ULTRASONOGRAPHIC CLASSIFICATION OF POLYCYSTIC OVARY

(ultrasound/polycystic ovary/classification)

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Two thousand and nine hundred real-time ultrasonographic examinations were performed in the outpatient Department of Obstetrics and Gynecology at Hirata Municipal Hospital, Japan from April '84 to September '86, and polycystic ovaries were detected in 28 patients. Characteristic internal structures of polycystic ovaries were general cystic and peripheral cystic ovaries. In 26 out of the 28 for whom the bilateral ovaries were assessed ultrasonographically, bilateral peripheral cystic ovaries were identified in 12 (46.2%), peripheral and general cystic ovaries in 7 (26.9%), peripheral cystic ovarty and homogenous ovary in 4 (15.4%), and peripheral cystic ovary and dominant single cystic ovary in 3 (11.5%), respectively. The clinical symptoms in each patient varied and sterility was evident in 6 of the 28. Ultrasonography proved to be a non-invasive diagnostic tool for the primary screening of the polycystic ovary and is most economic of time.

In 1935 Stein & Leventhal (1) reported data on a patient with bilateral polycystic ovaries and clinical symptoms of amenorrhea, hirsutism, and obesity, that is the Stein-Leventhal syndrome. With recent advance of ultrasonic instruments, reports of ultrasonographic identification of the ovary have been made (2-4) and the ultrasonographic assessments of polycystic ovaries have also been made (5-6). We examine all our patients in the outpatient Department of Obstetrics and Gynecology, using ultrasound, and we classified the internal structures of the polycystic ovary, on each echogram.

PATIENTS AND METHODS

Two thousand and nine hundred real-time ultrasonographic examination were performed in the outpatient Department of Obstetrics and Gynecology at Hirata Municipal Hospital from April '84 to September '86, and polycystic ovaries were detected in 28 (Table 1). Using the full bladder technique (7), various scanning lines were made to assess the maximum length of the ovary, measured using a superimposed caliper. The internal structures of the ovaries were classified on the ultrasonograms.

The apparatus was an Aloka SSD-256 with a 3.5MHz transducer. Student's t-test was used for statistical evaluation.

RESULTS

All these Japanese women aged 13-34 years had clinical symptoms of menstrual irregularities (11 out of 28, 39.3%), amenorrhea (10 out of 28, 35.7%), obesity (2 out of 28, 7.1%). Patients with the chief complaint of sterility numbered 6 (21.4%). Clinical symptoms and data on the hormone status of these patients are shown in Table 1.

The maximum length of the polycystic ovary varied from 17-46mm (average value 31.3mm), and was longer than that of patients without PCO (average value 18.0mm) (P<0.001).

Characteristic internal structures of polycystic ovaries were peripheral cystic ovary and general cystic ovary (6). Moreover, unilateral homogenous or dominant single cystic ovaries were recognized in those with a polycystic ovary. In 26 out of the 28 cases in whom the bilateral ovaries were assessed ultrasonically, bilateral peripheral cystic ovaries were identified in 12 (46.2%) (Fig.1), peripheral and general cystic ovaries in 7 (26.9%) (Fig.2), peripheral cystic ovary and homogenous ovary in 4 (15.4%) (Fig.3), and peripheral cystic ovary and dominant single cystic ovary in 3 (11.5%)(Fig.4) (Table 2).

DISCUSSION

Parisi et al (8) reported the following three types of polycystic ovary; [1] an ovarian structure with numerous small cystic spaces, all the same size (approximately 0.5cm in

