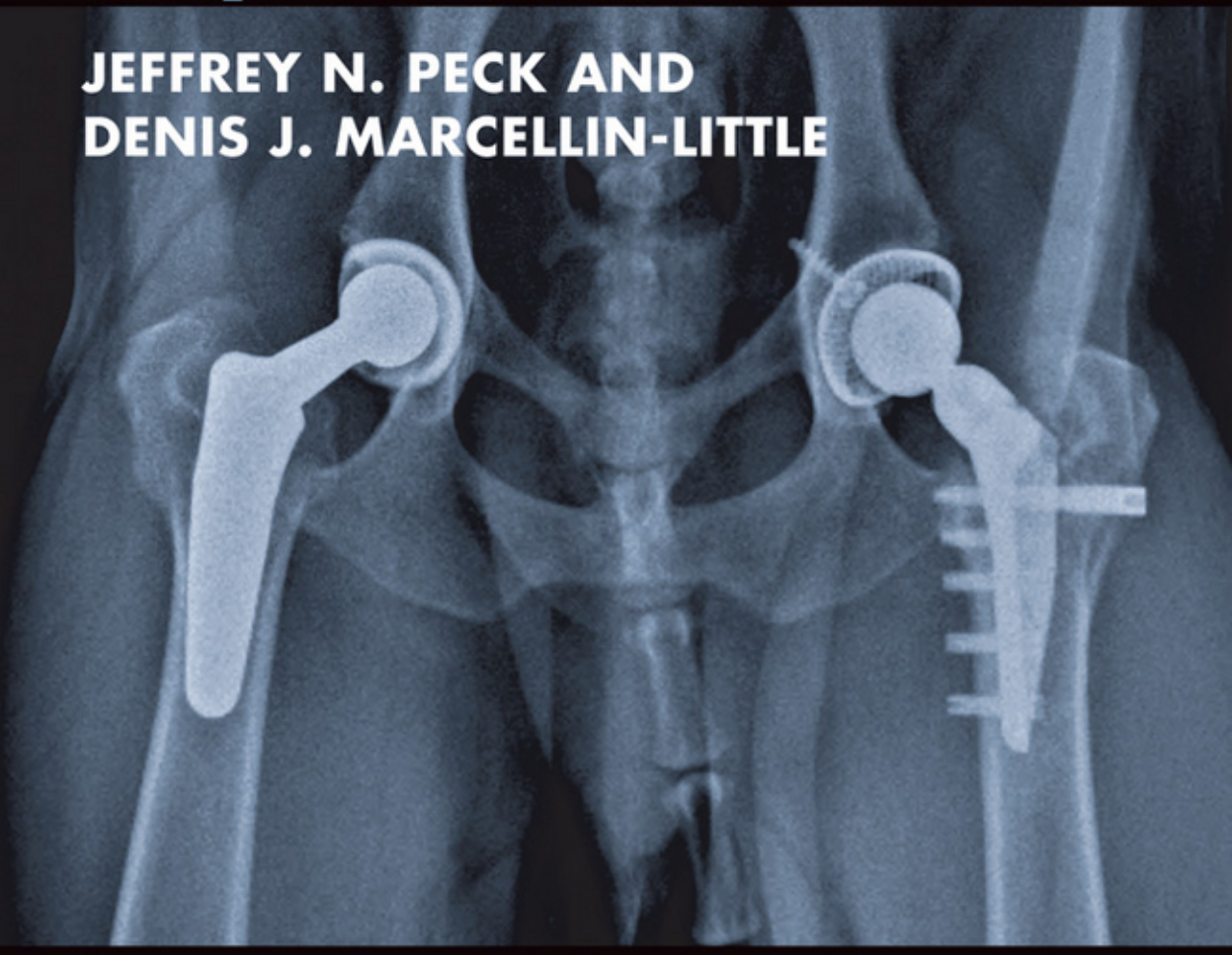
ADVANCES IN VETERINARY SURGERY

Advances In Small Animal Total Joint Replacement

JEFFREY N. PECK AND
DENIS J. MARCELLIN-LITTLE



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Dedication

This book is dedicated to Kathy and Kayla, and to the memory of Cody Ruderman, who reminded me that our most serious complications should be our greatest impetus for advancement.

Jeffrey N. Peck

This book is dedicated to Terry, Arianne, and Julien, and to all loving owners of dogs and cats.

Denis J. Marcellin-Little

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Foreword

The editors have asked me to write about my experience and thoughts on canine total hip replacements. I have often said that humans were the research animal for dogs when it came to total hip replacements. Although total hip replacements were being implanted in humans in the 1940s by surgeons such as Dr. Austin Moore, it was not until the late 1950s and early 1960s that Sir John Charnley's work on implant design, materials, and fixation with polymethylmethacrylate (PMMA) bone cement made the procedure popular and widely used in humans. In 1957, Dr. Harry Gorman at The Ohio State University (OSU) worked on an experimental hip prosthesis in canines. These implants were cementless and the project was testing a design that was to be used humans. The femoral head was held in the acetabulum by a constraining metal ring, which was fixed to the pelvis with screws. This design was flawed and failed in most patients. However, Dr. Richard Rudy did tell me about one dog he implanted with this hip replacement that lasted for 13 years. It was not until 1974 when Dr. William Hoefle reported on a cemented total hip replacement in one dog that some people again began to think about doing this surgery in veterinary patients.

