

Role of Transvaginal Sonography (TVS) and Saline Infusion Sonography (SIS) in the evaluation of Abnormal Uterine Bleeding (AUB)

Birundha. V. J.¹, Sundari. P.²

¹Formerly Senior Resident, Department of Obstetrics and Gynaecology, Coimbatore Medical College Hospital, Coimbatore, Tamilnadu.
Currently Assistant Surgeon, Government Hospital, Palani, Tamilnadu, India

²Formerly Professor, Dept. of Obstetrics and Gynaecology, Coimbatore Medical College Hospital, Coimbatore, Tamilnadu.
Currently Associate Professor, Dept. of Obstetrics and Gynaecology, Karpagam Faculty of Medical Sciences and Research, Coimbatore, Tamilnadu, India

Abstract: Objective: To determine the accuracy and detecting ability of transvaginal sonography (TVS) and saline infusion sonography (SIS) in the evaluation of intrauterine pathology in patients with Abnormal Uterine Bleeding (AUB) and to compare the diagnostic accuracy after hysterectomy. Methodology: This is a prospective cohort study conducted in the department of Obstetrics and Gynaecology, Coimbatore Medical College Hospital. 100 patients being subjected to hysterectomy for AUB were involved. TVS and SIS were done sequentially in every patient prior to hysterectomy. Results: The overall sensitivity and specificity when correlated with the intraoperative hysterectomy findings and HPE were 73.71% and 95.53% for TVS and 87.32% and 97.73% for SIS. Positive predictive value and Negative predictive value were 72.74% and 94.61% for TVS and 87.89% and 97.60% for SIS respectively. The false positive and false negative rates were high in TVS than SIS. Conclusion: TVS combined with SIS is a very sensitive and specific technique for diagnosing intrauterine abnormality in cases of AUB. SIS outlines the uterine cavity, detects myoma, polyp or endometrial abnormality missed on TVS.

Keywords: transvaginal sonography, saline infusion sonography, abnormal uterine bleeding

1. Introduction

Abnormal Uterine Bleeding (AUB) is a common presenting complaint among women attending gynaecology outpatient department [1], diagnosis of which is often difficult as the cause may be widely variable from simple DUB to endometrial carcinoma. It accounts for about 15% of office visits and almost 25% of gynecological surgeries [2]. Hysteroscopy with directed biopsy has assumed the role of reference standard investigation for AUB. This is because of its accuracy in diagnosing endometrial abnormalities and the feasibility of treatment in the same sitting. However it is invasive, expensive, associated with complications like perforation, embolism and cannot assess the myometrial and adnexal pathology [3].

Transvaginal sonography (TVS) has an important role in the initial evaluation of AUB as it is highly applicable and non invasive [4]. However its ability for screening the lesions in the endometrial cavity and focal endometrial lesions is limited. This can be overcome by Saline Infusion Sonography (SIS). It can be performed easily and rapidly and is well tolerated by the patients. It can accurately differentiate focal endometrial lesions and provides information about the localization and the extent of subendometrial lesions affecting the uterine cavity [5].

The infusion of saline serves as a contrast medium and distends the endometrial canal. This allows exquisite display of the inner lining of endometrium during real time imaging. This procedure is known by many names such as sonohysterography, ultrasonohysterography and saline infusion sonography [6]. Today saline infusion sonography

has evolved as a useful, safe and minimally invasive examination for women who have abnormal uterine bleeding, infertility and congenital uterine anomalies. The present study is undertaken to determine the accuracy of TVS and SIS in the evaluation of AUB.

2. Materials and Methods

This prospective study was conducted on 100 inpatients in the department of Obstetrics and Gynecology, Coimbatore Medical College Hospital, Coimbatore from August 2014 to July 2015. The Ethics committee of the hospital has approved the study. Written consent was obtained from all the patients.

The study included patients in reproductive age group with complaints of abnormal uterine bleeding, who were posted for hysterectomy. Women with evidence of pregnancy or pelvic inflammatory disease, who have undergone uterine or cervical surgery previously or with a suspected or proven case of endometrial carcinoma were excluded from the study.

A detailed history was taken; thorough clinical examinations and relevant laboratory investigations were done. All patients were then subjected to sequential examination with TVS and SIS before hysterectomy was done. All TVS examinations were performed first using endovaginal probe of 7.5 MHz (covered by a condom), with empty bladder. Uterine and adnexal pathology noted. The uterus was scanned in the sagittal and coronal planes for the presence of myometrial masses, and the endometrium was examined for an endometrial pathology. The endometrial thickness was

measured. The presence of focal endometrial thickening or a focal mass was noted.

The cervix was swabbed with the povidine-iodine solution. No.10 F Foley's catheter was placed in the cervix and the balloon inflated with 2 to 3 ml of distilled water such that it lies just above the internal os. This blocks the distension fluid from flowing out from the endometrial cavity. Speculum was removed and the vaginal probe (covered by a condom) was reintroduced.

