# Sonographic Diagnosis of Partial Versus Complete Molar Pregnancy: A Reappraisal

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**ABSTRACT:** *Purpose.* To assess the prospective sonographic diagnosis of molar pregnancy and compare sonographic features of complete versus partial molar pregnancy.

*Methods.* This institutional review board--approved retrospective chart review conducted between 2001 and 2011 identified 70 women with a histopathologic diagnosis of molar pregnancy and with available sonograms. Clinical data, images, and reports were reviewed, and features enumerated by radiologists blinded to the final diagnosis.

*Results.* Mean age of patients was 30.5 ± 7.0 (SD) years (range, 16–49 years) with a mean gravidity of 3.2 ± 2.3 (SD) (range 1–11). Mean gestational age was 74.0 ± 19.1 day (range 39–138) and serum β-human chorionic gonadotropin was 131 ± 156 mIU/ml (range 447–662,000). Pathologic results showed 48 partial and 22 complete molar pregnancies. Sonographically, partial moles more commonly showed a yolk sac (56.3% versus 0%, $p < 0.0001$), fetal pole (62.5% versus 4.6%, $p < 0.0001$), fine septa within the sac (25.0% versus 4.6%, $p = 0.05$), and normal (31.3% versus 0%, $p = 0.002$) or minimally cystic placenta (27.1% versus 4.6%, $p = 0.49$), while complete moles had larger gestational sacs (612 versus 44 mm, $p = 0.005$), were more often avascular on color Doppler imaging (45.5% versus 18.8%, $p = 0.02$), had more often abnormal tissue in the uterus (82.6% versus 20.8%, $p < 0.0001$) and placental masses (86.9% versus 16.7%, $p < 0.0001$), and were more often diagnosed prospectively (86.4% versus 41.7%, $p = 0.0005$).

*Conclusions.* Complete molar pregnancy is associated with marked cystic changes and mass formation and is often diagnosed sonographically. Partial molar pregnancy often presents with minor cystic changes of the placenta and remains underdiagnosed sonographically. However, correct prospective diagnosis was made more frequently in this study than in older reports, perhaps due to improved spatial resolution of sonographic equipment. © 2016 Wiley Periodicals, Inc. *J Clin Ultrasound* **45**:72–78, 2017; Published online in Wiley Online Library (wileyonlinelibrary.com). DOI: 10.1002/jcu.22410

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## INTRODUCTION

About in 1 in 700 pregnancies in the United States is complicated by a partial hydatidiform mole, whereas complete hydatidiform moles occur in 1 in 1500 pregnancies.[1] Molar pregnancies are nonviable gestations by definition, with tissue types varying according to their chromosomal makeup. Partial molar pregnancies are formed by an abnormal combination of an ovum and one or more spermatozoa and contain a range of fetal parts in combination with abnormally proliferative chorionic villi. Complete moles are entirely paternal in origin, arising from one or more spermatozoa combining with a nonviable ovum with no normal fetal tissue.[2] Approximately 10% to 20% of women with complete molar pregnancies and 0.5% to 11% of partial molar pregnancies will go on to develop persistent, invasive gestational

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trophoblastic disease, including invasive mole, choriocarcinoma, and placental-type trophoblastic tumor.[1,3] Clinical suspicion of hydatidiform mole in failed pregnancy has several potential impacts on clinical management, including determination of need and type of uterine evacuation, submission of products of conception to pathology, and serum β-human chorionic gonadotropin (β-hCG) surveillance.[4] Obstetric sonographic (US) practitioners, including radiologists, have the potential to significantly impact patient care by prospectively diagnosing molar pregnancy.

The typical US appearances of complete molar pregnancy include a complex, multicystic, and often hypervascular intrauterine mass and the absence of fetal tissue.[5–7] Partial molar pregnancy may present as a subtle placental abnormality with a live embryo, a spontaneous intrauterine demise, or an empty gestational sac (GS).[5] Criteria for specific US findings in partial molar pregnancy have been suggested in the literature, including a transverse/anteroposterior GS diameter ratio >1.5, and cystic changes or irregularity of the decidua, placenta, or myometrium.[5,8]

In the first trimester, frequency of US diagnosis of complete mole is higher than that of partial mole and improves with increasing GA. Fowler et al[1] reviewed imaging from 378 pathology-proven molar pregnancies, demonstrating pre-evacuation US diagnosis in 200 of 253 (79%) of complete hydatidiform moles and 178 of 616 (29%) of partial hydatidiform moles, with a trend toward improved diagnostic accuracy with increasing GA. Other authors have demonstrated similar trends.[5,9]

We hypothesize that despite development of more sensitive β-hCG serum assays and widespread use of pelvic US in the decade that followed these studies, molar pregnancy remains prospectively underdiagnosed in the first trimester. The aim of our study is to examine the sensitivity of contemporary first-trimester US examination for the diagnosis of molar pregnancy and to describe US features of pathologically proven complete and partial molar pregnancies.

