Ultrasonography of Shoulder in Dropped Iditarod Sled Dogs

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Objectives

- Ultrasound – How it works
- Canine shoulder anatomy
- Shoulder Ultrasonography
- Iditarod study
Ultrasound – How it works

• Ultrasound imaging, also called sonography, involves using a probe (transmitter and receiver) to send high frequency sound waves into the body and record the reflection of the sound waves to produce a multidimensional image on a computer monitor.
Other examples

• Imagine how a bat or a dolphin utilizes ultra high frequency to “See” (echolocation)
• Sonar from a submarine
Pros and cons

- Increased resolution
- Non invasive
- Real time (instant)
- Dynamic (motion)
- Assess blood flow
- Cost effective
- Minimal sedation

- Limitations due to operator experience and artifacts.
Ultrasound and Anatomy Definitions

- Attenuation – the amount of signal that is absorbed or reflected
- Hyperechoic – tissue that is brighter (white) on the monitor
- Hypoechoic – tissue that is darker (grey to black) or absent
- Sagittal – lengthwise
- Transverse – cross section
- Origin – where the tendon or ligament begins
- Insertion – where the tendon or ligament ends on a bone
Normal Canine Shoulder Anatomy

- **Supraspinatus**
  - Origin - supraspinous fossa
  - Insertion – greater tubercle

- **Infraspinatus**
  - Origin - infraspinous fossa
  - Insertion – minor tubercle

- **Teres minor**
  - Origin – infraglenoid tubercle
  - Insertion – greater tubercle

- **Biceps brachii**
  - Origin – supraglenoid tuberosity
  - Insertion – ulnar and radial tuberosity
Normal Canine Ultrasonographic Anatomy - Supraspinatus

Greater Tubercle

Supraspinatus

Scapula
Normal Canine Ultrasonographic Anatomy - Biceps

Supragenoid tuberosity

Biceps

Biceps

Humerus
Transverse images biceps

Biceps

Bicipital groove

Biceps muscle and tendon
2017 Iditarod Study

• Suspected to find chronic changes in all dropped dogs.

• Suspected to see acute on chronic changes such as rupture or partial tear with mineralization (periarticular and periosteal).

• A large athletic population with reported abnormalities and a similar control group
2017
Iditarod Objectives

• To identify, describe, and quantify ultrasonographic abnormalities of the shoulder in dropped sled dogs.
• Identify and document shoulder instability in dropped sled dogs.
Materials and Methods

• Dogs were enrolled if:
  – Mushers consent
  – Dogs were dropped

• Dogs were excluded if:
  – System illness
  – Unstable or unfit for sedation

• An orthopedic exam (boarded surgeon) determined whether dropped dogs had lameness or pain associated with the shoulder.
Materials and methods

- LOGIQ e Vet NEXTGen
- L10-22-RS High Frequency Linear Transducer
- Preparation of the shoulder
- Described and quantified ultrasonic abnormalities of the shoulder
Materials and methods

• Abduction angles under sedation was needed to rule out instability.
• Recovered and released once stable
Results

- 65 Total dogs (130 total shoulders)
  - 41 control (dogs w/out lameness)
  - 24 study (dogs w/ lameness)

- Dog demographics
  - Alaska husky (20-25kg)
    - Good appetite, good feet, love to run
  - 68% male
  - 434 average miles
    - Min 161 / max 808
  - 68 hr average delay between dropped and US exam
    - Min 12 hrs / max 120 hrs
Results

• 65 dogs
  – 24 of these were diagnosed w/ shoulder abnormalities by field vets or mushers
  – 24 dropped dogs received analgesics

• Orthopedic exam
  – 31 shoulder abnormalities or 24 dogs (37%)
  – But, the field vets only agreed with the Surgeon 38% of those dogs
  – 9/24 dogs received analgesics
Results

- Ultrasonography
  - 24/23 (96%)
  - We found an additional 35 dogs
    - Total 58 dogs or 107 shoulders
  - 24/58 (41%)
  - 31/107 (29%)
    - 95 were biceps abnormalities (89%)
    - Mineralizing biceps tenosynovitis in 18 shoulders (14 dogs) indicating chronic and or prior disease
    - No teres minor abnormalities

- Instability of any shoulder was not identified
- Acute rupture or tear was not identified
Infraspinatous Abnormalities

Infraspinatous

Mineral

Fluid

Infraspinatous
Discussion

• **Biceps abnormality**
  – Fluid around the biceps was the most common
  – Normal physiologic response for prolonged endurance
  – Or a true inflammatory condition
  – Harness rub
Discussion

• Discrepancies in findings b/w field vets, orthopedic exam, and US exam
  – Field vet lack of experience and/or limitations
    • Time, environment, knowledge
  – Time delay from time of being dropped to exam
    • Rest
    • Decreased inflammation
    • Elbow disease masking lameness
  – Analgesics
  – Field vets may have identified lameness
Limitations

- Time delay from being dropped to US exam
- As per Iditarod regulations and requirements, dogs dropped for lameness were given analgesics at dropped checkpoints
- Physical exam found lameness localized to the triceps (of which we did not examine)
- Lack of cytology/histopathology
Conclusion

• The most common US abnormality – fluid surrounding biceps
  – Follow on study
• There is no evidence of acute rupture or tear
• No shoulder instability identified
• A low incidence of chronic or prior abnormalities on US
Thank you and Questions
References

• Corey R, Cook C, et al. Diagnostic sensitivity of radiography, ultrasonography and magnetic resonance imaging for detecting shoulder osteochondrosis/osteochondritis dissecans in dogs. Vet Radiol Ultrasound 2014;56:3-11