RECORDING OF THE CONTRACTILE ACTIVITY OF THE UTERUS BY MEANS OF A TWO-CHANNEL HYSTEROGRAPH

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UDC 615.471:618.14-009.1-073.96-71

The successful completion of childbirth depends in many respects on the character of the contractile activity of the uterus: force of labor pains, their duration and rhythm, the reaction of the uterine muscles to injection of parturifacients and other drugs, etc. The subjective sensations of the parturient at the moment of a labor pain and the long-existing palpatory methods far from always permit a correct evaluation of the character of parturition and selection of the method of promoting labor.

The contractions of the smooth-muscle wall of the uterus usually begin in the region of the tubal angles, where ganglia are located, and then cover the fundus uteri and propagate in a descending direction to the corpus uteri and lower segment. It is most important to determine the character of the contractile activity of the uterine muscles in the region of its fundus and lower segment. It is difficult to characterize the contraction of the uterus simultaneously by palpation in its indicated two, and the more so in other, regions. Therefore, for a number of years methods have been proposed for solving these problems based on the use of a different type of instrument, hysterographs. There are methods of internal (via natural parturient canals) and external hysterography with the use of mechanical, pneumatic, and electromechanical pickups placed on the abdomen of the parturient, methods of measuring the bioelectric potentials of the uterus during its contraction, etc.

Fig. 1. Hysterograph.

All-Union Research Institute of Medical Instrument Manufacture, Central Institute of Postgraduate Medicine, Moscow. Translated from Meditsinskaya Tekhnika, No. 4, pp. 44-47, July-August, 1970. Original article submitted June 27, 1969.

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Fig. 2. Fragment of hysterogram recorded 14 days before labor, a) Contraction of the muscles of the fundus uteri; b) functional state of the lower uterine segment (negative signals, relaxation of the lower portions of the uterus).

Fig. 3. Fragment of hysterogram with 6-cm expansion of the cervix. Multipara. Without amniotic fluid for 2 h. Here and in Fig. 4: a) contraction of musculature of fundus uteri; b) contraction of musculature of lower uterine segment.

The complexity of use and the high cost of most of the known instruments, and sometimes the inaccuracy of the information obtained, are the main reason that hysterography methods have still not gained popularity in obstetrical practice. The so-called external hysterographs are the simplest and most reliable in operation.

Being guided by the fact that it is very important to record the contractions of the uterine muscles in the two regions indicated above, we decided to study the possibility of recording the contractile activity of the uterus by means of a laboratory model of a two-channel hysterograph, developed at the All-Union Research Institute of Medical Instrument Manufacture, which is based on a pneumomechanical principle (Fig. 1).

The instrument consists of two pneumomechanical pickups and a recorder with a tape-drawing mechanism. The pickups are connected with the recorder by a flexible hose with an inside diameter of 2-2.5 mm and length of 1.5 m. Both measuring channels are identical, have the same sensitivity, and provide recording of the measurement results on graph paper with an amplitude up to 35-40 mm. A steady travel speed of the paper tape (20 mm/sec) makes it possible to do without a time marker, and the time of the investigation and the duration and frequency of uterine contractions can be determined from the hysterogram. The pickups are attached to the abdomen of the woman being examined by elastic bands. The pickup is pressed to the abdominal wall by a special device, and the degree of pressing of the pickup is monitored by the movement of the recorder stylus. Contractions are recorded over two channels, from the muscles of the fundus and lower portions of the uterus. In comparison with known two-channel instruments for external hysterography, regardless of the principles of their construction and operation, this pneumomechanical hysterograph is distinguished by minimum weight, can be moved easily from one room to another, can be installed on any stand or bed, and is simple to use. The operation of the instrument is noiseless and it is not affected by other instruments or apparatus.

The attachment of the pickups and even many-hour operation of the instrument does not cause unpleasant subjective sensations on the part of the gravida. The constant presence of a technician or someone from the medical personnel is not required during operation of the instrument. The use of the instrument is safe for the pregnant women and her fetus.

The data of external hysterography are compared in each individual case with the results of the vaginal investigation.

Using the method of external hysterography, we examined 60 women, aged 18-40 years: 29 in the 38-40th week of pregnancy and 31 in labor; there were 42 primiparae. We established that in those women whose pregnancy terminated with term, spontaneous births, the physiological activity of the uterus was noted even before the onset of regular birth activity. This activity was expressed by uterine contractions rhythmically recurring, but subjectively not perceived, which were recorded by the hysterograph (Fig. 2).

It is known that by the start of labor the functional state of the central nervous system is directed toward the unique and proper development of the birth act. I. I. Yakovlev called this special functional state of the CNS the "dominant of labor," which takes over from the "dominant of pregnancy." The physiological course of labor with a favorable outcome for mother and fetus is possible in the presence of reciprocal relations between the corpus and cervix of the uterus (contraction and relaxation), directed and regulated by the CNS. There is a definite regularity in the contractile activity of the uterus; with each labor pain the wave of contractions of the uterine muscles propagates from the fundus toward the lower