

# Sonographic value in diagnosis of hemorrhagic ovarian cysts

Z. Ding, M.D.; D. Zhang, M.D.; W. Ying, M.D.; J. Wang, M.D.

Women's Hospital, School of Medicine, Zhejiang University, Hangzhou (China)

## Summary

**Purpose:** To investigate the sonographic characteristics of hemorrhagic ovarian cysts (HOC) and to avoid unnecessary surgery. **Methods:** 113 cases of suspected HOC underwent sonographic and clinical follow-up for three months. **Results:** 104 cases were clinically diagnosed with HOC as the masses disappeared naturally. The mean length of the greatest diameter was  $5.12 \pm 1.33$  cm, and the mean period of disappearance was  $3.5 \pm 2.4$  weeks. There were four patterns of the image: 21 cases (20.2%) showed a diffused dense echo pattern, 25 cases (24.0%) displayed a mixed pattern, 30 cases (28.8%) expressed a sponge-like pattern and 28 cases (27.0%) exhibited a cystic pattern. Ring blood flow with high velocity and low resistance was detected in 41 cases (40%) and there was no internal blood flow. **Conclusion:** HOC showed characteristic features on sonography, which provided useful information to differentiate HOC from ovarian tumors.

**Key words:** Hemorrhagic ovarian cysts; Sonography; Color Doppler.

## Introduction

Most ovarian disorders are benign, with the majority being functional ovarian cysts and benign neoplasms [1]. It is rather difficult for clinical gynecologists to discriminate between ovarian tumors and benign ovarian disorders, such as hemorrhagic ovarian cysts (HOC). The difficulties are caused by the deep location of the ovary in the pelvic cavity, and the insidious clinical symptoms of ovarian diseases. Sonographic or MR imaging can often aid in diagnosis and risk assessment [2, 3]. HOC usually result from bleeding of the ovarian follicle or corpus luteum [4]. To date ultrasound (US) examination is a relatively simple and cheap diagnostic method. Different types of non-neoplastic ovarian cysts vary in sonographic spectrums. HOC may have miscellaneous US features [5], which cause difficulties in differentiation from ovarian neoplasms. Surgery is unnecessary for functional HOC, so it is valuable to distinguish HOC from ovarian tumors correctly.

The aim of this study was to describe the clinical and sonographic characteristics of HOC, and to enhance the diagnostic accuracy of HOC, thus avoiding unnecessary surgery. One hundred and thirteen patients with an adnexal mass were included in the study and the sonographic patterns and clinical outcomes were analyzed.

## Materials and Methods

**Patients:** 113 patients with an adnexal mass detected by clinical examination and sonography were retrospectively evaluated between 6/2002 and 6/2008 at Women's Hospital, School of Medicine, Zhejiang University, China. Pertinent gynecologic histories were obtained on all patients. None of the patients had fever, evidence of infection or a history of ectopic gestation. None of these patients were treated with antibiotics or hormones, and

none had clinical evidence or typical ultrasonic characteristic of an ovarian tumor, endometrioma, teratoma, or fallopian hydrops.

The patients included in this study were 13-52 years old (mean, 30 years; median, 28 years). Sixty patients (53%) had acute pelvic and/or lower abdominal pain. There were a variety of other symptoms such as waist soreness, abdominal mass, nausea, vomiting, etc. Some patients displayed no symptoms.

**Methods:** Patients underwent transvaginal or transrectal US examination by a skilled examiner using Medison 530D and ESAOTE MYLAB50 equipment with a 5-MHz transducer. Patients were examined in the supine position with an empty bladder. Masses were scanned from several angles in an attempt to evaluate all sonographic characteristics. High- and low-gain studies were performed on any anechoic mass for evaluation of internal echoes. Masses were analyzed for size, shape, internal echogenicity, periphery and internal blood flow, peak flow rate (PFR) and resistance index (RI) during systolic period.

Sonographic follow-up was carried out every one to two weeks till three months after the first discovery of an adnexal mass. One hundred and four patients displayed gradual disappearance of the ovarian cyst. Surgery was required in nine patients whose mass remained intact.

