

Expanding Frontiers in Canine Total Joint Replacement

Despite tremendous developments in reconstructive and regenerative approaches to the management of ligamentous and osteoarticular disorders, end-stage joint disease continues to be a medically, socially and financially important problem in veterinary and human patients. Many patients can be managed effectively with rest, controlled exercise, weight management and the tactical use of analgesics and/or non-steroidal anti-inflammatory drugs. For patients that do not respond optimally to this conservative approach, surgical options may include joint replacement, arthrodesis or amputation.

In this issue of VCOT, two papers are presented that highlight two of the current trends in canine total joint replacement: the development of new implant options, and the use of revision implants to replace failed total joint replacements.

In their paper on a medial compartment elbow replacement, Smith et al. describe a cadaveric study that compares the mechanical performance of the new implant against that of the intact, normal elbow joint (1). Veterinary orthopedic implants are not subject to the sort of regulatory oversight that is required for human medical devices. On the upside, the pathway to device approval is shorter and much less expensive, which is critical given the relatively limited markets for any veterinary implant system. The downside of this arrangement is that the onus for ensuring the safety and efficacy of veterinary implants falls on manufacturers and the veterinarians who prescribe these implants. As a profession, it is absolutely critical that we develop and implement objective assessment of implant performance. Although cadaveric studies will always suffer from limitations, most especially related to the lack of joint pathology and the absence of any biological response to the implant, they

can be extremely helpful in answering specific questions. In this instance, the question being posed is straightforward: is a forelimb implanted with the new elbow replacement capable of sustaining the loads to which forelimbs are normally exposed *in vivo*? Data from this sort of study offer an opportunity for manufacturers and surgeons to make an informed go/no-go decision on an implant, without any risk to clinical patients. Many of the complications reported with current elbow replacement implants, such as the Iowa and TATE, relate to the surgical approach to the joint and the difficulties for stabilizing the medial epicondylar osteotomy (2, 3). It is entirely logical and reasonable, therefore, to think of the elbow replacement as a composite construct, consisting of a prosthetic articulation within a surgically stabilized humerus. As such, “worst-case scenario” testing to evaluate both components of the construct represents a logical and clinically relevant means of predicting the likely response to early postoperative loading. Taken in isolation, the positive results reported by Smith et al. do not guarantee clinical success of this implant but they do provide objective evidence that the implant will be capable of resisting the loads to which it will likely be exposed *in vivo* (1). Ideally, the next step of the testing paradigm for this implant system would be to evaluate the kinematics of the new joint *ex vivo* and then to undertake a limited pre-clinical study (if the implant contains non-standard materials or coatings) or to move into a single-center prospective clinical trial in a well-defined patient population. The outcomes from this clinical trial would provide a second opportunity for a go/no-go decision to be made, and positive results would support the more widespread introduction of the implant system into clinical patients.

The paper by Vezzoni et al. describes an elegant revision option for managing aseptic loosening of the acetabular component of the Zurich (cementless) hip system (4).



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The demand for revision procedures has increased dramatically over the last 10 years in human orthopedics, driven in large part by the increase in the numbers of patients undergoing primary hip or knee replacement procedures (5). As veterinary orthopedics continues to evolve, we will see both systematic improvements in current implant designs, as well as the development and introduction of new solutions for total disc, hock and shoulder replacement (6). These new implants will revolutionize our ability to manage patients with degenerative disc or joint disorders, increasing the number of patients for whom total joint replacement is a clinically appropriate treatment. However, even if clinical results with these new implants turn out to be as good as those with current total hip replacement implants, revision procedures will still be needed to deal with failures of fixation, the consequences of implant wear, and the

devastating effects of infection on periprosthetic bone. As we continue to expand and improve the instruments, implants and techniques available to veterinarians undertaking orthopedic surgery, we should be mindful of the fact that artificial joints have a finite working life span. The complications that develop as a consequence of, or that lead to, total joint replacement failure are the same now as they were in the early days of Charnley. In the words of Jean-Baptiste Alphonse Carr: *plus ça change, plus c'est la même chose*.



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