CORPUS LUTEUM ACTIVITY
AFTER HYSTERECTOMY IN WOMEN

By

Cesare Andreoli

ABSTRACT

The influence of total abdominal hysterectomy on the corpus luteum activity in women has been investigated. Urinary pregnane-3α,20α-diol determinations and vaginal smears indicated that hysterectomy performed on day 17–18 of the cycle caused a prolongation of the life span of a normally functioning corpus luteum, whereas hysterectomy performed during the last few days of the menstrual cycle did not affect the activity of the corpus luteum.

The influence of hysterectomy on the life span and the activity of the corpus luteum in mammals has been widely studied. Total hysterectomy performed during oestrus in adult guinea pigs prevents the regression of the corpora lutea which persist for almost three months (Loeb 1923). The corpora lutea retain their size and ovulation-inhibiting function and contain more progesterone than found during pregnancy (Rowlands & Short 1959). Hysterectomy has been shown to extend the period of corpus luteum activity in the sow (Duncan et al. 1961), in the ewe and heifer (Wiltbank & Casida 1956), while it appears to have no effect in the monkey (Burford & Diddle 1936) and the rat (Bradbury et al. 1950). On the other hand, hysterectomy of pregnant or pseudopregnant rats causes persistence of corpora lutea (Bradbury et al. 1950).

Since the information available with regard to the situation in the human
female is insufficient (Amoroso & Finn 1962) it was felt of interest to carry out the study described in this paper.

**MATERIALS AND METHOD**

**Clinical material. – Methods.** Of 184 abdominal total hysterectomies performed at the School of Obstetrics in Vercelli during the year 1963 we have selected 10 women, ages 35–45 years, with normal menstrual cycles of 28 days, in whom laparotomy had to be performed because of uterine fibroids.

In all cases the approximate time of ovulation has been determined by following the basal temperature, vaginal smears, cervical mucus and urinary pregnanediol excretion (Klopper et al. 1955). At surgery the corpus luteum activity was assessed by direct inspection of the ovary and by an endometrial biopsy.

After surgery daily pregnanediol determinations were performed on these patients while the assessment of vaginal smears started from the 6th–7th days post-operatively.

The vaginal smears were grouped into three classes according to the degree of luteal activity: 1) non luteal smears, 2) hypoluteal smears, 3) normal luteal smears.

**RESULTS**

The activity of the corpora lutea after hysterectomy allowed us to subdivide our patients into 3 different groups, according to the day of the menstrual cycle on which surgery was performed and to the level of endocrine function of the corpus luteum (Table 1).

**Group 1:** cases no. 1, 2, 3, 4, 5. Hysterectomy was performed either on day 17 or 18 of the menstrual cycle. Corpus luteum activity on the day of surgery was normal as demonstrated by normal rise of basal temperature, elevated pregnanediol excretion, normal luteal vaginal smears, negative fern test, detection of secretory endometrium and the finding of a fresh corpus luteum on direct inspection of the ovary. The determination of urinary pregnanediol excretion and vaginal smears indicated that after hysterectomy, corpus luteum activity was extended beyond the term seen in untreated normal women.

**Group 2:** case no. 6. Hysterectomy was performed on day 18 of the menstrual cycle. In this patient ovulation had recently occurred and a corpus luteum was present in the ovary which had low activity as demonstrated by an abnormal secretory endometrium, low pregnanediol excretion and a hypoluteal vaginal smear pattern. In this case prolongation of the corpus luteum life span had not occurred.

**Group 3:** Cases no. 7, 8, 9, 10. Hysterectomy was performed on day 24 or 25 of the menstrual cycle. Ovulation had occurred and the clinical and laboratory evaluations confirmed the existence of a normal corpus luteum activity. The results in this group of patients showed a normal regression of the corpus luteum, suggesting that its activity had not been prolonged.
Table 1.
Pregnadiol excretion and vaginal smears in cases 1–10. Pregnadiol excretion is expressed as mg/24 h.
Smears: 1 Non luteal, 2 Hypoluteal, 3 Normal luteal. H represents the day on which hysterectomy was performed.

