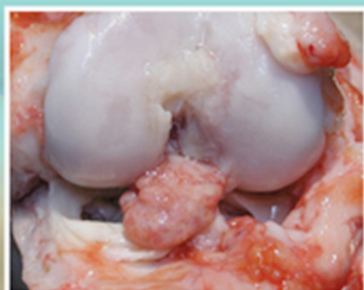


# Advances In The Canine Cranial Cruciate Ligament

ADVANCES IN  
VETERINARY  
SURGERY

Second Edition

PETER MUIR



WILEY Blackwell



Advances In  
**The Canine  
Cranial Cruciate  
Ligament**



# Advances In **The Canine Cranial Cruciate Ligament**

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Second Edition

Edited by

**Peter Muir** BVSc, MVetClinStud, PhD, Diplomate ACVS, ECVS

**WILEY** Blackwell



This edition first published 2018

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This Work is a co-publication between the American College of Veterinary Surgeons Foundation and Wiley-Blackwell.

*Edition History*

1st Edition © 2010 ACVS Foundation; 2nd Edition © 2018 ACVS Foundation

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John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, USA

*Editorial Office*

111 River Street, Hoboken, NJ 07030, USA

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*Library of Congress Cataloging-in-Publication Data*

Names: Muir, Peter, BVSc, editor. | American College of Veterinary Surgeons. Foundation, issuing body.

Title: Advances in the canine cranial cruciate ligament / edited by Peter Muir.

Description: Second edition. | Hoboken, NJ : Wiley ; [United States] : American College of Veterinary Surgeons Foundation, 2018. | Includes bibliographical references and index. |

Identifiers: LCCN 2017026733 (print) | LCCN 2017027885 (ebook) | ISBN 9781119261735 (pdf) | ISBN 9781119261742 (epub) | ISBN 9781119261711 (cloth)

Subjects: | MESH: Dog Diseases–surgery | Anterior Cruciate Ligament | Dogs–injuries | Orthopaedic Procedures–veterinary | Rupture–veterinary | Rupture, Spontaneous–veterinary

Classification: LCC SF991 (ebook) | LCC SF991 .A38 2018 (print) | NLM SF 991 | DDC 636.7/0897582059–dc23

LC record available at <https://lcn.loc.gov/2017026733>

Cover Design: Wiley

Cover Images: Courtesy of Peter Muir

Set in 9.5/11.5pt PalatinoStd by Aptara Inc., New Delhi, India

# Dedication

This book is dedicated to Susannah Sample, to my family, and to all of my colleagues who have contributed effort to advancing the understanding of canine cruciate ligament rupture, and the treatment of affected dogs.



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## About the Editor

---

**Peter Muir** BVSc, MVetClinStud, PhD, Diplomate ACVS, ECVS. Dr Muir obtained his veterinary degree in 1985 from Bristol University in the United Kingdom. After working in private practice in the UK, he returned to Bristol and obtained a PhD in veterinary science in 1990. He then moved to The University of Sydney to undertake training in small animal surgery, obtaining a Masters degree in 1992. He completed his surgery training at the University of Wisconsin-Madison and became a

Diplomate of the American College of Veterinary Surgeons in 1995. After periods on faculty at the University of California, Davis and the Royal Veterinary College, University of London, he returned to Madison as a faculty member, where he is currently the Melita Grunow Family Professor of Companion Animal Health. He has authored many peer-reviewed publications on stifle osteoarthritis and cruciate ligament rupture and speaks regularly at international meetings on this work.



# Foreword to the Second Edition

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The popularity and success of the First Edition of this authoritative collection of work on canine cranial cruciate ligament rupture has been an impetus to launch a thoroughly revised new, Second Edition. This move is easily justifiable considering the immense clinical importance of this disease in small animal clinical practice, and also the numerous advances that have been made in knowledge about the problem in the last few years. The appeal of this book to the busy clinician is that all the latest developments are assembled under one umbrella in this volume. The editor of this volume, Dr Peter Muir, has arranged and organized the various chapters in a coherent manner that takes the reader from the basics of the disease pathophysiology, through the essence of diagnosis and treatment options, to a view of the future.

