FERTILITY AND STERILITY®
Vol 67, No 4, April 1997

Printed on acid-free paper in U S A
Published by Elsevier Science Inc

Sonohysterography for screening in recurrent pregnancy loss*

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Objective: To evaluate the role of sonohysterography for screening of the uterine cavity in patients with recurrent pregnancy loss.

Design: Prospective evaluation of sonohysterography, including comparison with available hysterosalpingography and hysteroscopy.

Setting: University referral center.

Patient(s): Thirty-four reproductive-aged women with at least two consecutive pregnancy losses.

Intervention(s): Sonohysterography was performed on all patients, using saline instilled through an endocervically placed balloon catheter with concurrent vaginal sonography.

Result(s): Seventeen of 34 sonohysterograms (50.0%) demonstrated intrauterine abnormalities. Eighteen of 34 cases have undergone hysteroscopy or, in 1 case, laparoscopy. All confirmed the positive or negative sonohysterographic finding, resulting in a sensitivity and specificity of 100%. Additionally, 100% (12/12) of the defects were diagnosed accurately at sonohysterography when confirmed by surgery. Twenty-seven of 34 patients also had a hysterosalpingogram that demonstrated a 90.0% sensitivity and 20.0% specificity based on hysteroscopic findings, yet only 5 of 11 (45.5%) defects were diagnosed accurately at hysterosalpingography when compared with surgery.

Conclusion(s): Sonohysterography is a highly sensitive, specific, and accurate screening tool for the evaluation of uterine cavitary defects associated with recurrent pregnancy loss and offers several advantages over hysterosalpingography. (Fertil Steril® 1997;67:670–4. © 1997 by American Society for Reproductive Medicine.)

Key Words: Sonohysterography, recurrent pregnancy loss, hysterosalpingography, hysteroscopy

Recurrent pregnancy loss, defined as three consecutive losses, affects up to 1% of women (1) but is associated with a significantly increased risk of future pregnancy wastage after only two consecutive losses (2). Numerous studies have evaluated the rates of suspected etiologic factors in recurrent pregnancy loss (3–5). At least one etiologic factor was identified in 56% to 68% of couples, and the rate of uterine abnormalities ranged from 15% to 27% in these studies. The diagnosis and surgical correction of intrauterine defects, including a septate uterus (6) and intrauterine synechiae (7), significantly increases the rate of subsequent full-term deliveries. It is also likely that hysteroscopic myomectomy for submucous myomas improves the reproductive outcome of patients with recurrent pregnancy loss (8). Given the high rate of uterine anomalies and the potential benefits of surgical correction, it is important to evaluate accurately the uterine corpus and cavity in patients with recurrent spontaneous abortions.

Received June 24, 1996; revised and accepted December 11, 1996

* Presented at the 51st Annual Meeting of the American Society for Reproductive Medicine, Seattle, Washington, October 7 to 12, 1995.

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0015-0282/97/$17.00
PII S0015-0282(97)00049-6

Traditionally, hysterosalpingography has been used to screen for anatomic abnormalities in recurrent abortion. As hysterosalpingography is limited to outlining the uterine cavity, laparoscopy has been necessary to differentiate a bicornuate from septate uterus. Recent studies have found that hysterosalpingography will not provide a precise diagnosis of a uterine anomaly whereas magnetic resonance imaging and endovaginal ultrasound were 100% and 92% accurate, respectively (9). In addition to the inability to make a precise uterine diagnosis with hysterosalpingography alone, when some abnormality is found on a hysterosalpingogram, the rate of false-positive findings may be as high as 32% (10, 11).

The use of sonography combined with saline instillation, termed sonohysterography, is an attractive alternative to hysterosalpingography in evaluating the uterus and endometrium. In 1986, Randolph et al. (12) compared abdominal sonohysterography with hysterosalpingography and found sonohysterography highly sensitive and specific in identifying uterine abnormalities. Parsons and Lense (13) and other authors (14–17) have found that sonohysterography using transvaginal sonography is quite accurate in evaluating a number of endometrial lesions including polyps, myomas, synechiae, and neoplasia. Because sonohysterography appears to be an accurate method of evaluating the uterus and uterine cavity, we chose to assess sonohysterography as a screening test in recurrent pregnancy loss.

