Does the Treatment Influence Heart Rate Variability in Horses Affected by Gastric Ulcers?

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Introduction

Gastric ulcers (Sykes et al, 2015)

Most common disease affecting the equine stomach

High prevalence

Affects performance and welfare

Introduction

Heart Rate Variability (HRV) (Stucke et al, 2015)

Reflects the neurohormonal regulation of the heart

It can be affected by pain and disease

Can help to assess changes in autonomic tone

Aim of the study

To evaluate HRV indices in horses naturally affected by gastric ulcers, submitted or not to treatment

The study was approved by the Ethical Committee of University of Pisa (n. 7/24)

Materials and Methods

A cohort (n=45) of mares underwent gastroscopy

24 standardbred mares

- Aged 3-23 years
- Paddock
- Hay and water *ad libitum*

Inclusion criteria

- ESGD at least 2/4
- No treatment in the past 2 months

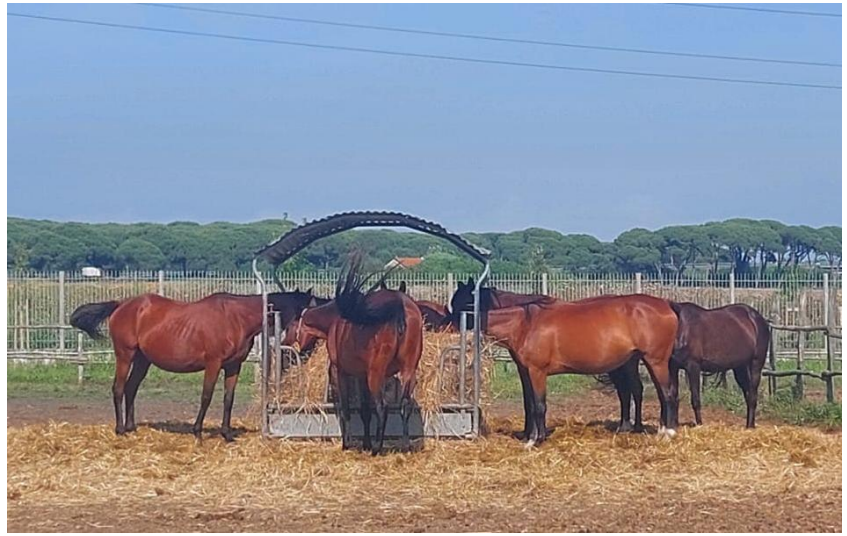
Exclusion criteria

- Worsening of lesion during the study
- Presence of other pathologies

Materials and Methods

Horses were opportunistically divided in:

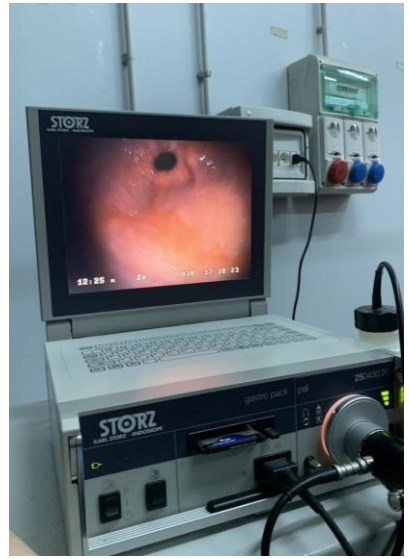
- T group = 12/24 treated horses
- NT group = 12/24 non-treated horses



Treatment (Sykes et al, 2015)

- Omeprazole 4 mg/kg orally, once daily
- Sucralfate 12 mg/kg orally, twice daily

Materials and Methods



Gastroscopy

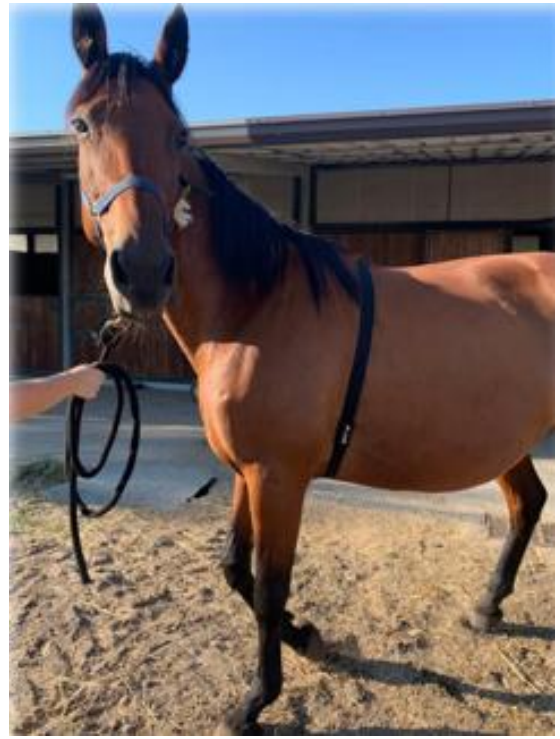
- T0 and T28 + T14 NT group
- 3m endoscope and portable processor
  (Karl Storz)
- Score system 0-4 for ESGD and EGGD
  (Pineau et al, 2024; Sykes et al, 2015)

Equine squamous gastric disease score (ESGD)	Equine glandular gastric disease score (EGGD)
0: No lesions	0: No lesions
1: Areas of hyperkeratosis	1: Mild focal hyperemic areas (gastritis)
2: Small, single, multifocal lesions	2: Moderate, focal to multifocal erythematous areas
3: Large single or extensive superficial lesions	3: Large erythematous areas with possible deeper or fibrinosuppurative lesions
4: Deep ulcerations (sometimes bleeding)	4: Extensive erythematous areas with focal fibrinosuppurative and hemorrhagic lesions

