

# Ultrasound of the cranial aspect of the thigh and stifle

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DVM, GP Cardia, CCRT, PhD, DECVDI



Thank to [www.imaios.com](http://www.imaios.com)

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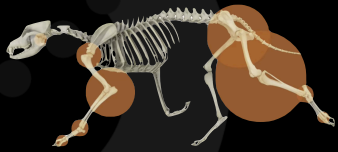
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## Objectives

- Sport-related injuries have increased in rate and severity
- Highly trained patients often suffer from chronic tendinopathy and teno-muscular pain
- Ultrasound is gaining an essential role in canine hind limb lameness - low performance - pain management



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Ultrasonographic technique for the stifle



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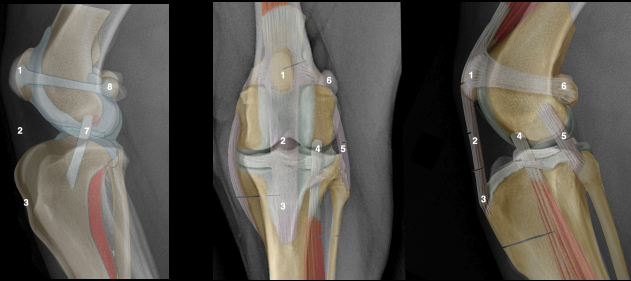
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Stifle joint: 1-8

Medial face

Cranial face

Lateral face



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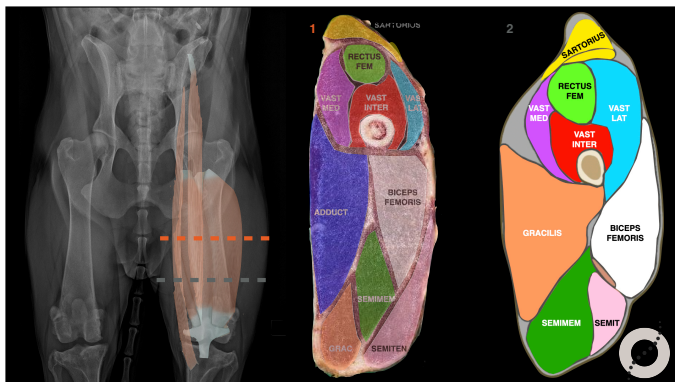
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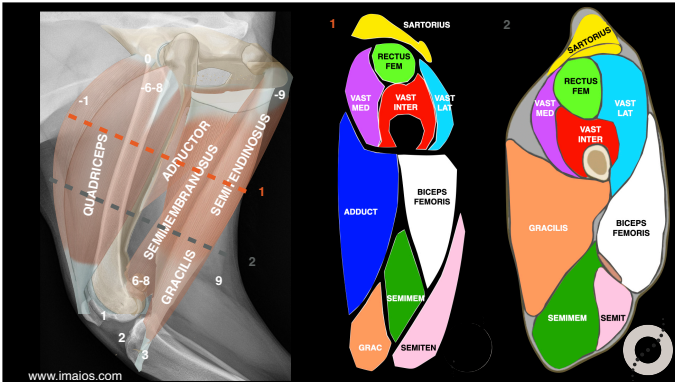
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Dante, Whippet, MI, 1 year

- After running cried and had fourth-degree lameness left hind limb
- He cries if touched
- Negative radiographs
- Impossible to locate the pain




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Dante, Whippet, MI, 1 year

- After two months: He is fine if He walks
- Recurrent second-degree lameness after running




