

**Open Heart Surgery
Queen Mother Hospital for Animals
Royal Veterinary College**

Open heart surgery is a general term for surgical repairs of congenital or acquired heart conditions performed during cardiopulmonary bypass (i.e. with the aid of a heart-lung machine). The open heart surgery program at the Queen Mother Hospital for Animals (QMHA), under the direction of Professor Dan Brockman, is a service that is being developed at The Royal Veterinary College (RVC). Open heart surgery is performed in dogs at other centres around the world for a variety of heart defects or diseases.

Types of Open Heart Surgery

The following open heart surgeries have been successfully performed in dogs include:

- Correction of Pulmonic Stenosis
- Correction of Double-Chambered Right Ventricle
- Correction of Atrial Septal Defect
- Correction of Ventricular Septal Defect
- Correction of Atrioventricular Septal Defect
- Correction of Tetralogy of Fallot
- Mitral and Tricuspid Valve Repair

Clinical open heart surgery is currently only available for dogs at RVC.

General Considerations for Open Heart Surgery

The medical determination of whether open heart surgery is indicated or possible for a dog is based on several considerations including the type and severity of heart defect/disease, the presence and severity of secondary cardiac changes (i.e. congestive heart failure, cardiac arrhythmias, heart muscle failure), the health of other organ systems (i.e. lungs, kidneys, liver, central nervous system), and the size and age of the patient. Dogs being considered for open heart surgery should undergo complete cardiac evaluation by a veterinary medical cardiologist. The final determination of whether open heart surgery should be undertaken is made jointly between the dog's owner, the medical cardiologist, and the cardiac surgeon. In the final analysis, both medical and non-medical (financial, logistical, emotional, ethical) issues must be considered by the dog's owner. Open heart surgery should be considered a "pioneering" procedure to undertake in a dog at this time. (It is not "experimental" because it is based on established techniques in human patients and our increasing experience in dogs). The decision can be very emotional for owners because it almost always involves a life or death situation. Nevertheless, owners should give very careful consideration as to whether open heart surgery is a good idea for their dog, themselves, and their family.

Current Specific Guidelines for Open Heart Surgeries

Mitral Valve Repair: Experience with repair of the mitral valve has shown that dramatic results are obtained when the mitral valve is made more competent valve. Even animals in end stage heart failure with can recover relatively normal cardiac function and no longer require diuretic therapy. The estimated chance of surviving surgery is about 70%. Because formation of clot was a devastating complication leading to failure of artificial mechanical valves, we are investigating the use valve repair and have collaboration with a team from Japan led by Dr Masami Uechi, who has success with these techniques.

Tricuspid Repair: See comments on mitral valve replacement. We are also keen to attempt tricuspid valve repair in dogs with congenital valve dysplasia because valve replacement was associated with complications associated with blood clot formation.

Congenital Heart Defects: Open heart surgery can be considered for a variety of congenital heart defects in dogs including atrial septal defect, ventricular septal defect, pulmonic stenosis, double-chambered right ventricle, tetralogy of Fallot and some patients with subaortic stenosis. The general indication for open heart correction of congenital heart defects is that they are hemodynamically significant (determined by medical cardiologist based on cardiac evaluation). In general, open heart correction of congenital septal defects is undertaken with curative intent. Dogs should be at least 5 months old before undergoing open heart surgery and be free of other life-shortening congenital defects.

Non-Medical Considerations

Cost: The estimated total medical fee (preoperative evaluation, surgery, care after surgery) for open heart surgery is to be determined depending on surgery and postoperative course. Additional owner costs include travel to and lodging near The Royal Veterinary College, during the time of surgery.

Duration: Final preoperative evaluations are scheduled the week before the surgery date. Surgery is performed the following Monday. The length of surgery is about 4 to 5 hours. Most dogs are able to leave the hospital usually within two weeks.

Aftercare: Aftercare after open heart surgery is minimal. Dogs will be walking and eating by the time they leave the hospital. Periodic follow up cardiac evaluations with the medical cardiologist will be required after surgery. Most dogs will require some drugs for a period of time after surgery.