## Results

One hundred and four HOCs (92%) out of 113 patients had total resolution documented by follow-up sonograms and/or by the clinical disappearance of a palpable mass. The sizes of HOC varied from 2.0 cm to 7.6 cm (mean  $5.12 \pm 1.33$  cm). Time intervals of disappearance of HOC between the first and last examinations ranged from one to ten weeks (mean  $3.5 \pm 2.4$  weeks). The masses in the other nine patients remained intact in the 3-month follow-up. These nine patients underwent surgery, and the pathological results proved to be ovarian serous cystadenoma

Revised manuscript accepted for publication March 25, 2009



Fig. 1



Fig. 2



Fig. 3



Fig. 4

Figure 1. — Homogeneous dense echo pattern (Pattern I).  
Figure 3. — Sponge-like echo pattern (Pattern III).

Figure 2. — Mixed echo pattern (Pattern II).  
Figure 4. — Low echo pattern (Pattern IV).

(5 cases), ovarian endometriotic cyst (3 cases), and ovarian mucous cystadenoma (1 case), respectively.

According to the internal echogenicity, the sonographic characteristics of HOC were summarized and divided into the following four patterns:

1) Pattern (homogeneous dense echo pattern): 21 cases (20.2%) displayed internal homogeneous dense echo diffused inside the cyst (Figure 1)

2) Pattern (mixed echo pattern): 25 cases (24.0%) showed mixed sonographic features with dense echo and echo-free spaces (Figure 2).

3) Pattern (sponge-like echo): 30 cases (28.8%) displayed a pattern as a micro-network, similar to the sponge image. Buffeting of the internal tremelloid substance was observed when the mass was gently pushed by an ultrasonic transducer (Figure 3).

4) Pattern (low echo pattern): 28 cases (27.0%) showed low-level echo or an echo-free internal space, with sparse fine echogenic dots (Figure 4).

Color Doppler examination showed that the ring blood flow with high velocity and low resistance were detected in 41 cases (40%), and there was no internal blood flow in either the dense echo or low echo position.

## Discussion

Hemorrhagic ovarian cysts (HOC) are one of the functional ovarian cysts. Some patients with HOC suffer different degrees of pelvic and/or lower abdominal pain to different extents, while others may display no clinical symptoms. It is difficult to discriminate HOC from ovarian tumors under clinical conditions. US examination is a relatively simple and cheap diagnostic method. It is widely accepted as the main method for diagnosis of HOC. Sonographic technology is a valuable tool for gynecologists as it may characterize HOC, improve accuracy of clinical diagnosis and avoid unnecessary surgery.

In this study, 104 patients with adnexal masses displayed a comparable ultrasonic spectrum and clinical characteristics as Reynold [6] and Swire [7] described. Resolution documented by sonograms and clinical evidence of disappearance of a palpable mass confirmed the diagnosis of HOC. HOC differed in the side and internal echogenicity. In the present study, the smallest diameter was 2 cm, and the longest was 7.6 cm (mean  $5.12 \pm 1.33$  cm). It was reported by Jain that the maximum diameter reached 10.0 cm [8]. The size of HOC is related to hemorrhagic volume. The internal echogenicity of HOC

depends on both hemorrhagic volume and time of hemorrhage occurrence. Blood is known to have a variable sonographic appearance, mostly related to the temporal sequence of clot formation and lysis [9]. In a standard case, fresh blood is anechoic, progressing subacutely to a mixed echogenicity, and finally becoming anechoic [10]. In most cases, however, any pattern may exist independently or in combination with one another. Therefore, it is not surprising that HOCs have such variable sonographic features. Coelho *et al.* [11] showed that acute bleeding with higher hemorrhage volume usually exhibited hyper-echogenicity, similar with pattern in our study. However, acute bleeding with lower hemorrhage volume might exhibit network-like or sponginess echogenicity similar to Pattern in our study, partly because the blood had not fully coagulated. Pattern and pattern were possible consequences of clot lysis of pattern and pattern, respectively.