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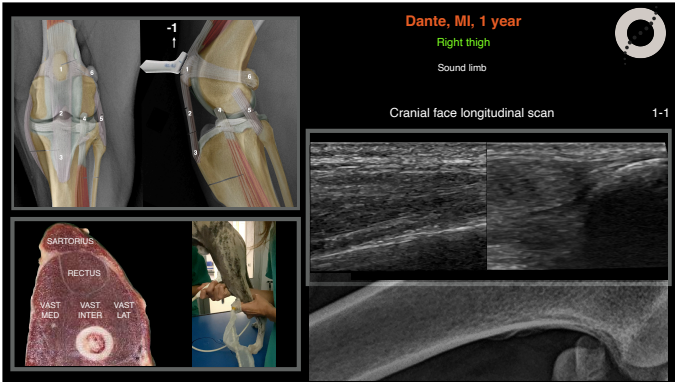
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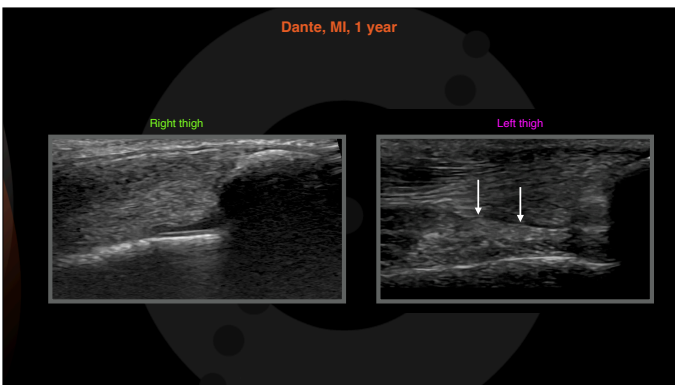
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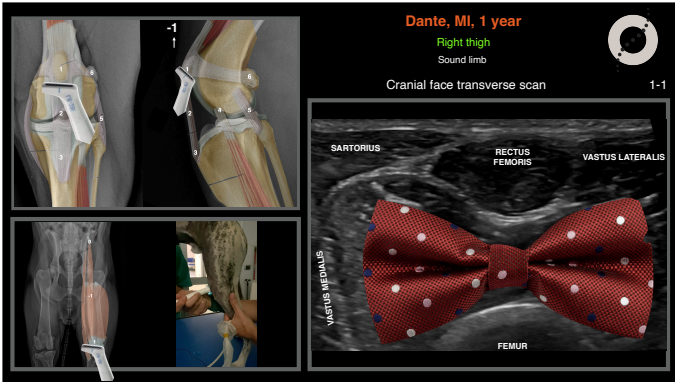
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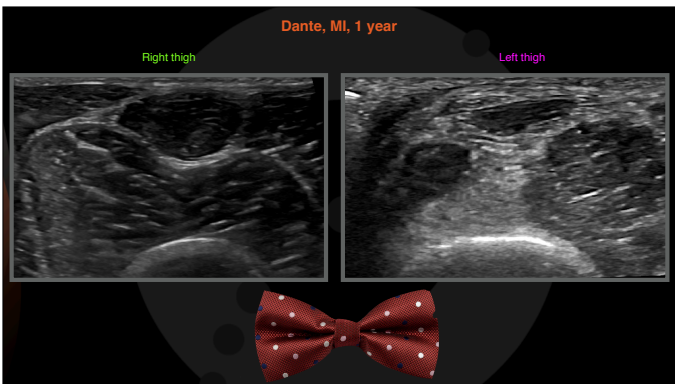
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## Dante, MI, 1 year

### Ultrasonographic diagnoses:

- Left vastus intermedius (VI) myopathy



### Conclusions

Suspected partial left VI partial avulsion/tear

## How to arrive to Conclusions:

- PE examination
- X-rays, blood works...
- Ultrasonographic findings
- Literature



The screenshot shows a PubMed search results page for the query "vastus intermedius rupture". The search bar at the top contains the text "vastus intermedius rupture" and a "Search" button. Below the search bar are options for "Advanced", "Create alert", and "Create RSS". There are also buttons for "Save", "Email", and "Send to". The results are sorted by "Best match" and displayed in a list format. The first result is "Rehabilitation and Return to Play Following Meniscus Repair" by Wedge C, Crowell M, Mason J, et al., published in Sports Med Arthrosc Rev in 2021. The second result is "Patellar Tendon Rupture" by Hsu H, Swicek TM, published in Treasure Island (FL) in 2024. The third result is "Utility of Neuromuscular Electrical Stimulation to Preserve Quadriceps Muscle Fiber Size and Contractility After Anterior Cruciate Ligament Injuries and Reconstruction: A Randomized, Sham-Controlled, Blinded Trial" by Toth MJ, Youville TW, Voigt TB, Choquette RH, Anwar BM, Falcone MJ, Fatta MJ, Stevens-Lapsley JE, Endres NK, Staufenbiel JB, Beynon BD, published in Am J Sports Med in 2020. The page also includes a "RESULTS BY YEAR" graph showing a peak in 2024, and various filters for text availability, article attributes, and article types.

PubMed® vastus intermedius avulsion Search User Guide

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Save Email Send to Sort by: Best match Display options

