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# Comprehensive Analysis of Electrohysterography Signal Features in Term and Preterm Labor

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**Abstract :** Premature birth, defined as birth before 37 completed weeks of gestation is a leading cause of neonatal morbidity and mortality and has long-term adverse consequences for health. It has recently been reported that the worldwide preterm birth rate is around 10%. The existing measurement techniques for diagnosing preterm delivery include tocodynamometer, ultrasound and fetal fibronectin. However, they are subjective, or suffer from high measurement variability and inaccurate diagnosis and prediction of preterm labor. Electrohysterography (EHG) method based on recording of uterine electrical activity by electrodes attached to maternal abdomen, is a promising method to assess uterine activity and diagnose preterm labor. The purpose of this study is to analyze the difference of EHG signal features between term labor and preterm labor. Free access database was used with 300 signals acquired in two groups of pregnant women who delivered at term (262 cases) and preterm (38 cases). Among them, EHG signals from 38 term labor and 38 preterm labor were preprocessed with band-pass Butterworth filters of 0.08–4Hz. Then, EHG signal features were extracted, which comprised classical time domain description including root mean square and zero-crossing number, spectral parameters including peak frequency, mean frequency and median frequency, wavelet packet coefficients, autoregression (AR) model coefficients, and nonlinear measures including maximal Lyapunov exponent, sample entropy and correlation dimension. Their statistical significance for recognition of two groups of recordings was provided. The results showed that mean frequency of preterm labor was significantly smaller than term labor ($p < 0.05$). 5 coefficients of AR model showed significant difference between term labor and preterm labor. The maximal Lyapunov exponent of early preterm (time of recording < the 26th week of gestation) was significantly smaller than early term. The sample entropy of late preterm (time of recording > the 26th week of gestation) was significantly smaller than late term. There was no significant difference for other features between the term labor and preterm labor groups. Any future work regarding classification should therefore focus on using multiple techniques, with the mean frequency, AR coefficients, maximal Lyapunov exponent and the sample entropy being among the prime candidates. Even if these methods are not yet useful for clinical practice, they do bring the most promising indicators for the preterm labor.

**Keywords :** electrohysterogram, feature, preterm labor, term labor
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