Table 1. Clinical profiles of patients

Patient no.	Age (y.o)	Clinical symptoms	Serum LH (mIU/ml)	Serum FSH (mIU/ml)	LH/FSH ratio	PRL (ng/ml)	Testosterone (ng/ml)	Diameter of the ovary (mm)	Ultrasonic findings
1.	28	Irregular menses	basal 40 / LH-RH test 382	16	2.6	14	0.7	31 (R) / 31 (L)	PCP / HO
2.	24	Amenorrhea	basal 40	12	3.3	18		34 (R) / 46 (L)	PCP / PCP
3.	24	Left mammary pain				36		29 (R) / 27 (L)	HO / PCP
4.	27	Amenorrhea	basal 24	13	1.8	11	0.4	33 (R) / 43 (L)	PCP / PCP
5.	22	Amenorrhea	basal 64	13	5	38	0.7	41 (R) / 38 (L)	PCP / PCP
6.	31	Irregular menses	basal 46	11	4.2	18	0.5	46 (R) / 38 (L)	DSC / PCP
7.	25	Irregular menses / Obesity	basal 23	7	3.4	33	0.8	34 (R) / 34 (L)	PCP / PCP
8.	27	Irregular menses / Galactorrhea				63		27 (R) / 36 (L)	HO / PCP
9.	18	Irregular menses / Galactorrhea				10		36 (R) / 30 (L)	GCP / PCP
10.	13	Lower abdominal pain / Fever						21 (R) / 24 (L)	GCP / PCP
11.	31	Amenorrhea / Galactorrhea				37		26 (R) / 21 (L)	PCP / GCP
12.	26	Irregular menses	basal 19 / LH-RH test 68	9	2.1	32		19 (R) / 20 (L)	PCP / HO
13.	20	Amenorrhea	basal 47	6	7.7	23		31 (R) / 29 (L)	PCP / PCP
14.	32	Excessive genital bleeding						40 (R) / 39 (L)	PCP / PCP
15.	25	Irregular menses						33 (R) / 34 (L)	PCP / PCP
16.	16	Irregular menses	basel 15 / LH-RH test 55	7	2.2	17	0.6	35 (R) / 28 (L)	PCP / PCP
17.	21	Amenorrhea						27 (R) / 18 (L)	PCP / PCP
18.	23	Amenorrhea	basal 29 / LH-RH test 107	8	3.7	13	0.8	33 (R) / 40 (L)	PCP / PCP
19.	22	Amenorrhea, Obesity / Hirsutism	basal 52	8	6.2	9	0.7	19 (R) / 31 (L)	PCP / GCP
20.	33	Irregular menses						33 (L)	PCP
21.	33	Irregular menses / Galactorrhea				8		27 (R) / 24 (L)	PCP / DSC
22.	32	Hypermenorrhea						25 (R) / 32 (L)	GCP / PCP
23.	28	Galactorrhea	basal 19	9	2.2	20	0.5	30 (R) / 25 (L)	PCP / PCP
24.	* 34	Irregular menses						34 (R) / 42 (L)	PCP / GCP
25.	29	Lower abdominal pain						30 (R) / 45 (L)	PCP / DSC
26.	24	Amenorrhea	basal 31	10	3.1	15	0.9	28 (R) / 30 (L)	PCP / GCP
27.	16	Dysmenorrhea						17 (R)	PCP
28.	19	Amenorrhea						31 (R) / 37 (L)	PCP / PCP

LH-RH test: value at 30 min. after injection of LH-RH. PCP: ovary of peripheral cystic pattern. GCP: ovary of general cystic pattern. DSC: ovary with dominant single cyst. HO: homogeneous ovary. R: right ovary. L: left ovary. *: This patient was hyperthyroid.

Table 2. Ultrasonic classification of polycystic ovary

Ultrasonic classification	(n=26)
Bilateral PCP	12(46.2)
PCP & GCP	7(26.9)
PCP & DSC	3(11.5)
PCP & HO	4(15.4)
Bilateral GCP	0(0)
GCP & DSC	0(0)
GCP & HO	0(0)

PCP: ovary of peripheral cystic pattern
GCP: ovary of general cystic pattern
DSC: ovary with dominant single cyst
HO: homogeneous ovary

Values in parentheses are percentages.

