HYSTEROSCOPIC DIFFERENCES IN THE GESTATIONAL SAC IN ASYMPTOMATIC BLIGHTED OVUM AND VIABLE PREGNANCY AT EARLY GESTATION

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SUMMARY

Objective: To assess differences in the surface anatomy of the gestational sac and endometrium in cases of blighted ovum and viable pregnancies using flexible hysteroscopy.

Methods: This was an observational case-control study. Seventeen patients with asymptomatic blighted ovum at gestational ages of 8–13 weeks and 32 women with viable pregnancy at 6–12 weeks of gestation were recruited. Subjects at 8–10 weeks of gestation in both groups were matched for comparison. The gross surface anatomy of the gestational sac and the endometrium was assessed and compared between the two groups.

Results: In the viable pregnancy group, the gestational sac was either round (84.4%, 27/32) or ellipsoid and slightly creased (15.6%, 5/32). In the blighted ovum group, the sac appeared collapsed and wrinkled (58.8%, 10/17), small for gestational age (11.8%, 2/17), a combination of the two (17.6%, 3/17), or round and normal (11.8%, 2/17). In general, the sac in subjects with blighted ovum tended to have various degrees of loss in surface tension, collapse in shape, decrease in sac size, and dark blue color at the sac dome compared with the sac in viable pregnancies.

Conclusion: The anatomic alterations of the gestational sac reflect impending sac necrosis and abortion in early-stage pregnancy loss. There were no morphologic differences between the two groups in the pattern of capillary distribution on the endometrium or the implantation base. [Taiwanese J Obstet Gynecol 2005;44(4):342–346]

Key Words: blighted ovum, endometrium, gestational sac, surface anatomy

Introduction

The incidence of pregnancy loss after implantation is 31–43% [1,2], and at least 10–15% of clinically recognized pregnancies end in abortion [2,3]. Blighted ovum, a common form of early pregnancy loss, is strictly described as anembryonic development with an ultrasonic image of an empty intrauterine chorionic cavity with no fetus [4]. Ultrasound is a convenient tool to examine the internal elements of a developing gestational sac and to assess the process of early pregnancy failure [3,5]. However, the gross morphology of extrasacate dark space between the decidua capsularis (the dome of the gestational sac) and the decidua parietalis (the decidual endometrium) and its surroundings remains obscure.

With the development and refinement of flexible hysteroscopy through sophisticated fiberoptic light systems, the darkness of the uterine cavity can be illuminated [6]. Using endoscopy to visualize the developing conceptus in prenatal diagnosis, although invasive, provides a detailed anatomic picture beyond the capabilities of ultrasonography [7–9]. In this study, we examined chronologic changes in the gestational sac at different stages of pregnancy under flexible hysteroscopy and compared the findings in asymptomatic blighted ovum and compatible viable pregnancy
at 8–10 weeks of gestation. The aim was to determine whether there are changes in the surface anatomy of the asymptomatic blighted ovum.

**Methods**

A case-control design was used to recruit patients with a history of regular menstruation for study. The study and control groups, limited to women who had intrauterine pregnancies with gestational age less than 12 weeks, underwent surgical termination. Gestational age was calculated from the last menstrual period. Case and control subjects were matched according to postmenstrual gestational age.

**Definition of blighted ovum and viable pregnancy and subject selection**

The definition of blighted ovum was the absence of a fetal pole within the sac on at least two consecutive ultrasound examinations 1 week apart. The diagnosis was not confirmed until at least 8 weeks of gestation. Viable pregnancy required fetal heart activity associated with a yolk sac in women with a gestational age of at least 6 weeks. In women with viable pregnancy of at least 8 weeks, the discrepancy between the gestational age calculated by menstrual history and from the crown–rump length was less than 4 days. All women in both groups met the following prerequisites: absence of vaginal spotting or bleeding since awareness of the missed period; a history of regular menstrual cycles at intervals of 28–30 days; neither pre-existing systemic diseases nor history of cesarean section, myomectomy, or metroplasty; spontaneous ovulation without exogenous ovarian stimulation and natural coitus during this conception cycle; and a single intrauterine sac without subchorionic hematoma demonstrated by transvaginal ultrasound. Patients who suffered from missed abortion, defined as an ultrasonically demonstrated fetus with no fetal heart movements, were excluded.

