ASOCIACION
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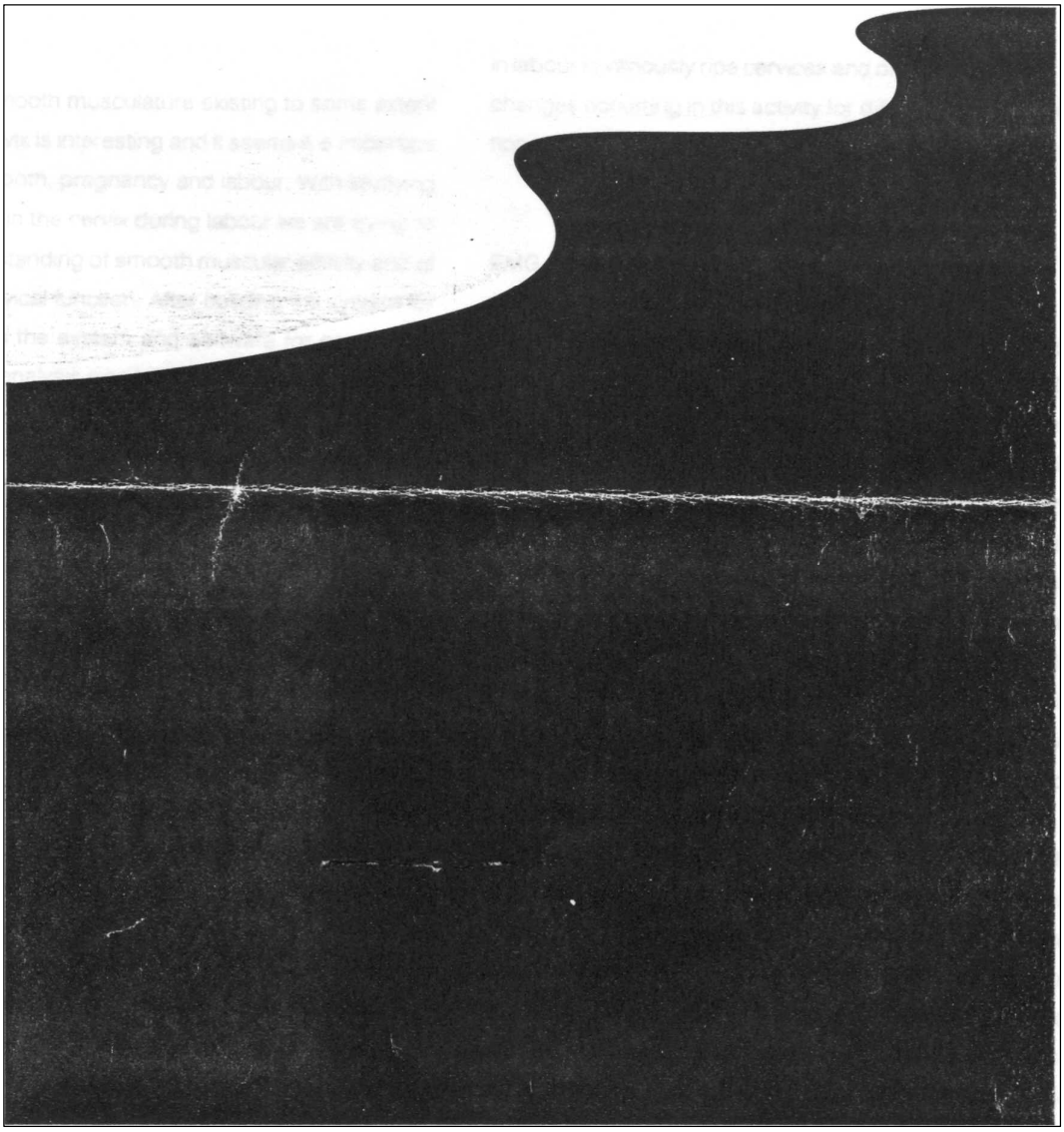
PROCEEDINGS



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REGISTRATION AND ANALYSIS OF CERVICAL EMG DURING LABOUR

M.Pajntar*, I.Verdenik, D.Rudel, B.Valentinčič*

*University Department of Obstetrics and Gynecology Ljubljana, Slovenia Faculty of Electroengineering and Computing, University of Ljubljana, Slovenia

Abstract

The activity of smooth musculature existing to some extent in the human cervix is interesting and it seems it is important to the course of both, pregnancy and labour. With studying electrical activity in the cervix during labour we are trying to get better understanding of smooth muscular activity and of its role in the cervical function. After building the system for EMG registration the system and software for continuous intrapartal EMG analysis was built. The system enables the registration and analysis of the activity of the smooth cervical musculature at the time of cervical dilatation during labour and enables the evaluation of various drugs effect. on the activity of these muscles.

INTRODUCTION

The activity of human cervical smooth muscles is one of relevant factors for its closure during pregnancy and for its dilatation during labour. Preterm opening of the cervix in pregnancy or too slow dilatation during labour cause numerous obstetrical complications. There exist the systems enabling continuous registration and studying of electrical uterine and cervical activities during pregnancy and labour in sheep (1). We have built the system enabling continuous registration of electrical uterine and cervical activities as well as its continuous analyses in humans (2, 3). Our investigation has concentrated on the analyses of electrical activity of the smooth cervical musculature in the process of dilatation in labour in variously ripe cervices and on the analyses of the changes occurring in this activity for different drugs application.

