FOOT PAD SURGERY

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Introduction

The foot pads of the dog include the digital pads, metacarpal pads, and metatarsal pads. They are capable of supporting the weight of the dog over a variety of surfaces. The epidermis of the pads is 1800 µm thick, considerably greater than the 25-40-µm thickness of the hairy skin.

The epidermis of the digital pads is elevated in a series of conical papillae. Secondary conical papillae are noted within each conical structure. This conical papillary surface provides a tough "anti-skid" surface for weight bearing, whereas the underlying pad cushion serves as a "shock absorber." Comprised of subcutaneous adipose tissue and collagenous and elastic fibers, the resilient pad cushion has the ability to compress, expand, and conform during activity on uniform or irregular surfaces. No other cutaneous surface can substitute completely for this highly specialized pad structure.

To date, options for foot pad replacement have focused on transposing or advancing digital pads to areas where their placement will provide a durable, weight-bearing surface. Careful dissection of the phalanges via a palmar or plantar incision may enable the surgeon to replace metacarpal or metatarsal pad defects (resulting from injury, tumor excision, or abnormal weight bearing secondary to musculoskeletal injuries) with one or more digital pads. With loss of the digital pads from trauma or disease, it is possible to advance and rotate the surviving metacarpal or metatarsal pad over the end of the exposed metacarpal or metatarsal bones to provide a satisfactory weight-bearing surface.

Complete loss of all foot pads of the forelimb or hind limb in the dog is considerably more serious since no adjacent pad tissues are available for coverage. Skin, as a pad substitute, generally lacks the durability to withstand the daily physical abuse normally sustained by foot pads in all but the smallest veterinary patients. In cats, successful skin coverage of the foot requires restricting the cat to a more sedentary existence in the house, ideally on soft surfaces to minimize trauma to the cutaneous transplant. In large dogs, amputation of the involved limb has been performed when there was no viable option for pad replacement.

In providing a durable pad surface to the affected limb devoid of foot pads in large dogs, three potential options exist: microvascular transfer of a digital pad from another foot, free grafting of a digital pad from another foot, or possible delayed cross-limb reimplantation from the opposite limb. Each technique has potential advantages and disadvantages. Although experimental attempts at transplanting small punch grafts of pad tissue into denuded areas failed to achieve satisfactory coverage in one study, more recently rectangular pad grafts were used to repair a traumatized foot successfully.

Pad Laceration and Lesion Excision

The thick corneal pad is susceptible to abrasive and shearing forces during ambulation. The feet also are susceptible to sharp objects that may result in penetrating wounds or lacerations.

Freshly lacerated wounds can be lavaged, debrided and closed primarily. Grossly contaminated or infected wounds may require open wound management for a variable period of time prior to closures.
Foot pads have relatively poor "suture holding power". Sutures can pull out of the dermal-corneal tissues during ambulation. The displacement of the underlying pad cushion can further stress any suture line. As a result, 2-0 sized suture materials, employing vertical mattress sutures with large "bites" of pad tissue, are best employed to oppose pad lacerations. A heavily padded foot bandage, possibly with a metallic or plastic Mason metasplint, is advisable to blunt impact and minimize digital cushion spread beneath the incision. It is strongly advisable to protect the healing pad for approximately three weeks to help assure proper healing. In general, sutures can be removed in about two weeks.

**Digital Pad Transfer**
Digital pads tethered on a vascularized cutaneous pedicle can be transplanted within their arc of rotation to defects on weight-bearing surfaces. This is most useful when portions of the metatarsal or metacarpal pads are lost. Similarly, abnormal weight-bearing as a result of limb trauma may require positioning a digital pad over an ulcerated area.

A ventral incision, for removal of the first and second phalanx, is preferable to a dorsal incision, thus enabling immediate placement of the flap into its new position. The veterinary surgeon will find that pads heal more slowly than other skin closures. Partial dehiscence may be noted, but the sutures can easily be replaced. A heavily padded bandage with external support is required to promote healing in this weight-bearing area.

**Metacarpal/Metatarsal Pad Transfer**
Loss of the digital pads from trauma or disease may require repositioning of the metacarpal or metatarsal pad to provide a durable weight-bearing surface to the limb. This procedure can result in a fully functional limb despite the loss of all digits.

**Pad Grafting**
Complete traumatic loss of the pads of a foot presents a significant problem to a dog: amputation may be necessary. However, severed digital and metacarpal/metatarsal pads have the potential to be grafted onto the limb.

**Reference**