CHRONIC CRANIAL CRUCIATE LIGAMENT RUPTURE IN SMALL DOGS: FOUR LEGS EVALUATION OF A MILD GAIT WITH A WALKWAY

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INTRODUCTION

Degenerative or traumatic rupture of the cranial cruciate ligament is a frequent canine orthopaedic affliction leading to knee instability and secondary osteoarthritis lesions. The clinical evaluation of gait is subjective, even for an experienced surgeon. The quality of the stance, the lameness, the pain or mobility are difficult to evaluate correctly, in particular with light lameness. Since the works of Muybridge, many devices have been developed for gait analysis. Different systems are currently available for dogs: force plates, pressure platforms, treadmills and kinematics systems. However, their use are often difficult and complex and not very possible/practical in private practice.

OBJECTIVES

The objective of this study was to qualify and quantify the lameness of dogs with an old rupture of the cranial cruciate ligament compared to normal dogs at a walk using a walkway (GAITRite®/GAITFour®).

Figure 1 : GAITRite® pressure walkway gait analysis system in situ for dogs

MATERIALS AND METHOD

group 1: 21 dogs beagles females (mean age 11 +/- 1 months and mean weight 10.7+/-0.9 kg) have undergone a section of the right cranial cruciate ligament with a mini medial approach under general anaesthesia. The pain was controlled with the morphine assistance and a patch of fentanyl.

group 2: 9 bitches (mean age 24 +/- 4 months and mean weight 10.7+/-0.9) clinically sound constituted the reference group.

Every week, an orthopaedic clinical examination was carried out with group 1. At Day 75, dogs of group 1 and 2 were tested at walking gait (mean velocity 1.5 +/- 0.2 m/s). The GAITRite® system is a walkway with half inch square sensors encapsulated within a carpet, connected to a computer and software, GAITFour®, modified for dogs (**Figures 1 and 2**). For this study, parameters selected were the **relative stance time** (ratio of the stance time and stride time), **the number of activated sensors** and **the relative peak of pressure** of the stance. The ratios between the front and back legs, the left and right side (left front and back/ right front and back), the left front and right front and finally the left back and right back. The statistical study was performed with non-parametric tests. Differences were considered significant if * $p < 0.05$ ** $p< 0.01$ *** $p<0.001$.

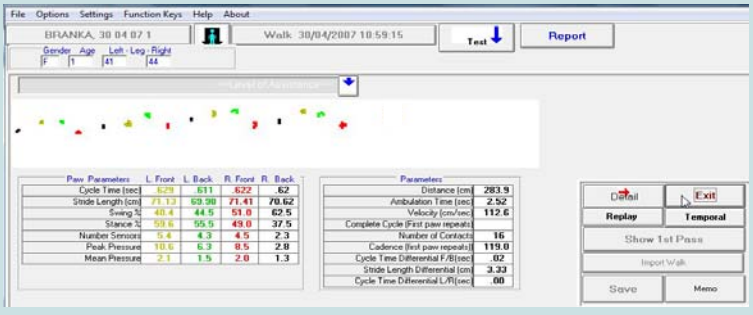

Figure 2 : Screen print from the GAITFour® software after data acquisition and treatment. Footprints had been identified as :

Yellow: left forelimb **Red: right forelimb**
Green: left hindlimb **Black: right hindlimb**

BIBLIOGRAPHY

DeCamp CE, "Kinetic and kinematic gait analysis and the assessment of lameness in the dogs". Vet. Clin. North. Am. Small. Pract., 27, PP. 825-840, 1997

Rumph PF et al., "Redistribution of vertical ground reaction force in dogs with experimental induced chronic hindlimb lameness", Vet. Surg., 24, pp 384-389, 1995

RESULTS

The clinical examinations of group 1 showed a **decreased lameness** from J-21 to J-75 (**Figure 3**)

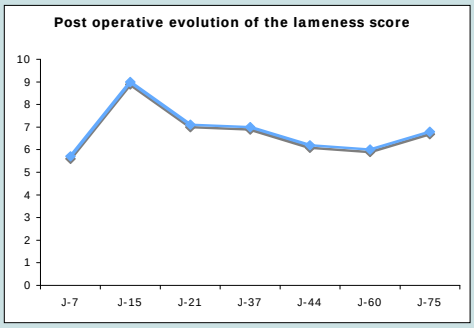

Figure 3 : Post operative lameness score

At the time of walkway test, the stance of the front legs and the left back leg of group 1 presented a relative stance time, a relative peak of pressure and a number of activated sensor more important than group 2. Conversely, these parameters were lower for the right back leg of group 1. **For 11/12 parameters, we observed a significant difference** (**Table 1**). Group 2 showed a symmetric stance between left and right front legs and between left and right back legs for these same parameters. While group 1 kept symmetry of the front legs, they lost posterior symmetry (G/D) with a stance time of the left back longer (1.39) heavier (2.31) and broader (1.84).

	relative stance time		relative peak pressure		activated sensors			relative stance time		relative peak pressure		activated sensors	
	Group 1	Group 2	Group 1	Group 2	Group 1	Group 2		Group 1	Group 2	Group 1	Group 2	Group 1	Group 2
right front leg	* 0,46	0,43	*** 32,02	21,33	*** 11,23	8,71		* 1,14	1,01	* 1,26	1,06	** 1,2	1,06
right back leg	0,33	0,35	*** 11,24	15,03	*** 4,88	6,66		1,21	1,20	*** 1,96	1,44	*** 1,69	1,34
left front leg	* 0,42	0,42	*** 31,88	21,73	*** 10,84	9,16		0,98	0,99	1,00	1,04	*** 0,97	1,07
left back leg	*** 0,44	0,36	*** 21,87	16,27	*** 8,34	7,10		*** 1,39	1,04	*** 2,31	1,12	*** 1,84	1,07

Table 1 : Comparison between Group 1 (section of CCL) and Group 2 (sound dogs)

DISCUSSION and CONCLUSION

In this study, **after 75 days, the CCL rupture lameness was light but still perceptible,** just as described in the literature. At a walk, some of the dogs didn't limp any more, so evaluation was therefore very difficult. The walkway quantified pre-set parameters of gait and showed us interesting and significant differences. Group 2 presented a stance symmetry between the left and right, but the stance on the front legs was always higher than the back legs. The **injured limb presented an obviously disturbed function, with a stance that was shorter, weaker and smaller** (consistent with what has been reported during similar gait analysis with other devices).

With the walkway, we obtained **4 to 5 strides for the 4 legs during a single trial; data collection and processing were fast and usable**, and all regular walks could be interpreted. With a force plate, strides are not calculated, and many trials are required to obtain usable data, particularly with a lame dog. The GAITRite® walkway is a reliable, practical and simple tool to assess a discrete lameness in dogs. It could easily be used for the **qualification and quantification of gait for the evaluation of a medical or surgical treatment and for long-term follow-up in clinical practice**.