when a blood vessel (an artery) next to the brain bursts, causing sudden bleeding in and around the brain. This type of bleeding can happen for various reasons. A common reason is the bursting of an aneurysm. An aneurysm forms when the wall of an artery weakens, stretches, and pouches out like a balloon. The thinned wall of an aneurysm can suddenly burst, causing dangerous bleeding. About four in 10 people will die from this kind of bleeding.² Those who live after this type of bleeding can have problems. When a ruptured aneurysm is found, the aneurysm has to be closed off or “clipped” by a surgeon to stop further bleeding. Even when this is done, those who live after having a ruptured aneurysm are more likely to have another aneurysm compared to others who have never had one. In fact, someone who had an SAH from a ruptured aneurysm has about a 22 times greater chance of having another SAH than someone who has never had an SAH.^{3,4} An aneurysm can come back at the same place as the original one, or form in a new place on another blood vessel.

WHAT DOES THIS STUDY TRY TO DO? The goal of this study is to understand whether it is helpful to perform testing to look for another aneurysm or aneurysms after a person has had an SAH and a clipped aneurysm. The researchers looked at several factors to decide whether testing was a good idea. They looked at how much screening would cost, including the preventive surgeries that screening might lead to. They compared this with the medical costs associated with *not* screening (and maybe having more patients experience emergency SAH). They looked at the number of new aneurysms that could be found by screening and treated. They estimated the number of new episodes of bleeding that screening could prevent. Finally, and importantly, they looked at not only changes in how long the patients would live with or without screening, but also “quality-adjusted life-years” (QALYs), which means how good their life would be with or without the screening.

HOW DID THE RESEARCHERS PERFORM THIS STUDY?

The researchers looked at 610 people who had SAH, had an aneurysm treated with surgical clipping, and had recovered enough to live independently. Previous studies had shown that these people have a higher chance of developing more aneurysms and having a second SAH compared to people who had never had an SAH. The researchers looked at the effects of using a test called a CTA (computed tomography angiography), which takes a picture of the blood vessels in the brain, to screen for new aneurysms in the study patients. They examined what the effects would be of performing this test every 5 years to look for any sign of a new aneurysm. If the CTA showed a new aneurysm, more testing followed. In this study, the screening CTA found new aneurysms in 96 patients. Twenty-six people had further aneurysm treatment. The others had aneurysms that were too small to require treatment but that needed to be watched closely.

These findings were fed into a computer program that figured out the consequences of choos-

ing to screen or not screen. The authors estimated how many aneurysms could be found early and how many SAHs were likely prevented. They used the computer program to calculate the effects of the screening process on cost, life expectancy, and quality of life.

WHAT DID THE RESEARCH SHOW? The researchers found that screening of *all* patients with a previous SAH was not cost-effective. Screening cost more than not screening, even when considering that early detection and treatment of aneurysms could save money by preventing SAH. Screening only extended life expectancy by a tiny amount on average, and it actually lowered the quality-of-life measure (QALYs). This was because there were complications connected to screening and preventive treatment that reduced quality-of-life measures. For example, an aneurysm found on CTA testing might lead to further testing such as an angiogram that can have complications, or to surgeries that can be more risky.

Other things that may predict a higher risk of aneurysm and rupture are high blood pressure and smoking. The authors found that if there were enough of these factors to *double* the chance of another aneurysm, screening became cost-effective but still did not improve quality of life (QALYs). If patients had *many* of these risk factors and were at *very* high risk (at least 4.5 times more likely to have recurrences), then screening was a good idea because it lowered costs *and* improved quality of life (QALYs).

One of the most interesting findings of the study came when the researchers tried to estimate the effect of fear on quality of life. Feelings such as fear are hard to quantify (put a number on), but most of us know that a person's quality of life might be worse if that person is always afraid of having another SAH. If the researchers considered even a small factor of reduced quality of life from this fear, then screening for recurrences *improved* quality-of-life measures even if patients did not have additional risk factors for SAH. This was because screening provided information to these patients that was either reassuring (there is no aneurysm) or that let them know what they were dealing with (there is a new aneurysm that needs preventive treatment). This testing was also found to be fairly cost-effective. Looking at this issue was an important step; many studies of this type do not take such patient factors and their effects on quality of life into account.

WHAT SHOULD PATIENTS WHO HAVE HAD AN SAH FROM PREVIOUS ANEURYSM DO?

All patients in this situation can greatly benefit from quitting smoking and keeping careful control of blood pressure. They should talk with their doctor about the decision to screen for new aneurysms. The effects of worry and fear should be considered in the decision.

WHAT REMAINS TO BE STUDIED? Other techniques to treat aneurysms besides surgical clipping have been developed. Sometimes aneurysms can be closed off using small coils. If other forms of treatment are used, the results of this analysis could be different. Also, this study was done in The Netherlands. The costs of screening and surgery are higher in the United States. Some of the testing thought to be cost-effective in this study may not be cost-effective in US hospitals.

In the future, it will be important for researchers to use study methods like those used for this project in other areas of investigation. In this study, the researchers chose to look at not just the *numbers* of patients who have aneurysms detected by testing, or the *numbers* of patients who have recurrent SAH prevented, but also how the testing affected the years of life and the *quality* of those years of life in their patients. This is what doctors have tried to do for years in practicing the “art of medicine.” This study shows that using scientific methods to ask these question leads to interesting and useful results for patients.

HOW THIS TYPE OF APPROACH IN RESEARCH MAY IMPROVE LIVES

The approach of looking at many issues surrounding disease screening and treatment, including patients' quality of life and sense of well-being, is likely to become even more important in the future. For example, how often and in what form should screening for breast cancer be done in a woman whose mother died of breast cancer? What about in a woman with a newly discovered gene that increases her risk for breast cancer? How much does screening cost? Is it a good use for limited health care dollars? Does the screening lead to a longer life, and are those years of better or worse quality of life? Does the testing reduce or increase the anxiety about a possible diagnosis? Should we screen a frightened patient to improve quality of life for that patient, but not screen a patient with the same risk factors who is not fearful of the future?

These and many other questions will need answers. More studies are important because they give doctors the tools they need to help patients and to practice the science and “art” of medicine.

FOR MORE INFORMATION

NINDS http://www.ninds.nih.gov/disorders/cerebral_aneurysm/cerebral_aneurysm.htm

Brain Aneurysm Foundation www.bafound.org

American Stroke Association: A Division of American Heart Association www.strokeassociation.org

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