

Part 1 of 3

## Veterinary Surgical Interventions & a PT Perspective



### Fore Limb Surgeries

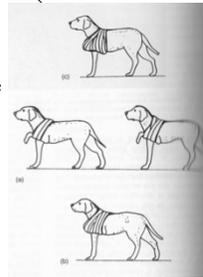
Laurie Edge-Hughes  
BScPT, CAFCI, CCRT,  
MAnimSt(Animal Physio)

## Forelimb Surgeries

- Scapular Fractures

- 
- 

- Conservative – due to soft tissue
- Velpeau Sling



## Forelimb Surgeries

- Scapular Fractures

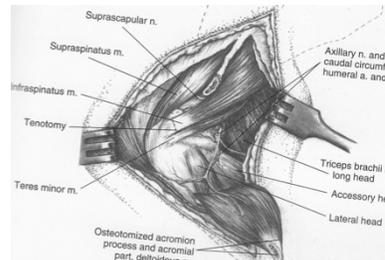
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- Internal Fixation



## Forelimb Surgeries

- Shoulder approaches (lateral)



Closure may require suturing of the osteotomized acromion

# Veterinary surgeries with PT perspective

## Forelimb Surgeries

- Shoulder approaches (lateral)

Closure may require suturing of the infraspinatus tendon

## Forelimb Surgeries

- Shoulder approaches (lateral)

Closure may require suturing of the teres minor tendon

## Forelimb Surgeries

- Shoulder approaches (lateral)

Closure may require suturing of the triceps muscle(s) and teres minor tendon

## Forelimb Surgeries

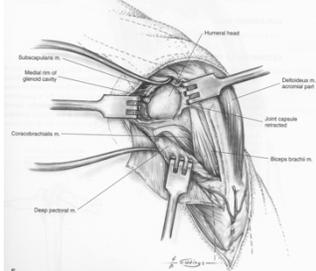
- Shoulder approaches (lateral)

Or no muscle tissues may have been damaged!

## Veterinary surgeries with PT perspective

### Forelimb Surgeries

- Shoulder approaches (medial)

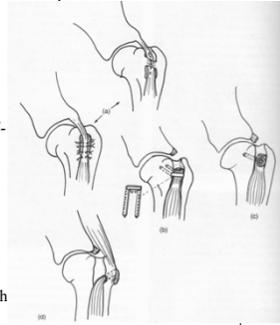


Closure may require suturing of the superficial, deep pectoral, and coracobrachialis

### Forelimb Surgeries

- Surgical management options for biceps tenosynovitis

- Transect transverse humeral ligament +/- suturing tendon to periosteum
- Sectioning tendon from scapular tuberosity and staple tendon in intertubercular groove
- Section tendon a/a and screw into intertubercular groove
- Section tendon a/a and pass through a bone tunnel in greater tubercle and attach to supraspinatus attachment



### Forelimb surgeries

- Osteochondritis Dissicans

- within 6 – 8 weeks of controlled (leashed) exercise
- Surgical interventions
  - (Shoulder, elbow, stifle, tarsus)
  - Cartilage flap is detached & removed
  - Edges of lesion are curetted (scraped) to remove loose tissues (and create some bleeding which may create scar tissue that fills in the defect).

### Forelimb Surgeries

- Elbow Dysplasia

- OCD (of the medial humeral condyle) = 25%
- FCP (medial coronoid disease) = 53%
- OCD + FCP = 12%
- UAP = 7%
- (Ununited medial humeral condyle) = 3%

Denny HR, 1995

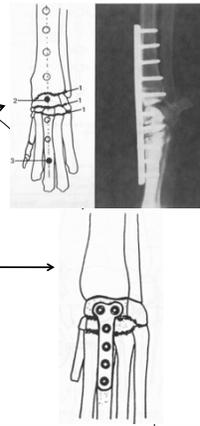
## Veterinary surgeries with PT perspective

### Forelimb Surgeries

- FCP or OCD approaches
  - 
  - 
  -
- UAP approaches
  - 
  - 
  - must be < 6 months
  - Osteotomy (distal to joint, releasing the proximal segment)

