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Do dogs with non-surgically managed cranial cruciate ligament disease have better outcomes with rehabilitation?

A Knowledge Summary by

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KNOWLEDGE SUMMARY

PICO question

In dogs with cranial cruciate ligament disease treated non-surgically with rehabilitation, is the outcome inferior/equivalent/superior as measured by owner and/or veterinarian evaluation to dogs treated non-surgically without rehabilitation?

Clinical bottom line

Category of research question

Treatment

The number and type of study designs reviewed

Four papers were critically appraised. One paper reviewed was a prospective, randomised clinical trial. The remaining three papers were retrospective cohort studies

Strength of evidence

Weak

Outcomes reported

There are no studies available that directly compare dogs managed non-surgically with and without rehabilitation following cranial cruciate ligament injury. In one study, 66% of dogs treated non-surgically with rehabilitation are reported to have successful outcomes 1 year following initiation of treatment. For dogs managed non-surgically without rehabilitation, successful outcomes varied from 19%–90% of cases among several retrospective studies

Conclusion

There is evidence suggesting the addition of rehabilitation to conservative therapy is beneficial, but based on the current literature, it is impossible to say whether it is superior to conservative treatment without rehabilitation

[How to apply this evidence in practice]

The application of evidence into practice should take into account multiple factors, not limited to: individual clinical expertise, patient's circumstances and owners' values, country, location or clinic where you work, the individual case in front of you, the availability of therapies and resources.

Knowledge Summaries are a resource to help reinforce or inform decision making. They do not override the responsibility or judgement of the practitioner to do what is best for the animal in their care.

Clinical Scenario

You are presented with a 4-year-old, male neutered Labrador Retriever with recent right pelvic limb lameness. Based on history and physical exam findings, you determine the dog has cranial cruciate ligament disease. The owner is reluctant to pursue surgery due to financial restrictions. You recommend non-surgical management of a 4–6week rest period and non-steroidal anti-inflammatory drugs (NSAIDs). The owner would like to know if the addition of physical rehabilitation would be beneficial for the dog's long-term outcome.

The evidence

There is currently no literature available that directly addresses the present clinical question. Of the literature that addresses conservative management of dogs with cranial cruciate ligament injury, the majority of studies are retrospective cohort studies. There is one prospective, randomised clinical trial available, but it does not directly address the question. The evidence available from the three retrospective studies is weak and they are not comparative. Overall, because the literature addressing non-surgical treatment does not compare rehabilitation to no rehabilitation, it is not possible to draw meaningful conclusions from comparisons of these studies.

Abbreviations:

CCL	cranial cruciate ligament
GRF	ground reaction force
NSAIDs	non-steroidal anti-inflammatory drugs
CBPI	canine brief pain inventory
VAS	visual analogue scale

Summary of the evidence

Wucherer et al. (2013)	
Population:	Overweight dogs >20 kg, undergoing treatment for cranial cruciate ligament rupture at the University of Minnesota
Sample size:	40 dogs
Intervention details:	• Dogs were randomly assigned: • N=20 dogs nonsurgical group – physical therapy, weight loss, and NSAID administration • N=20 dogs surgical group – tibial plateau leveling osteotomy, physical therapy, weight loss, and NSAID administration • All dogs were administered deracoxib once per day at 1–2 mg/kg for 12 weeks • Weight loss program designed to achieve 0.5% to 2% reduction in body weight of dogs per week • Dogs received a minimum of six supervised physical therapy sessions. Sessions were individually designed for each dog
Study design:	Prospective, randomised clinical trial
Outcome studied:	• Objective: weight, body fat percentage and lean muscle mass by use of dual-energy x-ray absorptiometry images, GRF. Weight and GRF were assessed initially on day 0, and

	then on weeks 6, 12, 24, and 52. Body fat percentage and lean muscle mass were assessed on day 0 and on week 12 and 24 • Subjective: two owner questionnaires (the CBPI and the canine movement assessment VAS), investigator assessment via VAS and numeric rating scale, cranial drawer motion, and body condition score (BCS) were assessed on day 0 and then on week 6, 12, 24, and 52
Main findings: (relevant to PICO question):	• CBPI pain severity and interference scores improved significantly for dogs in both treatment groups between each evaluation time • Investigator assigned lameness and pain scores significantly decreased during the study for both groups • Percent of dogs in the nonsurgical treatment group with a successful outcome was 8/17 (47.1%), 5/15 (33.3%), and 7/11 (63.6%) at 12, 24, and 52 weeks respectively • Percent of dogs in the surgical treatment group with a successful outcome was 12/18 (67.7%), 13/14 (92.6%), and 9/12 (75%) at 12, 24, and 52 weeks respectively • Dogs in the nonsurgical treatment group had improvements in owner survey scores, veterinary examination scores, and GRF values during the present study, and 1 year after initiation of treatment almost two thirds of those dogs had a successful outcome as defined by a 10% or greater improvement in questionnaire variables and a net GRF greater than 85% of the value for healthy dogs in the affected limb
Limitations:	• CBPI pain severity and interference scores improved significantly for dogs in both treatment groups between each evaluation time • Investigator assigned lameness and pain scores significantly decreased during the study for both groups • Percent of dogs in the nonsurgical treatment group with a successful outcome was 8/17 (47.1%), 5/15 (33.3%), and 7/11 (63.6%) at 12, 24, and 52 weeks respectively • Percent of dogs in the surgical treatment group with a successful outcome was 12/18 (67.7%), 13/14 (92.6%), and 9/12 (75%) at 12, 24, and 52 weeks respectively • Dogs in the nonsurgical treatment group had improvements in owner survey scores, veterinary examination scores, and GRF values during the present study, and 1 year after initiation of treatment almost two thirds of those dogs had a successful outcome as defined by a 10% or greater improvement in questionnaire variables and a net GRF greater than 85% of the value for healthy dogs in the affected limb

