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Diagnostic Accuracy of Saline Infusion Sonohysterography versus Hysteroscopy in Detecting the Endometrial Polyps in Women with Abnormal Uterine Bleeding

Sofia Iqbal[1], Mahham Janjua[2], Amna Basharat[3], Shamila Ijaz Munir[4], Eisha Tahir[5], Noreen Rasool[6]

[1,2]*Associate Professor of Obs & Gynae, Fatima Jinnah Medical University, Lahore,*
[3]*Registrar of Obs & Gynae, Fatima Jinnah Medical University, Lahore*
[4]*Head of Department Obs & Gynae, Fatima Jinnah Medical University, Lahore*
[5]*Assistant Professor of Radiology, Shalamar Hospital Lahore*
[6]*Associate Professor Obstetrics and Gynecology Red Crescent Medical College Lahore*

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Correspondence
**E: amnausmanmaan@gmail.com*

A B S T R A C T

Objective: To evaluate the diagnostic accuracy of saline infusion sono-hysterography (SISH) in identifying endometrial polyps in women with abnormal uterine bleeding (AUB) taking hysteroscopy as gold standard.

Methodology: This Hospital-based Cross-sectional study was done at the Department of Obstetrics and Gynecology, Sir Ganga Ram Hospital, Lahore from September 2024 to March 2025. Women aged 25 to 40 years who presented with abnormal uterine bleeding and either showed endometrial polyps on transvaginal sonography (TVS) or had an endometrial thickness exceeding 10 mm were included. Patients were further evaluated with SISH under the supervision of radiologist and with positive findings the patients then underwent hysteroscopy for confirmation. SISH was carried out using a sterile Foley catheter and transvaginal ultrasound, following strict aseptic techniques. The presence or absence of endometrial polyps was recorded, and data were analyzed using SPSS version 25.

Results: The average age was 33.18 ± 4.31 years, and the mean BMI was 26.32 ± 2.94 kg/m². SISH and hysteroscopy both detected polyps in 70% of cases. Overall SISH showed 94.29% sensitivity meaning it correctly identified approximately 94 out of every 100 true polyp cases, sensitivity specificity 86.67%, positive predictive value (PPV) 94.29%, negative predictive value (NPV) 86.67%, and overall diagnostic accuracy of SISH 92.00%. No significant association was found between age (p = .577) or parity (p = .412) and polyp detection, while raised BMI and longer symptoms duration were significantly associated with polyp detection, (p >0.05).

Conclusion: SISH was evaluated as a minimally invasive, cost effective alternative, showed high sensitivity and accuracy taking hysteroscopy as the gold standard.

Keywords: AUB, Hysteroscopy, SISH, Endometrial Polyps, TV

Introduction

AUB represents one of the most prevalent and clinically significant gynecological disorders encountered in women across the reproductive and perimenopausal spectrum. It is estimated to affect more than 50% of reproductive-aged women and girls at some point during their lifetime.[1] The condition encompasses a broad spectrum of presentations, including heavy menstrual bleeding (menorrhagia), intermenstrual bleeding, irregular cycles, and postcoital spotting, all of which impose a substantial burden on a patient's physical health, psychological well-being, and quality of life.[1,2]

AUB developed from multiple causes that are approximately categorized into structural and non-structural factors, both of which affect the clinical appearances and overall outcomes among patients.[3]

Such widely assumed framework has proven important in streamlining the diagnostic estimations and directing pointed management of AUB across various clinical sites. Amongst the structural causes, endometrial polyps characterize a specifically common and clinically important subgroup etiologically. The timely and accurate identification is imperative not only for symptom relief but also for the exclusion of underlying pre-malignant or malignant conversion.[4]

The endometrial polyps are focal, benign overgrowths of the endometrial stroma and glands supported by the fibrovascular core, forming sessile or pedunculated projections into the cavity of uterus.[6]

The pathogenesis is closely associated to estrogen-driven endometrial proliferation, and recognized risk factors include overweight, delayed menopause,

