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Evaluation of intrauterine abnormalities in infertile patients by sonohysterography

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The purpose of this study was to assess the usefulness of sonohysterography in the detection of abnormalities of the uterine cavity in infertile patients, compared with other diagnostic methods. Transvaginal ultrasonography, sonohysterography, hysterosalpingography and finally hysteroscopy were performed in 37 patients with primary and 25 patients with secondary infertility. Suspected uterine anomalies were also confirmed by laparoscopy. Transvaginal ultrasonography and hysterosalpingography were able to detect 36.3 and 72.7% of uterine pathologies respectively. Sonohysterography was able to detect all the anomalies except for a single endometrial polyp (90.3%). However, there was no significant difference between the diagnostic capabilities of these methods. We recommend the use of sonohysterography as an easy, cheap and non-invasive method for the diagnosis of intrauterine pathologies in infertile patients.

Key words: hysterosalpingography/hysteroscopy/infertility/sonohysterography/vaginal ultrasonography

Introduction

Any evaluation of an infertile couple includes searching for an abnormality of the uterine cavity. Intrauterine abnormalities, especially congenital abnormalities of the Müllerian ducts, are relatively common and contribute to the problems of infertility, recurrent pregnancy loss and poor outcome in pregnancy.

There are various methods for evaluating the uterine cavity. Hysterosalpingography (HSG) is a widely used diagnostic tool. The overall risk of infection with HSG was reported to be $<$1%, but in a high-risk population infection can occur in 3% of cases (Stumpf and March, 1980). At present, ultrasonography is a basic diagnostic tool in the field of infertility. Transabdominal ultrasonography is used for monitoring follicular development and ovulation (Fleischer *et al.*, 1981). However, the transvaginal probe is preferred for evaluating the pelvic structures because of its better resolution capacity (Coleman *et al.*, 1988). Magnetic resonance imaging still has a limited value because it is a time-consuming and expensive imaging method (Haynor *et al.*, 1988). Hysteroscopy is the 'gold standard' in the diagnosis of intrauterine pathologies (Gillespie and Nichols, 1994). Sonohysterography, in which the uterine cavity is scanned while it is infused with sterile saline, is a new diagnostic tool for the detection of intracavitary abnormalities (Parsons and Lense, 1993).

The purpose of this study was to assess the usefulness of sonohysterography in the detection of intracavitary abnormalities in infertile patients and to compare this method with conventional transvaginal ultrasonography, HSG and hysteroscopy.

Materials and methods

The study was performed at the Department of Obstetrics and Gynecology at Ankara University Faculty of Medicine (Ankara, Turkiye). The study group comprised 40 patients with primary and 26 patients with secondary infertility. Four patients with mucopurulant vaginal discharge were excluded from the study group. All patients were informed about the study, and the procedures were performed with their permission. Initially, all patients were evaluated with pelvic ultrasonography using a transvaginal probe with a 7.5 MHz transducer (Sonolayer 270 A; Toshiba Co., Tokyo, Japan). The dimensions and contours of the uterus, the endometrial lining and thickness, and both adnexal structures were examined. Afterwards, sonohysterography was performed with the patient in the dorsal lithotomy position. A standard bivalve speculum was inserted, the cervix was cleaned with povidone–iodine solution and the anterior lip of the cervix was grasped with a tenaculum. A paediatric 8F Foley catheter, threaded with a ring forceps, was inserted through the cervical canal, until it reached the fundus. It was then drawn 1.0–1.5 cm back and the catheter was fixed by inflating its balloon with 1.5–2.0 ml sterile saline. The speculum was then removed carefully, so as not to dislodge the Foley catheter, and the transvaginal probe reinserted in the posterior vaginal vault. The uterine cavity was distended with a sterile isotonic saline infusion through the catheter at a rate of 10–20 ml/min. All the sonohysterography images were recorded on video. No prophylactic antibiotic or anaesthetic drug was used.

Before removing the catheter, HSG images were obtained with an oil-based contrast medium. Finally, hysteroscopy was performed by an endoscopic surgeon unaware of the findings of the previous examinations. The suspected uterine anomalies were also confirmed by laparoscopy.

Results

The mean ages of the two groups of patients with primary and secondary infertility were 25.2 $\pm$ 4.3 and 28.0 $\pm$ 4.8 years respectively. Table I presents the final hysteroscopic diagnosis of the patients. Three of the primary (8.1%) and eight of the secondary (32.0%) infertility patients had intrauterine pathologies. In all, 51 patients (82.2%) had normal hysteroscopic findings.