### Forelimb Surgeries

- Pancarpal Arthrodesis
  - For carpal hyperextension injuries
  - Plating the anterior surface of the carpus
- Partial Carpal Arthrodesis
  - Pinning/Plating the midcarpal & carpometacarpal joints
  - NOTE: cartilage is removed prior to plating in both Sx



### Forelimb Surgeries

- Radius Curvus
  - Lesion can occur in any of the physes
  - Distal ulnar physeal lesion is most common

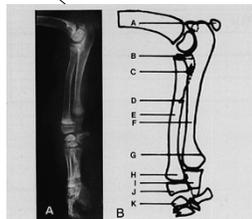


FIG. 45-1 (A) Radiograph of the foreleg of a 3-week-old foal. (B) Drawing of foal leg. Proximal epiphysis: (a) ulnar and (b) radial. Nutrient foramina: (c) ulnar and (d) radial. Distal epiphysis: (e) ulnar and (f) radial. Distal metaphyses: (g) ulnar and (h) radial. Distal epiphyses: (i) ulnar and (j) radial. (k) Carpal bone. (Riser WH, Shiver JF: Normal and abnormal growth of the distal foreleg in large and giant dogs. J Am Vet Radiol Soc 6:50, 1965)

### Forelimb Surgeries

- Radius curvus & distal ulnar physeal closure
  - length distal to elbow
  - Usually closes btwn 220 & 250 days of age
  - Signs
    - Cranial & lateral bowing of distal radius
    - Ulnar shortening
    - Valgus at carpus / External rotation at paw
    - DJD at elbow & carpus
    - Elbow subluxation +/- # of anconeal process

# Veterinary surgeries with PT perspective

## Forelimb Surgeries

- Radius curvus & distal ulnar physeal closure



## Forelimb Surgeries

- Radius curvus & distal ulnar physeal closure
  - Young dog (< 5 months) with < 25 degrees valgus
    - Distal ulnar ostectomy with fat graft
    - Triceps pulls the proximal portion up into the elbow
  - Mature dog
    - Focus on carpal and/or elbow problems
    - Radial derotational osteotomy with a plate
    - May also utilize a proximal ulnar dynamic osteotomy

The End



Next – Rear Limb Surgeries

Part 2 of 3

## Veterinary Surgical Interventions & a PT Perspective



### Rear Limb Surgeries

Laurie Edge-Hughes  
BScPT, CAFCI, CCRT,  
MAnimSt(Animal Physio)

## Veterinary surgeries with PT perspective

### Rear Limb Surgeries

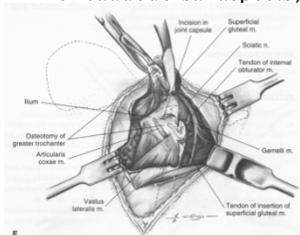
- Canine Hip Dysplasia
  - Surgical Options:
    - Triple Pelvic Osteotomy (for dogs 5 – 8 months)  
(Doornink et al JAVMA 2006: 35 – 70% complication rate)
    - Juvenile Pubic Symphysiodesis (for dogs 3 – 5 months)  
(Manley et al 2007 JAVMA: JPS & TPO have similar effects on hip conformation in dogs with moderate to severe CHD, but neither eliminates the laxity present with CHD or the progression of DJD)

### Rear Limb Surgeries

- Canine Hip Dysplasia
  - Surgical Options:
    - Total Hip Replacement
    - 
    - Femoral Head Osteotomy
    - dysfunction
    - Capsular Denervation
    - Watch for Wallerian degeneration & muscle dysfunction

### Rear Limb Surgeries

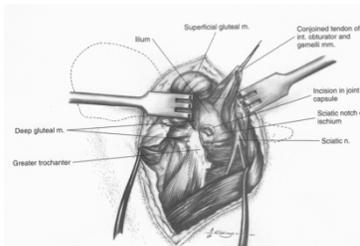
- Surgical approaches to the hip (craniodorsal or caudodorsal aspects)



Closure will require reattachment of the greater trochanter & suturing of the superficial gluteal insertion to the TFL, gluteal fascia, and biceps femoris

### Rear Limb Surgeries

- Surgical approaches to the hip (caudal aspect)



Closure requires suturing of the tendon of internal obturator and gemelli mms to the insertions of the deep & middle gluteals

