What is plasma exchange?

Plasma exchange is a process of replacing the plasma in a person's blood. Plasma is the liquid part of blood. The solid parts are white and red blood cells. In plasma exchange, blood is drawn from the person. The plasma is separated from the solid parts of the blood. It is then replaced with a protein fluid such as human albumin. Albumin is an important protein in plasma. In rare cases, plasma donated by a blood donor is used instead of albumin. The replacement fluid is mixed with the solid parts of the blood. A machine pumps this mixture through a tube into the body.

Like any medical procedure, plasma exchange poses some risks. The tube used to perform the plasma exchange can sometimes cause infection. The tube also can cause bleeding or puncture a lung when inserted. Another risk is a drop in calcium levels in the blood. This can happen because citrate is added to the blood when it is drawn into the machine. Citrate is a drug used to prevent the blood from clotting. When the citrate enters the body, it can bind with the calcium. The body breaks down the citrate, and the calcium is released rather than absorbed. To prevent low calcium, the person can take a calcium pill or receive a calcium injection. Talk with your doctor about the benefits and risks of plasma exchange.

What does the new research say about plasma exchange?

New studies show that plasma exchange can help treat certain inflammatory diseases of the central nervous system. This system is made up of the brain and spinal cord. These diseases involve demyelination. This is when the protective coating around certain nerves is damaged. The diseases also involve inflammation (swelling).

**Multiple Sclerosis and Fulminant (Sudden) Inflammatory Disease**

Multiple sclerosis (MS) is an autoimmune disease. This means it results from the immune system attacking the body. The nerve damage from MS worsens over time. MS takes different forms. In relapsing forms of MS, symptoms come and go. In other forms of MS, the condition often gets steadily worse. The cause of MS is unknown.

In relapsing forms of MS, there is good evidence that plasma exchange can help treat some severe acute flares. However, the treatment should be used only for a short time. In inflammatory diseases that come on suddenly, weak evidence shows plasma exchange may help when high-dose steroid treatments have failed. Examples of these diseases are transverse myelitis and neuromyelitis optica. Their cause often is not known.

Strong evidence shows that plasma exchange is not effective for treating chronic progressive or secondary progressive MS. There are no studies comparing plasma exchange to other treatment methods in MS.

**What does the research say about plasma exchange for treating other nerve disorders?**

**Inflammatory Demyelinating Polyneuropathies**

Research shows that plasma exchange plays an important role in treating inflammatory polyneuropathies. Like MS, these are disorders caused by the immune system attacking the body. They typically affect the nerves in the legs and arms. However, other nerves in the body also can be affected. The person experiences tingling and muscle weakness. He or she also can become paralyzed.

Strong evidence shows plasma exchange helps treat severe forms of acute inflammatory demyelinating polyneuropathy (AIDP). This is also known as Guillain-Barré syndrome (GBS). In these situations, the person is unable to walk independently or needs a breathing machine. There is good evidence that plasma exchange can help treat milder cases of AIDP/GBS. IV immunoglobulin (IVIg) can be used instead of plasma exchange to treat AIDP/GBS. However, there is not enough evidence to show if one treatment option is better than the other.

Chronic inflammatory demyelinating polyneuropathy (CIDP) is a chronic form of AIDP/GBS. For CIDP, strong evidence shows plasma exchange is a helpful treatment option.
However, its effects last only a short time. Other treatment options include steroids and IVIg. Drugs that slow or stop the immune response (immunosuppressants) also can be used.

**Dysimmune Neuropathies**

Plasma exchange also can help treat dysimmune neuropathies. A common type is associated with monoclonal gammopathy of undetermined significance (MGUS). This is a nerve disorder related to an abnormal protein called an M-protein. This shows up in a person’s blood or urine.

Presence of the protein may not lead to a health problem. However, the protein can be linked to a neuropathy that worsens over time. The main types of MGUS are immunoglobulin A (IgA) and immunoglobulin G (IgG). A third, less common, type is immunoglobulin M (IgM).

In IgA MGUS and IgG MGUS, good evidence shows plasma exchange can be helpful. However, there is good evidence that plasma exchange does not help treat IgM MGUS.

**Myasthenia Gravis**

Myasthenia gravis (MG) is a disorder that affects how certain nerves communicate with muscles. It affects voluntary muscles, which are the ones that a person can control. In MG, the affected nerves do not communicate well with the muscles they control. This leads to muscle weakness. MG occurs because of problems with the immune system. It is unclear what causes these problems. However, they can be related to the thymus (part of the immune system). In this case, the thymus is sometimes removed in surgery.

MG can become life-threatening. This is called myasthenic crisis (MC). In MC, the muscles used for breathing are weakened. This can cause severe breathing problems. It also can result in lung failure. A person with MC may need a breathing machine.

Not enough evidence is available to show if plasma exchange helps treat MG before surgery to remove the thymus. There also is not enough evidence to show if plasma exchange helps treat MC. Some studies have been done on this topic. However, they are not of high enough quality to give good information. Plasma exchange is one of the few treatment options available to treat MG and MC.

**Can plasma exchange treat nerve problems from infections?**

Plasma exchange is used to treat problems of the nervous system that can develop from certain infections. One such problem, Sydenham chorea, affects muscle movement. This can develop from rheumatic fever. Another condition is called pediatric autoimmune neuropsychiatric disorders associated with streptococcal infection (PANDAS). This condition can result from strep throat. PANDAS can trigger development of tics, or uncontrolled muscle movements. It also can lead to obsessive-compulsive disorder (OCD). The tics or OCD symptoms often appear suddenly. For any of these situations, there is not enough evidence to show if plasma exchange is a helpful treatment.

This statement is provided as an educational service of the American Academy of Neurology. It is based on an assessment of current scientific and clinical information. It is not intended to include all possible proper methods of care for a particular neurologic problem or all legitimate criteria for choosing to use a specific procedure. Neither is it intended to exclude any reasonable alternative methodologies. The AAN recognizes that specific patient care decisions are the prerogative of the patient and the physician caring for the patient, based on all of the circumstances involved.

*After the experts review all of the published research studies, they describe the strength of the evidence supporting each recommendation:

- **Strong evidence** = more than one high-quality scientific study
- **Good evidence** = at least one high-quality scientific study or two or more studies of a lesser quality
- **Weak evidence** = the studies, while supportive, are weak in design or strength of the findings
- **Not enough evidence** = either different studies have come to conflicting results or there are no studies of reasonable quality

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