Table I. Hysteroscopic findings

Group	Endometrial polyp	Uterine anomaly	Submucous myoma	Normal	Total
Primary infertility	1	1	1	34	37
Secondary infertility	2	3	3	17	25
Total (%)	3 (4.8)	4 (6.5)	4 (6.5)	51 (82.2)	62 (100)

Table II. Distribution of intrauterine pathologies according to the diagnostic methods and their comparison with hysteroscopic findings

Method	Endometrial polyp	Uterine anomaly	Submucous myoma	Total (%)[a]
Transvaginal ultrasonography	1	2	1	4 (36.3)
Hysterosalpingography	1	4	3	8 (72.7)
Sonohysterography	2	4	4	10 (90.9)
Hysteroscopy	3	4	4	11 (100)

[a]The rate at which the method could detect the presence of an abnormality that was confirmed by hysteroscopy.

The distribution of findings using different methods and the diagnostic capability of each method with respect to hysteroscopy are listed in Table II. Transvaginal ultrasonography alone was able to detect four intrauterine lesions (36.3%). HSG was able to detect more of these lesions (72.7%). All Müllerian anomalies were detected by HSG, but some of the endometrial polyps and submucous myomas were missed. On the other hand, except for a single endometrial polyp, all intrauterine pathologies (90.9%) were detected by sonohysterography.

There was no statistically significant difference between the methods when all were compared with one another (Table III). It is not possible to suggest which method is best to detect which kind of pathology because the number of patients in this study was not sufficient for that kind of speculation.

Discussion

An evaluation of the area where implantation takes place is an important step in the management of a patient with infertility. It is generally accepted that the initial method utilized should be HSG (Mol *et al.*, 1996). Diagnostic hysteroscopy and laparoscopy are usually undertaken when HSG discloses any pathology. Diagnostic hysteroscopy has been also used in women with repeated implant failures in in-vitro fertilization, regardless of previous HSG findings (Dicker *et al.*, 1990). However the above methods are invasive and may be associated with minor and major complications. Therefore there is a need for a simple and reproducible method for evaluating the uterine cavity. Transvaginal ultrasonography may fulfil the above premises because it may be utilized for evaluating intracavitary lesions (Itskovitz *et al.*, 1990). A clinical interpretation of the endometrial images is easy and practised worldwide (Brandt *et al.*, 1985). However, by using ultrasonography alone, it is not always possible to make a specific diagnosis when there is an abnormally thick or irregular endometrial lining.

Randolph *et al.* (1986) were the first to perform transabdominal ultrasonography during saline infusion into the uterine cavity. The diagnosis of specific disorders of the intrauterine cavity is directly dependent on the phase of the menstrual cycle when the ultrasonographic examination is performed. For example, while endometrial polyps are best seen during the proliferative phase, submucous myomas, uterine anomalies and synechiae are better observed during the secretory phase. Intracavitary saline infusion during sonohysterography makes it possible to examine the intrauterine cavity during any stage of the menstrual cycle (Parsons and Lense, 1993), and enhances the predictability of an endovaginal ultrasound examination (Goldstein, 1996). Achiron *et al.* (1995) used it in their evaluation of a tamoxifen-associated thickened endometrium.

In this study we observed endometrial polyps and submucous myoma as protrusions into the saline-filled intrauterine cavity under sonohysterographic imaging. An endometrial polyp was detected as a sessile, homogeneous echogenicity without distortion of the endometrial–myometrial junction (Figure 1a). Because a submucous myoma originates from the myometrium, the integrity of the uterine wall and the relationship of the lesion to the endometrial floor (sessile or pedunculate) were easily determined (Figure 1b). These details were very useful during hysteroscopic surgical management of the lesions.

In Müllerian anomalies, sonohysterography has the advantage of evaluating both the interior and exterior surfaces of the uterus at the same time (Figure 1c). In this way, it is easier to distinguish between septate and bicornuate uteri. In cases of septate uteri, the thickness of the septum and its relationship to fundal myometrium can be measured. These details are useful while performing hysteroscopic metroplasty. A normal sonohysterographic finding is defined as a unilocular, cone-like cavity with regular contours (Figure 1d). We did not detect any intrauterine synechiae.

In one study, consisting of 104 patients, the authors suggested that sonohysterography represented an improvement over transvaginal sonography and was fully capable of replacing HSG for evaluating the uterine cavity (Gaucherand *et al.*, 1995). Cullinen *et al.* (1995) also reported the value of sonohysterography for the differentiation of intracavitary, endometrial and submucosal abnormalities. In a further study, which compared sonohysterography with hysteroscopy, endo-uterine polyps could be effectively investigated by sonohysterography, but hysteroscopy was more sensitive (Cicinelli *et al.*, 1994). In addition, Cicinelli *et al.* (1995) suggested that, as with hysteroscopy, transabdominal sonohysterography had sensitivity, specificity and predictive values of 100% in the evaluation of submucous myomas.