MATERIALS AND METHODS

Thirty-four consecutive patients referred for the evaluation of recurrent pregnancy loss underwent sonohysterography. At least two consecutive losses were required for inclusion in this study, which was approved by the Human Investigations Committee of our institution. Sonohysterography was performed during the follicular phase of the cycle by a single examiner during an initial or follow-up consultation. Patients with a history consistent with a treated pelvic infection were given 3 days of doxycycline just before the procedure and were evaluated for a normal erythrocyte sedimentation rate and pelvic examination before the procedure, in accordance with our protocol for hysterosalpingography. An H-S catheter (Ackrad Labs, Cranford, NJ) was placed during a speculum examination, with the balloon distended intracervically. In a minority of cases, the balloon distended with 1 mL of saline would not remain in the cervix and either a tenaculum was placed occluding the exocervix or the balloon was placed in the lower uterine segment (18). After transvaginal sonographic evaluation of the adnexae, uterus, endometrium, and cul-de-sac, saline in a 10-mL syringe was instilled through the catheter during concomitant transvaginal sonography of the endometrium with sagittal and coronal views recorded.

A study was considered normal when serial sagittal and coronal views of the distended endometrial cavity failed to reveal any distortion, cavitary defect, or undistended regions. Incomplete separation of the anterior and posterior endometrium during saline instillation suggested intrauterine synechiae. Spherical lesions with a heterogeneous echogenic appearance either distorting or within the endometrial cavity were considered submucosal myomas. On coronal view of the fundus, a v-shaped echogenic midline extension into the endometrial cavity suggested a septum, whereas evidence of two endometrial cavities separated by the echogenic appearance of myometrium suggested a bicornuate uterus. Other intracavitary defects were described and a likely diagnosis was suggested.

The results of the study were shared with each patient. The patients along with their physicians decided whether to pursue any further diagnostic or therapeutic procedures. Surgical confirmation, performed by one of the authors, is available in 18 of 34 cases. The following reasons accounted for failure to obtain hysteroscopic confirmation: hysteroscopy was deferred after a normal sonohysterogram and normal hysterosalpingogram (5); hysteroscopy was deferred after a normal sonohysterogram with no available hysterosalpingogram (3); patient declined further evaluation despite an abnormal sonohysterographic finding (5); and patient conceived in the sonohysterography cycle (3). All prior hysterosalpingograms and procedures within 1 year of the sonohysterogram as well as any subsequent hysterosalpingograms or procedures were reviewed along with the radiologic report. Prior procedures included 2 diagnostic hysteroscopies, 1 diagnostic laparoscopy, and 22 hysterosalpingograms. Subsequent procedures included 15 hysteroscopies and 5 hysterosalpingograms. The Student's *t*-test or Fisher's exact test were used for statistical evaluation.

RESULTS

The 34 patients undergoing sonohysterography ranged in age from 19 to 44 years, with a mean age of 34.0 years. These patients had between two and seven prior pregnancy losses, with a mean of 3.41 losses. Seventeen of 34 (50.0%) sonohysterographic studies for recurrent pregnancy loss demonstrated an intrauterine defect. There was no difference between the age or number of pregnancy losses in patients with an abnormal or normal study. The abnor-

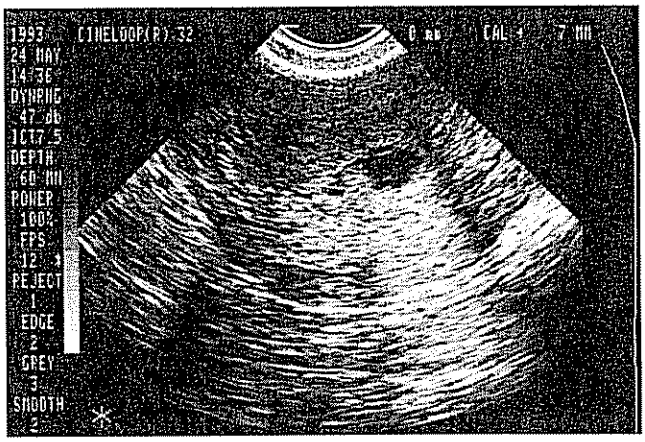

Figure 1 Coronal view during sonohysterography of the uterine fundus with the cursors demonstrating an adherent left cornual region. Left cornual adhesions were confirmed at hysteroscopy.

