Assessment of Long-Acting Reversible Intrauterine Contraceptives by using HDlive Technique

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ABSTRACT
The different IUDs types (Mirena, Copper T and Ancora) are shown using HDlive. This new technology allows a better vision of the levonorgestrel IUD, extremely difficult to observe with 2D.

Keywords: Copper T, Mirena, Ancora IUDs, Three-dimensional, HDlive.


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Conflict of interest: None

INTRODUCTION
Nowadays, the increasing use of long-acting reversible contraception (LARC) is a necessity. In fact, it is highly recommended by the OMS as a strategy to prevent unintended pregnancies, particularly in young women.1


Intrauterine devices (IUDs) have an important role in reducing unintended pregnancy rates and have a higher continuation of use than implants and depots. They are safe, highly effective, more cost/effective than any other method and a prevalent way of birth control.

However, despite all their advantages, they need to be controlled because:
• Uterine cavity differs considerably in size and shape not only during the menstrual cycle, but also after miscarriages and pregnancies.3,4 According to Hasson, the optimum geometric relationship of a properly inserted IUD is one in which the greatest transverse dimension of the IUD is equal or slightly in excess of the fundal transverse dimension.1
• After implantation, may occur some complications:5
  – Menstrual disorders
  – Pelvic pain
  – Dysmenorrhea
  – Migration
  – Infections
  – Pelvic inflammatory disease
  – Perforation of the uterus
  – Pregnancy (Fig. 1).

Menstrual disorders are the consequence of the IUD-induced increase of endometrial and subendometrial vascularization.6 Intrauterine devices are classified as follow:
• Inert: Ring-shaped (Grafenberg), Lippes Loop, Saft-T-Coil, Chinese Ring.
• Cooper-containing IUDs: T or 7 shaped, Cooper-T-380A, Ancora or Multiload.
• Hormone-containing IUDs: natural progesterone or progestogen-levonorgestrel.

The evaluation of the uterus not only before, but also after the IUD insertion, which is more important, includes:
• Vaginal and cervical examination by speculum.
• Two-dimensional (2D) transvaginal ultrasound (US) for evaluating the type and placement. It is the most used technique to diagnose compression, displacement, descent, malposition, ejection and inclusion in the myometrium. It is also used to try to know the nature of complications7 (Fig. 2).

Two-dimensional transvaginal US was, and continues being, the most employed technique to determine the intrauterine placement of IUDs8 (Fig. 3).
• 2D transvaginal sonography identification of the levonorgestrel-releasing IUDs results complicated.5,9-11 In fact, usually only the proximal and distal ends of the shafts and a central shadow of the intersection of the stem and arms can be seen in the sagittal and transverse planes.
• However, three-dimensional (3D) US appears recently to be more useful9 because it uses a volume rendering which contains the whole uterus with the IUD. The coronal view is particularly useful in demonstrating the relationship of the entire IUD to the endometrial cavity,4 which results in much more accuracy in the diagnosis of placement in all kinds of IUDs, especially the hormone-releasing ones.5

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Lately, the use of the HDlive US technique has improved a lot the visualization and assessment of not only IUD Mirena’s position, but also the other ones. The correct detection of abnormally located IUDs is really important, since many patients with pelvic pain or bleeding have a misplaced IUD. It is because of that, that all these methods used for the correct diagnosis of the IUD placement are crucial.

**IDENTIFICATION OF THE TYPE OF IUD**

**Copper-T**

It is a nonhormonal copper releasing IUD that measures 32 mm horizontally and 36 mm vertically. It has a 3 mm diameter bulb at the tip of the vertical stem and a straight shaft and cross-bars that form the shape of a T. Although the T-frame is made of polyethylene, a total of 380 mm² of copper wire is coiled around the stem and the two horizontal crossbars, which improves sonographic visualization. Copper T- IUDs acts by:

- Reducing the number, motility and viability of sperm in the uterine cervix.
- Modifying the protein structure of the cervical mucus.
- Increasing the number of leukocytes in the endometrial cavity.
- Changing the transport capacity of the ovum through the Fallopian tubes by disturbing the tubal motility.
- Modifying the tubal mucus composition.
- Additionally copper ions may have adverse effects on the myometrium surface and on the ova, in particular on the ovum maturation.

HDlive allows a clear identification of the IUD type, visualization of the copper wire and the cord (Fig. 4).
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By using HDlive, a clearer and more perfect IUD visualization is seen. The perfect image can be obtained by correctly locating the light source behind the IUD device and/or changing the surface mode for maximum/minimum transparency modes. Also, other images can be obtained by isolating the endometrium from the myometrium with the cut-off system (Fig. 5).

The HDlive system permits also the detection of the copper corrosion when it starts.11

Multiload/Ancora

The Ancora shaped intrauterine device consists on a polyethylene structure with a copper wire spiral rolled along its vertical axis and a polyethylene thread attached to its lower end. This thread allows a better fixation to the endometrial cavity and a lower index of displacements.

This special shape can be clearly observed with 2D but is much better seen by using 3D and/or HDlive (Fig. 6).
**Mirena**

It is a progesterone-releasing intrauterine system with a bowed-shaped T polyethylene frame that has a 32 mm vertical stem and a 32 mm horizontal portion with arms containing barium sulfate, which aids in its identification radiographically but not sonographically. The stem has a reservoir that contains 52 mg of levonorgestrel covered by a silicone membrane. The hormone is released at a rate of 20 µg/day over 5 years.

The levonorgestrel IUD is significantly less conspicuous than the copper IUD, specially on 2D image. Three-dimensional ultrasound improves visualization and assessment of progesterone IUD position and location.

As mentioned before, the sonographic identification of the MIRENA device is complicated (Fig. 7).

**CONCLUSION**

Correct diagnosis of the IUD placement is crucial to detect gynecological problems of bleeding or pelvic pain caused by them. Improvements in 3D, allow us detailed examination of the position of this kind of devices. Recently, the introduction of the HDLIVE technique give us more clear images of IUDs, especially of MIRENA’s ones, which is useful not only for making easier an ordinary examination, but also for aiding us to see properly their location when the 2D or 3D US are not enough.

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