EMG REGISTRATION AND ANALYSIS TECHNIQUE

Bipolar registration of cervical electrical activity was implemented, using fetal spiral scalp electrodes (4). The electrodes were inserted on the cervix circularly to the cervical canal. A miniature two channel differential preamplifier was designed to amplify low amplitude EMG potentials with fixed gain of 1(X)() and bandwidth up to 5kHz (3dB) EMG was furtt1er amplified by a two channel galvanically isolated amplifier with an adjustable gain, an adjustable DC level, and a built-in low-pass filter (5Hz). The signals were recorded by two channel chart recorder and for further processing sampled and stored in computer. EMG data was preprocessed by first dividing them into series of sequences 10 seconds long. These sequences were further used for power spectrum calculation and for calculating their RMS (root mean square) value. From power spectrum of every sequence, median frequency was obtained. In this way, great reduction of data was achieved. while their information content was preserved. For analysis of preprocessed data MATLAB software package was used, which enables us to compare EMG activity during different phases of labour. Intrauterine pressure giving information on uterine contractions was also registered.

RESULTS

Figure 1.

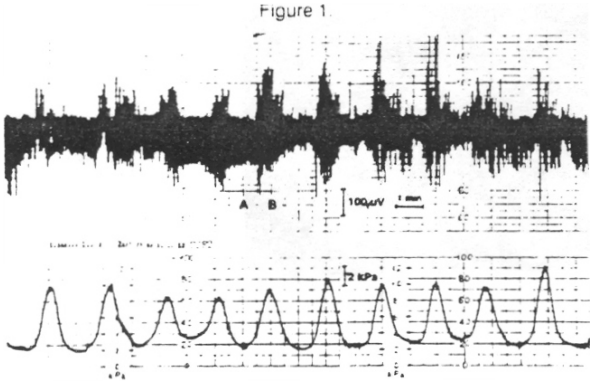

Fig.1 demonstrates rough cervical electromyographic activity and intrauterine pressure in a primiparous patient with unripe cervix. At the end of latent phase of labour the activity is grouped into bursts synchronised with uterine contractions but the activity between two contractions is pronounced too. especially if the latter Is compared to the activity of a ripe cervix (Fig.2)

Figure 2.

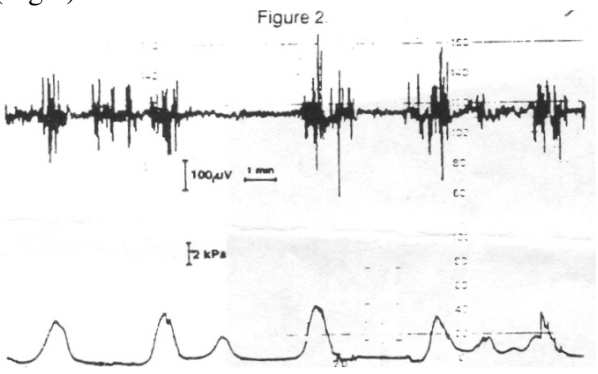

Figure 3

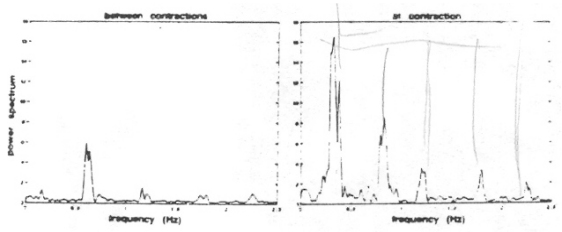

Fig.3 demonstrates power spectral analysis of EMG activity. Part A and B correspond to the events marked in the Fig.1. The differences between activity 'between two uterine contractions' (A) and 'at uterine contraction' (B) suggest that activity is different probably of different nerve supply.

Figure 4.

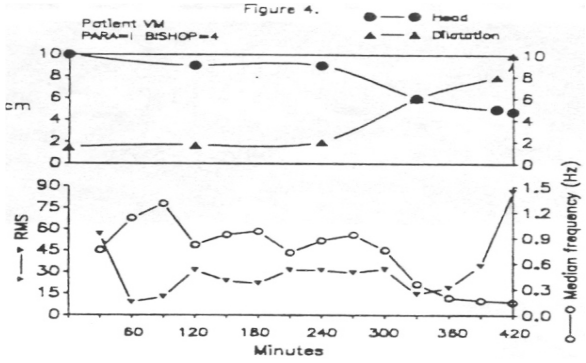

Fig. 4 demonstrates continuous analysis of median frequency and root mean square (RMS) regarding the course of labour (see partogram - upper part of figure). There is a lot of oscillation during the course of latent and less so in the active phase of labour; median frequency is significantly higher in latent than in active phase and RMS significantly lower in latent than in active phase; in the period of high median frequencies RMS is low and vice versa.

Figure 5.

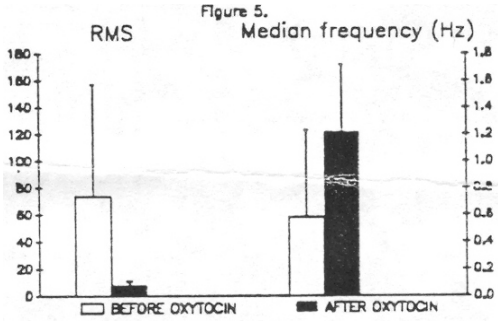

Fig.5 demonstrates changes in mean median frequencies and RMS after application of oxytocin (Syntocinon 6.75 mEq/min) 20 minutes after the induction of labour (patient VM) with amniotomy in the case of unripe cervix (Bishop 4).

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