MY NCBI FILTERS 93 results Page 1 of 10

RESULTS BY YEAR

TEXT AVAILABILITY

Abstract

Free full text

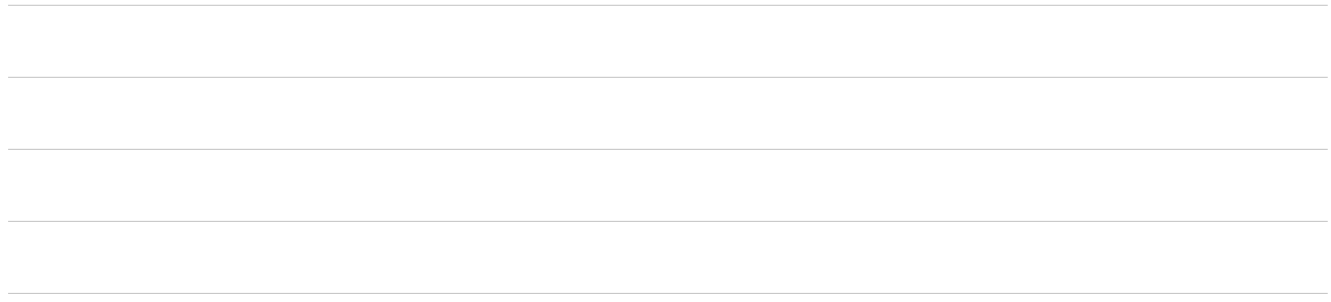
Full text

ARTICLE ATTRIBUTE

Associated data

1 **Management of anterior thigh injuries in soccer players: practical guide.**  
 Cite Lempainen L, Mecho S, Valle X, Mazzoni S, Villalon J, Freschi M, Stefanini L, Garcia-Romero-Perez A, Burova M, Pleshkov P, Pruna R, Pasta G, Kosola J.  
 BMC Sports Sci Med Rehabil. 2022 Mar 18;14(1):41. doi: 10.1186/s13102-022-00428-y.  
 PMID: 35303927 Free PMC article. Review  
 Analyzing injury mechanism and adding both clinical and imaging findings, clinicians can make the right treatment decisions already often in the acute phase of the injury. Low grade contusions and muscle strains are treated well with planned rehabilitation, but complete te ...

2 **Isolated Vastus Intermedius Avulsion Injury: A Case Report with Imaging Spectrum of this Rare Incidence.**  
 Cite Wegner U, Singh C.  
 J Clin Imaging Sci. 2019 Dec 11;9:54. doi: 10.25259/JCIS\_124\_2019. eCollection 2019.  
 PMID: 31853162 Free PMC article.  
 Isolated mid-tendon vastus intermedius avulsion injuries are rare, painful, and overuse-related changes with a wide spectrum of epidemiology often demonstrating an exceptional spectrum of imaging features, especially on conventional radiographs...Our case r ...



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RESULTS BY YEAR

TEXT AVAILABILITY

Abstract

Free full text

Full text

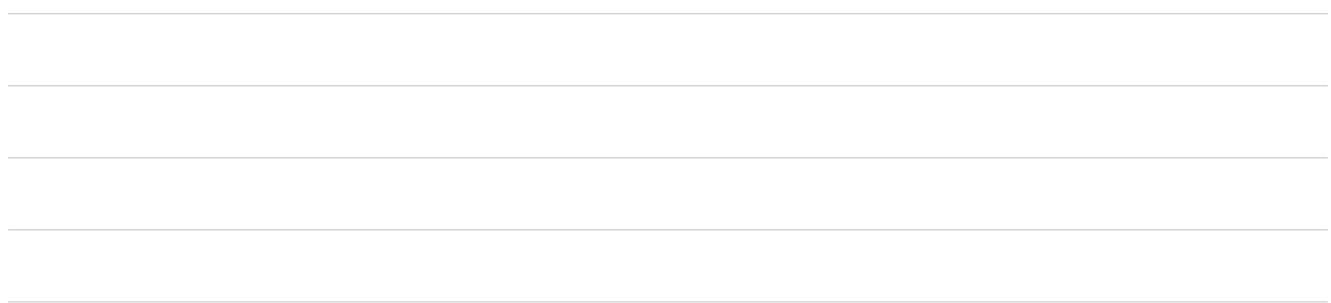
ARTICLE ATTRIBUTE

Associated data

ARTICLE TYPE

1 **Diagnostic test accuracy of ultrasound for sarcopenia diagnosis: A systematic review and meta-analysis.**  
 Cite Fu H, Wang L, Zhang W, Lu J, Yang M.  
 J Cachexia Sarcopenia Muscle. 2023 Feb;14(1):57-70. doi: 10.1002/jcsm.13149. Epub 2022 Dec 13.  
 PMID: 36513380 Free PMC article. Review.  
 Muscle ultrasound is an emerging tool for diagnosing sarcopenia. This review aims to summarize the current knowledge on the diagnostic test accuracy of ultrasound for the diagnosis of sarcopenia...The CSA of rectus femoris, biceps brachii muscles and ...

2 **Longer Interset Rest Periods Enhance Muscle Strength and Hypertrophy in Resistance-Trained Men.**  
 Cite Schoenfeld BJ, Pope ZK, Benk FM, Hester GM, Sellers J, Nooner JL, Schnaiter JA, Bond-Williams KE, Carter AS, Ross CL, Just BL, Henselmans M, Krieger JW.  
 J Strength Cond Res. 2016 Jul;30(7):1805-12. doi: 10.1519/JSC.0000000000001272.  
 PMID: 26605807 Clinical Trial.  
 The study period lasted 8 weeks with subjects performing 3 total body workouts a week comprised 3 sets of 8-12 repetition maximum (RM) of 3 different exercises per session. Testing was performed prestudy and poststudy for muscle strength (1RM bench press and back-squat), ...