# Veterinary surgeries with PT perspective

## Rear Limb Surgeries

- Surgical approaches to the hip (ventral aspect)

Closure requires suturing of the pectineus muscle to the prepubic tendon (not done in TPO/Sx)

## Rear Limb Surgeries

- The darn cruciate!
  - \$1.32 Billion dollar industry in 2003
  - Wilke et al 2005 JAVMA

## Rear Limb Surgeries

- Extracapsular Technique
  - Still the most commonly used
  - Original work: DeAngelis

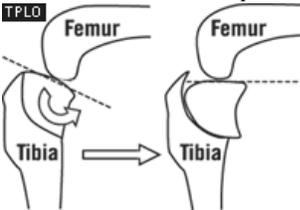
## Rear Limb Surgeries

- Extracapsular Technique
  - Modified Retinacular Imbrication Technique

# Veterinary surgeries with PT perspective

## Rear Limb Surgeries

- Tibial Plateau Levelling Osteotomy
  - Created by Barclay Slocum, 1993
  - Licensed technique / Instrumentation / Implants



The diagram shows two views of a knee joint. On the left, the femur and tibia are shown with a dashed line representing the tibial plateau slope. An arrow points to the right, where the femur and tibia are shown with a solid line representing the corrected slope. Labels 'Femur' and 'Tibia' are present. A small box labeled 'TPLO' is in the top left.

Theory: Slope of the tibial plateau determines shearing forces on CCL during weight bearing.  
Excessive slope = wear & tear of CCL  
Sx = correct slope with or without medial meniscal release

## Rear Limb Surgeries

- Lateral preoperative assessment of right stifle. There is mild osteoarthritic change. The Tibial plateau angle (TPA) is 25 degrees



A lateral radiograph of a right stifle joint. A line is drawn across the tibial plateau to measure the angle. The text indicates this angle is 25 degrees.

## Rear Limb Surgeries

- Tibial plateau levelling osteotomy postoperative radiograph. The TPLO bone plate has been applied stabilising the proximal tibia at a TPA of 6 degrees



A lateral radiograph of the same right stifle joint after TPLO surgery. A long, white bone plate is visible along the proximal tibia, stabilizing it. The tibial plateau is now level.

## Rear Limb Surgeries

- TPLO postoperatively demonstrating normal limb alignment with the stabilising bone plate



A lateral radiograph of the same right stifle joint after TPLO surgery, showing the bone plate and the resulting normal limb alignment.

# Veterinary surgeries with PT perspective

## Rear Limb Surgeries

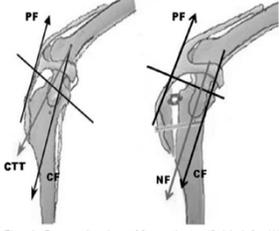
- Tibial Plateau Levelling Osteotomy



Note: in order to place the plate, the medial structure (pes anserine) is lifted and later sutured to fascia. The tibialis anterior is also lifted in order to saw the tibia.

## Rear Limb Surgeries

- Tibial tubercle advancement

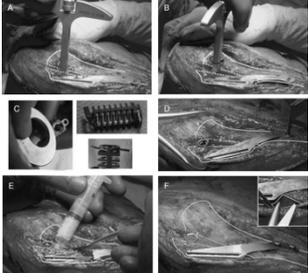


Created by Dr Slobodan Tepic @ the U. Of Zurich  
Based on the same tibial slope / tibial trust premise

Figure 1 - Representative scheme of forces acting on stifle joint before (A) and after (B) modified TTA.  
PF: Patellar forces, CF: Compression forces, CTT: Cranial Tibial Thrust, NF: Neutral force.

## Rear Limb Surgeries

- Tibial tubercle advancement



Note: In order to place the plate, the caudal belly of sartorius is incised, as well as the aponeurosis of gracilis, semitendinosus, & semimembranosus

## Rear Limb Surgeries

- Tight Rope Procedure



Illustrations of a TightRope® CCL surgical procedure taken from the Arthrex® Vet Systems procedure manual. Used with permission.

## Veterinary surgeries with PT perspective

### Rear Limb Surgeries

- Surgical Management of Cruciate Disease:
  - Conzemius et al (*JAVMA* 2005;226:232–236)

**Objective**

for rupture of the cranial cruciate ligament (RCCL) and injury to the medial meniscus in Labrador Retrievers.