As is generally the case in science, the ever-increasing body of knowledge has really served to expose the apparently growing complexity of the problem of canine cruciate ligament rupture. To achieve the best possible outcome for each and every dog presented with this problem, it is no longer acceptable to have just

one standard surgical treatment that we use in every case. We must be even more meticulous in objectively assessing each patient, and consider how we manage concurrent problems such as meniscal injury or patellar luxation. Also, advanced imaging is assuming an increasingly useful role in detecting variability in skeletal and articular morphology that can require modification in surgical technique. Furthermore, the development of dynamic imaging has allowed us to learn more about motion of the cruciate-deficient stifle during ambulation and full weight-bearing, before and after surgery. These are very exciting developments that we need to carefully and critically evaluate, and embrace as appropriate.

Dr Muir and all the contributing authors are warmly congratulated on the production of this new edition. However, as I previously foreshadowed in my foreword to the First Edition, I do suspect that in another few years, we will again be ready for yet another new edition!

*Kenneth A. Johnson*  
Sydney, Australia



# Foreword

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The American College of Veterinary Surgeons Foundation is excited to present the Second Edition of *Advances in the Canine Cranial Cruciate Ligament* in the book series entitled *Advances in Veterinary Surgery*. The American College of Veterinary Surgeons (ACVS) Foundation is an independently chartered philanthropic organization devoted to advancing the charitable, educational and scientific goals of the ACVS. Founded in 1965, the ACVS sets the standards for the specialty of veterinary surgery. The ACVS, which is approved by the American Veterinary Medical Association, administers the board certification process for Diplomates in veterinary surgery and advances veterinary surgery and education. One of the principle goals of the ACVS Foundation is to foster the advancement of the art and science of veterinary surgery. The Foundation achieves these goals by: supporting investigations in the diagnosis and treatment of surgical diseases; increasing educational opportunities for surgeons, surgical residents and veterinary practitioners; improving the surgical training of residents and veterinary students;

and bettering animal patients' care, treatment, and welfare. This collaboration with Wiley-Blackwell will benefit all who are interested in veterinary surgery by presenting the latest evidence-based information on a particular surgical topic.

*Advances in the Canine Cranial Cruciate Ligament* is edited by Dr Peter Muir, who is well recognized as an expert in this field. He has chosen a group of strong contributing authors to detail the areas of structure and function, etiopathogenesis, clinical features, surgical and medical management, and postoperative care and rehabilitation. We are sure you will find this reference extremely valuable.

The ACVS Foundation is proud to partner with Wiley-Blackwell in this important series, and is honored to present this newest book in the *Advances in Veterinary Surgery* series.

R. Randy Basinger  
Chair, Board of Trustees  
ACVS Foundation



# Preface

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Although cruciate ligament rupture has been recognized clinically in dogs for more than 50 years, research into this condition has largely focused on the development of methods for surgical treatment of the unstable stifle, and not the disease mechanism. Cruciate ligament rupture is one of the most common reasons that dogs are presented to veterinarians for the treatment of lameness. It has been a long-held clinical belief that the disease mechanism for cruciate ligament rupture in dogs is similar to that for anterior cruciate ligament rupture in human beings. Over the past 10 years there has been increasing recognition that second ruptures are common in both human beings and dogs. Historically, the dog has been a common animal model for research into the surgical treatment of anterior cruciate ligament rupture. Transection of the cranial cruciate ligament in experimental dogs has also been a common ani-

mal model for biomedical research studies of osteoarthritis.

During the past 15 years, an increasing body of work investigating the disease mechanism for cruciate ligament rupture has been published. Cruciate ligament rupture in the dog is a complex trait, with genetic and environmental factors contributing to disease risk. This research is challenging established views about what causes cruciate ligament rupture and how affected dogs should be managed clinically. My goals for the Second Edition of this book were to produce a text that summarizes state of the art knowledge about cruciate ligament rupture in the dog, including recent advances in the past 5 years, to provide a useful reference for a broad audience, and to highlight areas for development of future work in this field.