PCOS, tamoxifen therapy, hypertension, and unopposed exposure of the estrogen.[5,6] The prevalence of endometrial polyps in the general female population has been reported to range from 16% to 34%, with rates rising considerably among perimenopausal and postmenopausal women.[6]

The diagnostic evaluation of AUB has evolved considerably over recent decades, with several imaging and endoscopic modalities now available to clinicians. Transvaginal ultrasonography (TVS) remains the first-line screening tool for uterine pathology due to its accessibility, non-invasive nature, and widespread availability.[7,8] However, the inability of standard TVS to reliably distinguish between polyps, submucosal fibroids, and focal endometrial hyperplasia significantly limits its clinical utility in definitive polyp diagnosis.[9]

On the other hand, SISH, represents a significant advancement in the non-invasive evaluation of the uterine cavity. The technique involves the transvaginal instillation of sterile saline solution through a thin intrauterine catheter, which distends the endometrial cavity and provides an acoustic contrast medium that enhances the delineation of intracavitary lesions under real-time ultrasound guidance.[10] Through separating the uterine walls and creating a fluid interface, SISH enables reliable differentiation of focal lesions from diffuse endometrial changes, precise characterization of polyps versus submucosal fibroids, and assessment of lesion size, morphology, and attachment site.[10,11] The technique is minimally invasive, can be performed in an outpatient setting without anesthesia, is generally well tolerated, and is significantly less expensive and time-consuming compared to the hysteroscopy. Importantly, a systematic review and meta-analysis reported the sensitivity and specificity of SISH in diagnosing endometrial polyps in women with AUB to be 87% and 86%, respectively a marked improvement over conventional TVS.[8] However the hysteroscopy is universally recognized as the gold standard for the evaluation and management of intrauterine pathology.[12,13] By facilitating direct endoscopic visualization of the entire uterine cavity, hysteroscopy allows for accurate identification, characterization, and targeted biopsy or excision of endometrial lesions with a sensitivity of 92% and specificity of 85% for polyp detection.[14] However, is more invasive and resource-intensive than ultrasound-based modalities, typically requires a specialized facility, and carries risks albeit low of uterine perforation, infection, and patient discomfort, particularly in an outpatient setting without anesthesia.[12] Such limitations have stimulated ongoing interest in identifying perfect, less invasive alternatives of screening such as SISH that can effectively direct patients toward or away from hysteroscopy procedure. Generally given the considerable disease burden attributable to AUB, the clinical significance of endometrial polyps within this context, and the pressing need for cost-effective diagnostic methods in resource-limited healthcare regions, the accurate estimation of SISH against the accepted gold standard of hysteroscopy remains an important area of ongoing clinical investigation. The present study, therefore, aims to evaluate the diagnostic accuracy of SISH in detecting endometrial polyps in women presenting with AUB, using hysteroscopy as the reference standard. The findings are intended to inform and to determine whether SISH can serve as a reliable, minimally invasive diagnostic tool.

Methodology

This Hospital-based Cross-sectional study, was conducted at department of Obstetrics and Gynecology Unit 2, Sir Ganga Ram Hospital, Lahore. Study was conducted during six 6 months after the approval of synopsis from the ethical review board from September 2024 to March 2025. Non-probability consecutive sampling was employed. All the women aged between aged $\geq$18 years, presenting with AUB and having endometrial polyps on TVS or endometrial thickness > 10mm, and who were scheduled to undergo both SISH and diagnostic hysteroscopy.

Women with known pregnancy or positive urine/serum beta-hCG at the time of enrolment, active PID or lower genital tract infection, women with cervical stenosis, multiple intramural /sub serosal fibroids, adnexal and ovarian pathology, women who have received hormonal therapy during past three months, women with coagulation disorders and those who were not willing to take a part in study were excluded. Before any procedure, all enrolled participants underwent a thorough clinical evaluation including detailed history, general physical examination, and clinical examination of pelvis.