**Animals**—131 Labrador Retrievers; unilateral RCCL & injury to the medial meniscus and 17 clinically normal Labrador Retrievers.

**Procedure**—RCCL dogs had partial or complete medial meniscectomy and lateral suture stabilization (LSS), intracapsular stabilization (ICS), or tibial plateau levelling osteotomy (TPLO). Limb function was measured before surgery and 2 and 6 months after surgery.

**Results**—No difference between LSS or TPLO groups, but dogs treated with ICS had significantly lower ground reaction forces at 2 and 6 months. Compared with clinically normal dogs only, 14.9% of LSS-, 15% of ICS-, and 10.9% of TPLO-treated dogs had normal limb function. Improvement was seen in only 15% of dogs treated via ICS, 34% treated via TPLO, and 40% treated via LSS.

**Conclusions and Clinical Relevance**—Surgical technique can influence limb function after surgery. Labrador Retrievers treated via LSS, ICS, or TPLO for repair for of RCCL and medial meniscal injury managed with partial or complete meniscectomy infrequently achieve normal function. Results of LSS and TPLO are similar and superior to ICS.

### Rear Limb Surgeries

- Surgical Management of Cruciate Disease:
  - Au et al (*Vet Surg* 2010;37(2):173–180)

**OBJECTIVE:** To compare short- and long-term functional and radiographic outcome of cranial cruciate ligament (CrCL) injury in dogs treated with postoperative physical rehabilitation and either tibial plateau leveling osteotomy (TPLO) or lateral fabellar suture stabilization (LFS).

**METHODS:** Dogs with CrCL injury were treated with either TPLO or LFS and with identical physical rehabilitation regimes postoperatively. Limb peak vertical force (PVF) was measured preoperatively and at 3, 5, and 7 weeks, and 6 months and 24 months postoperatively. Stifles were radiographically assessed for osteoarthritis (OA) preoperatively and 24 months postoperatively.

**RESULTS:** Thirty-five dogs had LFS and 30 dogs had TPLO. Radiographic OA scores were significantly increased at 24 months compared with preoperative scores in all dogs. Radiographic OA scores preoperatively and at 24 months were not significantly different between treatment groups. PVF was significantly increased from preoperative to 24 months among both treatment groups but not significantly different between treatment groups preoperatively or at 3, 5, 7 weeks, 6, or 24 months.

**CONCLUSION:** No significant difference in outcome as determined by ground reaction forces or radiographic OA scores were found between dogs with CrCL injury treated with LFS or TPLO.  
**CLINICAL RELEVANCE:** LFS and TPLO remain good options for stabilizing stifles with CrCL injury with all dogs showing significant functional improvement. This study does not support the superiority of either surgical technique.

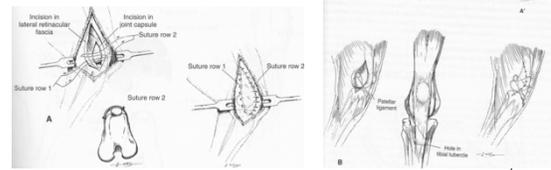
### Rear Limb Surgeries

- Surgical Management of Cruciate Disease:
  - Gordon-Evans et al (*J Am Vet Assoc* 2013;243(5):675–680)

**Objective:** To compare 1-year outcomes after lateral fabellar suture stabilization (LFS) and tibial plateau leveling osteotomy (TPLO) for the treatment of dogs with cranial cruciate ligament disease. Design: Randomized blinded controlled clinical trial. Animals: 80 dogs with naturally occurring unilateral cranial cruciate ligament disease. Procedures: All dogs were randomly assigned to undergo LFS (n = 40) or TPLO (40). Clinical data collected included age, weight, body condition score, history information, stifle joint instability, radiographic findings, surgical findings, and complications. Outcome measures were determined prior to surgery and at 6 and 12 weeks and 6 and 12 months after surgery, including values of pressure platform gait analysis variables, Canine Brief Pain Inventory scores, owner satisfaction ratings, thigh circumference, and stifle joint goniometry values. Results: Signalment and data for possible confounding variables were similar between groups. Peak vertical force of affected hind limbs at a walk and trot was 5% to 11% higher for dogs in the TPLO group versus those in the LFS group during the 12 months after surgery. Canine Brief Pain Inventory, goniometry, and thigh circumference results indicated dogs in both groups improved after surgery, but significant differences between groups were not detected. Owner satisfaction ratings at 12 months after surgery were significantly different between groups; 93% and 75% of owners of dogs in the TPLO and LFS groups indicated a satisfaction score  $\geq 9$  (scale, 1 to 10), respectively. Conclusions and Clinical Relevance: Kinematic and owner satisfaction results indicated dogs that underwent TPLO had better outcomes than those that underwent LFS.