*Peter Muir*



# Acknowledgements

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I would like to acknowledge the consistent support of Erica Judisch of Wiley Blackwell, and of Dr Mark Markel, Chair of the ACVS Foundation's Board of Trustees for the *Advances in Veterinary Surgery* book series. I am extremely grateful to all of the chapter authors who have consistently been very committed to this project and have made such amazing and thoughtful contributions to this book. I am also grateful to all of the organizations that have pro-

vided financial support for clinical research into canine cruciate ligament rupture. Without these gifts, my work and the work of many others that is summarized in this book would not have been possible. Lastly, I would like to thank dog owners and breeders for their interest in and enthusiasm for new knowledge regarding this important orthopaedic condition.

*Peter Muir*



# Contributing Authors

---

**Matthew J. Allen**, Vet MB, PhD, MRCVS  
Professor of Small Animal Surgery  
Director, Surgical Discovery Centre  
University of Cambridge  
Department of Veterinary Medicine  
Maddingly Road  
Cambridge CB3 0ES  
United Kingdom  
e-mail: mja1000@cam.ac.uk

**Courtney J. Arnoldy**, CCRP  
Physical Therapist  
University of Wisconsin-Madison  
School of Veterinary Medicine  
UW Veterinary Care Hospital  
2015 Linden Drive  
Madison, Wisconsin 53706  
USA  
e-mail: courtney.arnoldy@wisc.edu

**Lauren A. Baker**, DVM, MS  
Post-doctoral Fellow  
Comparative Orthopaedic and Genetics  
Research Laboratory  
University of Wisconsin-Madison  
School of Veterinary Medicine  
2015 Linden Drive  
Madison, Wisconsin 53706  
USA  
e-mail: iwicki@wisc.edu

**Brian S. Beale**, DVM, Diplomate ACVS  
Gulf Coast Veterinary Specialists  
1111 West Loop South #160

Houston, TX 77027  
USA  
e-mail: dogscooper@aol.com

**Mary Sarah Bergh**, DVM, MS, Diplomate  
ACVS, ACVSMR  
Associate Professor, Orthopaedic Surgery  
Iowa State University  
College of Veterinary Medicine  
Department of Veterinary Clinical Sciences  
1600 S. 16th Street  
Ames, IA 50011-1250  
USA  
e-mail: msbergh@iastate.edu

**Jeffery J. Biskup**, DVM, Diplomate ACVS-SA  
Assistant Professor  
University of Tennessee  
College of Veterinary Medicine  
Department of Small Animal Clinical Sciences  
2407 River Drive  
Knoxville, TN 37996  
USA  
e-mail: jbiskup@utk.edu

**Jason A. Bleedorn**, DVM, MS, Dipomate ACVS  
Clinical Assistant Professor of Small Animal  
Orthopaedics  
University of Wisconsin-Madison  
School of Veterinary Medicine  
2015 Linden Drive  
Madison, Wisconsin 53706  
USA  
e-mail: jason.bleedorn@wisc.edu

**Randy J. Boudrieau**, DVM, Diplomate ACVS, ECVS  
Professor  
Tufts University  
Cummings School of Veterinary Medicine  
Department of Clinical Sciences  
200 Westboro Road  
North Grafton, MA 01536  
USA  
e-mail: randy.boudrieau@tufts.edu

**Valentina Brioschi**, DVM, GPCert(SAS), MRCVS  
Senior Clinical Training Scholar in Small Animal Surgery  
University of Cambridge  
The Queen's Veterinary School Hospital  
Madingley Road  
Cambridge CB3 0ES  
United Kingdom

**Dorothy Cimino Brown**, MSCE, DVM, Diplomate ACVS  
Senior Research Advisor  
Translational Comparative Medical Research  
Elanco Animal Health  
2500 Innovation Way  
Greenfield, IN 46140  
USA  
e-mail: dottedvm@gmail.com

