

Assessment of luteal function after surgical tubal sterilization

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Abstract

To evaluate ovarian luteal function after tubal occlusion, a group of women who underwent Pomeroy sterilization were studied. A prospective group I ($n=16$) were followed for one year and scheduled for blood sampling every other day during their luteal phase before surgical procedure and at 3 and 12 months thereafter. Group II ($n=15$) included women who were studied during their luteal phase at 1 or 5 years post-surgery.

Mid-luteal progesterone and estradiol serum levels were calculated by estimating the average of at least 3 values of serum samples obtained in days 20-25 of a menstrual cycle.

The data suggest that no major changes occur in ovarian function after surgical tubal occlusion, as assessed by the mid-luteal hormone serum levels, and underscore the safety of this procedure.

Introduction

When implementing female sterilization programs in countries where this permanent fertility regulating method is extensively used, it is important to ensure that these techniques are appropriately assessed regarding their short- and long-term safety. Although immediate and early post-surgical complications of various procedures have been extensively evaluated [1,2] there is concern about the frequency of a long-term sequelae following female sterilization [3-5].

A number of reports aimed at assessing the complications of surgical female sterilization methods have led to conflicting results. While, in some instances, changes in menstrual patterns and hormone levels have been observed [3–7], other investigations have failed to demonstrate endocrine abnormalities [8–14]. Indeed, some authors ascribe the term 'post-tubal occlusion syndrome' to describe the alterations in serum levels of ovarian steroids (high estradiol and low progesterone levels during the mid-luteal phase of the cycle) [7]. It has been advocated that the ovarian blood supply affected by surgery alters its hormonal secretion predominantly in the luteal phase. This hypothesis may also have a predictive value in those cases requiring reversal surgery. Other investigators have not been able to demonstrate ovarian endocrine dysfunction after surgical tubal occlusion [15–17].

In order to clarify this controversial issue, we designed a study aimed at assessing the ovarian function in women after Pomeroy surgical tubal occlusion with particular focus on the luteal phase of the menstrual cycle.

Subjects and methods

Thirty-one women of reproductive age attending the Family Planning Clinic of the National Institute of Nutrition, wanting a permanent method of fertility regulation, volunteered for the study. The study received local ethical committee endorsement. All participating women were healthy, as assessed by medical history and physical examination.

A prospective group I ($n=16$) and a cross-sectional group II ($n=15$) were formed. A bilateral tubal occlusion procedure via minilaparotomy was performed on each subject following the technique as previously described [18,19].

Women from group I were studied during their luteal phase of a presurgery cycle (control) and at three months and one year after surgical sterilization. Venous blood samples of 10 ml were taken every other day during the second half of menstrual cycle. Group II consisted of two subgroups: IIa, women at one year ($n=6$); and IIb, women five years after surgery ($n=9$). Serial blood samples were taken following the schedule used for group I. Accurate records of their menstrual bleeding patterns were kept throughout the study.

Luteal function was assessed by the measurement of serum estradiol and progesterone levels determined at midluteal phase (day 20–25 of a cycle). Thus the means of at least three samples were calculated. Radioimmunoassay for estradiol and progesterone were performed following protocols and using reagents provided by the WHO Matched Reagent Program [20]. Within and between assay coefficients of variation for estradiol were 7.8% and 11.3%, and for progesterone were 4.8% and 5.7%, respectively.

The results of mean progesterone and estradiol serum levels were grouped and the differences among the groups were established by analysis of variance followed by Student's *t*-test for unpaired and paired samples as appropriate. The clinical characteristics of participating women are shown in Table 1.

Table 1. Admission physical characteristics of women studied

Group	Age (years)	Weight (kg)	Height (m)	Parity
I (n=16)	24.7 (4.2)	58 (7.3)	1.53 (0.07)	2.8 (0.92)
IIa (n=6)	28.5 (1.8)	58 (8.2)	1.48 (0.03)	3.0 (1.09)
IIb (n=9)	32.1 (1.8)	57 (7.7)	1.52 (0.04)	4.7 (2.05)

