Diagnostic Value of Ultrasound and Colour Doppler in Endometrial and Cervical Polyps

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Abstract

Introduction: Endometrial and cervical polyps are common causes of abnormal uterine bleeding in females in different age groups. These polyps may range in pathology from simple endometrial hyperplasia to endometrial carcinoma which affects patient management.

Objective: The aim of this study was to evaluate the role of transvaginal ultrasonography and colour Doppler (TVUS) in the diagnosis and differentiation of various endometrial polypoidal masses and to correlate its findings with operative and hysteroscopic results.

Patients and Methods: This study included forty-one female patients, ranging in age from 23-58 years. Thirty-five patients had abnormal uterine bleeding, while six patients presented with infertility. TVUS, colour flow mapping and power Doppler were done to all patients and so also 3 & 4 D US. Saline infusion sonohysterography (SIS) was performed to 10 patients and Hysterosalpingography (HSG) was done to 6 patients.

Hysteroscopy was performed to 17 patients, while dilatation and curettage was done for 22 patients and two cases had done follow-up after two months treatment.

The results of TVUS, HSG and SIS were correlated with hysteroscopic findings and the pathological results of biopsies.

Results and Conclusion: TVUS could diagnose forty five polypoidal lesions. The lesions included hyperplasic endometrial polyps in 22 cases, Cervical polyps in 12 cases, submucous fibroids in 8 cases, in addition to three polypoidal endometrial masses wrongly diagnosed as endometrial polyps and by pathology one proved to contain malignant cells, the second was focal endometrial hyperplasia, the third was retained products of conception. The sensitivity on TVS in detection of polypoidal masses was 100%, but the specificity of mass characterization was 95.2%.

Key Words: Endometrial polyps – Cervical polyps – Submucous fibroids – TVUS – Colour doppler.

Introduction

Menometrorrhagia is a frequent cause of medical consultation. After clinical examination showing the uterine origin of bleeding and excluding a cervical or vulvo-vaginal cause, ultrasonography is indicated. It is the first-line technique examination for the identification of an etiology: Benign endometrial lesion (polyp, endometrial atrophy or hypertrophy) or malignant tumor, myometrial lesions (adenomyosis, leiomyoma), adnexal tumors and first trimester pregnancy complication. Color Doppler sonography and hysterosonography are useful tools for ultrasound performance improvement. Ultrasound gives orientation for diagnosis and therapeutic strategy [2].

Endometrial polyps are a common cause of bleeding. Although endometrial polyps may be visualized at transvaginal US as nonspecific endometrial thickening, they are frequently identified as focal masses within the endometrial canal. Color Doppler US may be used to image vessels within the stalk. Fibroids or foci of endometrial hyperplasia or carcinoma can mimic a sessile polyp and foci of atypical hyperplasia are sometimes found within polyps [3].

Aim of work:

The aim of this study was to evaluate the diagnostic accuracy of transvaginal US and assess different signs of endometrial polypoidal masses favouring specific diagnosis. The addition of colour Doppler, 3 & 4D US, sonohysterography was evaluated also as complementary tools. The results were correlate with operative, hysteroscopic findings versus ultrasound follow-up.

Patients and Methods

This study included 41 female patients. Their ages ranged from 23-58 years referred from gynecological clinics, 35 cases were referred for trans-
vaginal US (TVUS) due to abnormal uterine bleeding (3 cases were postmenopausal, 9 cases were peri-menopausal (45-53 years), 23 cases were in child bearing age: 4 of them presented by contact bleeding, 19 cases were complaining of menorrhagia from which 1 case presented one month after abortion). Six cases were referred for hystro-salpingography (HSG) due to infertility where obstruction was encountered at dye injection (2 cases) or filling defects were seen (4 cases) necessitating TVUS.

