

Always Ask Your Vet This Question, No Matter How Minor the Surgery

The next time your pet needs any type of surgical procedure, be sure to ask this important question. Research shows that when this is used even during the most minor of procedures, your pet's microcirculation and possibly blood pressure can be enhanced.

Reviewed by Dr. Becker

STORY AT-A-GLANCE

- Researchers at the University of Pennsylvania have determined that IV fluids should be administered to veterinary patients during even the most minor surgical procedures
- The study evaluated three groups of dogs undergoing spays. Results showed that the group receiving the highest level of IV fluids during surgery had better blood flow to the microcirculation than the other groups
- The researchers plan to conduct future studies using different types and amounts of IV fluids to test their impact on the microcirculatory system

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The next time your canine companion needs a surgical procedure, you might want to ask your veterinarian if he or she administers IV fluids during every surgery, no matter how minor.

A study performed at the University of Pennsylvania School of Veterinary Medicine points to the importance of administering IV fluids during even minor surgery on pets.¹ This is currently the recommended standard of care, but isn't practiced routinely in many veterinary hospitals.

For the study, the UPenn researchers focused on the effect of IV fluids on the network of small arterioles, venules, and capillaries that directly feed an animal's tissues and cells. Collectively this network of small vessels is known as the microcirculation.

The researchers used a video microscope to capture the blood flow of dogs undergoing spays and discovered that increasing the amount of IV fluid they received improved the number of vessels receiving blood flow.

Monitoring Blood Flow at the Cellular Level

Your dog's circulatory system transports oxygen and nutrients to the cells and tissues of his body, and removes waste products and carbon dioxide. Arteries and veins travel to and from the heart, lungs, and other organs, and these larger vessels branch off into smaller arterioles and venules that contract and expand to allow blood to flow to and from the capillaries. Cells reside inside the network of tiny capillaries.

Depending on his hydration level, metabolism, hormones, and other factors, your dog's body can regulate when and how much blood travels to different parts of his circulatory system.

Anesthesia can inhibit the body's ability to regulate blood pressure, and the combination of fluid loss and anesthetic drugs can result in a decrease in blood flow to and from the cells of your pet's body.

According to lead study author Deborah Silverstein, an associate professor at UPenn in the School of Veterinary Medicine's Department of Clinical Studies:

"When we monitor a patient's blood pressure or oxygen levels, we're not always able to discern what is happening at the cellular level. Sometimes there are tissues and cells that are getting a surplus of oxygen while other cells or tissues are in need of more, but our measuring the big things, like blood pressure, doesn't tell us that.

*The only way we figure that out is when the patient develops organ dysfunction or new complications arise following anesthesia."*²

What Silverstein is saying is that vital sign monitoring procedures used during surgery don't give a complete picture of how things are going in the cells and tissues fed by the microcirculatory system.

In human medicine, it's routine during even the most minor surgical procedures to administer an IV drip to offset fluid loss. The same standard of care is recommended by the American Animal Hospital Association (AAHA) and the American Association of Feline Practitioners (AAFP), however, it isn't uniformly practiced by all veterinarians, probably because of the added cost.

Study Involved 49 Dogs Undergoing Spay Surgery

The UPenn researchers set out to learn whether administering IV fluids during minor veterinary procedures in a healthy animal would affect microcirculation. They also wanted to determine the amount of fluid needed to achieve optimal results.

The researchers studied 49 healthy pet dogs undergoing spay surgery to evaluate how varying levels of IV fluids (lactated Ringer's solution, a commonly used fluid in veterinary medicine) affected their blood flow. The dogs were separated into three groups. One group received no fluid, one group received 10 milliliters per kilogram weight per hour of IV solution, and the third group received 20 milliliters per kilogram weight per hour.

The video microscope mentioned earlier, which magnifies blood vessels 326 times onto a computer monitor, was placed against the dogs' gums to assess blood flow in vessels of various sizes before the procedure, and 30 and 60 minutes after the dogs were anesthetized.

Study Results Indicate That IV Fluids Affect Circulation During Veterinary Surgical Procedures

When they reviewed the videos, the researchers found no differences among the three groups in the number of vessels receiving blood flow or the amount of blood flow. To their surprise, they also found no differences among the groups in the tiny capillaries that are less than 20 micrometers in diameter.

The researchers did, however, see a difference in the blood vessels larger than 20 micrometers. The dogs in the group that received the highest level of fluids had greater densities of these blood vessels than the other two groups.

These results suggest that fluids do affect circulation, but more research is needed to better understand what this information means, as well as the optimal rate of fluid delivery. According to researcher Silverstein:

“The larger vessels are the ones that are constricting and dilating to feed the microcirculation. And it appears that the animals that got the highest rate of fluids in this study – which may not be the optimal rate – are the ones that seemed to have the greatest recruitment of arterioles and venules.”³

During their spay surgeries, about a third of the dogs in the study had a drop in blood pressure that required an infusion of fluids, which further emphasizes the need for constant blood pressure monitoring as well as IV fluid support.

Silverstein noted that some of the dogs might have gone into surgery slightly dehydrated after spending the night in the hospital and possibly refusing to eat or drink due to stress.

The Microcirculatory System: So Small, But So Important

The researchers hope to conduct future studies using different types and amounts of IV fluids to test their impact on the microcirculation. She also plans to continue her study of microcirculation in animals with diseases such as sepsis to see if measuring blood flow to the smallest vessels can be used to better detect or predict outcomes.

Silverstein says she loves being able to focus on something so small, but so important. “The microcirculatory system is one of the largest organs in the body but impossible for the naked eye to see,” she said.

Sources and References

¹ [American Journal of Veterinary Research, September 2014, Vol. 75, No. 9, pp 809-817](#)

^{2, 3} [MedicalXpress, October 15, 2014](#)
