

# VISUAL EXAMINATION WITH VISUAL EVOKED POTENTIAL USING FLASH STIMULUS IN DOGS

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## Introduction & Purpose

- Visual Evoked Potentials (VEP) play a role for assessing visual sense and/or diagnosing visual impairment caused by post retinal disorders in human. During the years since the first description of canine VEP in 1968, there have not been many reports.
- We recorded Flash VEP (f-VEP) to investigate influence of mydriasis, the differences of stimulated sides of eye, and reproducibility, in healthy beagles, and to evaluate f-VEP as a visual examination in cases. And we considered the suitable method for dogs.

## Materials and Methods

### Animals

- Normal Group: 7 normal beagles (6 males and 1 female, 6 to 7-year-old)
- Disease Group: 4 cases with visual impairment

### f-VEP recording

f-VEP was recorded with portable VEP system (LE-3000, Tomey Corp., Nagoya, Japan), including amplifier, recorder and flash VEP stimulator, using the following stimulus conditions;

- Plate-type electrodes were positioned at inion, nasion and temporal region.
- All dogs were sedated with a combination of medetomidine (0.01 mg/kg), midazolam (0.015 mg/kg) and butorphanol (0.025 mg/kg) intravenously.
- Combination-drops of 0.5 % tropicamide and 0.5 % phenylephrine hydrochloride are used for mydriasis.

Table 1. Stimulus setting for f-VEP

Intensity	Frequency	Repetition	Length to Cornea
3.0 cd-s/m <sup>2</sup> (3000 cd/m <sup>2</sup> × 1 msec)	2 Hz	128 times	2 cm

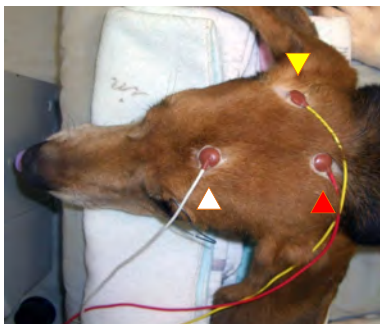


Figure 1. Positions of electrodes

- ▲ : Recording electrode on Inion
- △ : Reference electrode on Nasion
- ▼ : Ground electrode on Temporal



Figure 2. LED Built-In flash VEP Stimulator

## Results

Table 2. Data of f-VEP in Normal Group

		(n = 14 eyes)	
		Implicit time (msec)	Amplitude (μV)
		N2	P2
		N2-P2	

### Influences of Mydriasis

Before mydriasis	49.2 ± 12.1	98.5 ± 11.7	6.0 ± 1.4
After mydriasis	33.5 ± 8.4	79.7 ± 16.0	9.6 ± 3.3

### Differences of stimulated sides of eye †

Before mydriasis			
Right	51.3 ± 12.8	100.4 ± 12.4	6.2 ± 2.0
Left	47.1 ± 14.0	97.8 ± 13.1	5.7 ± 1.5
After mydriasis			
Right	34.7 ± 9.0	81.9 ± 16.4	9.2 ± 3.0
Left	32.5 ± 8.3	78.3 ± 16.9	10.5 ± 4.1

### Reproducibility

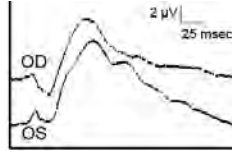
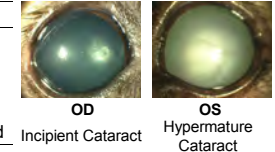
1st recording	33.5 ± 8.4	79.7 ± 16.0	9.6 ± 3.3
2nd recording	36.7 ± 11.4	77.6 ± 14.5	7.2 ± 4.1

- \*) Significant differences comparing values between before and after mydriasis (p<0.05)
- †) No significant differences in comparing right and left eyes
- ‡) Significant differences comparing values of Amplitude between 1st and 2nd recording (p<0.05)

- In normal group, implicit times and amplitudes after mydriasis were significantly shortened and increased, respectively, compared with those before mydriasis.
- In our recording method, there were no differences in f-VEP components by stimulated sides.
- And there was significant difference in amplitude compared with first recording results.
  - ⇒ Implicit times were reproduced.

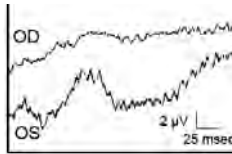
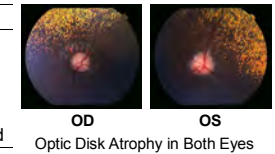
Case 1. Cataract - Jack Russell Terrier, 7-year-old, Male

	OD	OS
PLR (D / ID)	+ / +	+ / +
Menace	+	-
Dazzle	+	+
Etc.	ERG was recorded	ERG was recorded



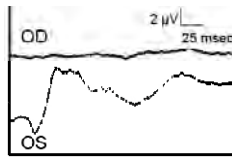
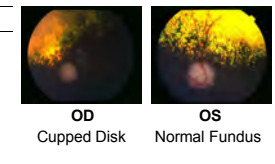
Case 2. Optic Nerve Atrophy - Cavalier King Charles Spaniel, 7-year-old, Male

	OD	OS
PLR (D / ID)	- / +	+ / -
Menace	-	-
Dazzle	-	+
Etc.	ERG was recorded	ERG was recorded



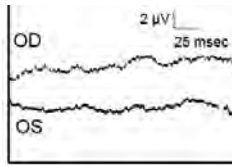
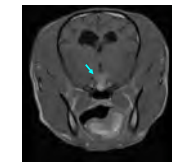
Case 3. Chronic Glaucoma - American Cocker Spaniel, 6-year-old, Male

	OD	OS
PLR (D / ID)	- / -	+ / -
Menace	-	+
Dazzle	-	+
IOP (mmHg)	44	16
Etc.	ERG was recorded	ERG was recorded



Case 4. Brain Tumor - Chihuahua, 7-year-old, Female

	OD	OS
PLR (D / ID)	- / -	- / -
Menace	-	-
Dazzle	-	-
Etc.	ERG was recorded	ERG was recorded



- In cataract case, f-VEP was recorded from both eyes, even if menace response of left eye was negative.
- In case of optic nerve atrophy, f-VEP showed non-detectable form on right eye.
- f-VEP was not recorded from the cases with chronic glaucoma and brain tumor.

## Conclusions

- Pupil size influences f-VEP components, implicit times and amplitude. And our results indicated reproducibility of implicit times.
  - ⇒ We proposed that dogs should be in mydriatic condition on f-VEP recording and implicit time is superior in the analysis. And comparing with the responses evoked from each eye would be useful, as an additional evaluation.
- VEP could not be recorded from dogs with disorder regarded in post-retinal.
  - ⇒ f-VEP is useful to objective their vision in clinical cases.

## Acknowledgement

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