# DIAGNOSIS OF LUTEINIZED UNRUPTURED FOLLICLE SYNDROME USING ULTRASONOGRAPHY AND BASAL BODY TEMPERATURE CHARTS

By

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*Introduction*

The concept of ovum entrapment leading to luteinization of the unruptured follicle was first proposed by Van Hall and Mastboom in 1969. Since then luteinized unruptured follicle (LUF) syndrome has been recognised as a subtle cause of infertility, especially common in unexplained infertility and endometriosis. Till recently, the diagnosis was based on the laparoscopic visualisation of ovaries for the stigma of ovulation in the immediate post-ovulatory period. If the stigma were absent, LUF syndrome was presumed to exist. Now with the availability of ultrasound, the Graafian follicle can be visualised and ovulation timed accurately without resorting to invasive techniques. Here a non-invasive and simple method, based on ultrasound and basal body temperature, for diagnosis of LUF syndrome is proposed.

*Material and Methods*

Forty five infertile women attending the Gynaecology Out-patients department of our hospital were enrolled for this study and were divided into two groups: Group 1: Natural cycles—20 cycles, Group 2: Stimulated cycles—25 cycles. Group 2 patients received clomiphene citrate or human menopausal gonadotropin (hMG) for induction from 3rd day of menstrual cycle.

Patients were subjected to pelvic ultrasonography by the full bladder technique using a grey scale real-time ultrasound machine with a 3.5 MHz transducer from the 6th-8th day of menstrual cycle. The scans were repeated at 1-3 day intervals till the dominant follicle was identified. The follicle were then scanned daily for signs of ovulation (Table I). All patients maintained an oral basal body temperature (BBT) chart throughout the menstrual cycle. The day of thermogenic shift in each biphasic chart was noted and compared with the day of ovulation determined by ultrasonography.

TABLE I
*Signs of Ovulation*

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|---|
| — Appearance of internal echoes in a previously echofree area. |
| — Development of irregular margin in a round/ Oval follicle. |
| — Flattening or collapse of a follicle. |
| — Disappearance of follicle. |
| — Decrease in size of follicle without change in shape. |
| — Appearance of fluid in the pouch of Douglas. |

Endometrial biopsy was done in all Group 1 patients in the premenstrual phase as a routine investigation for infertility. Material obtained was studied

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histologically for presence of secretory activity.

*Results*

The mature Graafian follicle was visualized as a round or oval echofree area within the ovarian substance (Fig. 1). The size of the mature preovulatory follicle ranged between 16-28 mm diameter.

Group 1 (Natural cycles)

Ovulation was documented by ultrasound in 18/20 patients using the signs of ovulation (Table I), 2 cycles being anovulatory. This finding was confirmed by endometrial biopsy which showed secretory activity in the group of 18 patients and proliferative activity in the remaining two. Out of 20 BBT charts, 19 were in order; one chart was improperly maintained, the patient having discontinued temperature monitoring midway. Biphasic BBT was seen in 14/19 (73.7%) charts, the remaining (26.3%) showed a monophasic pattern. In all 14 cycles ovulation was documented by ultrasonography. Out of the monophasic BBT, two were anovulatory, while 3 were ovulatory by ultrasound.

The mean day of ovulation by ultrasonography was 14.14 ± 1.64 and the mean day of thermogenic shift was 15.15 ± 1.68. In 3 cycles the temperature rise was documented before any sign of ovulation at ultrasonography. The dominant Graafian follicle failed to show any sign of ovulation on or before the day of temperature rise and persisted without change in shape or size. Each of these follicles became hyperechoic in the days (1, 2 and 3 days respectively) following the temperature rise (Fig. 2).

Group 2 (Stimulated cycles)

Ovulation was documented by ultrasound in 20/25 cycles, 5 being anovulatory. Out of the 25 BBT charts, 19 (76%) were biphasic, while 6 (24%) were monophasic. In all 19 patients, ovulation was documented by ultrasound. Out of the 6 monophasic BBT, 5 were anovulatory and 1 was ovulatory by ultrasound.

The mean day of ovulation by ultrasound was 13.95 ±1.52. In one cycle thermogenic shift occurred prior to any change in shape or size of the follicle. On the third day of thermogenic shift, this follicle also showed a hyperechoic change.

Thus in a total of 4/45 (8.9%) cycles, Graafian follicles failed to show any sign of ovulation on or before the day of thermogenic shift.

*Discussion*

The presence of LUF syndrome can now be demonstrated sonographically with a high degree of confidence; the ideal criteria being, persistence of dominant follicles beyond 36 hours after luteinizing hormone (LH) peak, with increased levels of circulating progesterone.

In the absence of LH monitoring, LUF syndrome was documented in the present study by comparing ultrasound and BBT findings. In 4 patients the dominant follicle persisted without change in shape or size at the time of thermogenic shift; to become hyperechoic later on. As the thermogenic shift occurs only after significant circulating levels of progesterone are reached, it can be taken as an evidence of luteinization. Thus these findings were taken as an evidence of LUF syndrome. The incidence of LUF in this study was 8.9%.

LUF syndrome has been demonstrated by other workers using ultrasound and hormonal criteria and the findings have been confirmed by laparoscopy (Marik and Hulka, 1978; Coulam *et al* 1982; LiukKonen *et al*, 1984). Incidence of LUF syndrome in infertile patients has been reported in a wide range of 6-79% (LiukKonen *et al*, 1984). Thus the importance of this syndrome as a cause of infertility cannot be underestimated. In the absence of ready availability of radioimmunoscopy for estimation of various hormone levels, combining BBT and ultrasonography provides a suitable non-invasive method for the diagnosis of this condition. However it may by difficult to document LUF syndrome in patients where BBT is of the monophasic pattern inspite of luteinization. In these patients, we suggest monitoring of cycles by LH and progesterone levels in addition to ultrasonography.

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