ORTHOTICS AND PROSTHETICS IN VETERINARY MEDICINE

Caroline P. Adamson, MSPT, CCRP
Alameda East Veterinary Hospital, Denver, Colorado

Orthotic and prosthetic prescription is a well-known intervention in human physical therapy to achieve rehabilitative goals. An orthotic device is designed to support a weak or injured limb; whereas a prosthetic device replaces a missing limb. Until recently, the use of these devices has been limited in the field of veterinary medicine.

The goal of an orthosis may include: to provide rest to an injured limb, immobilization, joint protection, control of a limb, and/or to assist, prevent, or correct movement. If the therapist's goal is to rest a part of the body, the orthosis must be able to substitute for, or assist with, the action of the muscles. Orthotic intervention, on the other hand, may be indicated to immobilize a limb to reduce pain or provide joint protection immediately following surgery or injury. In these cases, the orthosis takes over the role of intrinsic stability normally achieved by the bony, ligamentous, or muscular components of the animal.

Prior to consideration of a prosthesis, goals of treatment for a patient that has undergone a limb amputation must be met. Imperative for functional outcomes is the identification of the spared muscle groups and their respective function. Full range of motion in all remaining joints of the involved extremity must be available. Cardiovascular endurance must be improved. Pain and inflammation can be decreased utilizing appropriate modalities. Finally, prevention of adhesion and scar management must be achieved to maintain soft tissue mobility. Once these goals have been met, appropriateness of a prosthesis may be evaluated. And, treatment of the entire animal is necessary, especially evaluation of the uninvolved limb(s) as fatigue and overloading is often present.

Other considerations are just as important for achieving a successful outcome when considering orthotic and prosthetic intervention. Skin integrity and sensitivity of the underlying tissues must be known. The orthotic should not restrict the impact the performance of the patient. A patient should be able to freely perform transitional functional tasks such as sitting to standing, particularly for patients with neurological or musculoskeletal deficits.

Three cases describing canine patients who have received an orthosis or prosthesis will be discussed. The first is Finn, a 1½ year old Newfoundland diagnosed with distal tibial torsion causing a varus deformity of the hind foot with internal tibial torsion. Which happened first, the varus deformity or the tibial torsion? They actually feed into one another, continuing the abnormal biomechanical cycle. With a varus deformity, the foot is inset. This brings the weight line inside the stifle joint. As the dog walks because the weight line is abnormally medial to the joint, the joint has an outward torsion moment. The body restructures to the pressure causing the internal tibial torsion. This also feeds into the varus deformity which continues to worsen, thus the abnormal biomechanical cycle continues.

In order to counteract these abnormal biomechanics during ambulation, the dog's body weight is used to help counter the progression of the deformity. Ironically, it is also the dog's body weight that is feeding this deformity through the animal's weight line. Thus, the weight line is moved

laterally by adding a lateral post. This post keeps the weight line more lateral and therefore minimizes the torsion of the stifle joint. The proximal lateral plastic on the orthotic also gives a medial force to minimize the varus deformity.

Cheyenne is a 9 year old German Shepherd with a history of a right stifle cruciate tear. He is not a candidate for surgery at this time. In order to stabilize the dog's stifle and hopefully prevent cranial drawer motion, a stifle brace was designed. Previous designs of a Stifle Ox used circumferential pressure to help stabilize the stifle. By holding the stifle in all directions all motion was stopped. It was this theory that was used to hold the limb stiff.

Our particular design utilizes a more biomechanically sound theory of a three-point pressure system to help reduce the anterior draw of the tibia on the femur. The first force is pointed posterior and is placed on the proximal anterior tibia. The second and third forces are pointed anterior. The second is the cuff on the thigh section, and the third is the plastic on the distal posterior tibia.

Using this three point force system, motion at the stifle joint is allowed while maintaining stability of the stifle. To avoid suspension issues, a Neoprene sleeve velcroed to the Ox helps hold it in position and keep it from slipping.

Rubi is a 6 year old Chihuahua that suffered a left forelimb amputation secondary to throwing a blood clot. A clam shell prosthetic suspended above the bony condyles of the distal radius and ulna has been designed to replace her missing forelimb. The liner is designed with a gel lining to lessen shear forces on Rubi's skin and provide a cushion to avoid irritation to her residual stump.

These three cases describe the numerous uses for and subjectively successful outcomes of orthotic and prosthetic intervention. The next challenge is to objectively analyze gait while the animal dons these devices to determine actual changes in biomechics and weightbearing.