Case Letter

Point-of-care ultrasound identification of yolk stalk sign in a case of failed first trimester pregnancy

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Dear editor,

Emergency physicians are often the first providers to encounter patients with complications in early pregnancy. Point-of-care (POC) pelvic ultrasound is being increasingly used in the evaluation of emergency department (ED) patients with first trimester symptoms.^[1] While the initial aim of POC ultrasound in this setting is to confirm an intrauterine pregnancy, a secondary goal is to differentiate between a normal and abnormal pregnancy. There exist a number of sonographic features to suggest a pregnancy is non-viable.^[2–4] One of which is the entity known as the yolk stalk sign. During early embryonic development, the embryo is routinely detected immediately adjacent to the yolk sac, as the yolk stalk has yet to develop (Figure 1). Later in pregnancy, as the yolk stalk develops, the embryo will then be noted to separate from the yolk sac. “Yolk stalk sign” is abnormal separation of the embryo from the yolk sac in early embryonic development, specifically where crown-rump length (CRL) is 5 mm or less with no visible heartbeat.^[5] At this point, any separation of the embryo from the yolk sac with development of yolk stalk is abnormal as the yolk stalk should be non-existent. Thus, an unexpected separation of the embryo from the yolk sac in embryos with a CRL of 5 mm or less and lacking a heartbeat could be indicative of a threatened abortion.^[5]

We present this case of a patient who had a yolk stalk sign on a POC ultrasound performed to evaluate a pregnancy that inevitably ended in fetal demise. This case emphasizes the importance of identification of the yolk-stalk sign in the assessment of an early pregnancy.

CASE

A 17- year old female G1P0 presented to the ED with

a chief complaint of vaginal bleeding. The patient states she had a confirmed intrauterine pregnancy, estimated at 8 weeks gestation by ultrasound a week prior at her obstetrician’s office. On the day of her initial visit, she endorsed painless vaginal bleeding. Overall, the patient was well appearing and hemodynamically stable on presentation. Physical examination demonstrated some minimal suprapubic tenderness to palpation without guarding or rebound. A vaginal speculum examination was significant for scant blood in the vaginal vault and a closed cervical os. Bimanual examination revealed no abnormalities. At this visit, the patient’s beta human chorionic gonadotropin (hCG) was 29,559 mIU/mL. As the results of the patient’s previous ultrasound were not available, the decision was made to perform a POC ultrasound in the ED to confirm an intrauterine pregnancy. The ultrasound examination was performed using Zonare Ultra system (Zonare Medical Systems, Mountain View, California) with a 9–4 MHz endocavity transducer. The embryo was noted to have a CRL of <5 mm and no detectable heart rate was found. Additionally, a long yolk stalk sign was identified, with a yolk sac seen significantly displaced from the embryo (Figure 2 and Figure 3). Given these findings, the patient was counseled that this was likely a non-viable pregnancy. She was discharged home with instructions to follow up with her obstetrician.

The patient returned to the ED 2 days later for worsening of her vaginal bleeding and pelvic cramping. Her beta hCG was repeated and was significantly lower at 18,000 mIU/mL. A repeat ultrasound during this visit demonstrated gestational sac without fetal pole. Obstetric consultation was obtained during this visit based on these findings. On their pelvic examination, they removed products of conception from cervix. The patient was

eventually discharged with a diagnosis of abortion in progress.

Figure 1. Transvaginal ultrasound of intrauterine pregnancy with small embryo (E) seen adjacent to the yolk sac (YS) suggesting yolk stalk has yet to develop.

Figure 2. Transvaginal ultrasound images showing a small embryo (E) with no cardiac activity, yolk sac (YS) and amnion (A). Significant separation of the embryo from yolk sac seen in this image suggests the presence of a long yolk stalk.

Figure 3. Transvaginal ultrasound image demonstrating yolk stalk (YSt), embryo (E), yolk sac (YS) and amnion (A). The yolk stalk allows marked separation between the small embryo and yolk sac.

