**Original Articles**

# Three-dimensional sonography and hysterosalpingosonography in the diagnosis of uterine anomalies

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**Summary**

Uterine anomalies implicated in female subfertility, implantation failure and miscarriages can often be detected often by two-dimensional transvaginal (2D TV) ultrasound scanning. When used as a screening test TV ultrasound has provided sensitivity rates of up to 100% about uterine anomalies. Improved depiction has been achieved with the development of hysterosalpingosonography (HSSG). The anechoic interface provided by the saline solution allows the examiner to determine whether an abnormality is intracavitary, endometrial, or submucosal. The aim of this study was to evaluate the role of 2D TV contrast sonography and 3D TV ultrasound in the diagnosis of congenital uterine anomalies in comparison with their appearance of hysterosalpingosonography findings.

*Key words:* Uterine anomalies; Three-dimensional transvaginal ultrasonography; Hysterosalpingosonography.

## Introduction

Uterine anomalies implicated in female subfertility, implantation failure and miscarriages can often be detected by two-dimensional transvaginal (2D TV) ultrasound scanning. The uterus can always be identified and the appearance of the uterine cavity and myometrium can be analyzed in great detail. When used as a screening test TV ultrasound has provided sensitivity rates of up to 100% for uterine anomalies [1, 2]. However the distinction between the different types of anomalies is often difficult [2, 3], therefore other diagnostic methods are usually required to complete the diagnostic evaluation [4, 5]. Improved depiction has been achieved with the development of the technique of hysterosalpingosonography (HSSG) [6]. HSSG involves the instillation of a sterile saline solution under continuous sonographic visualization [7]. The anechoic interface provided by the saline solution allows the examiner to determine whether an abnormality is intracavitary, endometrial, or submucosal. Indications for hysterosonography (HSG) include both clinical and sonographic findings. Clinical indications include unexplained infertility or abnormal vaginal bleeding. Sonographic findings indicating the need for HSSG include a thickening of the endometrial interface that is out of phase with the patient's menstrual history, a poorly defined endometrium, or the presence of a uterine leiomyoma of indeterminate location [8]. Recently the development of three-dimensional (3D) ultrasound has permited scanning of the uterus in previously unobtainable views [9]. The aim of this study was to evaluate the role of 2D TV contrast sonography and 3D TV ultrasound in the diagnosis of congenital uterine anomalies in comparison with their appearance of hysterosalpingosonography findings [10-12].

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## Material and Method

At the Department of Gynecology, Perinatology and Child Health of the University of Rome "La Sapienza", over two years (2000 and 2001), a total of 112 women with a history of infertility underwent HSG after a TV sonography. A HSSG at the time of HSG was proposed to all of them. A total of 72 patients, mean age 27, were included in this study. Twelve patients had been amenorrhoic from four to eight months. The other women had had normal menstrual cycles lasting between 28 and 35 days. All the patients underwent conventional 2D TV sonography (SSD 2000 Color Doppler, Aloka) and 3D ultrasound scanning (Combison 730 3D-4D, Kretztechnik, Austria). Three-dimensional ultrasound volume was generated by automatic rotation of the mechanical transducer through 360°. The obtained volumes were immediately stored in removable hard-disk cartridges by Quest 88 Mb. Stored information was then analyzed using a computer-generated planar reformatted section.

After written consent, once 2D and 3D scanning was completed the patients underwent 2D TV contrast sonography. A no. 5 French catheter with a 5 ml retention balloon inserted through the cervix and 20 ml of sterile saline solution was instilled slowly into the uterine cavity. The regularity of the endometrial outline and the myometrial border were observed and the cavity was examined for any intrauterine structure delineated by the fluid. All the patients underwent hysterosalpingosonography. Results were compared, examined and discussed.

## Results

Two-dimensional TV contrast sonography and 3D TV ultrasound showed large fibroids which distorted the uterine cavity in 23 patients and bicornuate uterus in five cases. The fibroids ranged in size from 5 mm to 8 cm. Eighteen patients had anterior intramural fibroids and five woman had a fundal fibroid (Figure 1) which appeared to protrude into the uterine cavity distorting the endometrial line on contrast scan (Figure 2). One of those

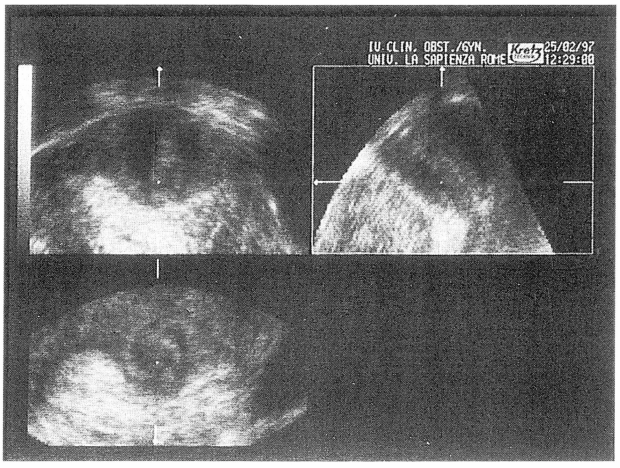


Figure 1. — 3D sonography image showing a fundal fibroid at the top of the uterine cavity.