diameter), [2] a predominant cyst, [3] numerous thick echoes
arranged along parallel lines. Swanson et al (9) classified two
types; [1] size of cysts was uniform and they were arranged along
the periphery of the ovary, [2] the cysts were more variable in
size and distributed throughout the parenchyma. Orsini et al
(10) observed four ultrasonographic ovarian patterns in
polycystic ovary syndrome; [1] enlarged cystic, [2] enlarged
solid, [3] normal sized cystic, [4] normal sized solid. Tabbakh
et al (11) detected three ultrasonic patterns; [1] isoechoic,
with no discernible cysts, [2] hypoechoic, with multiple small
cysts of <1cm, [3] hypoechoic, with single cyst of >1cm. In our
study, we examined all our patients ultrasonographically to
identify the polycystic structure of the ovary. The character-
istic internal structures of the polycystic ovary were defined as
peripheral cystic ovary (microcysts were aligned in the
subcapsular region of the ovary) and general cystic ovary
(microcysts occupied the entire parenchyma of the ovary) by
ultrasound (6). When the bilateral or at least unilateral
ovaries were recognized, the patient was considered to have a
polycystic ovary. Other ultrasonographic ovarian structures
accompanying peripheral or general cystic ovaries were dominant
single cystic ovary (single cyst (1<, <5cm) occupied the ovary)
and homogenous ovary (ovary was isoechoic to the uterus, and

cyst could not be clearly detected). Therefore, we noted 7 combinations of bilateral ovaries in those with a polycystic ovary. The bilateral peripheral cystic ovaries seen in 12 were the most predominant (46.2%)(Table 2).

Polycystic ovaries are associate with various clinical conditions, such as Cushing's syndrome, hyperprolactinemia, basophilic pituitary adenoma, post-pill amenorrhea, congenital adrenal hyperplasia, hyper- and hypothyroidism, and virilizing ovarian or adrenal tumors (12-14). Merill (15) found that the ovaries of prepubertal girls (aged 10 to 15 years) appear morphologically similar to the ovaries seen in those with a polycystic covary syndrome. Stanhope et al (16) reported that the ultrasound appearnace of polycystic ovaries occurs as a feature of normal puberty when the development is associated with high amplitude nocturnal pulses of LH and FSH but the daytime gonadotropin pulses are of a low frequency and amplitude. Moreover, Adams et al (17) observed multifollicular ovaries (MFO), which are either normal in size or are slightly enlarged and filled with six or more 4-10 mm cysts. They reported that MFO was observed in women with a weight loss related amenorrhea. In our study, 8 patients were considered to have polycystic ovary syndrome (LH$\geq$20mIU/ml, and LH/FSH ratio$\geq$3) (28.6%), but testosterone levels wee all within 1.0ng/ml. On the other hand, hyperprolactinemia (>25ng/ml) was seen in 6 (21.4%), and hyperthyroidism in 1 (3.6%). Prepubertial or pubertial patients numbered 5 (17.9%). Therefore, polycystic ovary was present in case of various pathologic hormonal conditions. Ultrasonography proved to be a useful diagnostic tool for identification and recognition of the polycystic and other pathologic changes of the ovary and should finding ready application for primary screening.

ACKNOWLEDGEMENT

REFERENCES

1) Stein, I.F. and Leventhal, M.L.(1935) Amenorrhea associated with bilateral polycystic ovaries, Am. J. Obstet. Gynecol., 29, 181.

2) Kratochwil, A., Uraban, G. and Friedrich, F.(1972)

Ultrasonic tomography of the ovaries, Ann. Chri. Gynaecol.
Fer., 61, 211.

3) Sample, W.F., Lippe, B.M. and Gyepes, M.T.(1977) Grayscale
ultrasonography of the normal female pelvis, Radiology, 125,
477.

4) Hackeloer, B.J., Robinson, H.P.(1978) Ultraschalldarstellung
des wachsenden Follikels und Corpus luteum im normalen
physiologishen Zyklus, Geburtsh Frauenheilk, 38, 163.

