**Tenotomy as a Treatment for Laminitis**

When used to treat complicated or unresponsive laminitis, deep digital flexor tenotomy remains the most cost-effective salvage procedure available. Patients with laminar damage sufficient enough to be considered for tenotomy have lost all potential for future athletic ability. Tenotomy is performed as a salvage procedure so the animal can be used as a broodmare or possibly as a pleasure horse. ( Turner, O'Grady, et al 1993) (Eastman 1998 )

Though the indications for a tenotomy will vary with individual cases, there are two basic guidelines. Tenotomy is indicated if1:

* The distal phalanx has rotated more than 12o in the first 30 days of the syndrome
* The extensor process is displaced distally as much as 1 cm during the first week of the disease.

Other candidates for tenotomy include unresponsive cases with massive laminar damage, or horses with chronic laminitis in which other forms of foot support and/ or heel elevation have been unsuccessful.

Following tenotomy, the distractive forces exerted by the deep digital flexor tendon are eliminated, and the tension on the apex of the distal phalanx is relieved, thus allowing increased blood flow to the laminae and solar corium. There is also an increase in the depth of the sole, resulting in immediate improvement in most cases (e.g. decreased pain, resolution of abscesses and seromas, and new growth in the sole and horn wall). The long-term effects of tenotomy can be extended if the procedure, in addition to therapeutic shoeing, is performed before evidence of bone disease such as osteomyelitis or osteoporosis occurs2.

In cases in which tenotomy is performed, it is helpful to work with a farrier to ensure that proper hoof care is provided. Proper hoof care entails realignment of the distal phalanx within the hoof capsule (derotation), and postoperative support of the heel area.

Derotation can be performed before or at the time of surgery using radiographs or the plane of the frog to determine the amount of heel to be removed. In lowering the heels, the distal phalanx should be repositioned as parallel to the ground as possible, thus taking the weight off the anterior portion of the bone. Lowering the heel in a tapered fashion begins at the apex of the frog and continues in a posterior direction until the frog is nearly parallel to the ground. Trimming in this manner increases the amount of hoof surface at the heels in contact with the ground before tenotomy, thus creating further stability following surgery. The toe is shortened from the dorsal hoof wall back to the white line (zona alba) to further align the hoof capsule to the dorsal surface of the distal phalanx and remove any additional bending forces at the toe. If hoof trimming is performed before surgery, the horse should be placed in wedges until surgery is performed because the force exerted by the deep digital flexor tendon on the newly trimmed hoof will increase the horse's discomfort.

Tenotomy is performed on the standing animal using a proximal metacarpal palmar nerve block. A 2 to 3 cm incision is made over the lateral aspect of the deep digital flexor tendon in the middle of the third metacarpal bone. This approach provides good exposure of the tendon and allows the surgeon to perform the procedure quickly and safely. The fascia is separated, and, with the limb flexed, the tendon is isolated and brought to the surface of the wound using small, curved retractors. The tendon is transected (Figure 1), and the wound is closed using a few skin staples. The limb is then bandaged. The bandage is changed at weekly intervals. The use of an extended heel shoe or preferably an egg bar shoe is indicated following surgery. This shoe will prevent the toe lift that may accompany a deep digital flexor tenotomy and will support the posterior aspect of the foot as the horse's weight shifts toward the heels. Shoeing will also prevent stretching of the palmar joint capsule, which results when the distal phalanx is returned to a more normal angle. This is thought to cause pain in the caudal hoof area.

Recently this author has glued most of the shoes on horses with laminitis. The advantages are it causes no trauma to the foot and the amount of composite used on the ground surface can be varied to provide better alignment of the bone within the hoof and eliminate sole pressure

If laminitic abscessation has occurred and is draining in the sole, a treatment plate made from ¼ in aluminum or aviation grade plastic can be attached to toe bottom of the shoe to facilitate treatment of the solar area. This plate can hold medication (such as gauze soaked in povidone iodine) against the solar area and will also protect the sole from bruising. The shoes can be applied before surgery or two weeks after surgery when the skin staples or sutures are removed.

Strict stall confinement is a necessity for the patient with massive laminar damage in which tenotomy was performed early in the course of the disease. These horses must be confined until the new growth ring extends three-fourths of the way down the hoof wall (this requires about six months). This amount of growth is necessary to establish a sufficient bond between the hoof wall and distal phalanx to adequately support the weight of the horse. Premature turnout or hand walking invariably results in treatment failure.

The chronic laminitis patient is confined to the stall for one month following a tenotomy, and brief periods (10 to 20 minutes twice daily) of hand walking are allowed. Turning the animal out in a small, flat paddock is permitted during the second month if the recovery has been satisfactory, as determined by an increase in hoof growth and sole depth and a decrease in pulse and lameness. Strict attention to hoof care and shoeing after surgery is necessary in order to obtain the maximum long-term benefits from the procedure.

Monthly follow-up radiographs are necessary after tenotomy to monitor the alignment of the distal phalanx. The distal phalanx should be realigned with the hoof capsule so that it is nearly parallel to the ground. Radiographs will help you determine how much sole should be trimmed to achieve this realignment. The rapid increase in sole depth after tenotomy requires that adequate sole be trimmed. Otherwise, extreme derotation of the distal phalanx may occur with weight abnormally placed on the heels.