Autonomic Cardiac Changes in Temporal Lobe Epilepsy

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ABSTRACT

Background: epileptic patients suffer from many autonomic symptoms either during the seizure or in between seizures. Interictal autonomic cardiac changes may cause arrhythmia which may be life threatening.

Aim of the work: to recognize the presence of cardiac autonomic changes in patients with temporal lobe epilepsy and to find the relation between autonomic cardiac changes and different variables.

Patients and methods: Twenty patients with well controlled TLE and twenty patients with uncontrolled TLE were subjected to standard 12-lead ECG and 24 hour holter ECG.

Results: QTc was significantly shorter in patients with uncontrolled TLE than in patients with well controlled TLE. Patients with uncontrolled TLE had a faster heart rate than patients with well controlled TLE. Patients with uncontrolled TLE showed significant less SDNN, rMSSD and PNN50 than those with well controlled seizures.On the other hand, LF and LF/HF ratio was significantly more in uncontrolled group than the controlled group.

Conclusion: There is an interictal alteration in autonomic control of the heart in TLE. This alteration is corrected with proper control of seizures

Keywords: -epilepsy, QT interval, Autonomic, ECG.

Abbreviations:- TLE temporal lobe epilepsy, ECG electrocardiogram, SDNN Standard deviation of all normal RR intervals in the entire 24 hr ECG recording,PNN50Percent of difference between adjacent normal RR intervals that are greater than 50 msec,rMSSDRoot mean square successive difference,LF low-frequency , HF high frequency.SUDEP sudden unexpected death in epilepsy.

INTRODUCTION

Approximately 1% of the population has epilepsy, the second most common neurological disorder. Different autonomic symptoms can be observed during seizures or precede epileptic seizure [1].

Epilepsy has widespread effects on the heart. These effects range from subtle decrease in heart rate variability that is detected only with 24 hours ECG monitoring to life threatening tachyarrhythmia or heart block. Sudden unexplained death in epilepsy (SUDEP) is suggested to be due to the effect of epilepsy on autonomic control on the heart[2].

Assessment of interictal heart rate and blood pressure suggest that the function of the parasympathetic and sympathetic nervous systems are diminished among patients with epilepsy, as compared with a control population [3].

Periictal and interictal ECG changes in different types of epilepsy were found in up to 60% of epileptic patients and these findings are variable including QT, QTc and PR abnormalities of various degrees. This finding suggests that the effect of epilepsy on the heart is not only at the time of seizure but also in between seizures[4].

Clinical evaluation of autonomic nervous system in patients with epilepsy is so important because it may help in distinguishing a group of people at greater risk of SUDEP[5,6].

Normal heart rate variation depends on the complex interaction between the sympathetic and parasympathetic effects on the heart which induces heart rate oscillations at different rhythms. Analysis of HRV is a non-invasive method for the assessment of autonomic cardiac control[7,8].

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Further information on mechanisms of altered autonomic nervous system function in epilepsy patients is required. It is important to know the clinical importance of such an altered autonomic disturbance and how to apply these findings to stratify patients with epilepsy to groups according to their risk to SUDEP and whether they need further intervention to decrease their risk. Many issues in this field, like the best method to evaluate autonomic disturbance and weather this method should be done to all epileptic patients or specific group, need to be clarified.

AIM OF THE WORK
The aims of this study are
1. To recognize the presence of cardiac autonomic changes (heart rate, heart rate variability) in temporal lobe epilepsy.
2. To find the relation between autonomic cardiac changes and different variables) e. g. Age of onset of seizures, frequency of seizures per month, type of seizure, control of seizures).

PATIENTS AND METHODS
Twenty Patients with uncontrolled TLE and twenty patients with well controlled TLE have been subjected to detailed history taking with special emphasis on the characteristics of epilepsy disorder and any cardiological symptoms. Neurological and cardiological examination was done. In addition seizure severity scale has been applied to each patient.

In addition to investigations needed for diagnosis(6 hours EEG-ECG and MRI epilepsy protocol), All patient have been subjected to routine ECG and 24 hours holter monitor ECG time domain parameters (SDNN, PNN50, rMSDD) and frequency domain analysis(LF, HF, LF/HF) were assessed in both well controlled and well controlled TLE patients.