5) Hata, T., Kaneda M., Sawada K., Yamamoto, K., Murao, F. and
Kitao M.(1983) Application of real-time ultrasound for
evaluation of sterile women, Jpn. J. Fert. Ster., 28, 50.

6) Matsunaga, I., Hata, T. and Kitao, M.(1985) Ultrasonographic
identification of polycystic ovary, Asia-Oceania J. Obstet.
Gynaecol., 11, 227.

7) Donald, I.(1963) Use of ultrasonics in diagnosis of
abdominal swellings, Br. Med. J., 9, 1154.

8) Parisi, L., Tramonti, M., Derch, L.E., Casciano, S., Zurli,
A. and Rocchi, P.(1984) Polycystic ovarian disease.
Ultrasonic evaluation and correlations with clinical and
hormonal data, J. Clin. Ultrasound, 12, 21.

9) Swanson, M., Sauerbrei, E.E. and Cooperberg, P.L.(1981)
Medical implications of ultrasonically detectd polycystic
ovaries. J. Clin. Ultrasound, 9, 219.

10) Orsini, L.F., Venturoli, S., Lorusso, R., Pluchinotta V,
Paradisi, R. and Bovicelli, L.(1985) Ultrasonic findings in
polycystic ovarian disease, Fert. and Ster., 43, 709.

11) Tabbakh, G.H., Lotfy, I., Azab I., Rahman, H.A., Southern
A.L. and Aleem, F.A.(1986) Correlation of the ultrasonic
appearance of the ovaries in polycystic ovarian disease and
the clinical, hormonal and laparoscopic findings, Am. J.
Obstet. Gynecol., 154, 892.

12) Ginsburg, J. and Harvard, C.W.H.(1976) Polycystic ovary
syndrome, Br. Med. J., 2, 737.

13) Yen, S.C.C.(1976) The polycystic ovary syndrome, Clin.
Endocrinol., 12, 177.

14) Lindsay, A.N., Voorhes, M.L. and MacGillivray, M.H.(1983)
Multicystic ovaries in primary hyperthyroidism, Obstet. &
Gynecol., 61, 433.

15) Merill, J.A.(1963) The morphology of the perpubertal ovary,
South. Med. J., 56, 225.

16) Stanhope, R., Adams J., Jacobs, H.S. and Brook, C.G.D.(1985)

Ovarian ultrasound assessment in normal children idiopathic precocious puberty and during low dose pulsatile gonadotropin releasing hormone treatment of hypogonadotrophic hypogonadism, Arch, Dis. Child, 60, 116.

