Three Dimensional Sonographic Appearances of Chinese Ring Intrauterine Device: A Case Report and Literature Review

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ABSTRACT

A 47-year-old Chinese lady presented at our clinic with an intermittent pelvic discomfort for years. Pelvic examination was unremarkable. Transvaginal scan revealed an anteflexed uterus containing a dense echogenic circular device, 3 centimeters in diameter. The heavy sonographic reverberation pattern suggested its metallic composition. Examination with three-dimensional sonographies (3D US) in a reconstructed coronal plane (C plane) with soft tissue subtraction showed a perfectly round intrauterine device (IUD). This device was centrally located and positioned along the axis of the upper part of the uterine cavity. No evidence of myometrial migration was found. To the best of our knowledge, this article presents the first 3D image of this rare device. It also suggested the application of 3D sonographies in determining the contraceptive efficacies and management plans. 3D US images that are related to the intrauterine device were also shown and discussed.

Keywords: Intrauterine contraceptive device, three-dimensional sonography

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Intrauterine contraceptive device (IUD) has been one of the most popular methods to prevent pregnancy for several decades. The shapes and forms of these devices have been continuously evolving. Traditional models generally are made from inert materials. These types of IUD can be placed in the uterus as long as contraception is desired. Their popularity has been declining with the advent of the more effective copper and hormonal IUDs. However, it is not uncommon to encounter a traditional inert IUD in the current practice.

Inert devices are varied in shape and size. Most of them are no longer available in the market, and therefore practitioners may have a challenge to identify some obsolete types of IUD found during the sonographic examination. Three dimensional ultrasonography (3D US) has been advocated to be superior to a conventional sonogram in terms of identifying and diagnosing the complications related with the IUD.[1] The usefulness of 3D US was recently reiterated in the review by Peri and colleagues.[2]

This case report demonstrates the 3D images of an obsolete stainless steel Chinese ring IUD. To the best of our knowledge, this is the first published 3D images of this particular device. The technicality to obtain optimal 3D images with an IUD *in situ* will be discussed according to the experiences at our institute. The value of 3D US examination for the IUD will also be explored, especially in the setting of limited resources like Thailand.

CASE REPORT

A 47-year-old Chinese woman presented with a history of intermittent pelvic discomfort for 5 years. Her pelvic examination was unremarkable. Transvaginal sonogram revealed an anteflexed uterus containing a dense echogenic circular device, 3 centimeters in diameter. The heavy ring down artifacts seen behind the whole device, as shown in Figure 1, suggested its metallic composition. 3D US examination with Voluson

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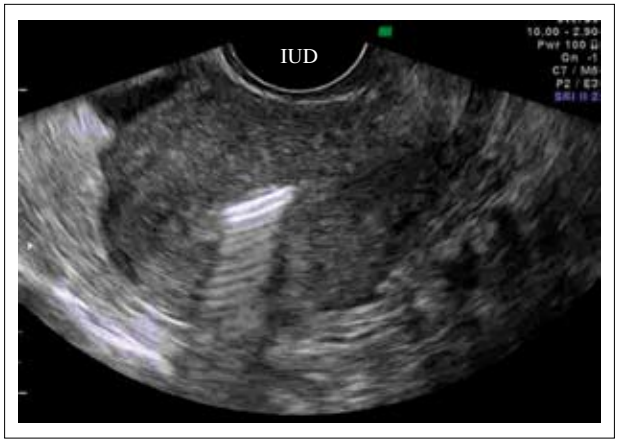

Fig 1. Conventional grey-scale image of the Chinese IUD. Notice the heavy ring down artifacts suggesting its metallic component.

E8 (GE Healthcare, UK) in a reconstructed coronal plane (C plane) with soft tissue subtraction showed a perfectly round IUD, as shown in Figure 2. The entire endometrial cavity concurrently visualized indicated that the device was centrally located and positioned along the coronal plane of the endometrial cavity. No evidence of myometrial migration was found. The sonographic appearances are characteristic for a stainless steel ring IUD. The patient recalled that she had this IUD inserted 25 years ago in China after her first delivery. Her past medical records were not immediately available.

DISCUSSION

The stainless steel ring device is an inert IUD, available only in China until it was withdrawn from the market in the year 1993. At that time, this device was already in use in approximately 80% of Chinese woman

Fig 2. Three dimensional sonographic image of the ring IUD. This technology allows for a simultaneous demonstration of the entire endometrial cavity along with the whole device to ensure its appropriate location and axis.