## PATIENTS AND METHODS

Institutional review board approval was obtained for a retrospective review of medical records between January 1, 2001 and December 31, 2011, which identified 130 women with early pregnancy loss and subsequent diagnosis of molar pregnancy during routine histopathologic examination of gestational products. Of these, 70 had US images available in the radiology archive and were included in this study.

Clinical data, including patient age, gravidity and parity, quantitative β-hCG levels, gestational age by last menstrual period (LMP), and histopathologic diagnosis, were obtained from the medical records. US imaging was performed using a Logiq 9 or Logiq E9 scanner (GE Healthcare, Wauwatosa, WI) or a iU22 scanner (Philips Healthcare, Andover, MA) and included transabdominal (3–8 MHz) and transvaginal (5–10 MHz) gray-scale imaging with both static images and videoclips in all patients. Color and spectral Doppler examinations were performed at the discretion of the sonographer and/or interpreting sonologist in order to further characterize the findings on gray-scale images. All original images, including videoclips, were available for retrospective review using a Syngo Dynamics US workstation (Siemens Medical Solutions, Malvern, PA). Images were reviewed in consensus by two abdominal imaging fellowship-trained radiologists with 5 and 8 years of subspecialty experience, respectively, blinded to the specific type of molar pregnancy. Data regarding the presence of a GS, minimum sac diameter, maximum sac diameter, ratio of maximum/minimum sac diameter, mean sac diameter, presence of septa within the GS, presence of a fetal pole and fetal heart rate, US GA, presence of yolk sac, abnormal tissue, vascularity of abnormal tissue, and placental abnormalities were recorded. A GS was considered to be present when an anechoic or hypoechoic collection was noted within the endometrial canal and measured by the sonographer. US GA was assessed on the basis of fetal pole when present or best assessment of mean GS diameter otherwise. Abnormal tissue was defined as the presence of nonfluid material in the endometrial canal that could not be clearly identified as normal gestational products. Because color Doppler images were not performed with standardized settings, the myometrium was used as an internal control for evaluation of vascularity of endometrial contents. The vascularity of gestational products was scored on a 0–2 scale, with 0 = no demonstrable vascularity, 1 = vascularity similar to that of the myometrium, and 2 = vascularity greater than that of the myometrium (Figure 1). The placenta was rated 0–3 (Figure 2) with 0 = sonographically normal, 1 = minor cystic changes, 2 = substantially cystic placenta, and 3 = mass in place of the normal lentiform placenta. The original study dictations were reviewed to determine whether the interpreting radiologist made the prospective diagnosis of molar pregnancy. The prospective diagnosis was considered positive if the