17) Adams, J., Franks, S., Polson, D.W., Mason, H.D., Abdulwahid, N., Tucker, M., Morris, V., Prince, J. and Jacobs, H.S.(1985) Multifollicular ovaries: clinical and endocrine features and response to pulsatile gonadotropin releasing hormone, The Lancet, ii, 375.
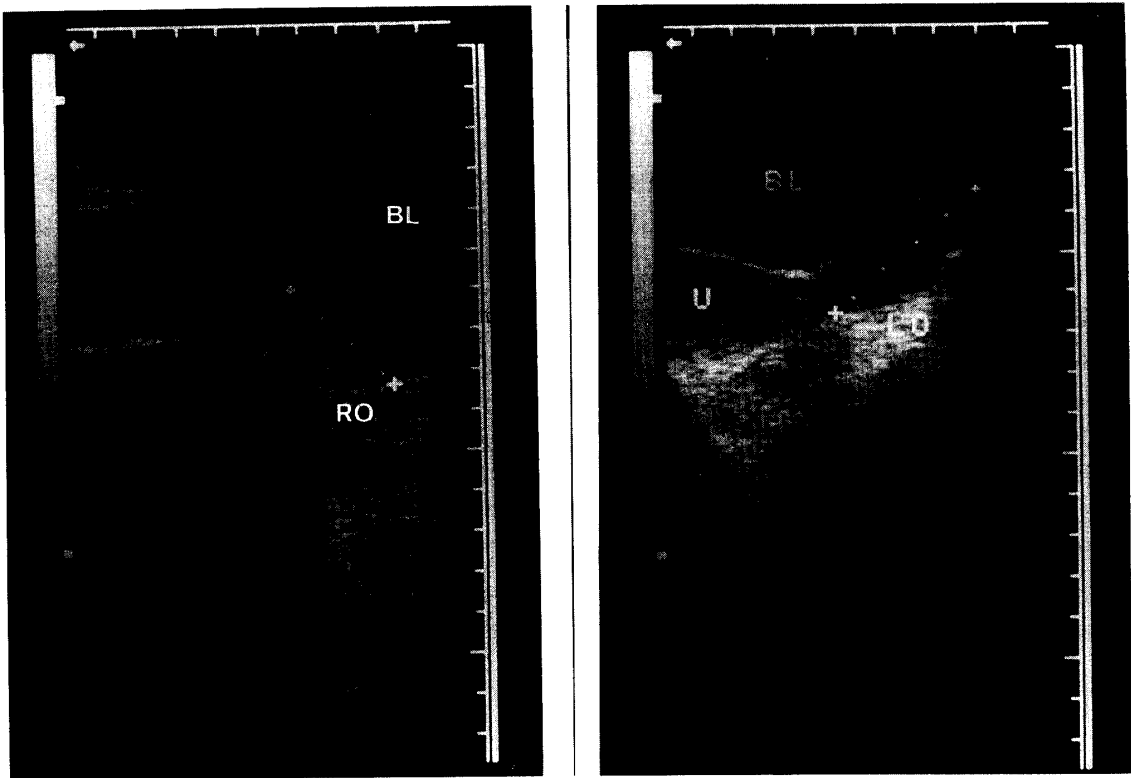
Fig.1   Ultrasonograms of bilateral peripheral cystic ovaries in Case 2.   BL:
        bladder, LO: left ovary, RO: right ovary, U: uterus.
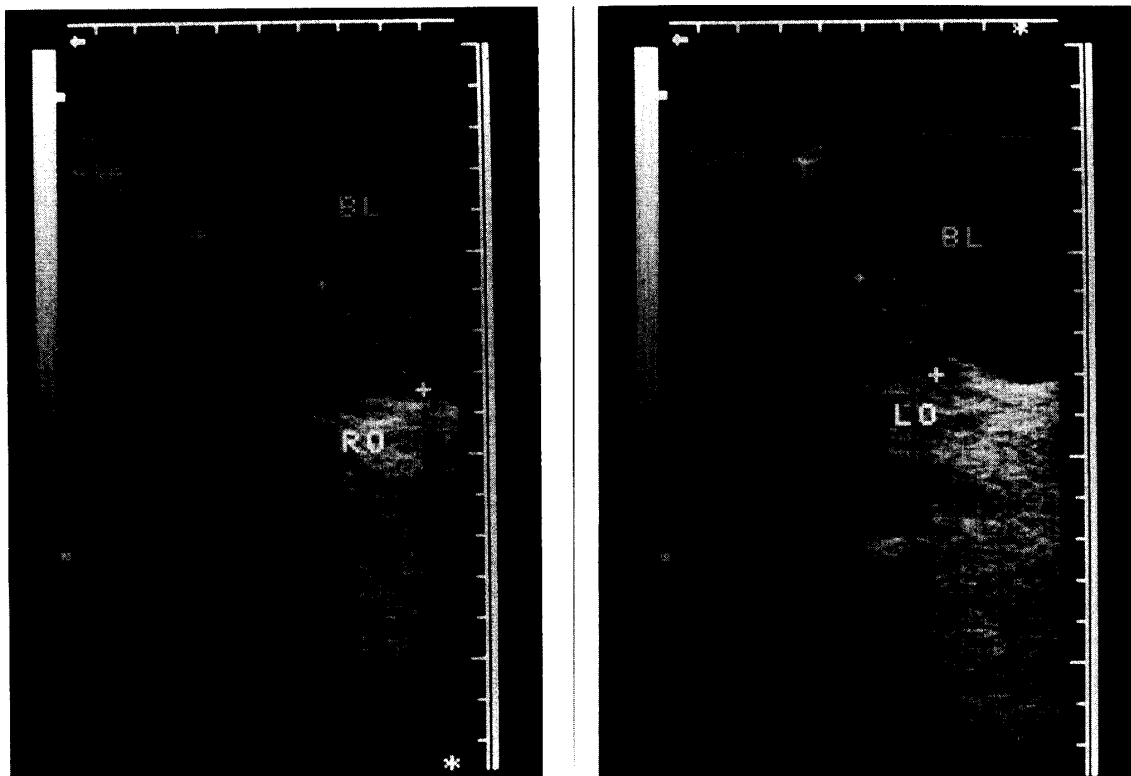