Pond et al. (1972)	
Population:	Large (>20 kg) and small (<20 kg) dogs with CCL rupture
Sample size:	107 dogs (large = 49; small = 58)
Intervention details:	• Conservative treatment (n=50) – animal closely confined for 4–8 weeks, only allowing short walks on the lead. If lameness persisted after this time the case was reviewed for consideration for surgery. Any mild degree of arthritis which developed later was treated with phenylbutazone at 200–600 mg/day in two or three doses for first 4 days and then reduced by 100 mg every 4 days until a dose of 100 mg/day was reached and continued for 10–14 days • Surgical (n=57) – skin prosthesis was used in most cases, usually with extra support being provided by a double strand of heavy monofilament nylon. In a few cases no prosthetic ligament was inserted
Study design:	Retrospective cohort study
Outcome studied:	Subjective: Owner reported lameness. Successful if owner reported no detectable lameness 1.5 years after treatment. For working dogs, treatment was considered successful if dog was able to complete a satisfactory day's work, as reported by owner
Main findings: (relevant to PICO question):	• Large dogs – 14/18 (78%) had a successful outcome with conservative therapy and 28/31 (90%) had a successful outcome with surgery • Small dogs – 29/32 (91%) had a successful outcome with conservative therapy and 22/26 (85%) had a successful outcome with surgery
Limitations:	• Retrospective study design • Variation in surgical technique. 15 surgeons of varying experience conducted the surgeries • Subjective evaluation of lameness is subject to bias

Vasseur (1986)	
Population:	Dogs with CCL injury treated with non-surgical management between 1971 and 1981 at the University of California, Davis Veterinary Medical Teaching Hospital
Sample size:	85 dogs
Intervention details:	• Records of dogs were divided into small (<15kg, n=28) and large (>15kg, n=57) dog groups • Conservative management was defined as restriction of activity to leash walks for 3–6 weeks, weight loss if indicated, and analgesic medication as needed
Study design:	Retrospective cohort study

Outcome studied:	Subjective: owner evaluation • Complete resolution of lameness with minimal or no clinically detectable muscle atrophy and a pain-free range of motion was considered a normal result • Dogs with only occasional lameness, minimal or no muscle atrophy, and normal or minimally reduced range of motion were classified as improved • Unchanged or worsening lameness for a minimum of 6 months was a failure of conservative management
Main findings: (relevant to PICO question):	• 24/28 dogs (86%) under 15 kg were clinically normal (21) or improved (3) after 36.6 months • 11/57 dogs (19%) dogs over 15 kg were normal (4) or improved (7) after 49.1 months
Limitations:	• Retrospective study design • Subjective evaluation of lameness is subject to bias

Chauvet et al. (1996)	
Population:	Dogs weighing 22.7 kg or more with CCL rupture between 1986 and 1991 managed with fibular head transposition (FHT), lateral fabellar suture (LFS), or conservative treatment at the University of Illinois Veterinary Medical Teaching Hospital
Sample size:	61 dogs
Intervention details:	• Dogs were treated via FHT (n=19), LFS (n=36), or conservative therapy (4–6 weeks rest and NSAIDs as needed) (n=10) • Four dogs included in two groups due to bilateral CCLR treated by different techniques. FHT and CT (n=1), LFS and CT (n=1), and FHT and LFS (n=2)
Study design:	Retrospective cohort study

Outcome studied:	• Subjective:
	  ○ Owner evaluation: Excellent (no sign of lameness), good (lame after exercise), fair (favours the leg all the time), poor (does not use leg)
	  ○ Investigator evaluation: Excellent (no lameness during exam), good (lame after exercise), fair (lame but weight bearing during exam), poor (reluctant to use leg)
	• Objective: force plate analysis

