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A Mirror-Image Artifact Mimicking Heterotopic Pregnancy Observed at Two Different Time-Points: A Case Report

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1. Abstract

We report a case of a 25-year-old woman showing two gestational sacs at obstetric ultrasound at 12 weeks of gestation. Thus, diagnosis of heterotopic pregnancy or a double uterus with a twin pregnancy was suspected. Following transvaginal ultrasound and complementary tests, she was diagnosed with a unique pregnancy with a mirror-image artifact. At 17 weeks of gestation, ultrasound examination showed, again, an specular image of a second embryo, being a mirror-image artifact. Although these artifacts are a very rare phenomenon, 7 cases of obstetric mirror-image artifacts have been previously published. Nevertheless, no cases of mirror-image artifacts at two different time-points in the same patient have been previously reported.

2. Introduction

Despite the advancements in ultrasound technology, mirror-image artifact remain elusive. They occur when the ultrasound beam is not reflected directly back to the transducer after hitting a reflective surface, but instead takes an indirect return pathway [1]. The signal is displayed as a real structure and typically appear as a deeper structure, blurred and distorted when compared with the real structure.

This phenomenon is inherent to the ultrasound imaging, although it is very uncommon in obstetrics. The first differential diagnosis that needs to be considered is an heterotopic pregnancy.

We present herein the case of a pregnant woman that displayed a mirror-image artifact in two separate occasions, at week 12 and subsequently at week 16 of pregnancy.

3. Case Report

A 25-year-old primiparous woman presented for routine ultrasound scan in the first trimester of gestation. The patient had no history of abdominal or pelvic surgery or previous or concomitant conditions, and no complications such as genital bleeding or pain were reported during the first term of pregnancy.

The ultrasound scan was performed per protocol by a senior clinician. Transabdominal ultrasound (TA-US) showed an intrauterine pregnancy with a live embryo measuring 64.4 mm, consistent with a gestational age of 12 weeks and 4 days. A second gestational sac with an irregular and undefined active embryo was visualized, located behind and to the left of the first sac (Figure 1). Given that neither abnormal ovaries nor pelvic fluid were identified, this finding suggested a concurrent heterotopic pregnancy or a double uterus with a twin pregnancy. To confirm the diagnosis, the patient underwent a physical exam, showing no signs of tenderness. Clinical laboratory tests were performed, revealing no hormonal pathological levels. Finally, the woman was asked to empty her bladder and a transvaginal ultrasound scan (TV-US) was performed. This second imaging procedure showed a single pregnancy sac, while the second sac was not observed. Based on imaging and exploratory findings she was diagnosed with a singleton pregnancy with mirror-image artifact.

Five weeks later, the patient was examined by the same physician using the same ultrasound scan. Sonography showed a live embryo consistent with a gestational age of 17.3 weeks. Again, a specular image of a second embryo was observed (Figure 2). This second sac showed a distorted and hyperechogenic image with an immobile foetus. The scan was replicated by another experienced sonographer with another ultrasound device, and the same results were observed. At abdominal scan, the second sonographer visualized both a live embryo and its specular image. Therefore, the mirror-artifact diagnosis was confirmed.

Figure 1: Transversal abdominal ultrasound showing an intrauterine pregnancy (on the left) and the mirror-image artifact (on the right) at 12.4 weeks of gestation

Figure 2: Transversal abdominal ultrasound showing intrauterine pregnancy (on the left) and the mirror-image artifact (on the right) at 17.3 weeks of gestation

4. Discussion

The mirror image is uncommon in clinical practice and as such, it is not well known. This imaging artifact is created when the ultrasound wave reflected from the object of the evaluation (the foetus) meets highly reflective tissue located between the transducer and the foetus. The sound beams are reflected back and forth between the two structures, before being reflected back to the transducer. This causes a delayed return to the transducer that creates a duplicate structure equidistant from the reflective interface but deeper than the original structure. This false image is observed as a mirror image: inverted and moving in the opposite direction as the true intervening [1,2].

Imaging artifacts appearing as a mirror image produced by the psoas interface muscle when the uterus was elevated outside the pelvic cavity because of a full bladder were first described by Kremkau et al [3]. In obstetric sonography, image artifacts are produced when high-reflecting interfaces are found behind the uterus wall. These high-reflecting structures can be the posterior uterine wall, accumulated gas or fluid located inside the bowels, or an interface producer, such as muscles. In other cases, individual characteristics of the patient, such as subcutaneous tissue, obesity or abdominal intestinal distention can act as reflecting structures [3]. In our case, the strongly reflective interface was not imputed. Nevertheless, it was probably due to an intrinsic characteristic of the patient, since it was observed with an interval of 5 weeks on two different scanning machines. Moreover, the bowel interface of the patient plus the perspective used in the sonography was the same in both examinations.

To date, 6 case reports describing 7 cases of obstetric image artifacts have been reported [4-9]. The first case described a single active foetus consistent with 12 weeks of gestation and two additional sac-like structures on the posterolateral aspects of the uterus in a TA-US scan. The uterine cavity was displaced from the pelvic cavity due to a full bladder, because after voiding, a single active foetus was observed in a TV-US. A full bladder can mobilize the uterus towards the abdominal cavity, and its proximity to the psoas muscle when this occurs can generate as an area of high reflection [4].

In 2012, Miglietta et al. reported the first case of a mirror-image artifact at TV-US. An 8.5-week-gestation scan showed an intrauterine live embryo and a second gestational sac in the retro-uterine space. This image was observed depending on the orientation of the transducer, intra-abdominal pressure, the volume of the bladder and the transmission characteristics of the patient herself [5]. Similarly, Malhotra et al. reported two similar cases of first trimester gestations showing a mirror image at TV-US [6].

Ahn et al. observed a mirror image in both TA-US and TV-US in a woman at 18 weeks gestation. In contrast to our case, in which the second image was only observed on TA-US, two foetuses of the

same size and performing the same movements were observed in both scans. The reflection was attributed to a thin posterior uterine wall and an air-fluid interface in the rectosigmoid bowel [7].

Finally, Ahmed et al. reported two extrauterine sacs, one at each side of the uterine cavity, in an ultrasound of a woman at 8.5 weeks gestation. The patient was diagnosed with double heterotopic gestation. In this case, the mirror image was due to an interface between air and fluid located inside the bowels [8]. Russell et al. came to the same conclusion when observing the same phenomenon in a 12-week gestation, when the ultrasonographic finding was not confirmed by magnetic resonance imaging (MRI) [9].

Ultrasound is the gold standard for monitoring pregnancy; therefore, it is strongly recommended that sonographic artifacts are always taken into consideration when heterotopic pregnancy is suspected. If sonographers do not bear these artifacts in mind, further imaging, and even unnecessary procedures (MRI, laparoscopy) may be undertaken [7,8]. Mirror-image artifacts are usually easy to identify, because both the original and its mirror image can be observed in the same frame. Changing the image depth, the scanning plane, the incident angle of the sound beam or patient positioning can help the operator to observe real returning echoes and to elucidate ambiguous cases of mirror-image artifact [2].

5. Conclusion

Despite their rarity, mirror image artifacts should be taken into account when heterotopic pregnancy is suspected. Clinicians should be aware of these sonographic artifacts to avoid misdiagnoses, further imaging and even unnecessary procedures.

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