When four different diagnostic methods were compared with one another there was no statistically significant difference between them (Table III). However, sonohysterography seemed to be more sensitive when compared with transvaginal ultrasonography and HSG (90.9 versus 36.3 and 72.7% respectively). In addition, although the specificity and positive predictive values were the same for the three methods, the

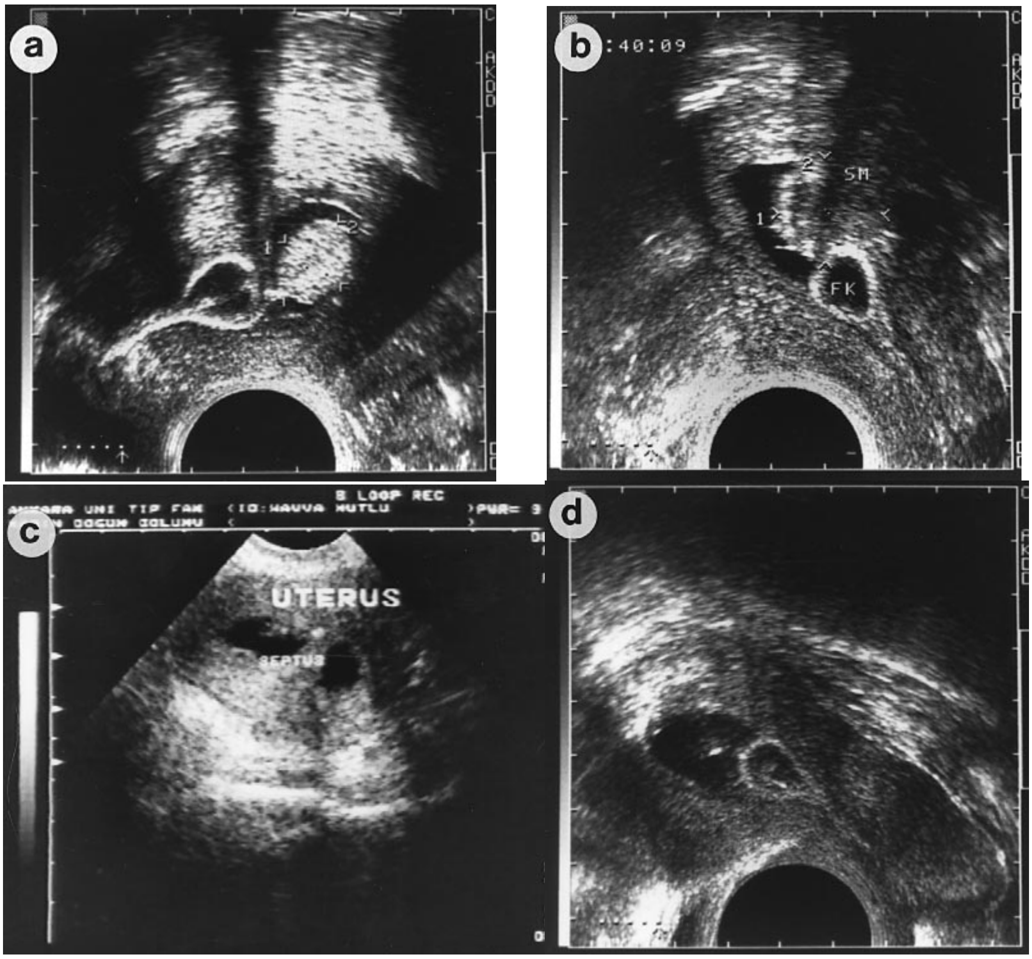

Figure 1. Sonohysterographic images. (**a**) Endometrial polyp; (**b**) submucous myoma; (**c**) Müllerian anomaly; (**d**) normal cavity.

Table III. Statistical analysis of the methods with respect to their diagnostic capabilities

Method	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)	*P* value
Transvaginal ultrasonography	36.4	100	100	87.9	NS
Hysterosalpingography	72.7	100	100	94.4	NS
Sonohysterography	90.9	100	100	98.1	NS

NS = non-significant.

negative predictive value was higher for sonohysterography. Sonohysterography appears to be almost as sensitive and specific as hysteroscopy.

An expected complication of sonohysterography is the possibility of intracavitary infection. To avoid such complications, four patients with mucopurulant discharge were excluded from the study group. The patients who remained in the study group did not receive prophylactic antibiotics because all procedures were performed under totally aseptic conditions. None of the patients developed an infectious complication. The risk of a postprocedural infection should be accepted as similar to that involved in traditional intrauterine manipulations, i.e. HSG. In addition, the procedure was painless and well tolerated in every case.