### Rear Limb Surgeries

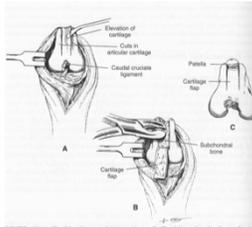
- Patellar Luxation
  - Imbrication of joint capsule & derotational sutures
  - (if sulcus is deep)



# Veterinary surgeries with PT perspective

## Rear Limb Surgeries

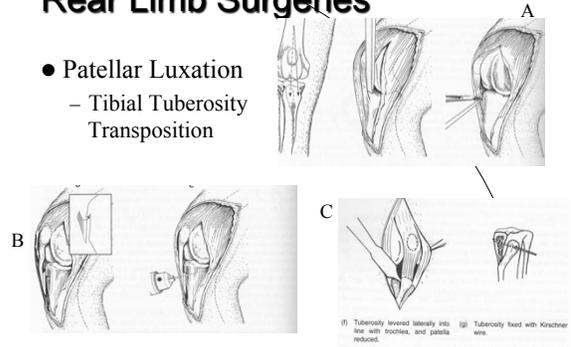
- Patellar Luxation
  - Trochleoplasty



More pictures found in your Intro to Canine Rehab manual

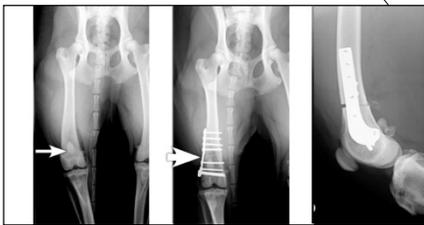
## Rear Limb Surgeries

- Patellar Luxation
  - Tibial Tuberosity Transposition



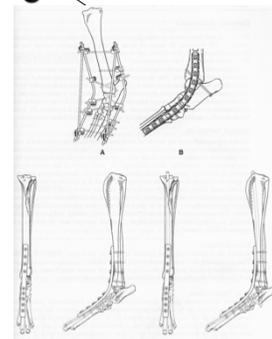
## Rear Limb Surgeries

- Patellar Luxation
  - Femoral Osteotomy



## Rear Limb Surgeries

- Pantarsal Arthrodesis



# Veterinary surgeries with PT perspective

The End



Next – Spinal Surgeries

Part 3 of 3

## Veterinary Surgical Interventions & a PT Perspective

### Spinal Surgeries



Laurie Edge-Hughes  
BScPT, CAFCI, CCRT,  
MAnimSt(Animal Physio)

### Spinal Surgeries



### Spinal Surgeries

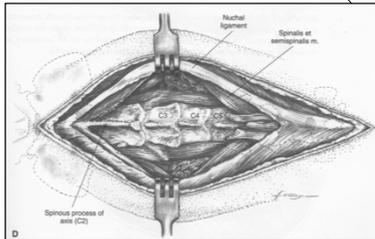
- Neurological Grades:
  1. Pain Only
  2. Ambulatory paresis
  3. Non-ambulatory paresis
  4. Paraplegia
  5. Paraplegia + urinary retention overflow
  6. Loss of conscious pain sensations



## Veterinary surgeries with PT perspective

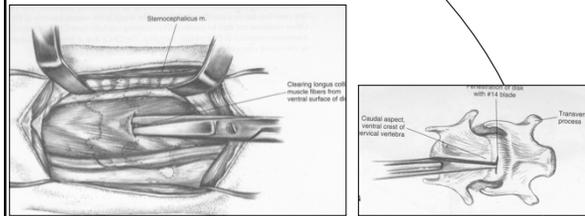
### Spinal Surgeries

- Midcervical Vertebral Dorsal Approach



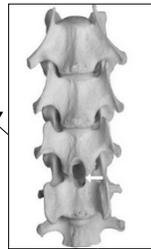
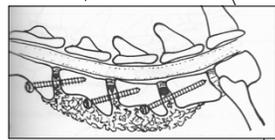
### Spinal Surgeries

