THE AVAILABILITY AND PRACTICALITY OF PROSTHETICS FOR DOGS

Emily Nutter (emn32@pitt.edu)

INTRODUCTION: MY THREE LEGGED DOG, SUNNY

In July 2015, my family noticed a strange wound on the pad of the rear left leg of our dog, a happy seven-year old yellow Labrador retriever named Sunny. We took her to the vet and they informed us she most likely had stepped on something and gotten a foreign object embedded in her foot and it would heal with prescribed antibiotics to help fight any infections present. It did not heal but the vet claimed that the pad of a dog’s foot is made from different tissue than regular skin and it would longer. By December 2015, the wound had tripled in size and her temperament was constantly unhappy. We took her to a different vet who took a biopsy and diagnosed her with squamous cell carcinoma, a type of skin cancer. The only treatment options were to try to rebuild the pad with a high risk of the cancer returning or amputate the whole leg up to the hip. We decided the best treatment for her future was the amputation, so on January 28, 2016, my dog became a member of the ‘tri-pawd’ community. We decided to research dog prosthetics to understand the cost and practicality of getting her a prosthetic leg or if it would be more beneficial to have her learn to walk on three legs.

DIFFERENTIATING BETWEEN NON-ELECTIVE AMPUTATION AND CONGENITAL LIMB MALFORMATIONS

When considering a dog prosthetic for your pet, you need to acknowledge the major differences between a dog that needs to have their leg amputated due to cancer or an accident verses a dog who is born with a congenital deformity or limb malformation that causes them to have a shorter leg or partial leg. In the case of an amputation, you’d want to preserve as much of the original leg as possible in order to keep aesthetic and functional properties. For Sunny, because her cancer was concentrated in her foot, we thought a partial amputation would be the best option so she’d have as much of her leg left as possible. You have the same “major risks associated with anesthesia/partial limb amputation are the same as for full limb amputation, however, the procedure is less invasive and involved” [1], but a hip or pelvic level amputation makes the dog ineligible for a prosthetic. A significant amount of the original limb must be present in order to attach the artificial limb to the residual limb. We most commonly see a “high femur amputation that results in a short, well-padded stump at the level of the rump/thigh. The muscles of the mid-thigh are cut and the femur is cut close to the hip” [2]. Veterinary surgeons do this because it’s easier for them and for amputations to treat malignant neoplasms, a higher amputation is preventative action to ensure there is no cancerous regrowth. A dog with a congenital amputation or congenital limb malformation could have a residual leg of any length and therefore is more likely to be eligible for a prosthetic.

My family’s first reaction to learning Sunny would need an amputation was to try and understand what getting a prosthetic would entail. We consulted the veterinarian who would be preforming the operation, Dr. Alexandra Bray, and she advised against amputating to accommodate for a prosthetic. Dr. Bray informed us that it would be more difficult for Sunny to recover from the amputation and then learn to walk on a prosthetic. A seven-year old dog would have trouble adjusting to a new four-legged gait with a prosthetic rather than the gait of three legs [3]. A dog with a prosthesis “…must relearn (or in the case of a congenital amputee, learn) proprioception, balance, gaitting at different speeds, and ambulation over varied terrain” [4]. For quadruped dogs this means you are essentially redesigning a four-legged motor plan already that is already established.

OBSTACLES IN OBTAINING AND MAINTAINING PROSTHETICS FOR YOUR DOG

Current technology for keeping a human leg prosthetic on include a socket with a liner which uses “suction, vacuum and pin lock” [5] most commonly. It is important that the prosthetic fit properly as well, because “a poorly fitted socket can lead to pain, sores, and blisters on [the] residual limb” [5]. The problem with a suction, vacuum, or pin lock prosthesis for dogs is their inability to communicate discomfort and therefore they are more susceptible to having sores. As I’ve mentioned before, there must be significant leg left since “the most successful fittings happen if the amputation is done through the carpus (wrist) or below, or through the hock (ankle) or below” [6]. If there isn’t a
substantial amount of leg, “the long segment that needs to be created to span the distance to the ground is often difficult for the dog to manipulate…there is also a tendency for the dog to hold the residual limb in and toward their body, thus making it difficult for them to want to put weight through the device” [6].