Baseline investigations were obtained as per clinical indications. The procedures were scheduled in the early proliferative phase of the menstrual cycle (Days 5–10) in premenopausal women to ensure optimal endometrial visualization and reduce the risk of disturbing an early intrauterine pregnancy; while the postmenopausal women were scheduled at any time. All patients underwent transvaginal sonography (TVS) for initial screening. If a polyp or a suspected polyp was identified on TVS, the patient underwent saline infusion sonohysterography (SISH) during the same session. All patients who underwent SISH subsequently underwent hysteroscopy for confirmation. SISH was performed in the Radiology Department by the primary researcher under the supervision of a consultant radiologist. Anesthesia or analgesia was generally not required for intrauterine

catheter insertion, as the procedure is typically painless. However, in cases where mild abdominal cramping was anticipated, patients were advised to take 400 mg of ibuprofen 30 minutes prior to the procedure. To ensure patient comfort, the procedure was thoroughly explained, and written informed consent was obtained beforehand. The patient was positioned in the dorsal lithotomy position. Sterile technique was strictly maintained to prevent infection, including endometritis.

A Sim's speculum was used to retract the posterior vaginal wall, and the anterior lip of the cervix was grasped with Vulsellum forceps. A sterile 8-F Foley catheter (30 cm in length, 2.7 mm in diameter) was inserted into the cervical canal up to the uterine fundus, and the balloon was inflated with 3 mL of distilled water. The catheter was then gently retracted to secure it against the internal os. The instruments were withdrawn, and a 5.0-MHz transvaginal ultrasound probe was introduced into the vaginal cavity. A 10-mL syringe filled with sterile normal saline was connected to the catheter. The infusion of saline and the distention of the uterine cavity were monitored in real-time via ultrasound. All findings were documented. Subsequently the hysteroscopy was performed during the next elective surgical list in the Gynecology Department. Preoperative preparations were completed beforehand. Cervical priming was done using 400 µg of misoprostol administered intravaginally two hours before the procedure. A single intravenous dose of ceftriaxone 1 g was given 30 minutes prior. Hysteroscopy was performed under spinal anesthesia with the patient in the dorsal lithotomy position. Findings from the examination under anesthesia (EUA) were recorded. A rigid hysteroscope (25 cm in length, 2.9 mm diameter, with a 4 mm outer sheath and a 30-degree fiber optic lens) was used. Illumination was provided by a fiber optic cable connected to an external light source. Normal saline served as the distention medium. The hysteroscope was gently advanced through the cervical canal into the uterine cavity. Once inside, a panoramic view of the uterine cavity was achieved. A systematic examination was conducted beginning at the fundus, then moving to the anterior, posterior, and lateral walls, and finally to the tubal ostia. Any endometrial abnormalities, including fibroids, polyps, or vascular malformations, were documented. For any detected polyps, their size, shape, and location were recorded. Identified polyps were excised using polypectomy scissors and sent for histopathological examination. Postoperative pain was managed as per hospital protocol. Routine follow-up was not mandatory; however, patients were advised to return in case of persistent pain, fever, vaginal bleeding, or foul-smelling discharge. All the relevant data was recorded by study proforma, subsequently it was entered and analyzed using SPSS version 25.

Results

A total of 50 women were enrolled, with mean age of 33.18 ± 4.31 years, and the mean BMI was 26.32 ± 2.94 kg/m²polyps. Overall mean duration of symptoms was 12.62 ± 8.07 months, indicating that many patients had a prolonged history of abnormal uterine symptoms prior to evaluation. Average hemoglobin level was 11.83 ± 1.18 g/dL, reflecting mild anemia in some cases and overall mean endometrial thickness was 11.80 ± 2.51 mm, suggesting an overall thickened endometrium among participants. According to parity, 8 (16.0%) women were nulliparous and 42 (84.0%) had other parity statuses; polyps were found in 62.5% of nulliparous and 71.4% of others. In terms of BMI, majority of women 35 (70.0%) were overweight. The duration of symptoms showed a significant association, where 35 (70.0%) patients with medium duration of symptoms had polyps while none with short duration had polyps (p=0.000). Irregular bleeding was present in 39 (78.0%) patients, intermenstrual bleeding was in