- Cervical Vertebrae & Ventral Approach



### Spinal Surgeries

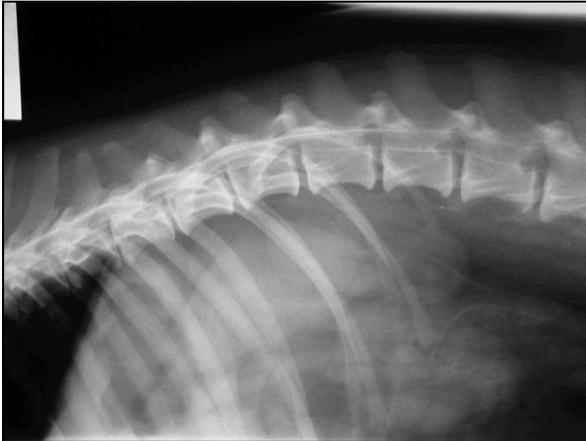
- Wobblers Surgeries
  - Ventral slot +/- Fenestration
  - Decompression & Stabilization
  - Dorsal Laminectomy



### Spinal Surgeries

- A Note on Surgical Interventions in the C/S for Wobblers Disease: (daCosta & Parent 2007, daCosta et al 2006)
  - Both medical and surgical treatment of caudal cervical spondylomyelopathy improved the clinical conditions of the animal and slowed the progression of clinical signs and MRI abnormalities.
  - Decompression hastened the development of additional areas of compression
  - Median survival time (36 months) was equivalent in both groups

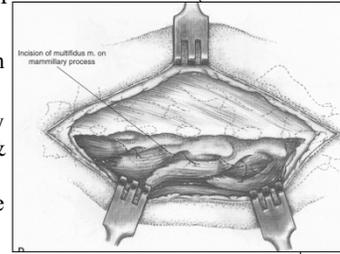
## Veterinary surgeries with PT perspective



### Spinal Surgeries

- Surgical approach to the thoracic or lumbar spine

- Note: impact on multifidus
- Note: proximity to nerve roots & potential for damage to these



### Spinal Surgeries

- Myelogram from a dachshund with intervertebral disc disease at T11-T12 lateralized to right

### Spinal Surgeries

- Surgical considerations

- I. 1<sup>st</sup> episode of pain. No paresis: Rx only
- II. Recurrent pain +/- mild paresis: Rx +/- Sx
- III. Severe paraparesis: Decompressive Sx
- IV. Paraplegia
  - i. With deep pain: Decompression
  - ii. Deep pain absent < 48 hours: Decompression +/- Durotomy
  - iii. Deep pain absent > 48 hours: Controversial

## Spinal Surgeries

- Dorsal Laminectomy:
  - Resection of dorsal SpP, dorsal laminae, & parts of articular process & pedicles of 2 or more consecutive vertebra
  - = instability

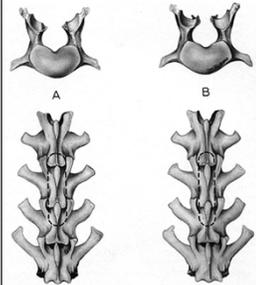


FIG. 82-20 Dorsal laminectomies. (A) Modified dorsal laminectomy. (B) Furgason dorsal laminectomy. (Reprinted after Shores A: Intervertebral disk surgery in the dog. Part III. Thoracolumbar disk surgery. The Compendium on Continuing Education for the Practising Veterinarian 4:24-34, 1982)

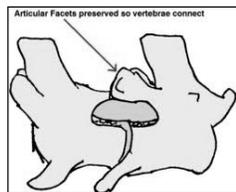
## Spinal Surgeries

- Hemilaminectomy
  - Most lesions are dorsolateral
  - Removal of articular facets
  - Must know WHICH side is impacted.



## Spinal Surgeries

- Pediclectomy / Mini-hemilaminectomy
  - Removal of the accessory processes



The End



The End