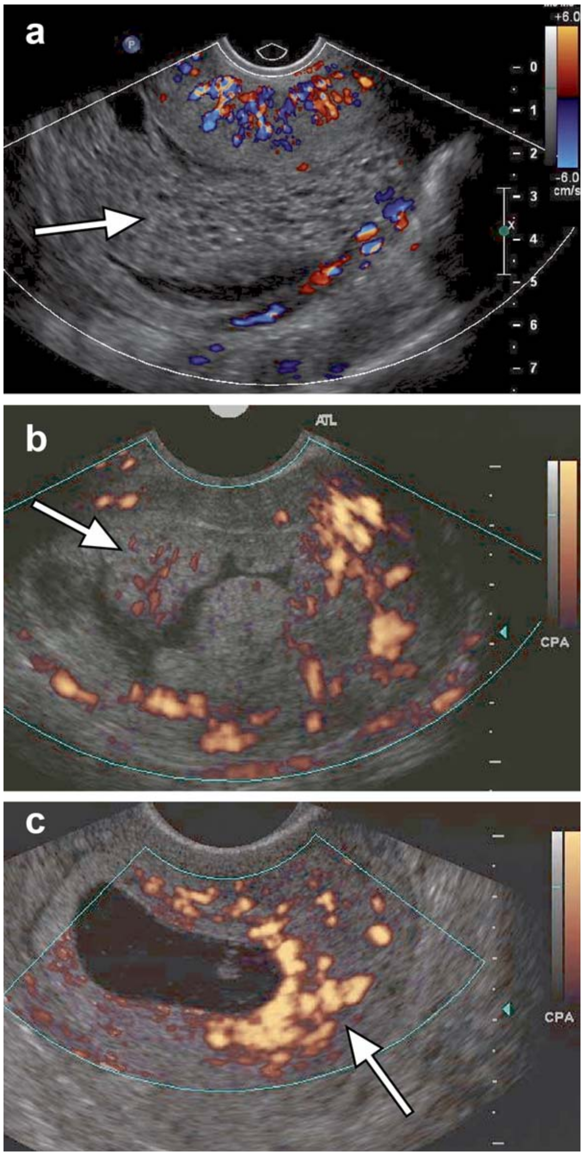


**FIGURE 1**. Examples of various types of vascularity noted on transvaginal color Doppler US of molar pregnancies. **(A)** Vascularity = 0. There is no demonstrable color Doppler signal in hydropic villi (arrow) in an 18-year-old woman with complete mole. **(B)** Vascularity = 1. Power Doppler US shows vascularity within placental tissue (arrow) similar to that of the surrounding myometrium in a 20-year-old woman with complete mole. **(C)** Vascularity = 2. Power Doppler US shows marked focal hypervascularity of the placenta (arrow) in a 40-year-old woman with partial mole.

original dictation described a possible or probable diagnosis of molar pregnancy. The specific subtype of molar pregnancy was rarely commented upon in the original dictations and was not quantified.

Descriptive statistics were performed using means, counts, and percentages. Comparisons were made between the partial and complete molar pregnancy pathologic groups using *t* tests for continuous variables and $\chi^2$ test or Fisher's exact test for categorical variables. The placenta and vascularity rating scales were analyzed both as continuous and as categorical variables. Multivariate logistic regression analysis of factors contributing to the correct prospective diagnosis was performed using stepwise forward selection of variables, initially including all clinically relevant contributing features: age; parity; serum β-hCG; GA by US and LMP; sac diameter; presence of yolk sac, fetal pole, septa, and/or abnormal tissue; placental and vascularity ratings. $p < 0.05$ was the standard for inclusion in logistic regression and overall statistical significance. All analyses were performed using SAS 9.3 (SAS Institute, Cary, NC).

## RESULTS

The mean age of patients was 30.5 ± 7.0 (SD) years (range, 16–49 years) with a mean gravidity of 3.2 ± 2.3 (SD) (range 1–11). The mean GA by LMP was 74.0 ± 19.1 days (range 39–138) and serum β-hCG tested within a day of US imaging was 131 ± 156 mIU/ml (range 447–662,000). Forty-eight women (68.6%) had partial molar pregnancies and 22 women (31.4%) had complete molar pregnancies after histopathologic examination of uterine contents. The demographic and clinical information in each group is provided in Table 1.

Specific US features and frequency of prospective diagnosis of partial and complete molar pregnancies in the original dictation are shown in Table 2. Complete molar pregnancies had significantly larger GSs, were more often associated with abnormal tissue in the uterus, and had greater abnormalities of the placenta. In fact, 19 (86.4%) of the complete molar pregnancies had frankly masslike placentas compared with only 8 (16.7%) of the partial molar pregnancies ($p < 0.0001$). Partial molar pregnancies more frequently demonstrated distinct yolk sacs and fetal poles and tended to be more vascular. Nine (18.8%) partial and 10 (45.5%) complete moles were avascular by color and/or power Doppler imaging ($p = 0.02$). Thin septa within the GS were more frequently observed in partial molar pregnancies (Figure 3).

In multivariate logistic regression, GA by LMP, presence of a yolk sac, and placental ratings were retained as statistically significant predictors of correct prospective US diagnosis of molar pregnancy. The overall score test for the model indicated a superior fit to the null model ($p < 0.0001$). For every one point increase in placenta score, there was a >999-fold increase in odds of correct prospective diagnosis (95% CI 1.13, >999.99, $p = 0.04$). For every 1 day increase in GA by LMP, the odds of correct prospective