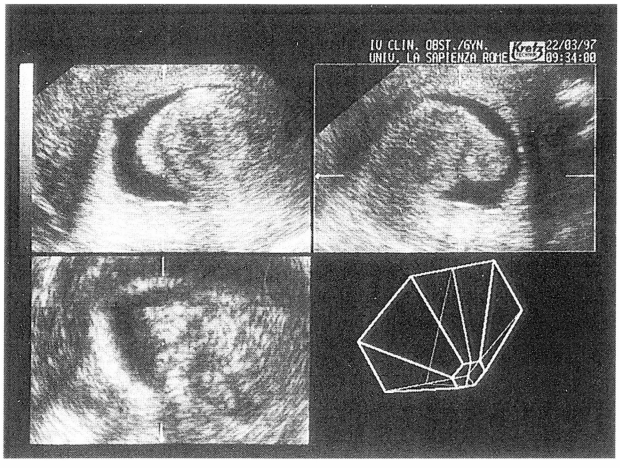


Figure 2. — 3D-HSSG showing the same fibroid protuding into the uterine cavity.

fibroids appeared like a bicornuate uterus on HSSG. Two endometrial polyps were detected both by 2D contrast and by 3D sonography, while fibroids and polyps gave the same images like an "empty area" on HSSG. Sonographic findings were compared with hysterosalpingography. None of the 16 cases of tubal occlusion diagnosed by hysterosalpingosonography obsviously was revealed by 3D TV ultrasound and only four cases were revealed by 2D TV contrast sonography because they were bilateral tubal occlusions. In every case free fluid was detected in the Douglas pouch.

The results are summarized in Table 1.

Table 1. — *Results obtained in 72 patients by 2D TV, 3D TV contrast and HSSG.*

| | 2D TV contrast Sonography | 3D TV ultrasound | Hysterosalpingosonography |
|---|---|---|---|
| Normal findings | 38 | 42 | 28 |
| Tubal occlusion | 4 | 0 | 16 |
| Fibroids | 23 | 23 | 22 |
| Polyps | 2 | 2 | – |
| Bicornuate uterus | 5 | 5 | 6 |

## Discussion

Congenital uterine anomalies are associated with an increased risk of sterility, miscarriage, premature birth, fetal loss, malpresentation and cesarean section [13, 14]. The prevalence of these anomalies in the general population is largely unknown.This is partly due to the lack of a simple, safe and accurate diagnostic test which can be used in these patients. TV ultrasound, using high resolution TV probes, is a widely performed investigation for the study of uterine morphology. The sensitivity of 2D TV ultrasound can be improved by using intrauterine contrast medium to distend the uterine cavity [13, 15]. This allows detailed examination of the endometrial lining and any distortion of the cavity can be assessed. The procedures are well tollerated [16] and, in our experience, do not appear to be associated with morbidity. Recently 3D reconstruction of TV ultrasound images of the uterine cavity has provided accurate and informative images. This method provides information of a similar diagnostic value as 2D TV ultrasound but with the advantage of enabling images to be manipulated to provide a comprehensive view of the uterine architecture [17]. These are simple, inexpensive and non invasive techniques to detect and to diagnose uterine anomalies in infertility patients. Our study showed that HSG remains the best technique for the assessment of the tubal patency [18]. Hysterosonography is well-tollerated by patients. It allows improved depiction of the endometrial cavity without the use of ionizing radiation or iodinated contrast agents, as well as differentiation of intracavitary, endometrial, and submucosal abnormalities [8]. The most important advantage of TV ultrasound over HSG is the ability to visualize both the uterine cavity and myometrium. It provides complete information about the nature and extent of uterine masses and congenital anomalies. In cases of bilateral tubal occlusion, 2D TV contrast sonography permits the detection or absence of saline medium in the Douglas pouch. Although the number of the patients was relatively small, we believe that 2D TV contrast sonography and 3D TV ultrasound are valid and safe screening tests to identify patients with uterine cavity anomalies.

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