Nineteen patients with a diagnosis of blighted ovum were recruited. During the study period, 35 women with a viable early pregnancy who requested elective termination for various medical reasons, such as rubella infection, radiation exposure, respiratory tract infection caused by virus, and drug use with potential risk of fetal jeopardy, were selected. Termination of pregnancy was available according to Taiwan health law for protection of maternal-fetal welfare.

One day before or on the day of dilatation and curettage (D&C), ultrasound was used both to confirm the diagnosis and to examine the endometrial echo pattern. Informed consent for D&C and hysteroscopy was obtained.

**Hysteroscopic procedure**

Hysteroscopy without cervical dilatation was performed in all patients under general anesthesia immediately prior to D&C. A flexible hysteroscope with an outer diameter of 4.9 mm (hysteroscope HYF-1T, Olympus, Tokyo, Japan) was used with 10% dextrose as the uterine distension medium. The pressure of the insufflating medium was kept at around 100 mmHg by endoscopic irrigation pump (Niagara High-Flow Irrigation System, Cabot Medical Corp, Langhorne, PA, USA) to distend the uterine cavity to ensure proper visualization [10]. In order to minimize the potential for insufflation-induced distortion of the gestational sac, a cervical-sealing tenaculum was not used and reflux of the medium through a patulous cervix was allowed. After inspection of the endocervical canal and internal cervical os, the hysteroscope was advanced into the uterine cavity. The low segment, lateral walls, fundus, surface tension of the gestation sac, implantation site (the base of the sac), distribution of emerged vessel on the endometrium, cornual recesses, and tubal ostia were methodically inspected. The whole hysteroscopic procedure was completed within 10 minutes. After this, suction D&C was performed to evacuate the distension medium and conceptus. Laparoscopic tubal ligation with the silastic ring was performed simultaneously in two patients who requested sterilization D&C.

**Assessment and comparison**

All of the imaging features in every patient were displayed on a video monitor and stored on videotape for subsequent analysis and comparison. To determine the serial dynamic changes in the uterine cavity in different stages of pregnancy and to make the examination reliable, we initially reviewed the gross appearance of the gestational sac under hysteroscopy in women with viable pregnancies of 6–12 weeks of gestation. To match appropriate candidates for hysteroscopic comparison, only those at 8–10 weeks of gestation in both groups were selected. All hysteroscopic evaluations were carried out by the author. Student’s t test was used to compare the age and gravidity in the two groups, with a p value of less than 0.05 considered to be significant.

**Results**

Hysteroscopy was completed in all cases except five (2 in the blighted ovum group and 3 in the viable pregnancy
group); these were excluded from the study database because of poor hysteroscopic visualization using a maximum pressure of 100 mmHg. Patient characteristics are listed in the Table. The distribution of age and gravidity was similar in the two groups.

Under hysteroscopy, the gestational sac was almost semicircularly located on the endometrium with an easily identified implantation base. The color, shape, and structure of the uterine cavity in response to pregnancy were visualized but the interior of the sac was invisible in 10% dextrose medium. The lower pole and the dome of the gestational sac could be viewed without difficulty, but the upper pole could not be approached with the tip of the hysteroscope. With increasing gestational age, the base became slowly enlarged and the dome obviously dominated. Normally, the dome appeared yellowish-brown, similar to the decidual endometrium in earlier gestation, and then turned to grayish-blue as gestational age increased. The Table shows the distribution of sac morphology in both groups. In the viable pregnancy group, the sac was either round (84.4%) or ellipsoid and slightly creased (15.6%). Surface tension of round sacs in the distension medium gave an impression of nearly complete fullness (Figure A). In the blighted ovum group, the sac was collapsed and wrinkled (58.8%) (Figure B), small for gestational age (11.8%), a combination of the two (17.6%), or round (11.8%).

To match appropriate candidates for hysteroscopic comparison, only those at 8–10 weeks of gestation were selected. Seven patients with blighted ovum were compared with nine women with viable pregnancy at 8.0–8.9 weeks of gestation, and six patients with blighted ovum were compared with six women with viable pregnancy at 9.0–10.0 weeks of gestation. In the blighted ovum group, the gestational sac tended to have various degrees of loss of surface tension, collapse in shape and decrease in size, and the top of the sac dome seemed to be dark blue. There was no difference in the pattern of capillary distribution on the endometrium or the implantation base between the two groups.