PubMed® vastus intermedius ultrasound dog Search User Guide

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MY NCBI FILTERS 10 results Page 1 of 2

RESULTS BY YEAR

TEXT AVAILABILITY

Abstract

Free full text

Full text

ARTICLE ATTRIBUTE

Associated data

ARTICLE TYPE

Books and Documents

Clinical Trial

Meta-Analysis

Randomized Controlled Trial

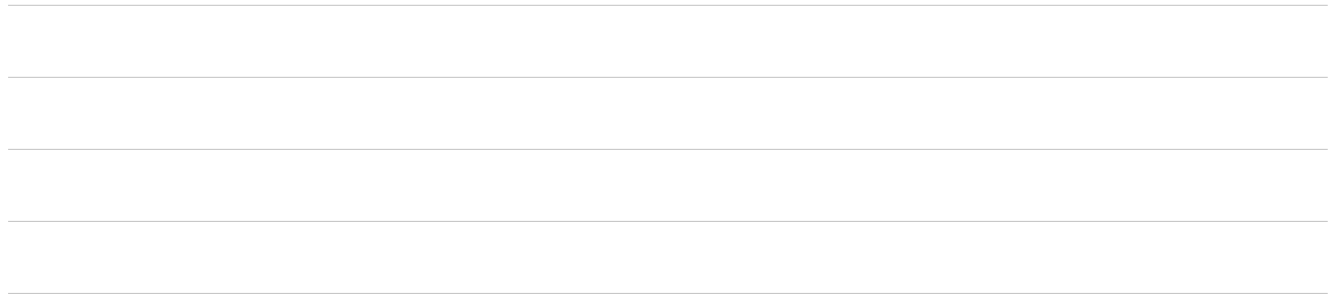
Review

Systematic Review

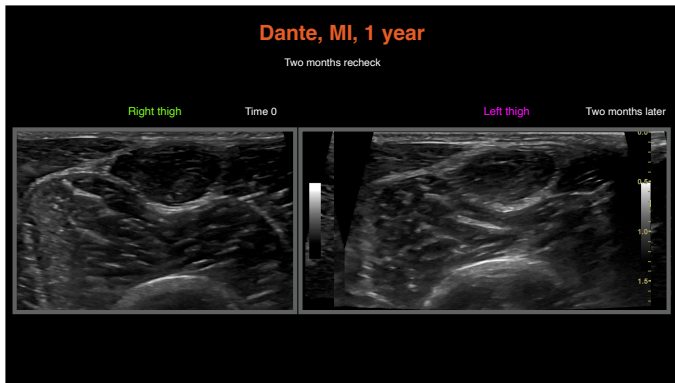
1 **Ultrasound guidance to approach the femoral nerve in the biceps muscle: a preliminary study in the dog.**  
 Cite Maier SP.  
 Vet Res Pract. 2012 Sep;9(5):550-4. doi: 10.1111/j.1467-2995.2012.00791.x. Epub 2012 May 30.  
 PMID: 22642401 Clinical Trial.  
 Phase I. The location of the femoral nerve within the biceps muscle was determined via ultrasonography in 11 healthy anesthetized dogs...Using ultrasonography, it was possible to observe the femoral nerve in nine dogs (82%). ...

2 **Radiographic measurement of the quadriceps angle in dogs.**  
 Cite Pires S, Romagosa N.  
 PLUS One. 2017 Oct 12;12(10):e0185833. doi: 10.1371/journal.pone.0185833. eCollection 2017.  
 PMID: 29229239 Free PMC article.  
 The direction of the force of the quadriceps muscle group is expressed by the value of the quadriceps angle, between the long axis of the muscle rectus femoris and the patellar ligament...The aims of the present study were to give a reference value f ...

3 **Long-Term Effects of Whole-Body Vibration on Hind Limb Muscles, Gait and Pain in Lame Dogs with Borderline-to-Severe Hip Dysplasia-A Pilot Study.**  
 Cite Gomez Hoyt, Isabel G, Serrac-Rico, Daniela G, Gonzalez M, Herrero M, Herrero JM, Torment M, Gomez Alvarez CB.  
 Annals (Basel). 2023 Feb 8;10(2):2456. doi: 10.3390/ani10222456.  
 PMID: 36820792 Free PMC article.  
 Muscles of the hind limbs were evaluated using measurements of thigh circumference, the cross-sectional processes of selected hind limb muscles by ultrasound assessment, and vastus lateralis muscle activity determined by surface electromyography (EMG)...Data ...