Sterile saline was infused gently until the distension of the uterine cavity was adequate to see any lesion or till pain appears and the findings were noted. Saline acts as a contrast that fills the uterine cavity. Uterine cavity was visualized in longitudinal plane from one ostia to the other and in coronal plane from fundus to endocervix.

The endometrial cavity was examined for the presence of polyps or submucosal myoma. Any projection inside the uterine cavity was observed with special attention to its shape and echogenicity. Evidence of abnormal endometrial thickening was also noted. The balloon was deflated and the catheter gently removed.

Then after hysterectomy the specimen was examined both grossly and histopathologically. Findings were analysed by Chi-square test and compared with that of TVS and SIS and sensitivity, specificity, positive predictive value and negative predictive value were calculated.

3. Observations and Results

In this study hundred patients who were being subjected to hysterectomy for AUB were analysed. It was made sure that they were fulfilling the inclusion and exclusion criteria. The women who had any evidence of systemic diseases such as diabetes, hypertension, PCOS, thyroid disorder, evidence of endometriosis were not taken into the study.

Mean age of the patients taken in the study is 45.17 years (range 28 to 51). The most common presenting complaint was heavy menstrual bleeding. (Table 1)

Table 1: Clinical presentationions

Symptom	Frequency
Heavy menstrual bleeding	66
Intermenstrual bleeding	18
Others	16
Total	100

The commonest HPE finding in our study was submucous myoma (19%) followed by simple cystic hyperplasia (18%) intramural leiomyoma (14%) and adenomyomatous polyp (8%) of cases. Table 2 shows comparison of TVS and SIS findings with intraoperative findings and HPE.

Table 2: Distribution according to diagnosis on TVS, SIS and hysterectomy and HPE

Lesion	TVS (%)	SIS (%)	HPE (%)
Intramural myoma	15	13	14
Submucous myoma	17	19	19
Endometrial polyp	6	8	8
Thickened endometrium	24	20	18
Normal	38	40	40
Endometrial carcinoma	0	0	1

Sensitivity and specificity of TVS and SIS compared to the intraoperative and histopathological findings are shown in table 3. Both sensitivity and specificity are higher for SIS than for TVS.

Table 3: Comparison of TVS and SIS findings with intraoperative hysterectomy and HPE (p value <0.001)

Test	TVS		SIS	
	Sensitivity (%)	Specificity (%)	Sensitivity (%)	Specificity (%)
Intraop & HPE				
Submucous myoma	82.35	93.98	89.47	97.53
Intramural myoma	66.67	95.29	92.31	97.70
Endometrial polyp	83.33	96.81	87.50	98.20
Thickened endometrium	62.50	96.05	80.00	97.50

Table 4 shows the positive predictive value and negative predictive values of the two tests compared with that of the intraoperative and HPE findings. False positive and false negative rates are shown in the table 5. False positive rate and false negative rate are less with SIS.

Table 4: Positive predictive value (PPV) and Negative predictive values (NPV) of TVS and SIS findings compared with intraoperative hysterectomy and HPE findings

Test	TVS		SIS	
	PPV (%)	NPV (%)	PPV (%)	NPV (%)
Intraop & HPE				
Submucous myoma	26.32	3.70	89.47	97.53
Intramural myoma	71.43	94.19	85.71	98.84
Endometrial polyp	62.50	98.91	87.50	98.92
Thickened endometrium	83.33	89.02	88.89	95.12

Table 5: False Positive Rate (FPR) and False Negative Rate (FNR) of TVS and SIS findings compared with intraoperative hysterectomy and HPE findings

Intraop & HPE	Imaging study	FPR (%)	FNR (%)
Intramural myoma	TVS	4.71	33.33
	SIS	2.30	7.69
Submucous myoma	TVS	6.02	17.65
	SIS	2.47	10.53
Endometrial polyp	TVS	3.19	1.80
	SIS	16.67	12.50

4. Discussion

Abnormal uterine bleeding is an important and common problem suffered by woman of any age group not only from menarche to menopause, but also after menopause. Heavy menstrual bleeding is the abnormal bleeding that has an impact on the woman's quality of life. It may affect the woman physically and emotionally restraining her from daily activities, or socially being the reason for her absence in workplace. It may also affect the woman's material quality

of life.

The causes of abnormal uterine bleeding vary depending on the age of the patient. Investigations should be chosen promptly keeping in mind the commonest causes. After the initial investigations to know the general condition of the patient, there come the specific investigations to identify the exact pathology responsible for the abnormal bleeding. Imaging modalities play an important role here before the endometrial sampling methods.