All patients were subjected to full clinical history, general and local examination. TVUS was done to all patients using Voluson Pro 730. Urinary bladder evacuation was requested before examination. Transvaginal sterile probe 5-9MHz was introduced after applying coupling gel and condom. Scanning in both antero-posterior and transverse pelvic planes was done. After full examination of uterus, Zooming with harmonic imaging was added for better visualization of the endometrium. The endometrium was measured in its thickest part in the fundus in longitudinal scan. When focal endometrial thickening was encountered in secretory phase, follow-up postmenstrual was done to be better delineated by hypoechoic proliferative endometrium. In cervical lesions, the probe is withdrawn outwards from vaginal fornix 2-3cm and excessive gel was put for better visualization.

On detecting polypoidal masses: Three dimensions were measured, the exact site was described; arising from which wall and distance from the internal os.

**US diagnostic criteria of endometrial and cervical polypoidal lesions included:**
- Focal endometrial contour bulge.
- Echopattern: Echogenic with or without cystic changes.
- Presence of surrounding hypoechoic halo.
- Presence of entrapped fluid or secretions proximal to polyp.
- Presence of mobility.

**US diagnostic criteria of submucous fibroids:**
- Echogenicity: Isoechoic to myometrium.
- Broad based with hyperechoic surrounding line (overlying stretched endometrium). The degree of protrusion within the cavity is better assessed by 4D US (100% means completely protruding into the cavity: 50% means half the length of the mass protruding into the cavity and 0% means completely placed within the myometrium after Tamura-Sadamori et al., 2007) [4].

*Then colour flow mapping and power Doppler was superimposed to show:*
- Presence or absence of vascularity.
- Vascular pedicle sign.
- Pattern of vessel distribution, 3&4D US smooth surface mode was done, coronal, sagittal and axial views and colour 3D of surrounding vascularity were taken.

Additional saline infusion sonohysterography (SIS) was performed to 10 patients for better delineation of polypoidal lesions. After cleaning the vagina, 15-20cc of sterile saline were infused through a disposable hysteroscopy catheter (Harris uterine injector, size 4.5mm, length 22.9cm) that was inserted in the cervical canal and fixed by its inflatable balloon (5cc). The transvaginal probe was simultaneously introduced. The uterine cavity was assessed for the presence of any polyps and if present, their location, size, number and echogenicity.

**SIS diagnostic criteria of endometrial polyps:** Smooth, homogenous, echogenic, usually pedunculated masses projecting from the endometrium into the saline-filled uterine cavity without disrupting the myometrial/endometrial interface. Hysterosalpingography (HSG) was done to 6 patients. Polypoidal lesions by HSG: Appeared as a well defined single or multiple, rounded or oval shaped persistent filling defect within the contrast-filled endometrial cavity.

Hysteroscopy was performed to 17 patients. In 22 patients dilatation and curettage was done followed by panhystrectomy for one patient (pathology showed malignant cells). Follow-up after two months treatment was done for two cases.

The results of TVUS and colour Doppler were correlated with hysteroscopic findings and the pathological results of biopsies. Descriptive Statistical analysis was done calculating the sensitivity, specificity and overall accuracy of TVUS, using other complementary tools in assessment of endometrial polypoidal masses.

**Results**

Forty-one female patients were included in this study. The age of the patients ranged from 23-58 years (mean age = 40 ± 9, median 39). Thirty-five patients (3 of them postmenopausal) presented with dysfunctional uterine bleeding; age ranged from 35-58 (mean=43.1 ± 7.1, median 42). Six pa-
Patients were included due to presence of filling defect on HSG, their age ranged from 23-32 (mean=28.6±3.4, median=30).

Forty five polypoidal lesions were detected in 41 cases (4 cases had two lesions). The majority were hyperplastic endometrial polyps 22 cases (48.9%), Cervical polyps 12 cases (26.7%) submucous fibroids-one of them cervical-8 cases (17.7%), in addition to three other polypoidal endometrial masses (wrongly diagnosed as polyps by US); one of them proved to be focal nodular hyperplasia, one case had retained product of conception one month after abortion and the third case was malignant at biopsy and panhysterectomy was done (Table 1).