**Steven C. Budsberg**, DVM, MS, Diplomate ACVS  
Professor  
University of Georgia  
College of Veterinary Medicine  
Department of Small Animal Medicine & Surgery  
Athens, GA 30602  
USA  
e-mail: budsberg@uga.edu

**Connie S. Chamberlain**, PhD  
Assistant Scientist  
University of Wisconsin-Madison  
School of Medicine & Public Health  
Department of Orthopedics & Rehabilitation  
1111 Highland Ave  
Madison, WI 53705  
USA  
e-mail: cschamberlai@wisc.edu

**Eithne Comerford**, BVSc, PhD, CertVR, DSAO, MRCVS  
Professor  
University of Liverpool  
Faculty of Veterinary Science  
Department of Veterinary Clinical Science  
Leahurst  
Chester High Road  
Neston, CH64 7TE  
United Kingdom  
e-mail: eithne.comerford@liverpool.ac.uk

**Michael G. Conzemius**, DVM, PhD, Diplomate ACVS  
Endowed Professor of Surgery  
University of Minnesota  
College of Veterinary Medicine  
Department of Veterinary Clinical Sciences  
1365 Gortner Avenue  
St Paul, MN 55108  
USA  
e-mail: conze012@umn.edu

**Cristi R. Cook**, DVM, MS, Diplomate ACVR  
Thompson Laboratory for Regenerative Orthopaedics  
Missouri Orthopaedic Institute  
University of Missouri-Columbia  
1100 Virginia Avenue  
Columbia, MO 65212  
USA  
e-mail: cookcr@missouri.edu

**James L. Cook**, DVM, PhD, Diplomate ACVS  
William & Kathryn Allen Distinguished Professor in Orthopaedic Surgery  
Director, Comparative Orthopaedic Laboratory, Orthopaedic Research Division & Mizzou BioJoint Center  
Missouri Orthopaedic Institute  
University of Missouri  
1100 Virginia Avenue  
Columbia, MO 65212  
USA  
e-mail: cookjl@missouri.edu

**Erin E. Crowley**, DVM  
Surgical Fellow  
University of Wisconsin-Madison  
School of Medicine & Public Health  
Department of Orthopedics & Rehabilitation

1111 Highland Ave  
Madison, WI 53705  
USA

**Hilde de Rooster**, DVM, MVM, PhD,  
Diplomate ECVS  
Professor in Soft Tissue Surgery  
Ghent University  
Faculty of Veterinary Medicine  
Department of Small Animals  
Salisburyann 133  
B-9820 Merelbeke  
Belgium  
e-mail: hilde.derooster@ugent.be

**Richard B. Evans**, PhD  
Waukesha, WI 53189  
USA  
e-mail: richard.bc.evans@gmail.com

**Simone Forterre**, Dr. med. vet, PhD  
University of Bern  
Vetsuisse Faculty Bern  
Department of Clinical Veterinary Medicine  
Längsassestrasse 128  
CH-3012 Bern  
Switzerland

**Samuel P. Franklin**, MS, DVM, PhD, Diplomate  
ACVS, ACVSMR  
Assistant Professor of Small Animal  
Orthopaedic Surgery  
University of Georgia  
Department of Small Animal Medicine &  
Surgery  
Veterinary Medical Center  
2200 College Station Road  
Athens, GA 30602  
USA  
e-mail: spfrank@uga.edu

**Ingrid Gielen**, DVM, PhD, MSC  
Clinical Professor  
Department of Veterinary Medical Imaging &  
Small Animal Orthopaedics  
Ghent University  
Faculty of Veterinary Medicine  
Salisburyann 133  
9230 Merelbeke  
Belgium

**Kei Hayashi**, DVM, PhD, Diplomate ACVS  
Associate Professor  
Cornell University  
College of Veterinary Medicine  
Department of Clinical Sciences  
School of Veterinary Medicine  
Ithaca, NY 14853  
USA  
e-mail: kh528@cornell.edu