HOCs exhibit so much diversity in sonographic features that it is necessary and important to discriminate them from ovarian neoplastic lesions. Clinical observation showed that pattern I and pattern II of HOC were often misdiagnosed as dermoid tumors or ovarian parenchymatous tumors. Pattern III of HOC might be misdiagnosed as ovarian mucous cystadenoma. Pattern IV of HOC might be confused with serous cystadenoma, ovarian endometriosis, and adnexal abscess. Color Doppler US plays an important role in the differential diagnosis of HOC and ovarian tumors. The results of this study showed that approximately 40% of HOC exhibited distinctive ring blood flow with high velocity and low resistance. Since the pathologic basis of most HOC is the bleeding of the corpus luteum, it is not surprising that the distinctive luteal blood flow surrounded HOC. In comparison, serous ovarian cystadenoma and ovarian endometriotic cysts rarely displayed blood flow in the cyst wall. Thus the appearance of the characteristic luteal ring blood flow in sonographic imaging is helpful in discriminating HOC from ovarian neoplastic cysts. In cases where an internal homogeneous dense echo, like echogenicity of parenchymatous tissue is present, examination of blood flow is also very important. The lack of blood flow detected by US indicates a high possibility of HOC. Patients suspected of having HOC are highly recommended to undergo ultrasonic and clinical follow-up due to the beneficial diagnostic accuracy. Our data revealed that the mean time interval for the disappearance of HOC was 3.5 weeks. The longest case lasted ten weeks.

As indicated by this study, the unique sonographic characteristics of HOC provided useful information to discriminate HOC from ovarian tumors. Because HOC

can resolve spontaneously, HOC should be included in the differential diagnosis of any adnexal mass that has good sound through-transmission. This differential diagnosis, however, may be extensive, including dermoid, endometrioma, abscess, ectopic pregnancy, cystadenoma, adnexal torsion, and carcinoma. To those patients with suspected ovarian neoplastic lesions smaller than 8 cm, it is especially valuable to conduct cautious sonographic follow-up before the decision to perform surgery. For HOC, a conservative approach monitoring resolution is more acceptable than immediate intervention.

## Conclusion

HOCs show characteristic features on sonography, which provide useful information to differentiate HOC from ovarian tumors.

## References

- [1] Stany M.P., Hamilton C.A.: "Benign disorders of the ovary". *Obstet. Gynecol. Clin. North Am.*, 2008, 35, 271.
- [2] Tamai K., Koyama T., Saga T., Kido A., Kataoka M., Umeoka S., Fujii S., Togashi K.: "MR features of physiologic and benign conditions of the ovary". *Eur Radiol.*, 2006, 16, 2700-11. Epub 2006 May 31.
- [3] Lee S.I.: "Radiological reasoning: imaging characterization of bilateral adnexal masses". *AJR Am. J. Roentgenol.*, 2006, 187 (3 suppl), S460-6.
- [4] Baltarowich O.H., Kurtz A.B., Pasto M.E., Rifkin M.D., Needleman L., Goldberg B.B.: "The spectrum of sonographic findings in hemorrhagic ovarian cysts". *AJR Am. J. Roentgenol.*, 1987, 148, 901.
- [5] Patel M.D., Feldstein V.A., Filly R.A.: "The likelihood ratio of sonographic findings for the diagnosis of hemorrhagic ovarian cysts". *J. Ultrasound Med.*, 2005, 24, 607-14; quiz 615.
- [6] Reynold T., Hill M.C., Glassman L.M.: "Sonography of hemorrhagic ovarian cysts". *J. Clin. ultrasound*, 1986, 14, 449.
- [7] Swire M.N., Castro-Aragon I., Levine D.: "Various sonographic appearances of the hemorrhagic corpus luteum cyst". *Ultrasound Q.*, 2004, 20, 45.
- [8] Jain K.: "Sonographic spectrum of hemorrhagic ovarian cysts". *J. Ultrasound Med.*, 2002, 21, 879.
- [9] Jeffrey R.B., Laing F.: "Echogenic clot: a useful sign of pelvic hemoperitoneum". *Radiology*, 1982, 145, 139.
- [10] Okai T., Kobayashi K., Ryo E., Kagawa H., Kozuma S., Taketani Y.: "Transvaginal sonographic appearance of hemorrhagic functional ovarian cysts and their spontaneous regression". *Int. J. Gynaecol. Obstet.*, 1994, 44, 47.
- [11] Coelho J.C., Sigel B., Ryva J.C., Machi J., Renigers S.A.: "B-mode sonography of blood clots". *J. Clin. ultrasound*, 1982, 10, 323.

Address reprint requests to:

D. ZHANG, M.D.

Department of Gynecologic Oncology

Women's Hospital, School of Medicine

Zhejiang University

Hangzhou, 310006 (China)

e-mail: zhangdan61@hotmail.cn