Table I: Comparative analysis of demographic and clinical variables. (n=50)

Variable	Category	POLYP		Total	p-value
		Yes (n, %)	No (n, %)		
Age Group	25–32	17 (73.9%)	6 (26.1%)	23(46.0%)	0.577
	33–40	18 (66.7%)	9 (33.3%)	27(54.0%)	
Parity	Nulliparous	5 (62.5%)	3 (37.5%)	8(16.0%)	0.412
	Others	30 (71.4%)	12 (28.6%)	42(84.0%)	
BMI Category	Normal	0 (0.0%)	15 (100.0%)	15(30.0%)	0.000*
	Overweight	35 (100.0%)	0 (0.0%)	35(70.0%)	
Duration of Symptoms	Short	0 (0.0%)	15 (100.0%)	15(30.0%)	0.000*
	Medium	35 (100.0%)	0 (0.0%)	35(70.0%)	
Intermenstrual Bleeding	Yes	30 (100.0%)	0 (0.0%)	30(60.0%)	0.000*
	No	5 (25.0%)	15 (75.0%)	20(40.0%)	
Irregular Bleeding	Yes	24 (61.5%)	15 (38.5%)	39(78.0%)	0.014*
	No	11 (100.0%)	0 (0.0%)	11(22.05)	
Heavy Bleeding	Yes	29 (70.7%)	12 (29.3%)	41(82.0%)	0.810
	No	6 (66.7%)	3 (33.3%)	9(18.0%)	

30(60.0%) patients and heavy bleeding was reported in 41 (82.0%) patients, specifically the irregular bleeding and intermenstrual bleeding were significantly associated with polyp presentation ($p<0.05$). Table I

Out of all patients with abnormal uterine bleeding, SISH identified the endometrial polyps among 35(70.0%) of the women, while hysteroscopy also detected polyps among 35(70.0%) women and this equal distribution between both modalities indicates a consistent prevalence of endometrial polyps in the sample of study. Table II

Table II: Cross tabulation for diagnostic accuracy of SISH taking hysteroscopy as gold standard.

SISH Result	Hysteroscopy (Gold Standard)		Row Total
	Polyp Present (+)	Polyp Absent (−)	
Positive(+)	33 (TP)	2 (FP)	35(70.0%)
Negative (−)	2 (FN)	13 (TN)	15(30.0%)
Column Total	35(70.0%)	15(30.0%)	50(100.0%)

Specifically, when findings of SISH were associated with findings of hysteroscopy in the 2×2 cross tabulation, 33 cases were true positives, indicating both SISH and hysteroscopy agreed on the presence of a polyp while 13 cases were true negatives. Although, 2 cases were false positives. Overall SISH showed 94.29% sensitivity meaning it correctly identified approximately 94 out of every 100 true polyp cases, sensitivity specificity 86.67%, positive predictive value (PPV) 94.29%, negative predictive value (NPV) 86.67%, and overall diagnostic accuracy of SISH 92.00%, as presented in Table II.

Table III: Diagnostic accuracy of SISH taking hysteroscopy as gold standard.

