



## Tibial Tuberosity Advancement (TTA) for treatment of canine cranial cruciate ligament deficiency

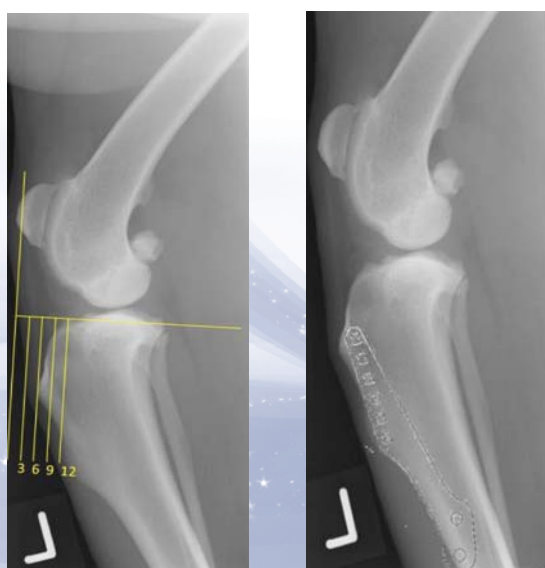
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### Indications

- 1 Tibial tuberosity advancement (TTA) is indicated for dogs with cranial cruciate ligament rupture (partial or complete tear) (Lafaver and others 2007)

### Pre-operative planning

An extended 135° mediolateral radiograph of the stifle is used for implant sizing. The TTA template is used to calculate the advancement distance to produce a patella tendon/tibial plateau angle of 90° at full extension (Figure 1A). A line is drawn tangentially to the tibial plateau. The template is then adjusted until a line perpendicular to the tangent intersects with the cranial border of the patella tendon origin. The distance of advancement can then be read off the template which equates to the size of cage required. The template is also used to calculate the maximum size of the plate that can be attached to the tibial tuberosity. Sequential plate transparencies are offered up to the radiograph (Figure 1B) until the maximum plate size is determined.



1A

1B

Figure 1: A, templating the cage size; B, templating the plate size

### Patient preparation

A standard surgical clip is performed from the hip to just above the tarsus. The foot is covered with an impermeable barrier. The dog is positioned in dorsolateral recumbency with the affected limb on the lower side. The foot is suspended from a stand with the stand positioned on the dorsal side of the animal. Four quarter draping with an additional impermeable layer is performed. An adhesive Opsite® is placed over the exposed skin.

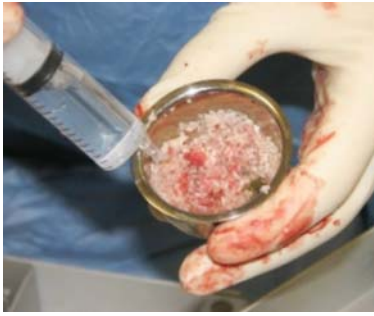
### Surgical approach

A medial approach to the stifle and proximal tibia is performed (Peirmattei and Johnson 2004). A medial arthrotomy is then performed to assess meniscal damage (or arthroscopy). Using the 8-hole drill guide the required number of holes are pre-drilled into the tuberosity using a 2.0mm drill. A partial curvilinear tibial tuberosity osteotomy is performed using an oscillating saw. The proximal aspect of the tuberosity is not completed until the plate is secured in place.

### Bone graft preparation

Grafting the osteotomy gap with allograft is recommended in this technique (Lafaver and others 2007). A suitable vial of Veterinary Tissue Bank freeze-dried canine cancellous chips (2-4mm) is chosen and rehydrated with sterile Hartmann's solution in a Galli pot. Graft volume is approximately 3cc for medium-sized dogs, 5-10cc for large and 8-10cc for giant breeds.

*Continued...*



**Figure 2:**  
**2-4mm cancellous chips are used to pack the void**

Demineralised bone matrix (DBM) (Hoffer and others 2008) as available from Veterinary Tissue Bank may be mixed with the allograft chips to further enhance osteoinduction.

## Implant placement

### Case example – 3yo Labrador with left cruciate ligament rupture



3A

3B

**Figure 3: Securing the TTA cage to the tibia. The plate can be seen attached to the tuberosity but has yet to be secured to the tibial diaphysis. A, Immediate post-TTA radiograph; cancellous graft can be seen in the osteotomy gap. B, 10 week post-operative radiograph showing osteotomy healing in the expected timeframe.**



**Figure 4**



A fork of appropriate size is inserted into the plate which is then hammered onto the tuberosity using a fork inserter. Once the osteotomy is complete the fragment is advanced using a spreader. The appropriate size cage is attached to the main body of the tibia using a 2.4mm self-tapping screw (See Figure 4). With the stifle in full flexion the tuberosity is compressed distally against the tibia, using the cage as a fulcrum, and secured with bone holding forceps. The plate is then secured to the tibia with two self-tapping screws (2.7 mm diameter for plates with 2-5 holes, and 3.5mm for plates with 6 holes or more). The cranial part of the cage is attached to the tuberosity, above the level of the plate, using a 2.4mm screw (Figure 4). Closure is routine.

## References

Hoffer, M. J., Griffon, D. J., Schaeffer, D. J., Johnson, A. L. & Thomas, M. W. (2008) Clinical applications of demineralized bone matrix: A retrospective and case-matched study of seventy-five dogs. *Veterinary Surgery* 37, 639-647.

Lafaver, S., Miller, N. A., Stubbs, W. P., Taylor, R. A. & Boudrieau, R. J. (2007) Tibial tuberosity advancement for stabilization of the canine cranial cruciate ligament-deficient stifle joint: Surgical technique, early results, and complications in 101 dogs. *Veterinary Surgery* 36, 573-586.

Piermattei, D.L. and Johnson, K.A. (2004) Approach to the proximal tibia through a medial incision. In: *An atlas of surgical approaches to the bones and joints of the dog and cat*. W.B.Saunders, Philadelphia p366-369.