Availability: Because open heart surgery is an intensive effort involving a large number of individuals, open heart surgery for dogs is available on limited basis at the QMH at this time. Dates for open heart surgery are predetermined and occur every few weeks. Open heart surgery can not be performed on an urgent or emergency basis. There may be a wait of several weeks or months before surgery can be scheduled. Most dogs who are appropriate candidates for open heart surgery will be able to tolerate the wait with proper medical care.

Scheduling Open Heart Surgery

1. All dogs should undergo a complete cardiac evaluation by a medical cardiologist, prior to any consideration for open heart surgery.
2. After careful consideration of the above information the medical cardiologist along with Professor Brockman will discuss the intended surgical procedure with the owner/caregiver following a review of the appropriate medical data (radiographs, echocardiogram, blood work, etc.).
3. If after consideration of all the medical and non-medical issues it is determined that open heart surgery is appropriate, then the patient will be placed on a waiting list for surgery and possible dates for surgery will be discussed as soon as available.

Checklist of information required for surgery consultation.

- Body Weight, Age, Gender, and Breed of the patient.
- Brief synopsis of previous medical history. Especially that pertaining to episodes of congestive heart failure.
- Echocardiography video or still images of the affected valve/defect. M-Mode echocardiography data \pm flow velocities where indicated.
- Complete blood count, serum chemistry panel, urinalysis, and blood type.

Reading

Orton EC. Inflow Occlusion and Cardiopulmonary Bypass. In, Textbook of Small Animal Surgery, 3rd ed, Slatter DH (ed), W. B. Saunders Co, Philadelphia, 2003, pp 944-955.

Orton EC. Cardiac Surgery. In, Textbook of Small Animal Surgery, 3rd ed, Slatter DH (ed), W. B. Saunders Co, Philadelphia, 2003, pp 955-986.

Monnet E, Orton C, Gaynor J, Boon J, Wagner A, Linn K, Brevard S. Open resection of subvalvular aortic stenosis in dogs. *J Am Vet Med Assoc*, 209:1255-1261, 1996.

Monnet E, Orton EC, Gaynor J, Boon J, Peterson D, Guadagnoli M. Partial atrioventricular septal defect: diagnosis and surgical repair in two dogs. *J Am Vet Med Assoc* 211:569-572, 1997.

Orton EC, Herndon GD, Boon J, Gaynor JS, Hackett TB, Monnet E. Intermediate-term outcome in dogs with subvalvular aortic stenosis: influence of open surgical correction. *J Am Vet Med Assoc* 216:364-367, 2000.

Orton EC, Mama K, Hellyer P, Hackett TB. Open surgical repair of tetralogy of Fallot in two dogs. *J Am Vet Med Assoc* 219:1089-1093, 2001

Martin J, Orton EC, Boon J, Mama K, Gaynor JM, Bright JM. Surgical correction of double-chambered right ventricle in dogs. *J Am Vet Med Assoc* 220:770-774, 2002.

Mizuno T, Mizukoshi T, Uechi M. Long-term outcome in dogs undergoing mitral valve repair with suture annuloplasty and chordae tendinae replacement. *J Small Anim Pract*. 2013 Feb;54(2):104-7.

Uechi M, Mizukoshi T, Mizuno T, Mizuno M, Harada K, Ebisawa T, Takeuchi J, Sawada T, Uchida S, Shinoda A, Kasuya A, Endo M, Nishida M, Kono S, Fujiwara M, Nakamura T. Mitral valve repair under cardiopulmonary bypass in small-breed dogs: 48 cases (2006-2009). *J Am Vet Med Assoc*. 2012 May 15;240(10):1194-201.

Richards JM, Farrar EJ, Kornreich BG, Moise NS, Butcher JT. The mechanobiology of mitral valve function, degeneration, and repair. *J Vet Cardiol*. 2012 Mar;14(1):47-58.

Uechi M. Mitral valve repair in dogs. *J Vet Cardiol*. 2012 Mar;14(1):185-92.

Nishida M, Kagawa Y, Mizukoshi T, Mizuno M, Mizuno T, Harada K, Uechi M. Post-mortem evaluation of expanded polytetrafluoroethylene (ePTFE) used in mitral valve repair in dogs. *J Vet Cardiol*. 2012 Mar;14(1):307-12.

Griffiths LG, Orton EC, Boon JA. Evaluation of techniques and outcomes of mitral valve repair in dogs. *J Am Vet Med Assoc*. 2004 Jun 15;224(12):1941-5.

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