If the dog somehow loses the prosthetic for any reason, leaving part of the leg also runs “a high risk for trauma to residual limb segment” [4]. If the dog tries to use the gait pattern it learned while wearing the prosthetic, they will have an awkward non weight bearing limb that alters their center of gravity and can cause them to fall. A pet with a partial leg amputation will try and weight bear on a stump if they feel there is enough leg left, so “the length of the leg is such that the dog is often trying to touch it down to the ground…a device needs only to protect the residual limb and to add enough length so the dog can weight bear through it effectively” [6].

The biggest obstacle for acquiring prosthesis is the fact that not enough veterinarians are trained to develop proper prosthetics. While there are technologies like 3-D printing being applied to human prosthesis to minimize cost, not enough people have a proper “…understanding of animal biomechanics in order to create a prosthesis that works safely and comfortably without causing harm and injury” [7]. Just like with human prosthesis, dog prosthesis requires a professional to fit and develop a prosthetic that will most benefit the dog. A veterinarian might also not have the skills to amputate a dog’s leg to allow for a prosthetic. Since dog prosthesis is a fairly new development, most vets do not even consider a prosthetic and opt for a high full amputation.

CONCLUSION: ARE DOG PROSTHESIS NECESSARY?

While dog prosthesis is not common, it can greatly improve the quality of life for congenital or non-elective canine amputees. Because dogs weight bear on all four of their legs, the biomechanics you must consider when designing the prosthetic are different from that of a human, especially when looking at the front legs of a dog. Despite being called a quadruped, implying four feet, the anatomy of the bones in the front two legs actually mimic that of the forearms of a human, while the back legs imitate the back legs of a human. A dog’s front legs have bicep and triceps muscles like a human arm while their back legs have quadriiceps and gastrocnemius muscles like a human leg. About 60% of the body weight of the dog is supported by the front two ‘legs’, despite the fact that these legs are not as strong as the back two. A dog amputee that learns to walk on three legs has all of the weight held previously by two legs now all on one leg. That means for the front legs, the 60% that was once split by two legs each holding 30% of the weight, an amputee has all 60% of the weight now entirely on the remaining front leg. The back legs are not as dramatic of a change, and a single remaining back leg holds 40% of the weight. This is still double the weight on one leg, but it almost evenly out to the front (30%, 30%, 40%). Amputees who learn to walk on three legs are prone to orthopedic injuries, but a prosthetic can decrease the likelihood of this occurring by relieving some of the weight that the remaining limb has to hold. Sunny’s amputation is a little higher than mid rear thigh since we decided that it was the safest decision for her, even if her cancer was just on the pad of her paw. She has adapted well to walking on three legs and gets stronger and more confident each day. I think for a dog that has cancer and needs an amputation, the more leg you take of will just ensure the safety of the animal. They won’t be tempted to weight bear on the residual limb and you will be removing more of the area cancer could have infected.

This is not saying there is no necessity at all for dog prosthetics. Congenital amputations are an obvious reason to get a prosthetic so the dog can adapt from when they are young. Prosthesis can hugely relieve the remaining limbs by redistributing the weight on the legs to the natural distribution. In order for dog prosthesis to become more normal, there needs to be a greater demand for it so more people are willing to pursue a career as a canine prosthetist/orthotist. I think dog prosthetics are not an absolute necessity because dogs can adapt so well to walking on three legs, however they should be more accessible if an owner or veterinary professional thinks it’s a necessity and a prosthetic would improve the quality of the dog’s life.

SOURCES


ADDITIONAL SOURCES


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