malities found during the sonohysterography were given the following diagnoses: synechiae (n = 6) (Fig. 1), intracavitary myomas (n = 4) ranging from 1.3 to 4 cm (Fig. 2), partial septum (n = 2), T-shaped uterus (n = 2), bicornuate uterus (n = 1), polypoid endometrium (n = 1), and retained placenta (n = 1). Of these 34 cases of recurrent pregnancy loss, 27 have undergone a hysterosalpingogram, with 16 (59.3%) demonstrating some intrauterine abnormality. A summary of the sonohysterographic, hysterosalpingographic, and hysteroscopic findings are presented in Table 1.

The sensitivity and specificity of sonohysterography were both 100% when compared with surgery. The sensitivity of hysterosalpingography was 90.0% and the specificity of hysterosalpingography was 20.0% significantly lower than sonohysterography ($P = 0.015$) using surgical confirmation as the gold standard. The accuracy of the sonohysterographic diagnoses of a uterine defect was 12 of 12 (100%) when compared with surgery, whereas hysterosalpingography accurately diagnosed a uterine defect in only 5 of 11 (45.5%) cases based on surgical confirmation ($P < 0.01$). Hysterosalpingography demonstrated some uterine abnormality in 11 of 14 (78.6%) cases of uterine abnormalities diagnosed by sonohysterography, and hysterosalpingography concurred with 9 of 13 (69.2%) normal sonohysterographic studies. In one case in which both sonohysterography and hysteroscopy found irregular fronds of endometrium consistent with multiple polyps, the histology demonstrated glandular-stromal dyssynchrony. There was a single complication after sonohysterography in which a patient was hospitalized for pelvic inflammatory disease despite receiving doxycycline prophylaxis. Although there was no sonographic evidence of a hydrosalpinx during the ultrasound exam in this patient, no free flow of saline into the posterior cul-de-sac could be identified, with a total of 10 mL of saline injected.

DISCUSSION

Sonohysterography demonstrated a uterine cavitary defect in 50.0% of patients studied, notably higher than the 15% to 27% rate previously found in studies evaluating the etiologic factors in recurrent pregnancy loss (3–5). Hysterosalpingography, which was used in all prior studies, also demonstrated a high rate of intrauterine defects (59.3%). A number of factors may be responsible for the higher rates of uterine defects that we found. These include the advancing maternal age of patients seeking reproductive care with increased acquired defects such as myomas or polyps, the increased sensitivity of sonohysterography in detecting uterine defects, and the possible selection bias introduced by subjects referred to a tertiary care facility focused on recurrent pregnancy loss. Regardless of the exact rate of intrauterine defects in recurrent pregnancy loss, they remain the most common finding associated with repeated spontaneous abortion. Given the potential benefit of surgical intervention, cavitary defects should be screened for in patients presenting with two or more consecutive losses.

This study suggests that sonohysterography is an extremely sensitive and specific screening test for intrauterine defects associated with recurrent pregnancy loss. Additionally, sonohysterography is highly accurate in making the precise diagnosis of a suspected intrauterine abnormality. Previously, sonohysterography has been shown to be highly sensitive and specific when screening for uterine defects associated with abnormal uterine bleeding and infertility (14, 15). In fact, in one study, abdominal

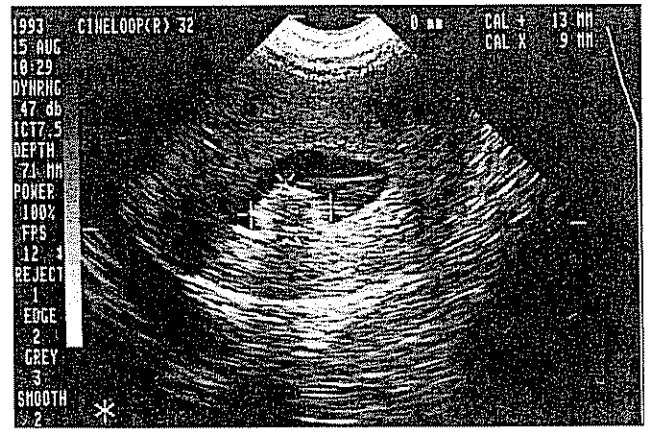

Figure 2 Coronal view during sonohysterography of a submucosal myoma confirmed at hysteroscopy and on histology

