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QUANTITATIVE ELECTROMYOGRAPHY OF HUMAN PARTURIENT UTERINE CORPUS AND CERVIX

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Abdominal or intrauterine electromyographic (EMG) recording during labour, which reflects the original process of myometrial smooth muscle fibres excitation, has mostly been studied qualitatively. The aim of this study was to categorize electrical potentials of the uterine corpus and cervix not only by visual observations. Quantitative information about the uterine electromyogram which should combine amplitude, shape as well as time characteristics was investigated exploring techniques used in random stationary signal computer processing methods. The technical difficulties encountered in recording and processing the uterine EMG in real-time in a way which should yield clinically applicable electrophysiological parameters are considerable. Yet the quantitative electromyography could be very useful in the management decisions and evaluation of the slow labour progress due to abnormal uterine contractions and slow cervical dilatation.

Standard electrophysiological equipment for cardio-tocography has been adapted to enable recording also the intrauterine pressure and EMG activity amplified by specially developed miniature two-channel preamplifier and filtered by suitable amplifier. Uterine corpus and cervix EMG detection has been achieved by abdominal disk and cervical spiral electrodes respectively. The two spiral cervical electrodes were attached in the circular or longitudinal direction ///. The selected combination of only two EMG tracings was due to limitations of the equipment being used.

Initially the quantitative analysis of changes in amplitude and frequency parameters for 10 mostly induced or stimulated labours was performed off-line using the spectral analysis computed by fast Fourier transformation algorithm to 4096 samples on each time sequence of EMG signal played back from the magnetic tape-recorder in FM (frequency modulation). Power spectral density function (PSDF) was estimated and its changes were studied by alterations in typical frequencies (mode or median frequency) with the frequency resolution of 31,2 mHz. The dedicated software on HP9826 16-bit microcomputer included also the artefacts handling. In the next phase of the study a two-channel Mini

FST Analysis System was used for the real-time spectral analysis with 25mHz frequency resolution and the significant patterns of the EMG uterine activity was further investigated in 5 induced labours. The frequency band investigated was from 0.1 Hz to 10Hz.

The results obtained are promising specially in the way they show the possibility of diagnosing the unripe cervix. Further on the differences between the EMG of the uterine corpus vs. cervix or the differences between longitudinally vs. circularly measured cervical EMG were studied. It was found that the uterine corpus EMG differs from that in the cervix specially during the latent phase of labour. The frequencies being present in the EMG of corpus in the latent phase are significantly lower against those in the cervical EMG. In the beginning of the active phase the frequencies in both signals become almost identical. It was concluded also that the cervical EMG measured from two different leads differs in unripe cervixes in the latent phase of labour. Further research on quantitative uterine electromyography should bring the typical patterns during labour for ripe and unripe cervix and thus enable better management of the labour.

1. Pajntar,M.,Roškar,E.,Rudel,D.:Electromyographic observations of the human cervix during labour. Am J Obst Gynec (in press).