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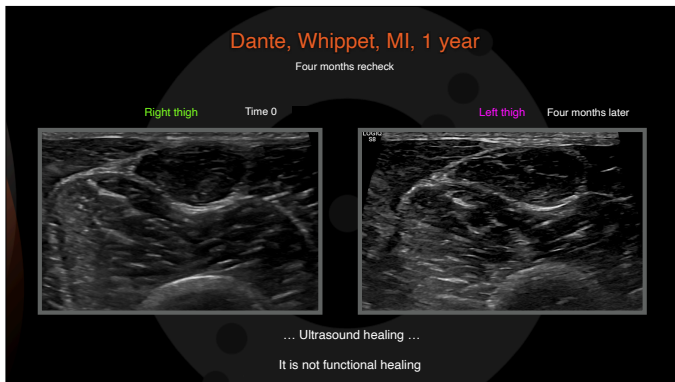
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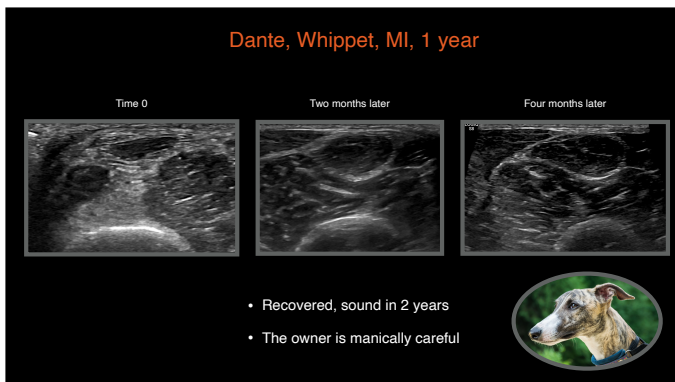
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Arizona, Border Collie, FS, 4 years

- Trauma three weeks ago



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Arizona, Border Collie, FS, 4 years

- After that "weird gait"
- Resistant in extending caudally the left hind limb



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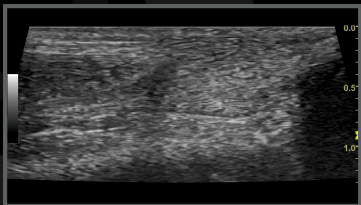
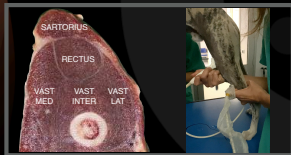
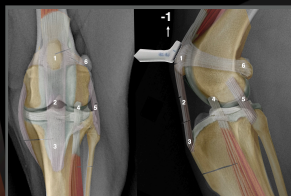
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Arizona, FS, 4 years

Right thigh  
Sound limb

Cranial face longitudinal scan

1-1



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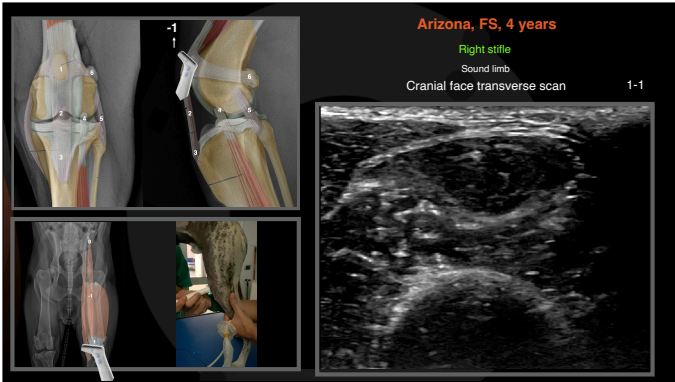
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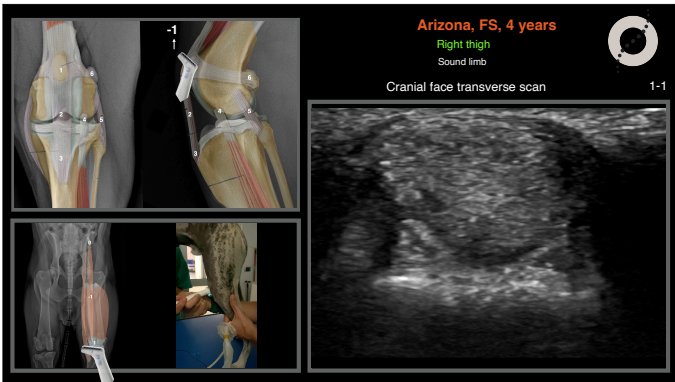
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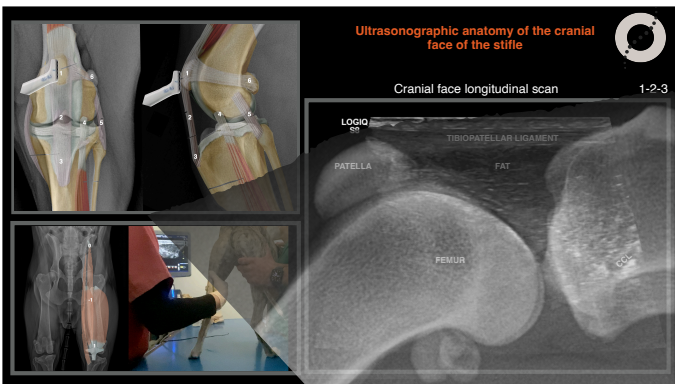
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PubMed  
ultrasound cranial cruciate ligament dog