Table 1 Comparative Findings at Sonohysterography, Hysterosalpingography, and Hysteroscopy*

Sonohysterography	Hysterosalpingography	Hysteroscopy
Normal cavity (17/6)	Filling defect (4/4) Normal cavity (9/1)	Normal cavity (6)
Uterine synechiae (6/6)	Filling defect suspect synechiae (4/4) Filling defect (2/2)	Uterine synechiae (6)
Submucosal myoma (4/2)	Suspect defect (2/2) Normal cavity (1/0)	Submucosal myoma (2) Recent myomectomy (1)
T-shaped uterus (2/1)	T-shaped uterus (2/1)	T-shaped uterus (1)
Partial septum (2/0)	Normal cavity (1/0)	
Bicornuate uterus (1/0)		Bicornuate uterus (1)†
Polypoid endometrium (1/1)	Irregular contour (1/1)	Polypoid endometrium (1)
Retained POC (1/1)	Normal cavity (1/1)	Retained products of conception (1)

* Values in parentheses are total number per number with hysteroscopic evaluation

† Diagnosis made on laparoscopy not hysteroscopy in this one case

sonohysterography proved even more accurate at detecting and evaluating submucous fibroids than hysteroscopy when findings were assessed at hysterectomy (19). As more gynecologists are trained in and perform transvaginal sonography in the office, sonohysterography will become an increasingly practical, as well as highly accurate, method of evaluating the uterine cavity.

Sonohysterography offers a number of benefits over hysterosalpingography as a screening test in recurrent pregnancy loss. The uterine cavity is the primary focus of anatomic screening in recurrent abortion, and a number of hysteroscopic studies have demonstrated that the use of hysterosalpingography results in a high rate of false-positive findings (31% to 57%) (20). This corresponds with our finding that 30.8% of abnormal hysterosalpingograms were normal at hysteroscopy. Additionally, it is difficult to make a definitive diagnosis when interpreting hysterosalpingograms. Pellerito et al. (9) found that hysterosalpingography was accurate in diagnosing only 20% of uterine anomalies. We found that, although hysterosalpingography often was diagnostic for uterine synechiae, most other cavitary defects require further evaluation. In addition to the diagnostic limitations of hysterosalpingography, this test require ionizing radiation and often is accompanied by peritoneal irritation (21). The use of sonohysterography in screening patients with recurrent pregnancy loss may reduce unnecessary hysteroscopies performed for false-positive or misleading findings on hysterosalpingography. Additionally, sonohysterography will enhance surgical planning by providing the diagnosis and location of a defect before hysteroscopic surgery.

This study was limited in that a number of patients, particularly those with normal sonohysterographic findings, chose not to undergo hysteroscopy. Although only 6 of 17 normal sonohysterograms were confirmed by surgery, 14 of 17 normals were confirmed by either hysterosalpingography or hysteroscopy, with the remaining 3 undergoing only a sonohysterogram. Despite selected antibiotic prophylaxis, physical examination, and laboratory evaluation, there was one case of pelvic inflammation after sonohysterography. It therefore is recommended that patients be counseled regarding this risk before sonohysterography as well as hysterosalpingography, after appropriate precautions have been taken. Although intrauterine catheters generally have been used for sonohysterography, we chose an endocervically placed balloon catheter, which both avoids possible misinterpretation of the image due to an echogenic catheter in the uterine cavity and allows greater control of the intrauterine pressure to assess cavitary volume (18).

In conclusion, sonohysterography offers a sensitive and specific method of screening and perhaps diagnosing intrauterine defects in recurrent pregnancy loss. The high rate of intrauterine defects demonstrated in this study provides further evidence of the importance of evaluating the uterine cavity after recurrent abortions. Although hysterosalpingography has been the standard screening test in recurrent pregnancy loss, the relatively low specificity and accuracy of hysterosalpingography may favor the use of sonohysterography by skilled examiners for intrauterine screening. Finally, with increased training and experience with endovaginal sonography, gynecologists will find sonohysterography a simple and accurate technique for the investigation of intrauterine pathology.

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