Experiments on the control of myometrial activity in the non-pregnant woman

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MYOMETRIAL activity is controlled by a series of anatomical, nervous and endocrine factors. We have concentrated on one group of endocrine factors, namely oestrogens and progestagens.

In the beginning of these studies we used the open-end catheter technique, introduced by Hendricks (1964). Later on we modified the technique by covering the intra-uterine end of the catheter with a small cylinder of a synthetic sponge (Bengtsson, 1968a). The many small channels of the sponge guarantee free passage to the tip, which greatly facilitates recording.

We found it necessary to start with myometrial activity during the normal menstrual cycle, the more so since this activity has been very much debated. It was shown that from the end of menstruation to around the 18th day of a 28-day ovulatory cycle, the principal myometrial activity consists of frequent contractions (2-4 min) of low amplitude (generally below 10 mmHg) and short duration. Around the 20th day another type of contraction appears with low frequency (every 2-3 min), higher amplitude and longer duration (1-2 min). These stronger contractions are gradually accentuated until 4 days before the next menstruation, when they form a 'pre-labour-like' pattern. Around the onset of menstruation the activity increases further, now corresponding to 'labour-like' activity. These findings (Moawad & Bengtsson, 1967), are in agreement with the recent studies of Hendricks (1966) and Coutinho (1967).

If the activity patterns during the menstrual cycle are plotted against known endocrine changes during the cycle, it seems that the small, frequent contractions coincide with oestrogen influence, pre-labour-like activity with a combined influence of oestrogen and progesterone, and labour-like activity with the withdrawal of both hormones.

During the continuation of our studies (Bengtsson & Theobald, 1966; Moawad & Bengtsson, 1968a, b) we found that in women with only or at least mainly oestrogen influence (anovulatory cycles, Stein-Leventhal syndrome, oestrogen-treated castrated or post-menopausal women) only the small, frequent

contractions typical for the proliferative phase can be demonstrated.

When progestogen is added to the oestrogen, the stronger, pre-labour-like contractions appear. This happens both after induction of ovulation by means of clomiphene (Bengtsson, 1969) and after combined oestrogen plus progestogen treatment (Moawad & Bengtsson, 1968b; Bengtsson, 1968a).

After withdrawal of combined oestrogen and progestogen treatment, labour-like activity appears just as at the very end of the ovulatory menstrual cycle (Moawad & Bengtsson, 1968a).

It was found that an increase of the doses of oestrogen plus progestogen produced a more rapid

FIG. 1. Myometrial activity on: (a) the 10th day of a normal menstrual cycle before onset of treatment; and (b) the 13th day of the same cycle as (a) after 0.2 mg ethinyloestradiol + 16 mg norethisterone daily for 3 days (i.e. on the 10th, 11th and 12th days of the cycle).

evolution of pre-labour-like activity (Bengtsson, 1968b). This is now under study. In a few cases we have given 0.2 mg ethinyloestradiol + 16 mg norethisterone daily (four tablets Anovlar, Schering) in the proliferative phase of normal cycles and recorded the myometrial activity daily. The results are illustrated in Fig. 1 which shows that *this dose of oestrogen plus progestogen is capable of inducing a remarkable myometrial activity in a few days.*

We do not know whether contractions as strong as those demonstrated in these experiments interfere with nidation of the fertilized ovum. But *if* they do, it is obvious that when a woman starts taking this hormone treatment daily from the day after a fertilizing coitus, the egg will meet a violently contracting myometrium and implantation will not take place. This *possibility* of 'post-coital contraception' will be carefully studied. We are also going to study whether other combinations of oestrogen plus progestagen induce drastically increased myometrial activity even more effectively and more rapidly.

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