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MY NCI FILTERS 15 200 results Page 1 of 20

RESULTS BY YEAR

TEXT AVAILABILITY

ARTICLE ATTRIBUTES

ARTICLE TYPE

1 High-frequency ultrasound, computed tomography and computed tomography arthrography of the cranial cruciate ligament, menisci and cranial meniscotibial ligaments in 10 radiographically normal canine cadaver stifles. Van der Vekens E, de Bakker E, Bogaerts E, Broeckx JGD, Ducatelle R, Kromhout K, Saunders JH. BMC Vet Res. 2019 May 16;15(1):146. doi: 10.1186/s12917-019-1892-y. PMID: 31081469 Free PMC article. Ultrasound cranial cruciate ligament disease and concurrent meniscal lesions cause progressive osteoarthritis and pain of the stifle joint. Linear areas of contrast may be detected within the cranial cruciate ligament of radiographically ...

2 Cranial cruciate ligament rupture in the dog—a retrospective study comparing surgical techniques. Moore AW, Reed RA. Aust Vet J. 1995 Aug;72(8):281-5. doi: 10.1111/j.1751-0813.1995.tb03555.x. PMID: 8579557 Three surgical techniques, grouped as intra-articular techniques, extra-articular techniques and fibular head transposition, were used for repair of the cranial cruciate ligament (CCL)-deficient stifle in 115 dogs over a 4 year 4 month period. The clinic ...

3 Tibial osteotomies for cranial cruciate ligament insufficiency in dogs. Kim SH, Pozzi A, Kowalewski MP, Lewak DD. Vet Surg. 2008 Feb;37(2):111-20. doi: 10.1111/j.1524-6040.2007.00365.x. PMID: 18229824 Review. OBJECTIVE: To review the biomechanical considerations, experimental investigations, and clinical data pertaining to tibial osteotomy procedures for treatment of cranial cruciate ligament (CCL) insufficiency in dogs. STUDY DESIGN: Literature review. ...

Van der Vekens et al. BMC Veterinary Research (2019) 15:146  
https://doi.org/10.1186/s12917-019-1892-y BMC Veterinary Research

RESEARCH ARTICLE Open Access

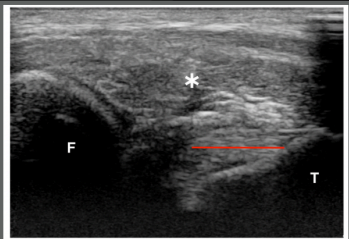
High-frequency ultrasound, computed tomography and computed tomography arthrography of the cranial cruciate ligament, menisci and cranial meniscotibial ligaments in 10 radiographically normal canine cadaver stifles

Elke Van der Vekens<sup>1\*</sup>, Evelien de Bakker<sup>1</sup>, Evelien Bogaerts<sup>1</sup>, Bart J. G. Broeckx<sup>2</sup>, Richard Ducatelle<sup>3</sup>, Kaatje Kromhout<sup>1</sup> and Jimmy H. Saunders<sup>1</sup>

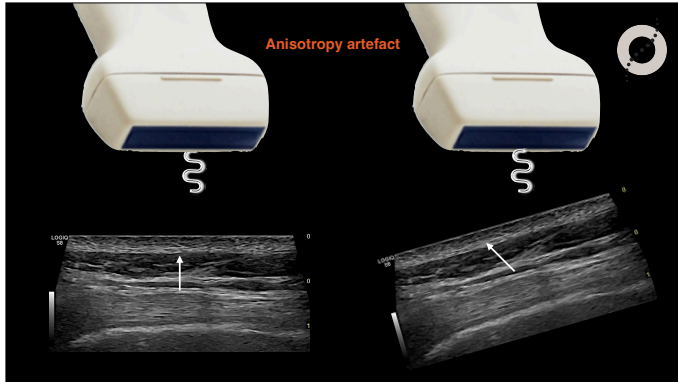
\*Check for updates

Why we cannot assess the CCL by ultrasound?