Fig.2   Ultrasonograms of peripheral (LO: left ovary) and general cystic ovaries
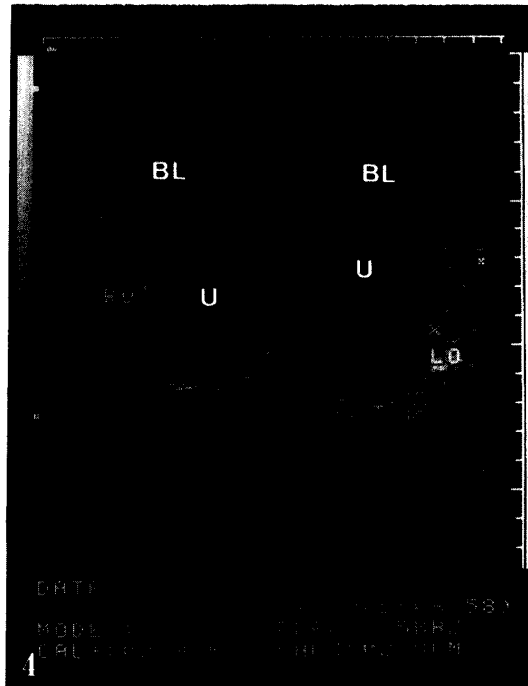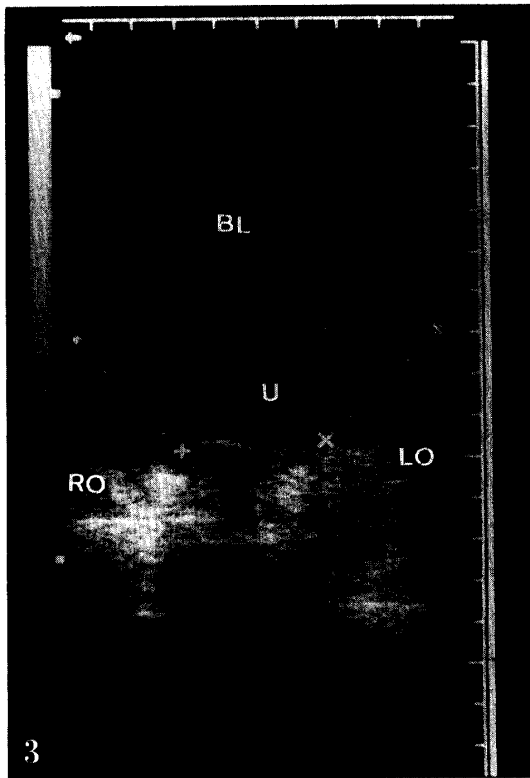   (RO: right ovary) in Case 10.   BL: bladder.

Fig.3 Ultrasonogram of peripheral cystic ovary (LO; left ovary)
and dominant single cystic ovary (RO; right ovary) in
Case 6. BL; bladder, U; uterus.

Fig.4 Ultrasonograms of peripheral cystic (RO; right ovary)
and homogeneous ovaries (LO; left ovary) in Case 1.
BL; bladder, U; uterus.