Results show mean and standard deviation in parenthesis

I = Prospective group

IIa = Cross-sectional group one year after surgery

IIb = Cross-sectional group five years after surgery

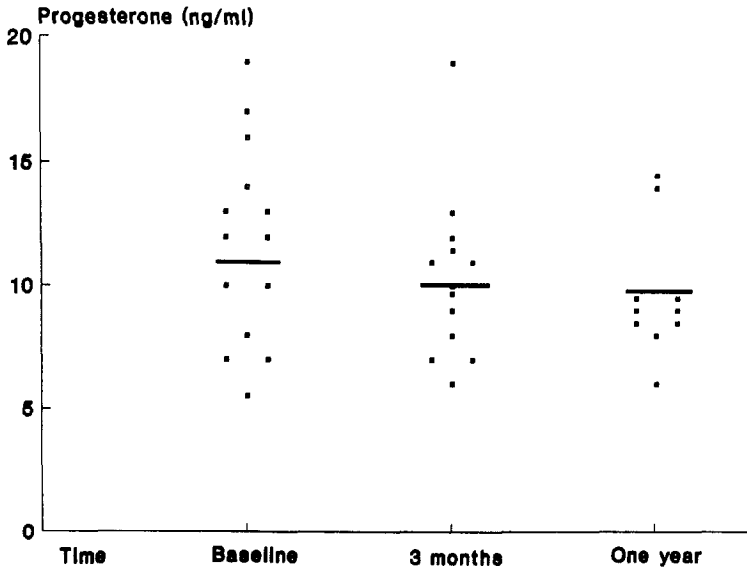


Figure 1. Mean and individual midluteal progesterone levels before tubal occlusion, at three months and at one year after surgery (Group I)

Results

The mean age for group I was 24.7 years, 28.5 years for group IIa and 32.1 for group IIb. These differences were due to inclusion criteria for women in group IIb, who were five years older than women in the other two groups. The parity was: group I, 2.8; group IIa, 3.0; and group IIb, 4.7, respectively.

Individual values of midluteal plasma progesterone in group I are shown in Figure 1. As can be observed, a slight but not significant ($p > 0.05$) decrement in

midluteal progesterone was documented three months after tubal ligation (mean progesterone levels of 10.1 ng/ml (SD 3.5) compared with 11.6 ng/ml (SD 3.9) observed prior to surgery). Twelve months after surgery the mean progesterone value was 9.5 ng/ml (SD 2.3). Four subjects abandoned the study for personal reasons after three months and therefore hormonal values are not available.

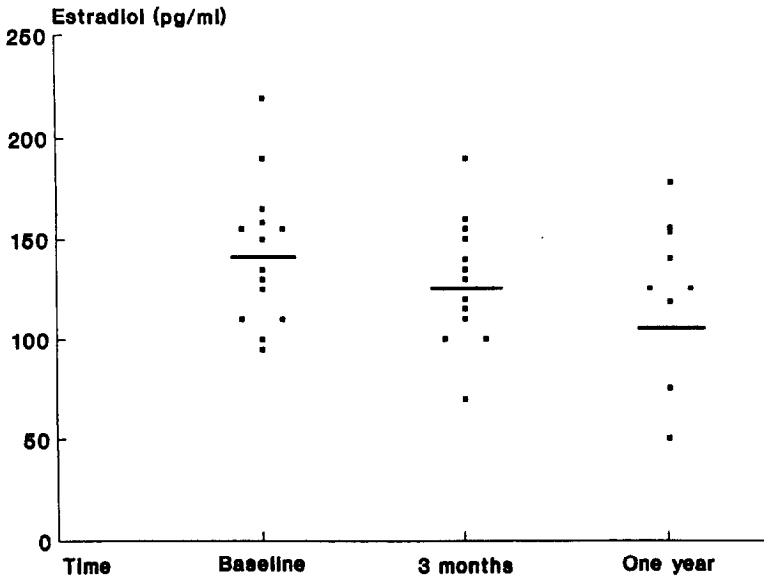


Figure 2. Mean and individual midluteal estradiol levels before tubal occlusion, at three months and at one year after surgery (Group I)

Individual midluteal estradiol serum levels are shown in Figure 2. No major differences ($p > 0.05$) in serum estradiol during the luteal phase were observed in any of the women either after three months post-surgery or after one year.

The mean progesterone levels in women after one year of tubal occlusion (group IIa) were 9.7 ng/ml (SD 3.4) and in group IIb (five years after tubal occlusion) midluteal progesterone levels were 10.4 ng/ml (SD 2.8) (Figure 3).

There were no significant differences among the groups. None of the subjects had complaints regarding the amount or duration of menstrual bleeding. The mean cycle length in group I was 29.2 days, (SD 2.1); in group IIa, 28.2 (SD 2.5); and in group IIb, 31.1 (SD 3.0).

Discussion

As it has been previously reported, tubal ligation may result in an impairment of ovarian endocrine function, particularly luteal phase deficiency [1-7], a concern that is

important not only for those women who request reversal of tubal sterilization but in women with post-tubal occlusion syndrome. Interruption of tubal vasculature has been advocated as the reason for abnormal ovarian perfusion and subsequent altered steroid hormone secretion [1,5,21–23]. To document this deficiency, cycle length, plasma progesterone levels and endometrial biopsies have been useful measurements, particularly during the luteal phase of the cycle [9,12,23,24]. In the present study, the luteal function was assessed by serial measurements of serum progesterone levels in sterilized women undergoing a modified Pomeroy technique of surgical tubal occlusion.