- Bone “cage”
- Anisotropy artifact
- Speed error artifact



**Fig. 1** Cranial proximolateral-distomedial oblique sagittal ultrasonographic image of the left stifle of dog in flexion. A clear fibrillar pattern is visible within the distal aspect of the CrCL. More proximal the ligament becomes hypochoic because of anisotropy artifact. F: Femur; T: tibia; \*, infrapatellar fat pad; red line: length fibrillar pattern visible within CrCL. Proximal is left and cranial to the top in the image.




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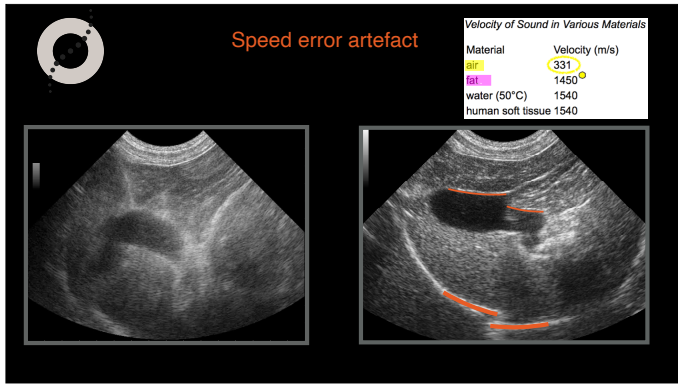
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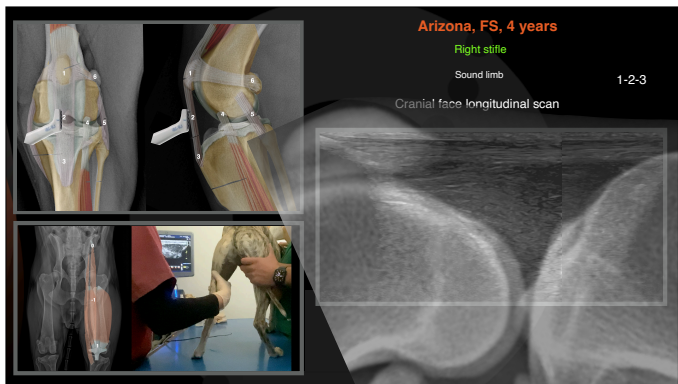
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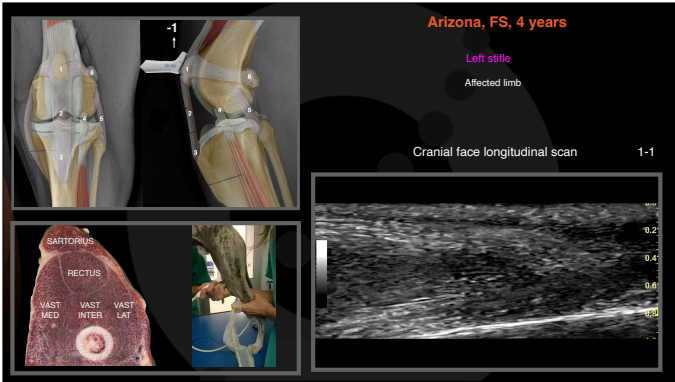
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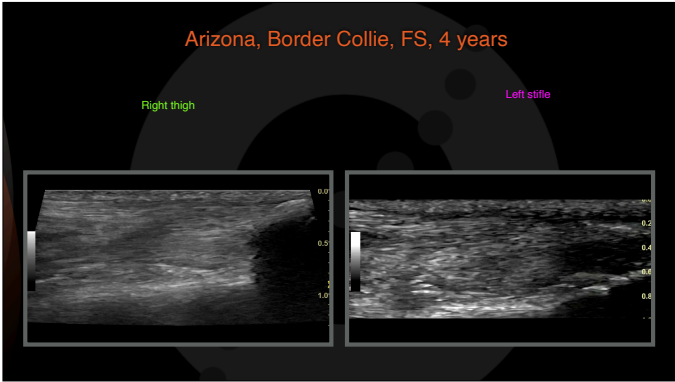
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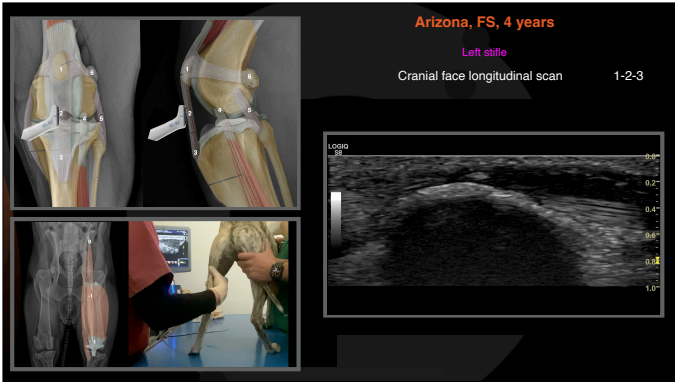
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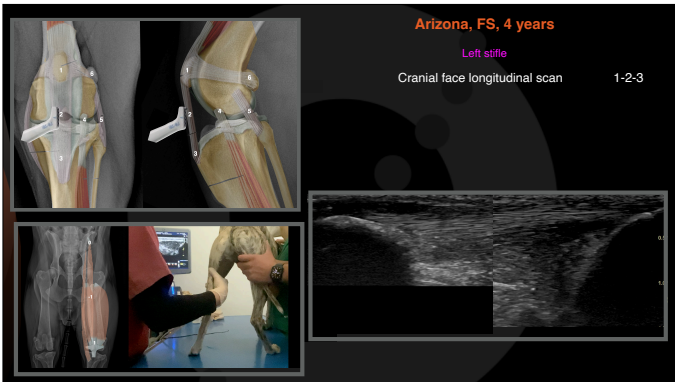
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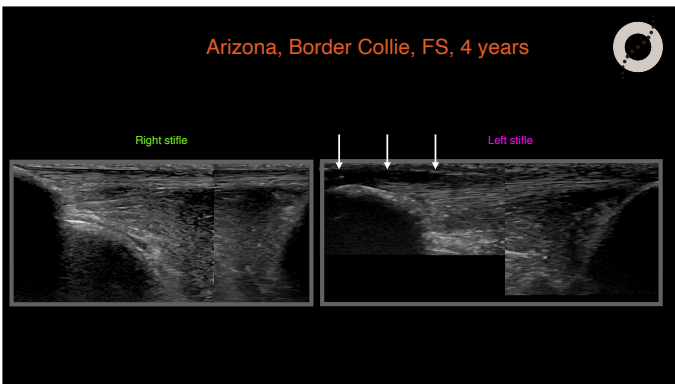
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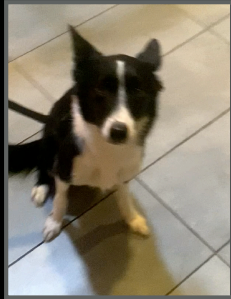
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Arizona, Border Collie, FS, 4 years