DISCUSSION

The utilization of a POC ultrasound in the ED helps to promptly and accurately evaluate early pregnancies. POC pelvic ultrasound can assist in distinguishing a viable pregnancy from an abnormal intrauterine pregnancy or miscarriage or an ectopic pregnancy. It helps avoid inappropriate reassurance about the viability

of an intra-uterine pregnancy in the ED. The predictive value of ultrasound findings for early embryonic demise has been well described.^[2] Sonographic identification of failed first trimester pregnancy in the ED allows for selection of appropriate case-specific management strategies (expectant, medical, and surgical).^[6]

The utility of pelvic ultrasound in the evaluation of a first trimester pregnancy has long been demonstrated in the Obstetric setting. A number of specific sonographic findings^[2] in early pregnancy have demonstrated predictive value for identifying an abnormal intrauterine pregnancy. Ultrasound is often used in Obstetric practice to identify high-risk pregnancies and determine the need for appropriate antepartum interventions.^[7] Doppler assessments are increasingly being used for the detection and surveillance of intrauterine growth restriction and prediction of preeclampsia.^[8–10] Additionally, ultrasound is utilized to screen for fetal anomalies in the Obstetric settings. A well-established example is the practice of measuring fetal nuchal translucency; one of the best screening tests for fetal Down syndrome. The detection rate of Down syndrome using this test alone can reach 60%–70%, with a low false-positive rate.^[11] In addition, an increased fetal nuchal translucency with a normal karyotype signifies greater risk for fetal cardiac defects and other syndromes.^[12]

This case highlights an instance in which the utilization of a POC pelvic ultrasound in the ED can help promptly and accurately evaluate early pregnancies. An ultrasound that suggests an abnormal pregnancy can drastically change the patient interaction and management in the ED. In cases of suspected fetal demise found on POC ultrasound, physicians are able to properly counsel patients on the prognosis of their pregnancy and help them to obtain timely follow up with Obstetrics consultant, whether in the ED or as an outpatient. Aside from the direct benefits of patient care, there is also a positive economical aspect of POC pelvic ultrasound to consider. With many hospitals experiencing a rise in their ED census over the recent years there are growing demands to decrease throughput time. Studies have shown that pelvic ultrasound performed by emergency physicians can actually decrease ED length of stay and improve throughput.^[13,14]

There are a number of sonographic findings that support the diagnosis of a failed pregnancy; one of which is the yolk stalk sign. A recent study undertook the exploration of this sonographic finding. Filly et al^[5] performed a retrospective study, which reviewed first trimester sonograms where there was a CRL <5 mm

and no fetal cardiac activity. These cases were reviewed to look for separation between the embryo and yolk sac, a “yolk stalk sign”. It was found that patients who demonstrated this sonographic sign subsequently proved to have failed pregnancies. In this cohort, the positive predictive value of the yolk stalk sign for predicting early pregnancy failure was 100%; indicating that the yolk stalk sign could serve as a predictor of early embryonic death on ultrasound.

To our knowledge, this is the first case report of a yolk stalk sign found on a POC ultrasound. In the case presented, the yolk stalk sign served as an indicator of early fetal demise. The treating physician suspected an abnormal pregnancy after noting an abnormal separation between the embryo and yolk sac. At this point, the patient was counseled that the findings on her ultrasound likely depicted fetal demise and was diagnosed with a threatened abortion. This was confirmed on repeat ultrasound performed two-days later and the patient eventually went on to have a completed abortion.

CONCLUSION

In conclusion, this case highlights the value of recognizing the yolk stalk sign on POC ultrasound. Emergency physicians frequently evaluate patients in the first trimester of pregnancy. As POC ultrasound becomes more widely utilized in the ED, it is imperative that providers familiarize themselves with these less common sonographic findings, whose presence can confirm a suspected diagnosis of an abnormal pregnancy. Failure to recognize an indicator of fetal demise can result in number of adverse consequences, such as misdiagnosis and providing false reassurance to the patient. Whether a yolk stalk sign is used independently or in conjunction with other abnormal sonographic findings, its presence can help guide physicians in further counseling their patients and establishing appropriate care and timely follow up.

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