| Day of cycle | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1 Pregnadiol | H  | 4.2| 3.1| 4.5| 2.7| 3.5| 2.5| 3.1| 3  | 4  | 4.5| 3  | 3.3| 2.7| 2.9| 3.7| 2.9| 3.2| 2.8| 2.5| 3.8|
| Smear        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 2 Pregnadiol | H  | 4.2| 5.4| 3  | 3.5| 4.1| 2.5| 3.4| 2  | 3  | 2  |    |    |    |    |    |    |    |    |    |    |    |
| Smear        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 3 Pregnadiol | H  | 5.8| 6.1| 5.2| 3.8| 3.5| 2.8| 3.2| 3  | 2  | 2  |    |    |    |    |    |    |    |    |    |    |    |
| Smear        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 4 Pregnadiol | H  | 5.6| 5.2| 4.2| 3  | 4.5| 5.2| 4.7| 4  | 3  |    |    |    |    |    |    |    |    |    |    |    |    |
| Smear        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 5 Pregnadiol | H  | 2.8| 3.6| 4.2| 2.5| 2.9| 3.4| 2.6| 3  | 2  | 2  |    |    |    |    |    |    |    |    |    |    |    |
| Smear        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 6 Pregnadiol | H  | 2.2| 1.8| 2.6| 2.8| 2.4| 1.2| 0.6| 1  | 0.8| 1  |    |    |    |    |    |    |    |    |    |    |    |
| Smear        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 7 Pregnadiol | H  | 3.2| 1.7| 0.9| 0.4| 1  | 1  | 1  | 0.9| 0.4| 0.6|    |    |    |    |    |    |    |    |    |    |    |
| Smear        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 8 Pregnadiol | H  | 1.6| 1.1| 0.8| 0.8| 0.8| 0.8| 0.8| 1  |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Smear        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 9 Pregnadiol | H  | 3.1| 2.4| 1.2| 0.8| 0.6| 1  | 1  |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Smear        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 10 Pregnadiol| H   | 2.6| 1.6| 1.0| 0.8| 0.6| 1  | 1  |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Smear        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
DISCUSSION

The data presented suggest that in women, hysterectomy can affect the life span of the corpus luteum. The removal of the uterus can prolong the corpus luteum activity (cases 1–5). Prolongation of the life span of the corpus luteum occurred only when hysterectomy was performed in women with an early corpus luteum (surgery performed on days 17–18 of the menstrual cycle) which had normal endocrine activity. In case no. 6 hysterectomy had been performed after ovulation and the presence of an apparently normal corpus luteum was noted. Laboratory findings did not demonstrate a normal luteal endocrine activity and in this woman, there was no prolongation of the life span of the corpus luteum. In cases 7, 8, 9, 10, where the hysterectomy was performed on day 24–25 of the menstrual cycle, surgery did not appear to influence the corpus luteum activity.

Numerous attempts have been made to explain the prolongation of the life span of the corpus luteum following hysterectomy by carrying out various types of animal experiments. Thus in the guinea pig (Butcher et al. 1962) and in the sow (Anderson et al. 1961) endometrial destruction gave a prolongation of the corpus luteum activity similar to that resulting from hysterectomy. In contrast to this, the injection of endometrial tissue suspension (Amoroso & Finn 1962) and endometrial or uterine transplantation (Butcher et al. 1962) shortened the life span of the corpus luteum in hysterectomized animals.

The importance of the uterus in the metabolism of oestrogens (Heckel 1942) and progesterone (de Jongh & Wolthuis 1964) suggests that hysterectomy may exert its effect through the hypothalamic-hypophyseal system by a feedback mechanism, positive with regard to luteotrophic hormone and negative with regard to luteinizing hormone. This is supported by Anderson et al. (1961) who observed in the sow an increase of luteotrophic hormone secretion following hysterectomy.

A prolongation of corpus luteum activity similar to one observed after hysterectomy was obtained in the guinea pig by uterine denervation (Hill 1962). This suggests that a nervous factor is involved. In support of this nervous factor are the reports on the prolongation of the life span of the corpus luteum after uterine stimulation in the guinea pig (Loeb 1927) and in the sow (Velardo et al. 1953) and changes in the oestrus cycle after uterine distension in the sheep (Moore & Nalbandov 1953) and in the cow (Hansel & Wagner 1960).

In the human subject there are some observations that uterine stimulations can influence ovarian activity. Andreoli (1955), in confirmation of the hypothesis of Dellepiane (1928) regarding the interactions between uterine distension and gonadal activity, observed that uterine distension in women with a
normally functioning corpus luteum, increased and prolonged the activity of
the corpus luteum of menstruation.

REFERENCES

Duncan G. W., Boweman A. M., Anderson L. L., Hearn R. W. & Melampy R. M.:  
Endocrinology 68 (1961) 199.
(1962).

Received on January 28th, 1965.