**Donald A. Hulse**, DVM, Diplomate ACVS  
Professor  
Texas A&M University  
Department of Small Animal Clinical Sciences  
College of Veterinary Medicine  
College Station, TX 77843  
USA

**Kenneth A. Johnson**, MVSc, PhD, FACVSc,  
Diplomate ACVS  
Professor  
The University of Sydney  
Faculty of Veterinary Science  
Sydney, NSW 2006  
Australia  
e-mail: kennethjohnson@usyd.edu.au

**Stanley E. Kim**, BVSc, MS, Diplomate ACVS  
Assistant Professor of Small Animal Surgery  
University of Florida  
College of Veterinary Medicine  
Department of Small Animal Clinical Sciences  
2015 SW 16<sup>th</sup> Ave  
Gainesville, FL 32610  
USA  
e-mail: stankim@ufl.edu

**Michael P. Kowaleski**, DVM, Diplomate ACVS,  
ECVS  
Professor  
Tufts University  
Cummings School of Veterinary Medicine  
Department of Clinical Sciences  
200 Westboro Road  
North Grafton, MA 01536  
USA  
e-mail: mike.kowaleski@tufts.edu

**Anke Langenbach**, Dr. med. Vet, Diplomate  
ACVS, ACVSMR  
Veterinary Surgical Centers  
140 Part Street, SE

Vienna, VA 22180  
USA

**William D. Liska**, DVM, Diplomate ACVS  
Global Veterinary Specialists  
3130 Grants Lake Blvd  
Sugar Land, TX 77496  
USA

**Denis J. Marcellin-Little**, DEDV, Diplomate ACVS, ACVSMR  
Professor, Small Animal Orthopedic Surgery  
University of California, Davis  
School of Veterinary Medicine  
Department of Surgical and Radiological Sciences  
One Shields Avenue  
Davis, CA 95616  
USA  
e-mail: djmarcel@ucdavis.edu

**Noël M.M. Moens**, DVM, MSc, Diplomate ACVS, ECVS  
Associate Professor of Orthopaedic Surgery  
University of Guelph  
Ontario Veterinary College  
Department of Clinical Studies  
Guelph, ON N1G 2W1  
Canada  
e-mail: nmoens@ovc.uoguelph.ca

**Peter Muir**, BVSc, MVetClinStud, PhD,  
Diplomate ACVS, ECVS, MRCVS  
Melita Grunow Family Professor of  
Companion Animal Health  
University of Wisconsin-Madison  
School of Veterinary Medicine  
Department of Surgical Sciences  
2015 Linden Drive  
Madison, Wisconsin 53706  
USA  
e-mail: peter.muir@wisc.edu

**Martha M. Murray**, MD  
Professor in Orthopedic Surgery  
Harvard University  
Boston Children's Hospital  
Department of Orthopaedic Surgery  
Hunnewell 2  
300 Longwood Avenue  
Boston, MA 02115

USA  
e-mail: martha.murray@childrens.harvard.edu

**Gabriel S. Perrone**  
Research Technologist  
Harvard University  
Boston Children's Hospital  
Department of Orthopaedic Surgery  
61 Binney Street, Enders 270.2  
Boston, MA 02115  
USA  
e-mail: gabriel.perrone@childrens.harvard.edu

**Antonio Pozzi**, Prof. Dr. med. vet, Diplomate ACVS, ACVSMR  
University of Zurich  
Vetsuisse Faculty  
Clinic for Small Animal Surgery  
Winterthurerstrasse 258c  
8057, Zurich  
Switzerland  
e-mail: apozzi@vetclinics.uzh.ch

**Simon C. Roe**, BVSc, PhD, Diplomate ACVS  
Professor of Orthopaedic Surgery  
North Carolina State University  
College of Veterinary Medicine  
Department of Clinical Sciences  
1052 William Moore Drive  
Raleigh, NC 27607  
USA  
e-mail: simon\_roe@ncsu.edu

