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# A COMPARATIVE STUDY OF HRV ANALYSIS IN REFLUX POSITIVE AND REFLUX NEGATIVE PATIENTS WITH ACID PEPTIC DISEASE

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**ABSTRACT** The Aim of the study was to investigate a possible relationship between gastroesophageal reflux and autonomic imbalance in patients symptomatic for acid peptic disease using spectral analysis of HRV. Demographic parameters such as Age, weight, Body Mass Index, resting heart rate and blood pressure were obtained. 24 hour pH analysis was done to identify reflux positive group. Frequency domain and time domain measures as well as demographic variables were compared between reflux positive(n=23) and reflux negative group(n=24). The results revealed simultaneous decrease of LF component and increase of HF in the reflux positive patients. We demonstrated the evidence of functional ANS disturbances, which may be responsible for changing the HRV parameters of the frequency and time domain analysis in GERD patients. The disturbances mentioned above are supposed to influence the normal modulation of the vagaltone, which is vital for maintaining the physiological functions of oesophageal sphincter.

**KEYWORDS :** pH analysis, GERD, Frequency domain, Time domain

## INTRODUCTION:

Gastric esophageal reflux disease(GERD) is defined as chronic symptoms of heart burn, acid regurgitation, or both, or mucosal damage, produced by the abnormal reflux of gastric contents into the esophagus(KR 2005) The motor control of the lower esophageal sphincter (LES) is critical for normal swallowing and emesis, as well as for the prevention of gastroesophageal reflux. Studies have often described modified Autonomic nervous system(ANS) activity in oesophageal disease; Previous studies have demonstrated an altered sympathetic–parasympathetic balance in patients with reflux oesophagitis; Studies have also shown a strong association between low resting vagal tone and increased oesophageal acid sensitivity.

GERD occurs when the normal anti-reflux barrier between the stomach and esophagus is impaired, either transiently or permanently. Therefore defects in the esophagogastric barrier such as incomplete, transient lower esophageal sphincter relaxation, and hiatal hernia, are the primary factors involved in the development of GERD (Cohen S ; Y 2007)

Normally the tonic LES contraction is the essential element of the anti-reflux barrier mentioned above and it prevents the occurrence of excessive reflux episodes. The autonomic LES insufficiency generates TLESRs -Transient Lower Esophageal Sphincter Relaxations, which may be the reason for both physiologic and most of pathologic reflux episodes(J 1998; NJ 1998; PJ 1998; R 1998; M 2001)

Heart rate variability analysis helps to identify possible autonomic imbalance in patients with gastroesophageal reflux disease and help us to understand the pathophysiology of gastroesophageal reflux disease.

## METHODOLGY:

After an overnight fast, 47 patients both males and females were presented to the gastrointestinal investigation unit. The patients were instructed to discontinue acid suppressing medications (PPI) 5 days prior to the study, histamine receptor antagonists 3 days prior to the study, and prokinetic agents 24 h before the test. Antacids were stopped at midnight the evening before evaluation. Patients were also asked to abstain from alcohol and tobacco after 10 PM the previous evening. Study was conducted after obtaining an informed consent from the patients and institutional ethical clearance obtained.

24 hour pH analysis(Naik-II pH Monitor; version II (RED TECH) was done and analysed using GiPc pH software the DeMeester score was calculated. Based on the Johnson and DeMeester scoring system study group was selected, where score above 14.75 was considered positive for reflux and less than 14.75 considered negative for reflux.

Heart Rate Variability analysis was done between both the groups and means were compared using unpaired T test

## RESULTS:

Comparison of baseline characteristics, resting heart rate ,blood pressure, frequency and time domain measure of HRV analysis were done between the reflux positive and reflux negative groups. The results were analysed and tabulated. There was no significant difference in the means of the two groups in the demographic characters whereas there is a significantly decreased mean resting heart rate in the reflux positive group when compared with the positive group. All the means of frequency domain and time domain parameters are statistically different between both the groups

**Table 1: Comparison of Baseline characteristics of the reflux positive and reflux negative group**

| | Reflux Positive MEAN ± SD | Reflux Negative MEAN ± SD | p value |
|---|---|---|---|
| AGE(yrs) | 36.04±4.49 | 36.83±4.42 | 0.546 (NS) |
| BMI(kg/m2) | 22.48±0.79 | 22.04±1.16 | 0.140 (NS) |
| WEIGHT(Kg) | 55.35±2.48 | 56.21±1.74 | 0.174(NS) |