Ultrasonographic diagnoses:

- Suspected chip fragment arising from the dorsal margin of the left patella
- Possible hematoma on the left tibia-patellar ligament



Next step?

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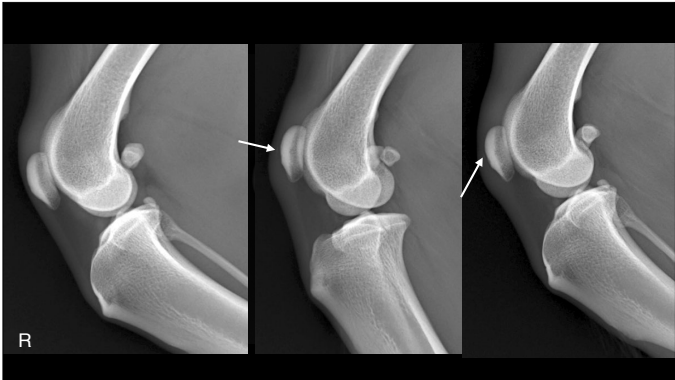
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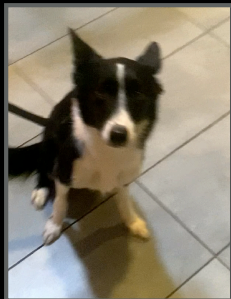
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Arizona, Border Collie, FS, 4 years

Follow up

- Physiotherapy started
- When She can go back to work?
- When would you do the follow up?



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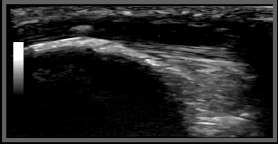
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## Arizona, Border Collie, FS, 4 years

Six months recheck

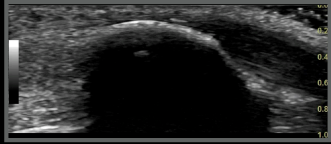
Left stifle

Time 0



Left stifle

Six months later



- Back to Agility aiming for international competitions

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## Conclusions

Ultrasound has a role in hind limb lameness in sportive patients. To use this modality is needed:

- 1) Anatomy knowledge
- 2) Systematic approach
- 3) Understand the artefacts
- 4) To know the most relevant conditions



Antique runic alphabet for death, used against nuclear army development in 1958 by Gerald Holton

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# Thank you



Diagnostic Mindset

[www.diagnosticmindset.com](http://www.diagnosticmindset.com)

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