Cranial Cruciate Disease in the Dog
TPLO vs TTA

Nate Rose, DVM, DACVS

My Biography
• DVM at U of MN 2007
• Internship at Tufts University 2008
• Surgery Residency at U of MN 2011
• Animal Emergency and Referral Center
• Owner Minnesota Mobile Veterinary Surgery
• NAMASA Pre-clinic Research

Outline
• Anatomy
• Physical Exam
• Differential Diagnosis
• Diagnostic Arthroscopy
• Mechanism of Action
• Rehabilitation

Canine Stifle Anatomy
• Four major ligaments
• Goal: Stability throughout range of motion
• Medial and lateral meniscus
  – Hoop Stress (stability)
  – Energy Absorption
  – Lubrication
  – Prevent synovial impingement

Cranial Cruciate Functions
1. Prevent Cranial Drawer
2. Prevent Tibial Thrust
3. Counteract Internal Rotation
4. Resist Hyperextension

Anatomy
Anatomy

Importance of Meniscus

Medial Meniscus Damage

The Tepic Model for Stifle Force

- Total force is parallel to patellar ligament
- An angle greater than 90° creates tibial thrust
Canine Cruciate Disease

- First reports of cruciate tear in dogs 1926
- Cause is still unknown
  1) Trauma - Excessive load
  2) Progressive Degenerative
     - Poor blood supply, Obesity, Tibial Plateau Slope, Lack of fitness, mismatching muscle groups, immune mediated, neutering (not age of neuter)
     - 20% association with MLP is small breeds
     - Breed variations (Greyhound vs Rottweiler)

History of Canine Cruciate Repair

- Early repairs Intra-Articular Reconstruction
  - Grafts: Autograft, Allograft, Xenograft
  - Patella Tendon, Fascia Lata
  - Four in one, Over the top, Medial Patella

- Later Repairs — Extra-Articular Reconstruction

Orthopedic History and Examination

General Orthopedic Cases

- Main objective is localization of pathology
- Biggest challenge “Where does it hurt?”
- Start with thorough history from owner while observing patient movements
- What is dog’s purpose? (Working vs Pet)
- Onset, Duration, Progression, Which Limbs, Activity, Medications, Diet

Young Hindlimb

- Congenital
  - Osteochondritis dissecans (Stifle, Hip, Hock), Patella Luxations, Hip Dysplasia, Panosteitis, Perthes’ Disease, Osgood-Schlatter’s Disease (tibial tuberosity), Angular Limb Deformities
- Degenerative
  - Cranial Cruciate Ligament
- Trauma
  - Cranial Cruciate Ligament, Fractures, Sacral Iliac Luxation, Hip Luxation, Common Calcaneal Tendon Tear, Patella Tendon Rupture/Teear, Muscle Contracture, Tenial Ligament Rupture, Growth Plate Injuries, Pat Lacerations, Post Traumatic Chondromalacia, Iliopatellar Injuries
- Immune
  - IMPA (Distal Joints), Erosive IMPA, Severe Dermatitis
- Neoplasia
  - Digital Masses, Pad Warts, Mast Cell Tumors, OSA, Nerve Sheath Tumors...
- Nutritional, Metabolic, Degenerative, Anatomic, Infectious, Toxic

Old Hindlimb

- Neoplasia
  - OSA, Nerve Sheath Tumors, Digital Masses, Synovial Cell Tumors...
- Congenital
- Degenerative Joint Disease (Cranial Cruciate Ligament, Hip Dysplasia, Old Injuries, Degenerative Disk Disease, DM)
- Trauma
  - Cranial Cruciate Ligament, Fractures, Sacral Iliac Luxation, Hip Luxation, Common Calcaneal Tendon Tear, Patella Tendon Rupture/Teear, Muscle Contracture, Tenial Ligament Rupture, Growth Plate Injuries, Pat Lacerations, Post Traumatic Chondromalacia, Erosive Injuries
- Immune
  - IMPA (Distal Joints), Erosive IMPA, Severe Dermatitis
- Metabolic- Neuropathy, Muscle Wasting, Paraneoplastic Syndrome
Stifle Exam: Cranial Cruciate Functions

1. Prevent Cranial Drawer
2. Prevent Tibial Thrust
3. Counteract Internal Rotation
4. Resist Hyperextension

**Exam should test all these functions while looking for pain.**

Stifle Radiographs

Stifle Arthroscopy

Images: Veterinary Surgery Small Animal, Tobias and Johnston
Current Extra- Articular Surgery

#1 Goal: Prevent tibial thrust during stance phase (Tepic Model)

Plan: Change biomechanics of normal joint thus eliminating tibial thrust and need for CCL

The Tepic Model for Stifle Force

- Total force is parallel to patellar ligament
- An angle greater than 90° creates tibial thrust

TLPO- Changing the Slope of the Tibial Plateau

TLPO: Move Plateau 90° to Long axis of Tibia (Slocum) or Patella (Tepic)

TTA- Changing the Position of the Patella in Relation to the Plateau

TTA: Move Patella 90° to Plateau

Images: Veterinary Surgery Small Animal, Tobias and Johnston
Prognosis

- 40-60% patients will tear the other side
- Partial tearing usually progresses to a full tear over time
- 85% of normal limb function with surgery
- < 70% of normal limb function with aggressive PT and NSAIDS and Diet (unilateral cases)

TPLO vs TTA

- “The decision between TPLO and TTA is based purely on the opinion of your surgeon and their personal technical experience. To date, no published data supports one technique being superior to the other.” (ACVS.org)
- Current abstracts recommend TPLO with plateau slopes over 28 degrees if the meniscus is left intact.

Open Surgery for Meniscus Exam

Pozzi Vet Surg 2008

- Cadaver study with blinded meniscal trauma
- Open Arthrotomy- 30% sensitive
- Arthroscopy alone-83% sensitive
- Arthroscopy with Probe- 95% sensitive

Open 30% vs Scope 95%

Pre-op Considerations

- Age, Size, Activity Level
- Bilateral vs Unilateral
- Tibial Plateau Angle
- CBC/CHEM
- Pre-op IV cefazolin 15mins prior to incision
- Repeat cefazolin every 90 mins

Post-op Care

- Compression Bandage 24 hours
- Ice pack 3-5 days (15 min three times daily)
- Prevent trauma to incision
- Restrict activity for 8 weeks
- Leash walks
  - First 2 weeks = 2 blocks
  - Next 6 weeks = ¼-1 mile
- 8 weeks post-op radiographs
- Usually 3-4 months before heavy activity

Rehabilitation/ Physical Therapy

- Prevent further muscle atrophy
- Restore original muscle mass
- Restore stifle range of motion
- Faster bone healing time (Wolfs Law)
Rehabilitation/ Physical Therapy

- Underwater treadmill
- Cavaletti
- Passive range of motion
- Balance balls
- Sit to stand
- Stretching
- Acupuncture
- Diet Management/ Weight control
- Pain Management

John Nielsen, CVT-VTS (ECC), CVPP, CCRP

Hydrotherapy

Cavaletti Work