

Ischemic Brain Injury (Stroke)

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BASIC INFORMATION

Description

The brain needs oxygen and nutrients such as glucose (sugar) to provide energy for its normal functions. Oxygen and nutrients are delivered to the brain through the blood. If the blood supply is disrupted, the brain is deprived of oxygen and nutrients, which results in neurologic dysfunction. Decreased oxygen delivery to the brain is referred to as *ischemia*. An obstruction in a blood vessel with loss of blood supply to an area of the brain is called an *infarction*. In people, an infarction is called a *stroke*. Ischemic brain injury is an uncommon event in animals; it occurs more frequently in dogs than in cats.

Causes

In most dogs, the reason for the infarction is unknown. Infarctions can occur secondary to a blood clot (thromboembolus), bacterial infection, inflammation, or invasion of blood vessels by cancer cells. Rarely, animals can develop atherosclerosis, similar to people; cholesterol and fat accumulate in the blood vessel wall, obstructing normal flow. Dogs with low thyroid hormone levels or increased fat in their blood are more prone to atherosclerosis. Other disorders that may be associated with infarctions include high blood pressure (hypertension), Cushing's disease (excessive steroid production by the adrenal glands), sugar diabetes, and kidney disease.

Disruption of the blood supply to the brain can also occur from rupture of a blood vessel and subsequent bleeding. Hemorrhage into the brain can occur with cancer or disorders that decrease the ability to form blood clots (such as anticoagulant drug treatment, certain rodent poisons, and hemophilia).

Clinical Signs

Clinical signs depend on the location of brain injury. Onset of signs is typically very sudden, and usually one side of the body is more affected than the other. Neurologic abnormalities do not often worsen with time unless edema (fluid buildup) forms in or around the damaged brain tissue or bleeding into the brain continues. Examples of common clinical signs include abnormal behavior, head tilt or turning, blindness in one eye, and seizures (less common).

Diagnostic Tests

Ischemic brain injury may be suspected based on the history and clinical signs. A presumptive diagnosis can be made with magnetic resonance imaging (MRI) or computed tomography (CT scan) of the

brain. MRI is the best method for evaluating the brain for characteristics that are compatible with an ischemic infarction or hemorrhage.

Additional diagnostic tests are needed to rule out other neurologic diseases that produce similar signs and to identify the underlying cause. Routine blood tests, a urinalysis, measurement of blood pressure, and blood clotting tests may all be recommended. In certain cases, evaluation of thyroid function may be done because low function (hypothyroidism) can lead to atherosclerosis and infarctions. A spinal tap and cerebrospinal fluid (CSF) analysis may be indicated to look for inflammation or infection. X-rays and an abdominal ultrasound may be recommended if cancer is suspected.

TREATMENT AND FOLLOW-UP

Treatment Options

There are no specific treatments for this type of brain injury. Affected animals are often given supportive care, such as intravenous fluid therapy, to ensure that they are adequately hydrated. If indicated, medications may be started to control hypertension, seizures, or brain edema. Continuous monitoring of neurologic function is performed while the animal is hospitalized. If an underlying condition is identified, treatment is directed at that disease process. Most animals show gradual improvement over days to weeks.

Follow-up Care

Follow-up visits are done frequently at first, to monitor the animal's progress, and then tapered to every few weeks to months. Laboratory tests and blood pressure measurements may be repeated to monitor resolution or control of any underlying disease. If improvement is seen in brain function, neurologic examinations may eventually be decreased to every 6 months. During the recovery period, notify your veterinarian immediately if any new neurologic signs develop or if previous ones recur or worsen.

Prognosis

Prognosis varies with the severity of neurologic damage and dysfunction. With mild damage, prognosis is generally good, because most animals regain normal neurologic function. Prognosis also depends on the underlying cause of the ischemic injury. Residual signs such as blindness and altered gait or movement are possible. Maximal recovery is usually seen within 3 months. Recurrence is possible, especially in those animals with an underlying disease process that cannot be well controlled.