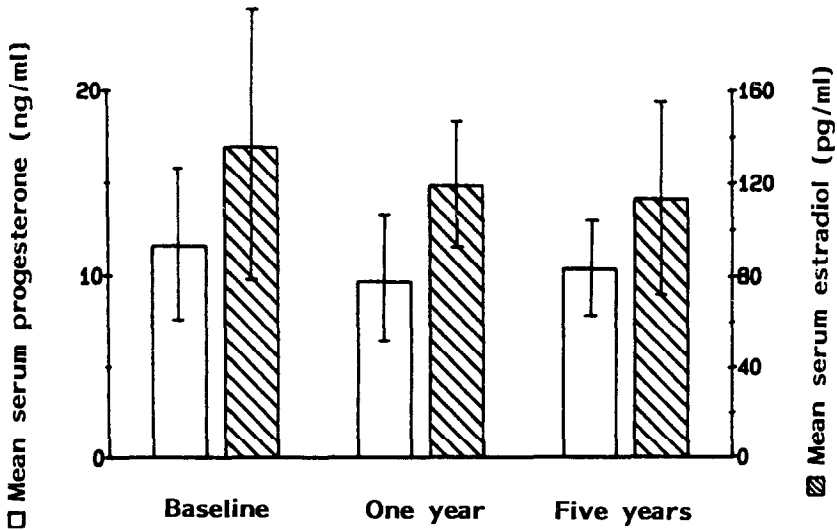


Figure 3. Mean progesterone and estradiol serum levels during the midluteal phase of the cycle, after one and five years of surgery (Group IIb). Standard deviations are shown in bars

The comparative analysis of the progesterone levels during the midluteal phase did not reveal significant differences among the study groups. Furthermore, no major changes in menstrual patterns, associated symptomatology or clinical manifestations of gynecological illness were observed.

A transient but not significant decrease in progesterone levels three months post-surgery was documented in the study. However, progesterone and estradiol levels, as measured one year after surgery, were comparable to baseline pre-surgery values. This fact may be due to restoration of normal ovarian function through recanalization of interrupted blood vessels, restoration of the ability of the vessels to dilate, development of new anastomotic channels and regeneration of the interrupted nerve fibers. These cannot be ascertained from the present study and require further investigations. According to the data presented herein, it is suggested that Pomeroy's

technique for tubal occlusion is a safe procedure and that no significant alteration in ovarian function occurred one or five years after this permanent method of fertility regulation.

Acknowledgements

This work received partial support from the Rockefeller Foundation New York, AVSC, and The WHO Special Programme in Human Reproduction, Geneva.

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MS received 15 Mar. 91.

Accepted for publication 5 Apr. 91.

Resumé

Pour permettre d'évaluer la fonction lutéale ovarienne après l'occlusion des trompes, on a étudié un groupe de femmes qui avaient subi l'intervention de Pomeroy. Un groupe de prospection I ($n=16$) a été suivi pendant un an. Des échantillons sanguins ont été prélevés tous les deux jours pendant la phase lutéale avant l'intervention et par la suite après 3 et 12 mois. Le groupe II ($n=15$) comprend des femmes qui ont été suivies pendant leur phase lutéale 1 ou 5 ans après l'intervention.

On a calculé les niveaux de progestérone et d'oestradiol au milieu de la phase lutéale en estimant la moyenne de 3 échantillons sériques au moins, obtenus pendant les jours 20 à 25 du cycle menstruel.

Les résultats laissent penser que la fonction ovarienne, déterminée en fonction des niveaux sériques hormonaux au milieu de la phase lutéale, n'avait subi aucun changement majeur après l'occlusion chirurgicale des trompes, ce qui met en évidence la sécurité de cette méthode.

Resumen

A fin de permitir evaluar la función lútea ovárica después de la oclusión tubaria, se estudió a un grupo de mujeres que habían sido sometidas a la intervención de Pomeroy. Un grupo de prospección I ($n=16$) fue seguido durante un año. Se tomaron muestras de sangre cada dos días durante la fase lútea antes de la intervención y luego a los 3 y 12 meses. El grupo II ($n=15$) comprendió a mujeres que fueron seguidas durante la fase lútea 1 ó 5 años después de la intervención.

Se calcularon los niveles de progesterona y de estradiol en la mitad de la fase lútea estimando la media de por lo menos 3 muestras séricas obtenidas en los días 20 a 25 del ciclo menstrual.

Los resultados hacen pensar que la función ovárica, determinada en función de los niveles séricos hormonales en la mitad de la fase lútea, no había sufrido ningún cambio importante después de la oclusión quirúrgica de las trompas, lo cual destaca la seguridad de este método.