In early August 1976, 1 month after I started working at OSU, Dr. R. Bruce Hohn implanted the Veterinary College's first Richards II Canine Cemented Total Hip Replacement. His second hip replacement occurred a few weeks later and I jumped at the chance to scrub with him on that hip. From that point on, we each did hip replacements at OSU. We wanted to document our technique, clinical results, postoperative care, and complications in a manner that would be most beneficial to the profession. Thus, we did not rush to publish our results but took time to reflect on what we learned. Our complication rate was high (20%) and by today's standards would be unacceptable, but we found that as we accumulated cases and critically evaluated each complication, avoidable causes were identified. There was a marked reduction in complications in the last 2 years of this study. By continuing this evaluation even today, complication rates are minimized and now occur in approximately 7% of the cases.

Starting in 1977, an annual continuing education course was taught at OSU that included in the faculty both veterinarians and MDs from around the country who were implanting total hips. This gave valuable insight that was incorporated into the techniques used at OSU and around the world. These courses gave us an opportunity to exchange ideas and to teach the most current technique to veterinarians. It was not long before many veterinary surgeons were offering total hip replacements to their clients and patients.

When it became known that we were doing total hip replacements at OSU, there were those who said it was unnecessary to do this in dogs because excision arthroplasty (femoral head and neck ostectomy) worked well. We found that the easiest way for us to show the benefits of total hip replacement is to compare hip extended radiographs of a dog with a replaced hip and one with an excision arthroplasty taken 6 months after surgery. The total-hip dog will have well-developed muscle mass, while the excision-arthroplasty dog's muscles are atrophied. The direct connection of the femoral head to the pelvis is important for the dog's muscles and limb function to reach their full potential.

Our first major publication on the subject was a technique paper in a 1981 volume of *Veterinary Surgery*. The paper, documenting the results of the first 5 years of 221 consecutive clinical cases (216 of which had follow-ups for varying periods), did not come out until 1983. Since then, many more publications by myself and others have further expanded our understanding of canine total hip replacements. Total hip replacements have become a well-accepted technique for resolving discomfort and poor function resulting from canine hip diseases.

It became obvious to me as I worked with the Richards system that changes in implant design and instrumentation would be of benefit, so I discussed this with the company representatives. They declined to make changes. Thus, when in 1989 I was contacted about a new modular hip replacement system, I agreed to work on it. This collaboration resulted in the development of the BioMedtrix Canine Cemented Hip Replacement System. This company has been very receptive to changing the implants and instruments when clinical findings indicated that something was not working as well as it could, even if that was in just a few patients, or when a need was found that was not addressed by the system at a given time.

In an effort to improve what was offered to the patient, I was part of the group that worked on the cementless hip system for BioMedtrix. I saw the cemented and cementless systems as complementary to each other and felt they would expand the options a surgeon had available. I have not found one system to be overall superior to the other, but there are some cases where one system will work better for a given patient. In some cases, they can even be combined into a hybrid hip replacement. The surgeon who wants to provide the best possible service to the client and patient will be well versed in all aspects of both the cemented and cementless total hip replacement systems.

In human medicine, total hip replacement is considered the most consistently reproducible surgery with the most predictable results. This should also be true in veterinary medicine. It takes strict attention to detail, technique, and patient selection and care. The success rate of 95% dogs returning to normal to near-normal function is found no matter which implant is used. It is up to the surgeon to choose the best implants for a given patient.

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Foreword

This textbook constitutes a summary of the current stage of arthroplasty in veterinary surgery. The foreword written by Marvin Olmstead provides us with a historical perspective of the landmark work of the pioneers of arthroplasty in veterinary medicine over the last quarter of the twentieth century. Not only was the technique developed by these individuals, but they also pushed arthroplasty beyond the barriers of the time and made total hip replacement the treatment of choice for veterinarians, as well as pet owners. It is important for the next generation of orthopedic surgeons to be aware of the steps that got us to this point and shoulder the responsibility of advancing the science and art of arthroplasty in the future.

As veterinary orthopedic surgeons, we have the responsibility to critically assess implant and patient performance and continue to develop implants and techniques to improve the outcomes for our patients. The ultimate goal of total joint replacement is to relieve pain, improve the patient's quality of life by returning function, and improve the client's relationship with their pet. In addition, the prosthesis should last the lifetime of the patient. Success toward meeting these goals has been measured using a variety of standards, most often retrospective studies involving assessment of patient function, as well as client satisfaction.

While clinical assessment is the most important outcome assessment, and was paramount to achieving improvements during the early stages of cemented total hip replacement in dogs, additional advancement could only be achieved using more finite criteria for implant performance. It was clear that patient function did not always correlate with radiographic assessment. In the mid-1980s, a retrieval analysis program was started at North Carolina State University (NCSU), offering us the opportunity to assess cemented implants, and the surrounding cement and bone harvested following the death of canine patients. The program provided the opportunity to assess mechanical stability of the implant–cement and cement–bone interfaces, establish the nature of the cells in fibrous membranes, and search for the presence of particulate debris. Serial sectioning of femurs with intact implants and cement revealed cement cracks or an incomplete cement mantle that provided channels for wear debris to gain access to the cement–bone interface leading to osteolysis. Over a period of years, serial radiographic assessment and retrieval analysis pointed out many of the failure mechanisms associated with bone cement and cementing techniques. These were addressed with varying degrees of success in dogs over the past decade. Every attempt has been made to link failures back to patient selection and surgical technique, and in