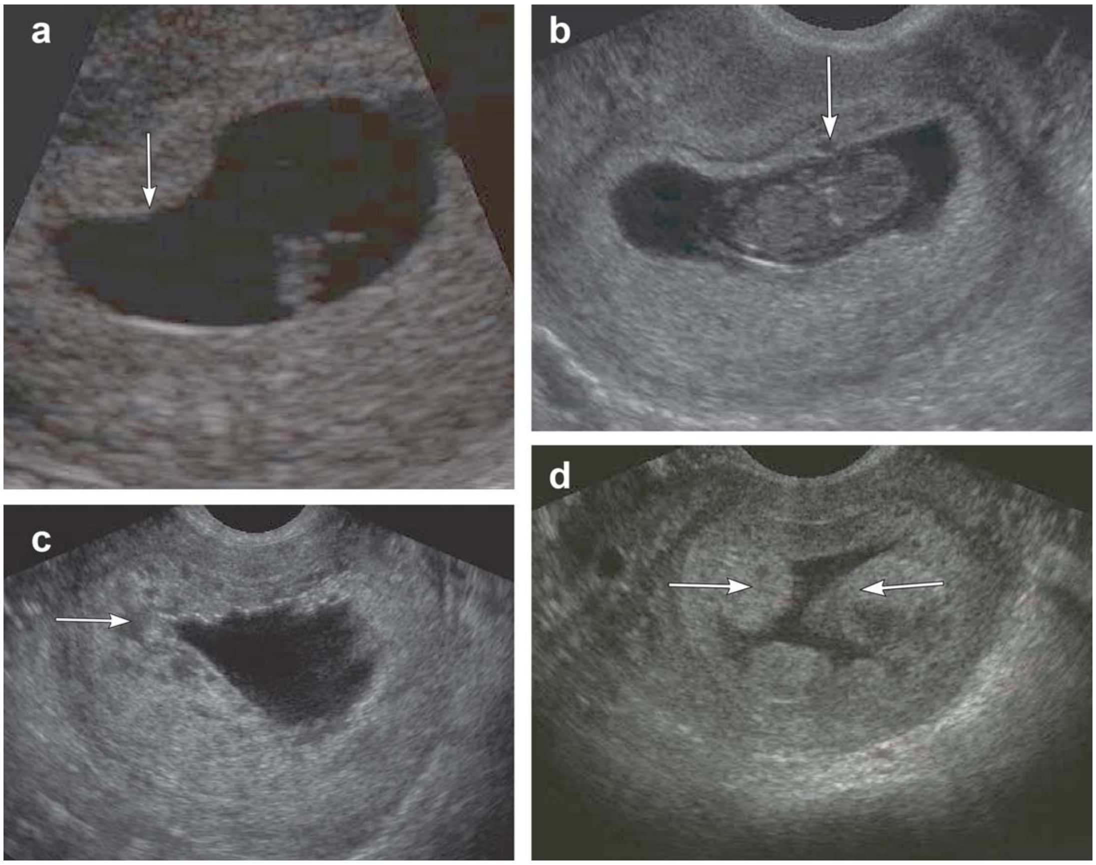


FIGURE 2. Examples of placental rating in four women with molar pregnancies. (A) Placenta = 1. Normal placenta (arrow) in a 29-year-old woman with partial mole. (B) Placenta = 2. Minor cystic change (arrow) in a 21-year-old woman with partial mole. (C) Placenta = 3. Substantial cystic changes (arrow) in a 28-year-old woman with partial mole. (D) Placenta = 4. Placental mass (arrows) in a 20-year-old woman with complete mole.

TABLE 1
Clinical and Demographic Information for 70 Women with Molar Pregnancy

| Parameter | Partial Molar Pregnancy (n = 48) | Complete Molar Pregnancy (n = 22) | *p* Value |
|---|---|---|---|
| Age (years) | 31.5 ± 5.8 | 28.4 ± 9.1 | 0.08 |
| Gravidity | 3.3 ± 2.2 | 3.1 ± 2.5 | 0.79 |
| Parity | 1.2 ± 1.4 | 1.3 ± 1.7 | 0.73 |
| GA by LMP (days) | 76.1 ± 16.7 | 69.6 ± 23.1 | 0.19 |
| Quantitative serum β-hCG (mIU/ml) | 115,952 ± 135,018 | 162,031 ± 187,950 | 0.27 |

Data are given as mean ± SD.
Abbreviations: GA, gestational age; LMP, last menstrual period.

diagnosis increased 1.19-fold (95% CI 0.97, 1.47, $p = 0.10$). The presence of a yolk sac increased the odds of correct prospective diagnosis by 514-fold (95% CI 0.19, >999.99, $p = 0.12$), but this was not statistically significant.

