

# Infection, vaccination, and childhood arterial ischemic stroke

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**DO CHILDREN HAVE STROKES?** A stroke occurs when a blood vessel to the brain is either blocked or ruptured. When blood to part of the brain is blocked, it causes what is called an ischemic stroke. Stroke is much more common in adults and the elderly. This is because fats and cholesterol can build up and block blood vessels as we age. Stroke is much less common in children. Stroke occurs in 11 per 100,000 children under the age of 18 every year.<sup>1</sup> Still, it is one of the top 10 causes of death for children.<sup>2</sup> We don't routinely expect children to have the major risk factors for atherosclerosis, such as high blood pressure, diabetes, high cholesterol, and smoking. When stroke occurs in children, the causes are much different. Infection has been shown to increase the risk of heart attack and stroke 3-fold among adults.<sup>3</sup> Previous studies have suggested that it may also be an important cause of pediatric stroke.

**WHAT DID THESE RESEARCHERS STUDY?** This study by Fullerton and colleagues<sup>4</sup> involved children from several different countries. The researchers compared 355 children with stroke to 354 stroke-free children (the control group). They assessed the presence of infections and vaccination status for their potential effect on stroke risk. The authors made sure the children with and without stroke were of similar ages. Some of the nonstroke children were being seen for routine visits. They also chose some children who were being seen for trauma. This helped them make sure that any difference in stroke risk was related specifically to infection and not just generally to illness.

**WHAT WERE THE MAIN FINDINGS?** Consistent with prior reports, a recent infection had occurred much more often in the children with stroke than in the controls. In fact, there was a roughly 6-fold increased risk of stroke following an infection. Half of the patients had an upper respiratory infection (like the common cold) and half had a fever. Children with few or no vaccinations were also found to have a much higher risk (about 7-fold increased risk) of stroke compared to those who had all or most of their vaccinations. Let's try to put that into perspective. We know that high blood pressure is an important risk factor for stroke. However, high blood pressure only increases the

risk for stroke about 2-fold. In addition, there has been much concern about the use of certain cold medications and the risk of stroke, but in this study there was no increased risk of stroke with the use of such medications in the young. Thankfully, the increased stroke risk following infection seemed to be short-lived. By 1–6 months after infection, there was no elevated stroke risk.

**WHAT ARE THE TAKE-HOME MESSAGES?** To summarize, strokes in children are relatively rare but very important to prevent. Recent infection slightly but measurably increases the risk of stroke. Children who did not have complete vaccinations were at much higher risk of having a stroke. However, it's important to recognize that there are other important causes of stroke. The majority of children with stroke (about 80%) did not have a recent infection. Other risk factors for stroke in children also need to be addressed. The authors emphasize that a recent infection alone does not fully explain why stroke occurs in children but that infection likely acts as a trigger in a child who is otherwise predisposed.

**WHAT SHOULD I DO DIFFERENTLY?** The evidence from this study is convincing. A recent infection may be a trigger for stroke. Vaccination does not increase stroke risk. In fact, it markedly lowers the risk of stroke in children. Further studies will be needed to determine whether any particular measure can be taken during an infection to reduce the risk.

## REFERENCES

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# About stroke and pediatric stroke

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**WHAT IS A STROKE?** A stroke occurs when the brain is injured because a blood vessel supplying the brain gets blocked or ruptures. When a vessel is blocked, the part of the brain it was supplying doesn't get enough oxygen and suffocates. If it goes without oxygen for too long, that part of the brain will die. Hemorrhage occurs when a blood vessel ruptures in the brain, such as when an aneurysm breaks. This not only leads to loss of blood to the brain but also causes physical damage from the hemorrhaging blood.

Strokes are typically very sudden, and even the term "stroke" comes from the symptom of being "struck down." The symptoms of stroke are related to the part of the brain the affected blood vessel was supplying, and the most common symptoms are weakness and numbness (particularly on one side of the body), speech difficulty, and difficulty walking. When a blood vessel ruptures, patients often experience a loss of consciousness or altered consciousness and a severe headache. Symptoms of stroke may be mild or severe and can even cause death.

Many different things can cause a blood vessel to become blocked. Blood clots formed at the level of the heart can break off and go to the brain and block a blood vessel; atherosclerosis or hardening of the arteries can lead to progressive blockage in a blood vessel; and blood vessels may tear from a trauma such as a car accident, causing blockage. Risk factors for stroke include problems that are inherited or present from birth, such as a tendency to form blood clots or break blood vessels. In addition, high blood pressure, diabetes, smoking, and high cholesterol are risk factors for stroke.

Prevention of stroke is far more effective than treatment of the stroke after it has occurred. One important prevention measure is treatment of high blood pressure. Overall, high blood pressure doubles the risk of stroke. Untreated high blood pressure is very dangerous. It can increase stroke risk as much as 4- to 10-fold compared to treated high blood pressure, which has a much lower risk. Control of diabetes and lowering of cholesterol have both been found to decrease the risk of stroke, as has quitting smoking. In addition, a daily aspirin may be prescribed to lower the risk of stroke.

It is important to know that if you are having a stroke 911 should be called immediately! The longer the brain or a part of the brain goes without oxygen, the more damage is done and the less likely the patient will recover. Modern treatment includes medication to dissolve blood clots and devices that can retract or disrupt the blood clot to restore normal blood flow to the brain. The effectiveness of these treatments decreases with time, so it is essential for patients to seek immediate treatment.

**PEDIATRIC STROKE** Although the risk of stroke rises with age, contrary to popular belief, stroke can occur in individuals of all ages, and no one is "too young to have a stroke." Stroke occurs in 11 of every 100,000 children under the age of 18 and is one of the top 10 causes of death in pediatric populations. However, the risk factors for stroke change over time. Elderly patients are more likely to have strokes related to atherosclerosis and heart diseases. In earlier adulthood, strokes are commonly due to traumatic dissection or tear of blood vessels, clotting disorders, and inflammation of the blood vessels, as well as atherosclerosis. In pediatric populations, congenital disorders explain a portion of strokes, but much of the cause of stroke is unknown in this population. One of the theories regarding why some pediatric strokes occur involves inflammation of the blood vessels, called arteriopathy. This inflammation may be in response to a recent infection or other irritation and may cause the blood vessel to become blocked or constrict.

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