Regarding endometrial and cervical hyperplastic polyps (34 cases), they were almost all oval in shape, their sizes ranged from 10-33mm, mean = 18.2±6.6mm in maximum dimension. Analysis of multiple diagnostic criteria was done; homogenously hyperechoic echopattern (presence of minute cystic changes included) was seen in 31 cases (91.2%) (Fig. 1), while 3 cases were hypoechoic (8.8%) (Fig. 2). Focal bulge within hyperechoic endometrium was seen in 5 cases (14.7%) (Fig. 3). Surrounding halo was seen in 12 cases (35%). Mobility of the polyp was seen in two cases. Retained secretions proximal to the mass were seen in three cases (Fig. 2). In two cases cervical polyps were the cause of obstruction during HSG contrast injection (Fig. 4). Narrow connection with the myometrium could be elicited in cases examined by sonohysterography. In the case that proved to be malignant, it was hyperechoic, no surrounding halo was seen but it was broad based.

Colour and Power Doppler US was done for all cases, in polyps cases vascular pedicle sign (VPS) was seen in 32 cases (94%) (Fig. 1-B), in the remaining two cases minimal vascularity was seen. In cases of three suspected polyps on US (one malignant polyp, one retained products of conception (Fig. 5), one cervical submucous fibroid), there was high vascularity with central and peripheral vessels. One case was wrongly diagnosed by US as polyp, at biopsy it proved to be focal nodular hyperplasia, no vascular stalk was seen. The vpshad 94% sensitivity 100% specificity.

Eight cases of submucous fibroids were diagnosed in this study, they range in size from 16-40mm in maximum diameter (mean 27±9.4mm), two of them were seen during HSG as filling defects, all are hypoechoic, broad based with endometrium displaced and stretched over them. The percentage of protrusion within the cavity was better calculated by 4D US, all showed more than 50% protrusion. Regarding colour Doppler one case (cervical fibroid was heterogeneous, highly vascular. In other cases (7 cases) of submucous fibroid peripheral flow with twigs towards center was seen (Fig. 6).

SIS in 6 cases confirmed signs seen on TVUS especially in two cases with only mild focal bulge. Hysteroscopy confirmed diagnosis in 10 cases. TVUS description of the site regarding the wall from which the polyps arised, the distance of the polyp from the internal os in endometrial masses, or from the external os in cervical masses was an accurate guide for hysteroscopy.

The sensitivity on TVS in detection of polypoidal masses was 100, but the specificity of mass characterization was 95.2%. The use of colour Doppler increased the specificity to 97.5%, so also SIS raises specificity to 97% in 10 cases done.

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Fig. (1): Female patient 35 years presented by meno-metrorraghia A- TVUS showing an oval shaped hyperechoic polyp with minute cystic changes arising from left anterolateral (small arrows note surrounding hypoechoic endometrium in the right curved arrow B, Colour Doppler transverse scan showing vascular pedicle from left anterior wall, histopathology after D&C revealed hyperplastic polyp.
Fig. (2): 40 years old female presenting by DUB. TVUS longitudinal scan of the cervix showing oval hypoechoic polyp (17x8mm) distending endocervical canal 1.4cm from external os, note echogenic retained secretion above it (arrow) hyperplastic polyp was the histopathological diagnosis.

Fig. (3): Female patient 30 years referred for HSG for assessment of infertility A- HSG revealed polypoidal filling defect in left cornu (arrow). B- TVUS transverse scan showing focal bulge in left side of endometrium (arrow heads). C- SISH confirm presence of hyperechoic polyp.
Fig. (4): 30 years old female referred for HSG to assess secondary infertility, difficult cannulation with dye reflux was seen. A- The cervical canal is distended with faint filling defect (arrow). B- TVUS longitudinal scan showed an oval shaped hyperechoic polyp (17x11 mm) with minute cystic changes filling cervical canal, note surrounded halo (arrow heads), by Power Doppler vascular pedicle could be detected.