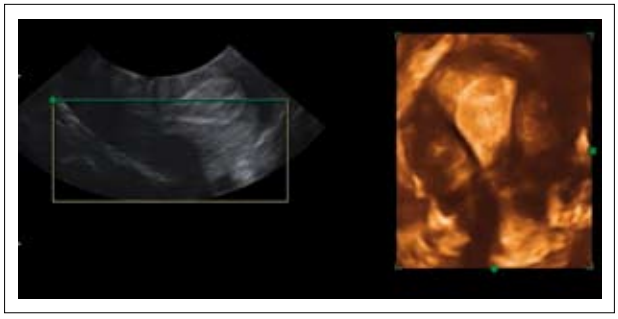

Fig 3. Demonstration of the volume of interest placed on the entire endometrial cavity. The normal cavity is inverted triangular shaped, with its apex pointing to the cervical canal. The surrounding myometrium is hypoechoic, compared to the endometrial cavity.

who opted for an IUD as a contraceptive method of choice.[3] This steel ring has a higher failure and expulsion rate than the copper IUD (8% versus 2.1% and 1% for copper V and T, respectively at 2 years).[4] This device does not have a string, and therefore pelvic examination will not be able to recognize its location. Using a conventional scan, it is a challenge to retrieve images of the whole device when the uterus is not in axial position, as discussed in a recent article.[2] 3D US has an advantage of electronically reconstructing the entire uterine cavity in the coronal plane, which it is not possible to obtain using the conventional sonogram. With this C plane, the whole device is readily demonstrated in relation to the endometrial cavity.[1] The penetration and mural migration are also better visualized using the three-dimensional technologies.[5]

For optimal 3D reconstruction of the endometrial cavity, good quality 2D images from the conventional scan have to be obtained first. A transvaginal or transrectal approach is preferred. The volume of interest will be placed across the endometrial stripe, as shown in Figure 3. The plane of interest can be adjusted electronically, therefore only modest manipulation of the transducer is required. This allows for a more comfortable examination for the patient. In addition, the endometrial cavity of the non-axial uterus can also be better visualized. With surface rendered mode applied, the reconstructed endometrial cavity will be seen as a triangular space. The apex of the cavity is pointing toward the cervical canal. The entire endometrial cavity can be documented on a single shot, resulting in a more meaningful photo-documentation. This issue is becoming more imperative in the current medico-legal atmosphere.

3D reconstruction has an advantage of a simultaneous demonstration of the relationship of the IUD, the endometrium, and the surrounding myometrium. This approach can readily determine if the IUD is placed in proper location. For example, Figure 4 shows a commonly used Copper T IUD. With its shaft and arms in a normal position, its contraceptive benefits should be ensured. The copper T IUD has a characteristic echogenic string, which can be seen all the way through the cervical canal.

Certain conditions can compromise the contraceptive effectiveness of the IUD. Thorough history taking and pelvic examination are vital. Routine pelvic sonographic examinations prior to the IUD insertion is not

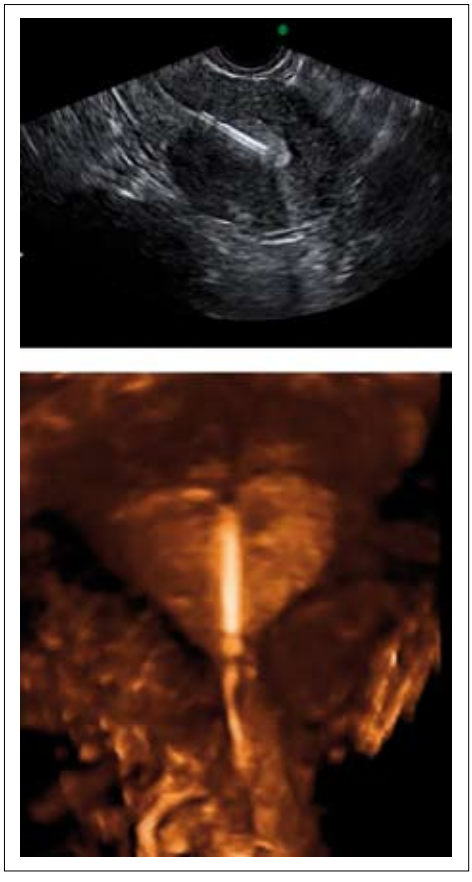

Fig 4. Conventional sonographic and C plane images of the uterus with Copper T in situ. Note that on a single 2D image, the Copper T looks similar to the stainless steel ring IUD. C plan 3D shows the whole device in relation with the entire endometrial cavity. The echogenic string is characteristic for Copper T IUD.