Decidual debris floating in the uterine cavity obscured the hysteroscopic view immediately after the hysteroscope passed through the internal cervical os. At that time, distension medium lavage down the outflow channel and the side port of the hysteroscope was needed to clear the field. The uterine cavity could be visualized with the flexible hysteroscope by adjusting the axis and direction. The shape and structure of cornual recesses were identifiable in all studied cases. Tubal ostia were hard to identify, especially when the gestational age was more than 8 weeks. Retrotubal intraperitoneal spill of the distension medium was not observed in the two patients who underwent simultaneous laparoscopy. Neither procedure-related endometrial bleeding nor gestation sac rupture occurred in any patients. During the postoperative follow-up period of 7 days, no infection was noted.

Microscopic examination of the endometrial specimen revealed gestational tissue only, without trophoblast neoplasm in any case.

| Table. Clinical data in patients with asymptomatic blighted ovum or viable pregnancy* |
|----------------------------------------|-------------------------------|------------------|
|                                       | Blighted ovum (n = 17)         | Viable pregnancy (n = 32) | p         |
| Age (yr)                              | 28.5 ± 3.7                    | 29.9 ± 5.3         | NS        |
| Gravidity                             | 2.7 ± 1.3                     | 2.8 ± 1.2          | NS        |
| Sac morphology                        |                               |                  |
| Round                                 | 2 (11.8)                      | 27 (84.4)          |           |
| Ellipsoid-like                        |                               | 5 (15.6)          |           |
| Collapsed and wrinkled                | 10 (58.8)                     |                  |           |
| Small for gestational age             | 2 (11.8)                      |                  |           |
| Combination of the above two          | 3 (17.6)                      |                  |           |

*Data are presented as mean ± standard deviation or number (%). NS = not significant.
Discussion

Our results demonstrated that the surface tension decreased gradually, the shape may be distorted and the center of the gestational sac dome may turn dark blue in asymptomatic blighted ovum. On the other hand, there were no morphologic differences in the decidual endometrium or in the density of vascular distribution on the decidua parietalis, decidua capsularis, and implantation site.

The loss of tension in the gestational sac in blighted ovum resulting in collapse on the decidua capsularis is speculated to be due to either leakage of fluid from the extraembryonic coelom through an occult lacerated decidua capsularis or inappropriate production of amniotic fluid from the abnormal conceptus. That the color of the sac dome becomes deep blue possibly reflects the impending tissue necrosis of the decidua capsularis.

At the end of the first trimester, the growing gestational sac fills the entire uterine cavity; with fusion of the decidua capsularis and parietalis, the uterine cavity is obliterated. Hysteroscopy provides macroscopic information about the responses of the endometrium to pregnancy and a vivid real-time visualization of the gestational sac in the first trimester. Cullen et al presented similar findings with embryoscopy, which was used to visualize the fetus by penetrating the chorionic membrane at 7.5–11 weeks gestational age [7].

Steiner et al used three-dimensional ultrasonography to precisely estimate sac volume and found that it was smaller in blighted ovum than with normal pregnancy in the first trimester [11]. Our hysteroscopic observations revealed that 89% of blighted ovum had a distorted sac outline with wrinkle or collapse or were small for gestational age. Therefore, there appears to be good volumetric correlation between three-dimensional ultrasonographic imaging and hysteroscopic visualization.

Technically, there was no difficulty in introducing the hysteroscope without cervical dilatation in patients with a softened cervix in pregnancy. The 10% dextrose distension medium is inexpensive, conveniently available, and provides good visualization [10]. A continuous flow system without sealing the patulous cervix is always needed to flush decidual debris from the uterine cavity. The space between the capsularis and parietalis at this gestational age is wide and is easily accessed and not traumatized by hysteroscopy. Aborted hysteroscopic examinations occurred in five cases because of insufficient uterine distension under the low insufflation pressure used in this study.

Although the shape and structure of cornual recesses were identifiable, tubal ostia were hard to identify because the decidual reaction in the cornual endometrium was prominent. Nevertheless, our findings in two patients who underwent simultaneous laparoscopy showed that there was no retrotubal spill of the distension medium pooling in the cul-de-sac. Therefore, we speculate that the tubal lumen remains closed when the pressure of the uterine cavity in pregnancy is at about 100 mmHg.

Although the practical application of hysteroscopy in the first trimester for prenatal diagnosis has been thought to be limited [12,13], hysteroscopy is able to explore the endometrial cavity of early gestation for vivid imaging. The gestational sacs of asymptomatic blighted ova appear to have various degrees of collapse in shape, decrease in size, and impending rupture with necrosis on the dome, but no morphologic alterations in the decidual endometrium.

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References