## DISCUSSION

Complete molar pregnancy has characteristic and often strikingly abnormal US features, while partial molar pregnancy may exhibit only subtle abnormalities.[10] As such, complete molar pregnancy was diagnosed prospectively by US more frequently than partial molar pregnancy in this study (86.4% versus 41.4%, $p = 0.0005$). Detection rates of complete molar pregnancy have been reported at 58% to 95%, and at 17% to 29% for partial molar pregnancy.[1,5,9] Although partial molar pregnancy remains prospectively underdiagnosed, it appears that there has been some improvement compared with these earlier reports. We suggest that this may be attributed to the improved contrast and spatial resolution of US scanners enabling better detection of placental cystic changes and

**TABLE 2**
**Sonographic Features in 70 Molar Pregnancies**

| Parameter | Partial Molar Pregnancy (n = 48) | Complete Molar Pregnancy (n = 22) | *p* Value |
|---|---|---|---|
| Mean sac diameter (mm) | 33.9 ± 13.5 | 49.8 ± 26.8 | **0.001** |
| Maximum sac diameter (mm) | 44.8 ± 18.2 | 61.9 ± 30.8 | **0.005** |
| Sac diameter ratio | 2.3 ± 1.1 | 1.9 ± 0.5 | 0.10 |
| Yolk sac visualized | 27 (56.3%) | 0 (0%) | **<0.0001** |
| Fetal pole visualized | 30 (62.5%) | 1 (4.6%) | **<0.0001** |
| Fetal cardiac activity | 1 (2.1%) | 0 (0%) | 0.49* |
| Sonographic GA in days | 57.3 ± 24.8 | 73.6 ± 56.3 | 0.09 |
| Abnormal tissue present | 11 (22.9%) | 19 (86.4%) | **<0.0001** |
| Septa within gestational sac | 12 (25.0%) | 1 (4.6%) | **0.05*** |
| Placenta rating (0–3 scale) | 1.3 ± 1.1 | 2.8 ± 0.5 | **<0.0001** |
| 0 = Normal | 15 (31.3%) | 0 (0.0%) | **0.002*** |
| 1 = Minor cystic changes | 13 (27.1%) | 1 (4.6%) | **0.049*** |
| 2 = Major cystic changes | 12 (25.0%) | 2 (9.1%) | 0.19* |
| 3 = Placental mass | 8 (16.7%) | 19 (86.4%) | **<0.0001** |
| Vascularity rating (0–2 scale) | 1.0 ± 0.6 | 0.6 ± 0.6 | **0.01** |
| 0 = Avascular | 9 (18.8%) | 10 (45.5%) | **0.02** |
| 1 = Vascularity similar to myometrium | 29 (60.4%) | 10 (45.5%) | 0.24 |
| 2 = Hypervascular compared with myometrium | 8 (16.7%) | 1 (4.5%) | 0.25* |
| Called a possible or probable molar pregnancy in original dictation? | 20 (41.7%) | 19 (86.4%) | **0.0005** |

Continuous variables are given as mean ± SD and compared using *t* tests, and categorical variables as n (%) and compared using $\chi^2$ test or Fisher's exact test (indicated by *), where cell counts were too low. Statistically significant results ($p < 0.05$) are bolded.
Abbreviation: GA, gestational age.

also to the greater awareness of the diagnosis of molar pregnancy on the part of interpreting sonologists.

In multivariate regression, the presence of cystic changes in the placenta was a strong predictor of correct US diagnosis, suggesting that radiologists are aware of the importance of this finding and indirectly supporting the idea that improved resolution is important for improved diagnosis. Both GA by LMP and the presence of a yolk sac were also retained as predictors in multivariate analysis, probably both reflections of the same concept: it is easier to identify the changes of molar pregnancy when the gestation is more advanced, the villi more hydropic, and the tissue mass larger.[11] In the current era of electronic medical records, we suspected that the radiologist's awareness of serum β-hCG values could improve the prospective diagnosis of molar pregnancy, but the serum β-hCG levels did not significantly predict a correct diagnosis, and we therefore did not formally evaluate whether readers were aware of these values at the time of their dictation.

Concordant with previous studies, the majority of complete molar pregnancies in this study exhibited exuberant cystic and/or masslike proliferation of placental tissue.[1,3,6,12] The GSs were larger and abnormal tissue was present in most cases. As expected, fetal parts were not identified in complete molar pregnancies, because complete molar pregnancies have no maternal genetic contribution. The study radiologists identified what they believed to be a probable fetal pole only in one case of complete molar pregnancy.

