OBSS - Analysis of electromyogram of uterus (EHG)

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1 Abstract

Uterine electromyogram (EMG), also termed electrohysterogram (EHG), represents electrical activity of uterus. The EHG signals contain also intervals with increased electrical activity of the uterus. The increased electrical activity is visible in the EHG signals as short bursts with higher signal amplitude. These intervals usually coincide with contractions. (But not all intervals with increased electrical activity of the uterus are a result of contractions.) The frequency contents of the EHG signal changes during contractions, but the studies have also shown, that the frequency contents of the EHG signals as well as frequency contents of individual contractions within a signal, changes as the labour approaches.

2 Introduction

Our task is to separate the uterine EMG records using sample entropy. For this purpose use the EMG records of the Term-Preterm EHG DataBase (TPEHG DB) [1] which is available on PhysioNet [2]. We decided to split the data into 4 groups. *early, late, preterm* and *term*. Data goes into the group *early* if it was taken before the 26th week of gestation. Data taken during or after the 26th week is in group *late*. Similarly records obtained during pregnancies which ended prematurely are in group *preterm*, while records obtained during pregnancies where delivery was on term and in group *term*. For each record sample entropy was calculated.

3 Methods

We calculate sample entropy using the pattern length of m=3 and pattern match margin of r=0.15 for each record.

4 Results

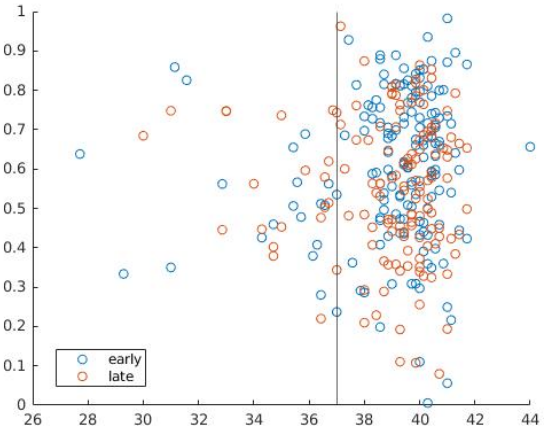

Figure 1: Sample entropy comparison based on delivery week. **Left** of the line are records with preterm delivery, where as records on the **right** had delivery on term.

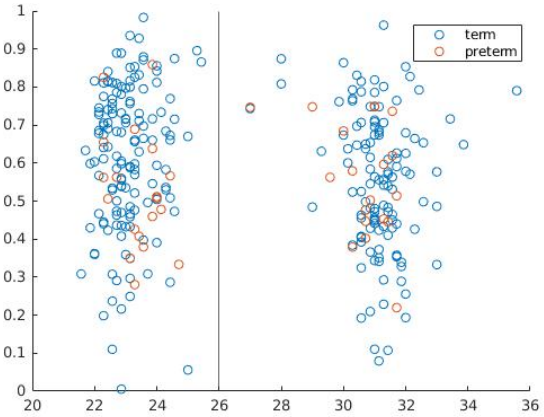

Figure 2: Sample entropy comparison based on week of obtained record. **Left** of the line are records obtained before the 26th week of gestation. Records on the **right** side are obtained during or after the 26th week of gestation.

We also computed mean of sample entropies for each group.

1. *Early* group had the mean of: 0.6050
2. *Late* group had the mean of: 0.5513
3. *Preterm* group had the mean of: 0.5423
4. *Term* group had the mean of: 0.5858

We also performed ttest2 between *early* and *late* which rejected the null hypothesis at the 5% significance level with p = 0.0130. When performing ttest2 on *preterm* and *term* groups, it accepted the null hypothesis with p = 0.1814.

5 Discussion

The closer the record is to labour the lower the sample entropy. By looking at means of groups, we accept this hypothesis, since *late* group had the lower mean than *early* group. Similarly *preterm* had a lower mean than *term*.

Literature

[1] Gašper Fele-Žorž et al. "A comparison of various linear and non-linear signal processing techniques to separate uterine EMG records of term and pre-term delivery groups". In: *Medical & Biological Engineering & Computing* 46.9 (2008), pp. 911–922.

[2] Ary L. Goldberger et al. "PhysioBank, PhysioToolkit, and PhysioNet: Components of a New Research Resource for Complex Physiologic Signals". In: *Circulation* 101.23 (June 2000), e215–e220. ISSN: 0009-7322. DOI: 10.1161/01.CIR.101.23.e215. URL: http://circ.ahajournals.org/content/101/23/e215.