Materials and Methods

Heart Rate Variability:

- T0 and T28 (Louie et al, 2023; Perron et al, 2023; Stucke et al, 2015; Vitale et al, 2013)
- Device: RR detector attached to a chest belt (Polar Electro Inc.)
- HRV analysis: Kubios software (Kubios Oy)
- HRV parameters:
  - ✓ Time domain analysis: mean HR, SDNN, RMSSD
  - ✓ Frequency domain analysis: HF and LF power, HF and LF peak, HF/LF ratio
  - ✓ Geometric indices: SD1, SD2



Materials and Methods – Statistical Analysis

- Data distribution assessed using Shapiro-Wilk test
- Data showed normal distribution, thus expressed as X±SD (continues variables) + frequency and percentage (categorical variables)
- Chi-square test: EGGD and ESGD score changes over time within groups
- One-way ANOVA: changes in HRV indices over time within groups
- Generalized mixed model (treatment as fixed effect): differences in HRV indices over time between groups

Results

		T GROUP		NT GROUP	
	Score	T0 (n=12)	T28 (n=12)	T0 (n=12)	T28 (n=11)
ESGD	0	0/12	1/12	0/12	0/11
	1	0/12	4/12	0/12	0/11
	2	6/12	2/12	6/12	4/11
	3	2/12	4/12	3/12	5/11
	4	4/12	1/12	3/12	2/11
EGGD	0	0/12	0/12	4/12	1/11
	1	2/12	4/12	1/12	4/11
	2	5/12	6/12	4/12	3/11
	3	5/12	2/12	3/12	3/11
	4	0/12	0/12	0/12	0/11

One NT horse was excluded at T14 due to lesions' worsening

Results

Treatment significantly reduced ESGD score
(p=0.042)

No significant changes in EGGD score
(p=0.322)

No differences in HRV indices within or between groups over time

Discussion

ESGD

- Efficacy of omeprazole in reducing ESGD severity in line with literature (Sykes et al, 2015)

EGGD

- Healing rate 67% (excluding grade 1), 22% (including grade 1)
- Horses should be fasted before treatment
- 30-minutes interval is recommended between administration of omeprazole and sucralfate (Rendle et al, 2018; Sykes et al, 2015)

Discussion

- No differences were found in HRV indices between or within groups
- Not in line with literature:
  - ✓ Louie et al., 2023 (n=8)→ decreased LF/HF ratio and LF power in treated vs. control horses when inducing ulcers
  - ✓ Experimental vs Clinical setting
  - ✓ Perron et al., 2023 (n=8)→increased mean HR and LF/HF ratio, decreased SDRR and RMSSD in horses with severe induced lesions
  - ✓ Did not assess treatment effect – Experimental vs. Clinical setting

Limits of the study

Horses were opportunistically assigned to the T group

Treatment modality:

- Not-fasted prior to treatment

- Omeprazole and sucralfate administered concurrently

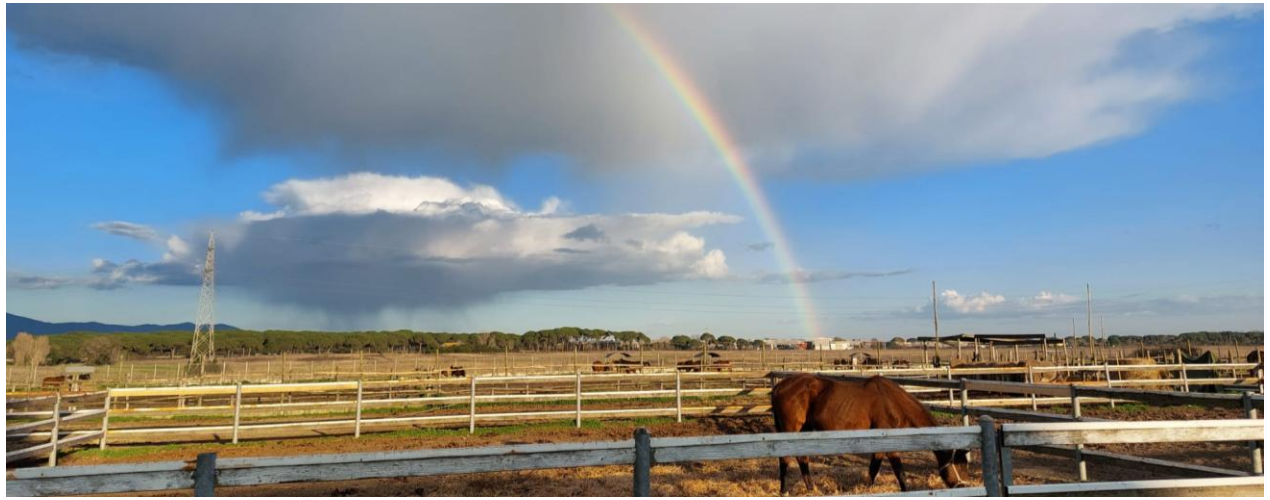
Conclusions

No significant differences in HRV indices were found following gastric ulcer treatment

HRV may serve as a valuable tool for gaining insight into the pathophysiology of equine gastric ulcer syndrome

Further research is required to determine whether a correlation exists between treatment and HRV

Thank you for your attention



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