RESULTS
The study included forty patients with TLE. Twentypatients have uncontrolled TLE and twentypatients have well controlled TLE with age range (11-58) years; 29 were male and 11 were female. In the patients with uncontrolled TLE group, the mean age was (32. 75±10. 76), the mean age of onset of epilepsy was (20. 25 ±9. 85) years and the mean duration of illness was (12. 53±10. 13) months. 40% was on monotherapy and 60% was on dual therapy. In the patients with well controlled TLE group, the mean age was (25. 25±9. 85), the mean age of onset of epilepsy was (17. 35 ±4. 75) years and the mean duration of illness was (7. 9±6. 5) months. 65% was on monotherapy and 35% was on dual therapy. The results are summarized in table (1)

QTc was significantly shorter in patients with uncontrolled TLE than in patients with well controlled TLE. Minimum heart rate and mean heart rate was more in uncontrolled group (table 1).

Patients with uncontrolled TLE showed statistically significant less SDNN, rMSSD and PNN50 than those with well controlled seizures. On the other hand, LF and LF/HF ratio was significantly more in uncontrolled group than the controlled group (table 1).

There was a statistically significant positive correlation between frequency of seizures and LF/HF ration and an inverse correlation between frequency of seizures and rMSSD.

DISCUSSION
Our results showed that QTc of uncontrolled patient was significantly less than that of well controlled indicating very rapid repolarization that may facilitate reentrant excitation and may be a predictor of SUDEP[9].

In line with our results, many studies found that interictal QTc intervals were shorter in patients with epilepsy compared to controls although QTc intervals were within the normal limits in two groups[10, 11]. On the other hand, interictal QTc interval in epileptic patients was within normal limits[12]. This disparity may be due to usage of different antiepileptic drugs that prolong QT interval or using polymedication.

Previous studies showed that TLE patients have an interictal faster heart rate suggesting an alteration of the autonomic balance. These findings are consistent with our study[13].

We found that RMSSD and PNN50 was significantly less in uncontrolled group than well controlled group. These results suggest decrease parasympathetic predominance. Increase LF power with increase LF/HF ratio was significant in uncontrolled group than well controlled group suggesting sympathetic predominance in those patients. HRV results showed that uncontrolled group showed suppressed autonomic functions with sympathetic dominance and decrease in parasympathetic drive. The same results were found also in the previous studies[11].

Proper control of seizures in TLE patients can improve overall autonomic control, reduce sympathetic drive and reduce heart rate[14]. Alteration in autonomic functions in epileptic patients may be due to epileptic electrical stimulation of higher centers that control autonomic functions like cortical limbic areas[6].

Established clinical data based on numerous studies published during the last decade consider decreased global HRV as a strong predictor of increased all-cause cardiac and/or arrhythmic mortality. Therefore, it is possible that changes in these variables may also predict the cardiovascular risk in patients with TLE[6.]

CONCLUSION

Results of current work suggest that TLE, in our studied cases who did not complain clinically of any autonomic disturbance or cardiac disease, has a clear disturbance of autonomic cardiac control. This disturbance may causesubsequent cardiac arrhythmias due to effects of frequent temporal lobe seizures. Moreover, appropriate control of seizures can improve that disturbance and may be a protective factor against SUDEP. Analysis of HRV from ambulatory ECG appears to be useful in the assessment of ANS function in patients with TLE. However, further work is needed to evaluate their predictive value with regard to increasing the risk of sudden cardiac fatalities in patients with epilepsy.

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(Table 1):- comparison between uncontrolled and well controlled patients as regards ECG and holter results

	Uncontrolled Mean ± SD	Well controlled Mean ± SD	t	P-value
QT interval (mSec)	376. 1±24. 54	375. 8±29. 23	0. 041	> 0.05
QT c(mSec)	392. 05±32. 33	435. 2±24.	4. 772	< 0. 05*
nimum heart rate(beat/m	54. 55±8. 19	47. 85±7. 47	2. 703	> 0.05
Maximum heart rate(beat/min)	148. 85±10. 01	143. 65±8. 09	1. 807	> 0.05
Mean heart rate(beat/min	85. 75±7. 34	77. 50±10. 35	2. 908	> 0.05
SDNN(mSec)	106. 60±25. 65	140. 0±21. 40	4. 471	< 0. 05*
RMSSD(mSec)	26. 16±11. 09	40. 52±14. 65	3. 495	<0. 05*
PNN50 (%)	4. 24±3. 38	8. 74±1. 30	5. 561	< 0. 05*
LF(msec^2)	1891. 06±555	891. 79±560	5. 661	< 0. 05*
HF(msec^2)	485. 88±175	417. 5±516. 4	0. 560	> 0. 05
LF/HF	4. 26±1. 57	2. 16±1. 14	4. 825	< 0. 05*

* Significant difference