**Table 2: Comparison of Resting heart rate and blood pressure of the reflux positive and reflux negative group**

| | Reflux Positive MEAN ± SD | Reflux Negative MEAN ± SD | p value |
|---|---|---|---|
| RHR(bpm) | 75.13±2.49 | 77.08±2.81 | 0.016* |
| SBP (mm Hg) | 121.4±5.40 | 122.92±5.27 | 0.361 (NS) |
| DBP (mm Hg) | 78.26±4.10 | 79.33±4.20 | 0.381(NS) |

*p value<0.05

**Table 3:Comparison of Frequency domain measures of reflux positive and reflux negative group**

| | Reflux Positive MEAN ± SD | Reflux Negative MEAN ± SD | p value |
|---|---|---|---|
| LF(nu) | 41.97±16.78 | 55.35±16.72 | 0.009** |
| HF(nu) | 58.02±16.78 | 44.65±16.72 | 0.009** |
| LF/HF RATIO | 0.87±0.57 | 1.57±0.98 | 0.005** |
| LF in ms | 292.85±51.65 | 247.51±63.54 | 0.01** |
| HF in ms | 637.29±221.97 | 455.94±215.98 | 0.007** |

** p value<0.001

**Table 4: Comparison of time domain measures of reflux positive and reflux negative group**

| | Reflux Positive MEAN ± SD | Reflux Negative MEAN ± SD | p value |
|---|---|---|---|
| Mean RR | 0.94±0.13 | 0.85±0.14 | 0.032* |
| RMSD | 55.82±10.32 | 49.05±9.71 | 0.025* |
| NN50 | 77.81±16.91 | 65.33±14.31 | 0.009** |
| pNN50 | 23.42±8.44 | 17.61±6.03 | 0.009** |

** p value<0.001

## DISCUSSION

The pathophysiology of GERD is associated with dysfunction of the various mechanisms called "the anti-reflux barrier". Lately, the disturbances of the autonomic nervous system have been stressed in the pathogenesis of GERD. Transient Lower Esophageal Sphincter Relaxation ( TLESR) in the absence of a swallow is an important mechanism responsible for gastroesophageal reflux .The TLESR is a vagally mediated reflex event that is triggered by intra esophageal or intragastric stimuli or both. Transient LES relaxations that do not occur during normal peristalsis lasts for up to 30 seconds in contrast to LES relaxations that accompany primary peristalsis which is brief (3 to 10 seconds in duration).

The association between pathological acid reflux and HRV changes have been demonstrated in several studies. Originally gastroesophageal reflux was thought to occur across a hypotensive LES. However, the LES basal pressure is variable in patients with GERD, and in most cases within normal limits(SM 2001). Autonomic changes associated with the perception of heartburn in patients with GERD are poorly understood.

The HRV examination seems to be the best non-invasive method to evaluate the disturbances of ANS. Frequency domain analysis of HRV is considered to be the best semi- quantitative method of ANS activity evaluation.

Our results show a decrease of LF component and increase of HF in the reflux positive patients. LF/HF ratio was decreased in reflux positive group. Our study gives a solid and strong evidence of altered cardiac autonomic activity in patients with gastroesophageal reflux.The key role has been attributed to parasympathetic dysfunction, which may adversely affect motor activity of this area by increasing transient LES relaxation number and impairing LES pressure, esophageal acid clearance and motility of the proximal stomach.

Other studies have also showed impaired ANS function in patients with GERD. Those authors, using the method of short term recording showed significant reduction of LF and HF in GERD patients in comparison with healthy individuals(U 2001).Campo et al. observed reduced activity of sympathetic system and the total duration of reflux. (SM 2001).Stimulation of esophagus with hydrochloric acid caused significant increase of parasympathetic component HF and decrease of LF/HF during acid provocation and return to initial status directly after the infusion(M 2001) Balloon distension of the esophagus resulted in an attenuated inhibitory esophagocardiac reflex in patients with noncardiac chest pain.(M 2001). In contrast using power spectral Heart Rate Variability as a measure of the vagal outflow of the heart, Tougas et al. demonstrated an increase in vagal activity in acid sensitive patients with non cardiac chest pain.

## CONCLUSION

Most patients with reflux disease do not produce more gastric acid than normal people. It is because of reflux of the acid into the esophagus. The most effective drugs currently available are those that inhibit acid production. Understanding the patho physiology of the gastroesophageal reflux and its relation to ANS functioning will help in the development of drugs that will enhance lower esophageal sphinter function, and thus prevent reflux. Control of transient lower esophageal sphincter relaxation by drug therapy is an attractive future option for management of supraesophageal complications of reflux disease.

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