Diagnostic Measure	Formula	Value	95% CI (Wilson Score)
Sensitivity	TP / (TP + FN)	94.29%	79.4% – 98.3%
Specificity	TN / (TN + FP)	86.67%	62.1% – 97.4%
(PPV)	TP / (TP + FP)	94.29%	79.4% – 98.3%
(NPV)	TN / (TN + FN)	86.67%	62.1% – 97.4%
Diagnostic Accuracy	(TP + TN) / Total	92.00%	79.4% – 97.3%
Positive Likelihood Ratio (LR+)	Sensitivity / (1 – Specificity)	7.07	Strong Rule-In (>10)

Discussion

The AUB is a usual gynecological complaint in which endometrial polyps are a frequent underlying cause. The SISH is a minimally invasive technique that improves endometrial visualization, making it a promising first-line tool for polyp detection incentres to the conventional ultrasound diagnosis. However present study compared the diagnostic accuracy of SISH with hysteroscopy in detecting endometrial polyps among women presenting with AUB, and according to our findings both SISH and hysteroscopy identified the endometrial polyps among 35(70.0%) of the women, indicates a consistent prevalence of endometrial polyps in the sample of study, with SISH diagnostic accuracy as 94.29% sensitivity, sensitivity specificity 86.67%, PPV 94.29%, NPV 86.67%, and overall diagnostic accuracy 92.00%. These findings align with several previous investigations, while some studies have reported higher diagnostic values for SISH, and others demonstrated its limitations more strongly, favoring hysteroscopy as the superior diagnostic tool.

A study conducted by Hadisaputra W et al[15] reported sensitivity and specificity for SISH in detecting endometrial polyps to be 93.5% and 81.8%, respectively, with a diagnostic accuracy of 91.6%. In agreement with our findings, Török P et.al systematically reviewed multiple studies and found that SISH had a pooled sensitivity of 95% and specificity of 88% for endometrial polyps.[16] While our sensitivity value was comparably high. A more critical comparison can be drawn with the findings of Ren F et al[17] who reported an overall diagnostic accuracy of 97% for hysteroscopy compared to 78% for SISH, emphasizing hysteroscopy's superiority as a gold standard**.** Another important study by Reddy S et al[18] compared the two techniques in a cohort of 100 women and found SISH sensitivity to be 87.1% and specificity 52.4%. They concluded that SISH is best used as a triage tool rather than a definitive diagnostic method, a recommendation consistent with our conclusion regarding SISH's role in clinical practice.[18] In the study by Kaveh M et al[19] reported that the SISH showed sensitively 0.87 and specificity 0.86 in identifying the endometrial polyps among women with AUB. The discrepancy in the findings across the studies may be attributed to population differences, variations in sonographic expertise, and selection bias, as their study excluded patients with thickened endometrium on TVS, while our study included a broader clinical spectrum. In another study by Mousa AM et al[20] also demonstrated that the 90.7% sensitivity, 85.7% specificity, 97.5% PPV, 60% NPV and 93% accuracy with highly significance in identifying the endometrial discovering.

In this study a significant correlation between BMI and polyp detection (p = 0.001) and this is corroborated by research from Hassan AA et.al who identified obesity as a major risk factor for endometrial polyps due to increased estrogenic stimulation in adipose tissue. Similarly, intermenstrual and irregular bleeding patterns were statistically significant indicators of polyp presence in our cohort (p = .000 and p = .014, respectively), which aligns with standard literature identifying such symptoms as classic manifestations of endometrial pathology.[21] Overall studies including this study showed that the SISH is a non-invasive and reliable diagnostic modality in identifying the polyp among women with AUB, while present study has several limitations that should be considered while interpreting the findings like very limited sample size and the single-center design may limit the generalizability of the results to the larger population and diagnostic accuracy of SISH and hysteroscopy is also operator-dependent, which could have influenced the outcomes. Additionally, the polyp diagnosis was not confirmed with histopathology in all cases, which may limit the verification of true diagnostic accuracy. Hence further large-scale studies are recommended and these studies should include histopathological evaluation to accurately verify the diagnostic findings of SISH and hysteroscopy.

Conclusion

In conclusion, SISH was evaluated as a minimally invasive, cost effective alternative and reliable identifying modality achieving a sensitivity of 94.29%, specificity of 86.67%, overall accuracy of 92.00%, and a good AUC of 0.905 with approximately perfect agreement with hysteroscopy. However due to several significant limitations further large-scale studies are recommended to validate the findings.

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