The range of US appearances of partial molar pregnancy was much broader, from a tiny empty sac to a 7-week fetal pole with a cystic placenta. Twenty-eight (58%) partial molar pregnancies had a normal placenta or only minor cystic changes. We identified a particular US appearance of multiple thin septa within the GS in a subset of cases, which was more common in partial molar pregnancies (25.0% versus 4.6%, $p = 0.05$). Although insensitive, this sign may favor a diagnosis of molar pregnancy in a first-trimester gestation. However, the positive predictive value of this finding remains incompletely assessed without a set of nonmolar controls. Partial moles were more vascular than complete moles, although in contrast to previous reports, hypervascularity was uncommon in both types of molar pregnancy.[13] The majority of both partial and complete molar pregnancies had sac size ratios >1.5, but the mean values did not differ significantly between groups.

Our study is limited by its retrospective nature and limited sample size. US equipment and imaging techniques varied over the years when these women were scanned, and there is inherent heterogeneity of the sonograms in this regard. In particular, Doppler imaging was

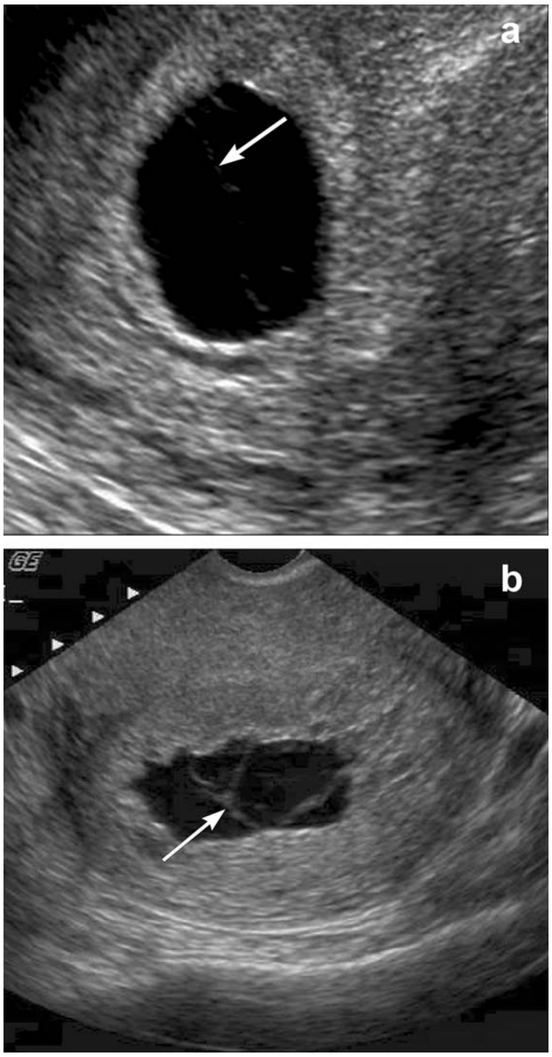


**FIGURE 3**. Septa in GS in two women with molar pregnancies. **(A)** Fine septa (arrow) within the GS in a 37-year-old woman with partial mole. **(B)** Slightly thicker septa (arrow) within the GS in a 23-year-old woman with partial mole.

employed in an ad hoc fashion and technical parameters including transducer frequency, angle of insonation, gain, and pulse repetition frequency in color Doppler US and the variable use of power Doppler US could not be controlled. Second, we used the originally dictated reports as the outcome variable for assessing prospective diagnosis, although not for evaluation of specific imaging features. Using the originally dictated report allows us to report on real life clinical practice but also introduces unquantified variation among readers. Finally, we are unable to comment on true diagnostic specificity and positive predictive value of sonography for detection of molar pregnancy in the absence of a set of nonmolar pregnancy controls.

In conclusion, complete molar pregnancies are often correctly diagnosed sonographically, and discrete placental abnormalities along a spectrum from cystic changes to overt masses are apparent in most cases. Partial molar pregnancy often presents with a recognizable yolk sac and sometimes a fetal pole (rarely with fetal cardiac motion), in the setting of mild to moderate cystic changes in placenta, and remains underdiagnosed prospectively. However, there is an increase in diagnostic sensitivity compared with older studies, perhaps owing to improved spatial resolution of sonography enabling detection of subtle cystic placental change and/or increased physician awareness of this diagnosis. Given the potential impact on clinical management, interpreting sonologists should remain alert to the possibility of molar pregnancy in first-trimester pregnancy loss.

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