Fig 5. An endometrial cavity containing a submucous myoma. The fibroids could decrease the contraceptive efficacy of the IUD.

Fig 6. An intrauterine gestational sac was found in the upper part of the uterine cavity in 3D C plane. Note the sonodense choriodecidual reaction surrounding the gestational sac.

universally recommended. Submucous fibroids, as shown in Figure 5, could remarkably distort the uterine cavity. Pregnancy has to be excluded either by a thorough menstrual history, pelvic examination, pregnancy test, or sonographic assessment. Early pregnancy has to be excluded when the menstrual history is unreliable. 3D US can demonstrate the intrauterine gestational sac with its typical surrounding choriodecidual reaction, as shown in Figure 6.

The availability and expenses of the ultrasound machine equipped with 3D technologies are still of concern in Thailand. Complications related to IUD most of the time can be diagnosed, managed, and monitored by plain pelvic radiograph and conventional sonography. In difficult cases, 3D US should be considered along with computed tomography or magnetic resonance imaging.[2] For instance, myometrial invasion of the IUD can be suspected in the case of new onset pelvic pain, especially when fever, or pregnancy is found when an IUD is in situ. A displaced IUD may result in contraceptive failure, and it should be removed. Demonstration of the minimal myometrial invasion, partial perforation, and malposition with conventional sonogram is a challenge. Her recent onset of chronic pelvic discomfort could partly be due to this IUD. The relief of pain following IUD removal would have confirmed this, although, the patient refused after an appropriate counseling. A scarred or anomalous uterine cavity can impact the diagnostic accuracy of the 2D scan.[6] Additional imaging technologies may be necessary, while 3D US has an advantage in terms of cost and patient's comfort. Also, if early pregnancy from an IUD failure cannot be excluded, initial examination with ultrasound will not put the fetus at the risk of ionizing radiation from computerized tomography.

CONCLUSION

3D US showed that the IUD in this patient was located properly in the endometrial cavity. However, stainless steel IUD has a low contraceptive efficacy, and can be associated with pelvic discomfort. Therefore we advised the patient to have it removed, and replaced with a more effective device, or she could opt for other contraceptive methods. Hysteroscopic removal may be necessary. However, after a lengthy discussion, the patient, decided to keep the IUD in place. She was advised to have a pelvic sonogram periodically to ensure its location. The plain radiograph has a lower diagnostic value, but could be applicable in a suspicion of IUD expulsion. Computed tomography and magnetic resonance imaging, are an alternative, but sonographic examination has an advantage in terms of cost and patient's comfort. Due to the high failure rate of this ring IUD, a patient should be advised to consider a more effective contraceptive method. This report advocates the application of 3D US to determine the presence and appropriate location of IUDs in selected cases.

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REFERENCES

1. Bonilla-Musoles F, Raga F, Osborne NG, Blanes J. Control of intrauterine device insertion with three-dimensional ultrasound: is it the future? J Clin Ultrasound 1996; 24:263-7.
2. Peri N, Graham D, Levine D. Imaging of intrauterine contraceptive devices. J Ultrasound Med 2007;26:1389-401.
3. World Health Organization Special Program of Research China changes from the stainless steel ring to modern IUDs. Prog Hum Reprod Res 1993;27:7.
4. Gao J, Shen H, Zheng S, Fan HM, Wu MH, Han LH, et al. A randomized comparative clinical evaluation of the Steel Ring, the VCu200 and the TCu220c IUDs. Contraception 1986;33:443-54.
5. Lee A, Eppel W, Sam C, Kratochwil A, Deutinger J, Bernaschek G. Intrauterine device localization by three-dimensional transvaginal sonography. Ultrasound Obstetrics Gynecol 1997;10:289-92.
6. Valsky DV, Cohen SM, Hochner-Celnikier D, Lev-Sagie A, Yagel S. The shadow of the intrauterine device. J Ultrasound Med 2006;25:613-6.