**Susannah J. Sample**, DVM, MS, PhD,  
Diplomate ACVS  
Assistant Scientist  
University of Wisconsin-Madison  
Comparative Orthopaedic and Genetics  
Research Laboratory  
School of Veterinary Medicine  
2015 Linden Drive  
Madison, Wisconsin 53706  
USA  
e-mail: susannah.sample@wisc.edu

**Susan L. Schaefer**, DVM, MS, Diplomate ACVS  
Clinical Associate Professor of Small Animal  
Orthopaedics  
University of Wisconsin-Madison  
School of Veterinary Medicine  
Department of Surgical Sciences

2015 Linden Drive  
Madison, Wisconsin 53706  
USA  
e-mail: susan.schaefer@wisc.edu

**Peter V. Scrivani**, DVM, Diplomate ACVR  
Associate Professor  
Cornell University  
College of Veterinary Medicine  
Department of Clinical Sciences  
Ithaca, NY 14853  
USA  
e-mail: pvs2@cornell.edu

**David E. Spreng**, Prof. Dr. Med. vet, Diplomate  
ECVS, ACVECC EMBA PHW  
University of Bern  
Vetsuisse Faculty Bern  
Department of Clinical Veterinary Medicine  
Länggassstrasse 128  
CH-3012 Bern  
Switzerland  
e-mail: david.spreng@vetsuisse.unibe.ch

**Selena Tinga**, DVM  
Resident in Small Animal Surgery  
University of Florida  
College of Veterinary Medicine  
Department of Small Animal Clinical Sciences  
2015 SW 16<sup>th</sup> Ave  
Gainesville, FL 32610  
USA

**Henri Van Bree**, DVM, PhD, Diplomate ECVDI,  
ECVS  
Professor  
Ghent University  
Faculty of Veterinary Medicine  
Department of Veterinary Medical Imaging &  
Small Animal Orthopaedics  
Salisburyland 133  
B-9820 Merelbeke  
Belgium  
e-mail: henri.vanbree@ugent.be

**Ray Vanderby Jr.**, PhD  
Professor  
University of Wisconsin-Madison  
School of Medicine & Public Health  
Department of Orthopedics & Rehabilitation  
1111 Highland Ave  
Madison, WI 53705  
USA  
e-mail: ray.vanderby@wisc.edu

**Patrick Vavken**, MD  
Lecturer in Orthopedic Surgery  
Harvard University  
Boston Children's Hospital  
Department of Orthopedic Surgery  
Orthopedics, Enders 1016  
300 Longwood Avenue  
Boston, MA 02115  
USA  
e-mail: patrick.vavken@childrens.harvard.edu

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Email addresses are listed for corresponding authors for each chapter. Contact information, including email addresses, for contributors who are ACVS and ECVS Diplomates is also available from [www.acvs.org](http://www.acvs.org) and [www.ecvs.org](http://www.ecvs.org), respectively.



# Section I

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## Structure and Function

### Introduction

The anatomy of canine stifle is complex. Our understanding of the anatomy of the cranial and caudal cruciate ligaments has gradually evolved over time, particularly with regard to the microvascular anatomy of the ligaments. Recent work suggesting the existence of a blood–cruciate ligament barrier, analogous to the blood–brain barrier, is a particularly interesting finding, which helps explain the mechanism that leads to incremental fiber rupture within the ligament matrix of both cruciate ligaments over time, and eventual rupture of the cranial cruciate ligament. In addition to their biomechanical role as joint stabilizers, the

cranial and caudal cruciate ligaments likely have key functions in joint proprioception. In the future, advances in knowledge of ligament matrix homeostasis effects on cruciate ligament mechanical properties and associated joint laxity should provide insight into the ligament rupture mechanism. Variation in joint proprioception and joint laxity may ultimately explain how fiber rupture is initiated in the early phase of the disease. An important weakness with current surgical treatments for the unstable stifle is that repair of the ruptured cranial cruciate ligament is not performed. This section provides a detailed discussion of stifle anatomy, including gross and microscopic anatomy of the cruciate ligaments.