Main findings: (relevant to PICO question):	• Owner evaluation:
	  ○ Conservative treatment – of 11 stifles treated conservatively, three excellent, five good, three poor
	  ○ FHT – of 22 stifles treated with FHT, six excellent, 11 good, three fair, two poor
	  ○ LFS – of 39 stifles treated with LFS, 24 excellent, eight good, six fair, one poor

	• Mean owner evaluation of dogs treated conservatively was not significantly different than other treatment methods
	• Investigator evaluation:
	  ○ Conservative treatment – three excellent, two fair, one poor
	  ○ FHT –- 10 excellent, one good, one fair
	  ○ LFS – 12 excellent, two good, two fair, two poor
	• No significant difference in investigator evaluation scores was found between the treatment groups
	• Of the two conservative treated stifles measured via force plate, both were under expected normal range

Limitations:	• Retrospective study design • Bias in determining which dogs receive which treatment • Owner compliance was not evaluated • Subjective evaluation is susceptible to bias • Sample size is small after group division

Appraisal, application and reflection

After a thorough search of the literature, four papers were found that partially addressed the present clinical question on the benefit of rehabilitation to the non-surgically managed cranial cruciate ligament rupture patient. Included in the present Knowledge Summary are three retrospective studies and one prospective, randomised clinical trial. Unfortunately, none of the available studies directly compare non-surgically managed dogs with and without the addition of rehabilitation. Therefore, no meaningful conclusion can be drawn with regards to the clinical question.

The strongest evidence available comes from the one prospective clinical trial (Wucherer et al., 2013). In this study, dogs receiving surgical management and rehabilitation were compared to those receiving non-surgical management and rehabilitation. With regard to the clinical question, 7/11 (63.6%) of dogs undergoing non-surgical management with rehabilitation had successful outcomes 1 year after initiation of treatment. In comparison, 9/12 (75%) of dogs treated with surgery and similar rehabilitation had successful outcomes one year after treatment. However, this study is not without limitations. The rehabilitation administered was individualised to each patient and not standardised across all patients. Furthermore, dogs were continually excluded from the study for various reasons during the 1 year follow-up period. At the 52 week evaluation only 11/20 non-surgically managed dogs remained in the study.

One retrospective study (Vasseur, 1986), analysed the records of 85 dogs with cranial cruciate ligament injury treated non-surgically without rehabilitation over a 10 year period. The cases were divided into small (<15kg) and large (>15kg) dog groups. Based on owner evaluation of lameness, 24/28 (85%) of small dogs were normal or improved after 36 months whereas only 11/57 (19%) of large dogs were normal or improved after 49 months. The retrospective nature of this study and the subjective outcome measures weaken the evidence which can be gleaned from it.

The two remaining retrospective studies (Chauvet et al., 1996; and Pond et al., 1972), compare dogs treated surgically to those managed non-surgically without rehabilitation. Pond et al. (1972) reported generally good outcomes with 29/32 (90%) of small dogs and 14/18 (77%) of large dogs having successful outcomes with conservative management as compared to 22/26 (84%) of small dogs and 28/31 (90%) of large dogs treated surgically. Chauvet et al. (1996), reported excellent or good outcomes in 8/11 (73%) stifles treated conservatively as compared to 49/61 (80%) stifles treated surgically. Again, the evidence is weak due to the retrospective study design, subject evaluation of outcomes, and small sample sizes.

From the available data, it is clear that some dogs with cranial cruciate ligament disease can have positive outcomes without surgical stabilisation. However, it is not readily evident if the addition of rehabilitation to traditional conservative therapy leads to superior outcomes. In order to definitively answer the present clinical question a prospective, randomised clinical trial comparing non-surgically managed dogs with and without rehabilitation would be necessary.

Methodology Section

Search Strategy	
Databases searched and dates covered:	PubMed on NCBI Platform; 1972–week 34 2020 CAB Abstracts on OVID Platform; 1973–week 34 2020
Search terms:	PubMed and CAB Abstracts: (((dog or canine) AND (cranial cruciate ligament disease OR CCL)) AND (rehabilitation OR nonsurgical OR non-surgical OR conservative management OR conservative treatment OR nonoperative OR non-operative)) The references of relevant articles were reviewed for further relevant articles missed in the initial search
Dates searches performed:	24 Aug 2020

Exclusion / Inclusion Criteria	
Exclusion:	Book chapters, conference proceedings, articles not available in English, clinical reviews, case studies
Inclusion:	Articles written in English relevant to the PICO question

Search Outcome

Database	Number of results	Excluded – Irrelevant to PICO question	Excluded – Foreign language	Excluded – Clinical review article	Included – From references of relevant articles	Total relevant papers
PubMed	51	48	0	0	1	4
CAB Abstracts	15	13	1	1	0	0
Total relevant papers when duplicates removed						**4**

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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