Some authors have suggested that there is a potential risk of transporting malignant cells into the peritoneum during intrauterine saline infusion in hysteroscopy (Romano *et al.*, 1992). This complication is also theoretically possible with sonohysterography. Our study included no patients with malignancy. However, when compared with hysteroscopy, the slower and low-pressure infusion of saline involved in sonohysterography would be expected to carry a lower risk of cell transportation.

Sonohysterography is an easy, sensitive and well tolerated diagnostic method. It is not time consuming and does not require anaesthesia. Under sterile conditions, it does not lead to infectious morbidity. It can be performed as an outpatient procedure. In conclusion, we recommend the use of sonohysterography in conjunction with transvaginal ultrasonography for the diagnosis of intrauterine pathologies in infertile patients.

References

Achiron, R., Lipitz, S., Sivan, E. *et al.* (1995) Sonohysterography for ultrasonographic evaluation of tamoxifen-associated cystic thickened endometrium. *J. Ultrasound Med.*, **14,** 685–688.

Brandt, T.D., Levy, E.B., Grant, T.H. *et al.* (1985) Endometrial echo and its significance in female infertility. *Radiology*, **157,** 225–229.

Cicinelli, E., Romano, F., Anastasio, P.S. *et al.* (1994) Sonohysterography versus hysteroscopy in the diagnosis of endouterine polyps. *Gynecol. Obstet. Invest.*, **38,** 266–271.

Cicinelli, E., Romano, F., Anastasio, P.S. *et al.* (1995) Transabdominal sonohysterography, transvaginal sonohysterography, and hysteroscopy in the evaluation of submucous myomas. *Obstet. Gynecol.*, **85,** 42–47.

Coleman, B.G., Arge, P.H., Grumbach, K. *et al.* (1988) Transvaginal and transabdominal sonography: prospective comparison. *Radiology*, **168,** 638–646.

Cullinen, J.A., Fleischer, A.C., Kepple, D.M. *et al.* (1995) Sonohysterography: a technique for endometrial evaluation. *Radiographics*, **15,** 501–514.

Dicker, D., Goldman, J.A. and Feldberg, A. (1990) The value of hysteroscopy in elderly women prior to in-vitro fertilization–embryo transfer (IVF-ET): a comparison study. *J. In Vitro Fertil. Embryo Transf.*, **7,** 267–270.

Fleischer, A.C., Daniell, J.F., Radier, J. *et al.* (1981) Sonographic monitoring of ovarian follicular development. *J. Clin. Ultrasound*, **9,** 275–279.

Gaucherand, P., Piacenza, J.M., Salle, B. *et al.* (1995) Sonohysterography of the uterine cavity: preliminary investigations. *J. Clin. Ultrasound*, **23,** 339–348.

Gillespie, A. and Nichols, A. (1994) The value of hysteroscopy. *Aust. N.Z. J. Obstet. Gynaecol.*, **34,** 85–87.

Goldstein, S.R. (1996) Saline infusion sonohysterography. *Clin. Obstet. Gynecol.*, **39,** 248–258.

Haynor, D.R., Mack, L.A., Shouldes, M.R. *et al.* (1986) Changing appearance of the normal uterus during the menstrual cycle. MR studies. *Radiology*, **161,** 459–462.

Itskovitz, J., Boldes, R., Levron, J. *et al.* (1990) Transvaginal ultrasonography in the diagnosis and treatment of infertility. *J. Clin. Ultrasound*, **18,** 248–256.

Mol, B.W.J., Swart, P., Bossyt, P.M.M. *et al.* (1996) Reproducibility of the interpretation of hysterosalpingography in the diagnosis of tubal pathology. *Hum. Reprod.*, **11,** 1204–1208.

Parsons, A.K. and Lense, J.J. (1993) Sonohysterography for endometrial abnormalities: preliminary results. *J. Clin. Urol.*, **21,** 87–95.

Randolph, J.R., Ying, Y.K., Maier, D.B. *et al.* (1986) Comparison of real-time ultrasonography, hysterosalpingography and laparoscopy/hysteroscopy in the evaluation of uterine abnormalities and tubal patency. *Fertil. Steril.*, **46,** 828–832.

Romano, S., Shimoni, Y., Muralee, D. *et al.* (1992) Retrograde seeding of endometrial carcinoma during hysteroscopy. *Gynecol. Oncol.*, **44,** 116–118.

Stumpf, P.G. and March, C.M. (1978) Febrile morbidity following hysterosalpingography. *Fertil. Steril.*, **30,** 733–738.

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