Transvaginal sonography is being performed as an initial investigation modality in the evaluation of uterine pathologies responsible for AUB. It can be performed easily in the outpatient setting. No premedication or anaesthesia is required. There is no need for prior cervical dilatation. Since a sterile condom is always used to cover the transvaginal probe the chance of infections is very minimal or almost nil. The images can be saved for future references.

Saline infusion sonography is one step ahead of transvaginal sonography where sterile saline infused through the catheter acts as a contrast medium inside the uterine cavity. The endometrial intra cavity pathologies which may be difficult to diagnose by TVS could easily be differentiated with the use of SIS.

Diagnostic hysteroscopy has become an acceptable modality of investigation to visualize the uterine cavity and perform biopsy in the same sitting if necessary. However this is invasive, expensive and does not contribute in the evaluation of myometrial or ovarian pathology. It also requires a more complicated setup. In a developing country like India this is still not available to every patient.

Hence the present study was conducted to find out and compare the diagnostic effectiveness of TVS and SIS. Various studies have already been done in small scale and also in large scale comparing the two modalities. This study shows that SIS has higher sensitivity and specificity when compared with TVS. Similar findings were observed in studies by Saidi et al [7], Reddi Rani P and Lakshmikantha G [8] and Muhammad Aslam et al [9]. This is shown in table 6.

Table 5: Summary of various studies

Study	Procedure	Sensitivity (%)	Specificity (%)
Saidi et al	TVS	95.7	63.6
	SIS	90.9	83.3
Reddi Rani & Lakshmikantha	TVS	65.5	88.0
	SIS	82.0	95.0
Muhammad Aslam et al	TVS	71.43	67.7
	SIS	92.86	89.65
Present study	TVS	73.71	95.53
	SIS	87.32	97.73

de Kroon et al [10] in a meta analysis made review of sixteen different studies which comprised 877 procedures. The diagnostic accuracy was compared between SIS and hysteroscopy with or without HPE or hysterectomy in the women presenting with AUB. The sensitivity of SIS was 95% and it showed a pooled specificity of 88%. According to this meta analysis, SIS is an accurate means of evaluating the uterine cavity with substantial cost savings as it can replace diagnostic hysteroscopy. The sensitivity and

specificity of SIS and TVS was different for different lesions. Various studies have also confirmed this. All imaging techniques can have a number of false results even in the experienced hands. It may be because of the large intra mural myomas compressing the cavity, hemorrhagic debris, sessile polyps, and polyps arising from endocervix. Sometimes even the bulb of the foley's catheter may compress the lesion. Ryu et al [11] noted false results in 12% of the cases. These were because of the small polyps which measured less than 5 mm, presence of uterine synechiae and chronic endometritis.

In our study, in three cases there was difficulty in passing the catheter for saline infusion as the patients complained of pelvic discomfort. The procedure was stopped for some time. They were given analgesic injection and then the study was resumed. In five cases there was leakage of the injected saline. There the procedure was completed with difficulty. In the study by Cicinelli et al [12] severe pain was experienced by 11 % of the patients. The pain may be due to difficulty in passing the catheter in stenosed cervix. The pain due to distension of the uterine cavity can be minimized if saline instillation is controlled and stopped as soon as the lesion is detected.

Rate of infection following the procedure could not be found out in our study because only the patients posted for hysterectomy were taken into the study. Hence long term follow up could not be done. However in a review by Chung et al [13] of 900 procedures of SIS, an infection rate of 0.6 % was observed. Infection rate of about 1 % and pelvic pain of about 1 % was noted in the study by Bonnamy et al [14].

5. Conclusion

Transvaginal sonography and saline infusion sonography together is a very sensitive and specific technique for diagnosing intrauterine abnormalities in cases of AUB. Both are simple, minimally invasive and low cost technique. SIS outlines the uterine cavity. Myoma, polyp or endometrial abnormality missed on transvaginal ultrasound alone is identified accurately with this technique. Hence it can even help in choosing the case where hysteroscopy and directed biopsy is required. There are no significant complications associated with SIS. Therefore we recommend that SIS should be used as a second line investigation in the evaluation of AUB along with TVS, where TVS findings are inconclusive.

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Author Profile



Dr. Birundha. V. J. has obtained M.B.B.S., and M.S. in Obstetrics and Gynaecology from Coimbatore Medical College Hospital, Coimbatore, Tamil nadu in 2011 and 2016, respectively and is currently working as Assistant Surgeon in Government Hospital, Palani,

Tamilnadu.



Dr. Sundari. P. has received the M.B.B.S., and D.G.O., from Coimbatore Medical College and M.D., in Obstetrics and Gynaecology from Institute of Obstetrics and Gynaecology, Madras Medical College, Chennai, Tamil nadu and is currently working as Associate Professor in Obstetrics and Gynaecology, Karpagam Faculty of Medical Sciences and Research, Coimbatore, Tamil nadu.