Fig. (5): 28ys old female presented by DUB, history of abortion one month ago. A- TVS longitudinal scan an isoechoic polypoidal mass 23x12 mm is seen in the fundus delineated by free fluid in cavit. B- Colour Doppler US showed high vascularity with large caliber central vessels. D&C histopathology revealed retained product of conception.

Fig. (6): 35 years female presenting by DUB. A- TVUS and colour Doppler longitudinal scan showed rounded hypoechoic submucous fibroid with peripheral vessels splayed on its periphery. B- 3D colour Doppler better identifying peripheral vascularity with central tapering vessels to the center C&D- 4D US LS&TS showing protruding submucous fibroid with broad base with myometrium, hyperechoic endometrium is displaced and splayed over it.
Table (1): Different pathological findings.

<table>
<thead>
<tr>
<th>Polypoidal lesion</th>
<th>Number of cases</th>
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<tbody>
<tr>
<td>Hyperplastic endometrial polyp</td>
<td>22</td>
</tr>
<tr>
<td>Cervical polyp</td>
<td>12</td>
</tr>
</tbody>
</table>
| Submucous fibroid:
  Uterine                 | 7               |
  Cervical                | 1               |
| Other polypoidal masses:
  Focal nodular hyperplasia | 1              |
  Retained product of conception | 1          |
  Malignant               | 1               |
| Total number of polypoidal masses | 45          |

Discussion

Endometrial polyps are a common cause of bleeding in pre- and postmenopausal women and are difficult to differentiate from other causes of endometrial thickening using TVUS. Unenhanced TVUS is not accurate in the detection of endometrial polyps. Currently, second-stage tests such as saline contrast sonohysterography and office hysteroscopy are used to diagnose endometrial lesions, but both have limitations and side effects [5]. However, in this study TVUS in association with other complementary tools including color Doppler, 3&4D US showed 100% sensitivity in detecting focal polypoidal masses.

Regarding the echopattern of the cervical and endometrial polyps found in this study (34 cases), 31 cases (91.2%) were hyperechoic with minute cystic changes inside and 3 cases were hypoechoic. All cases of submucous fibroids (8 cases) were hypoechoic except the cervical one which was heterogeneous. This coincides with the study of Tamuro-Sadamori and his associates who found that homogeneous hyperechoic masses were significantly seen in polyps [93.9% (31/33); \( p < 0.01 \)] but not in any fibroids except for 1 case [4]. In the study of Hulka CA et al., they found that most patients with polyps showed variable sized cystic spaces within the polyp which represented dilated glands on histological study [6].

In the study of Matthew T et al., they found all 17 patients with cystic changes in the endometrium at endovaginal US had polyps. They also mentioned that a focal mass may manifest as a thickened endometrium with a surrounding hyperechoic line at endovaginal US in the absence of associated internal cystic changes. Although this pattern is less specific, in their experience, it still occurs most commonly with endometrial polyps. It is also seen with submucosal or intracavitary fibroids, focal areas of endometrial thickening and focal carcinoma [7]. In this study we found that the hyperechoic line described is more consistent with stretched endometrium over submucous fibroids, while in endometrial polyps there is a hypoechoic halo surrounding the fibroid especially in the presence of surrounding hyperechoic endometrium.

Hulka et al., also found that the mean endometrial thickness at sonography in patients with endometrial carcinoma was 29.7mm which was greater than mean thickness in patients with polyps or hyperplasia (15.6 and 12.6mm respectively) [6]. While in this study, the size of the endometrial and cervical hyperplastic polyps (34 cases) ranged from 10-33mm, mean = 18.2 \( \pm \) 6.6mm in maximum dimension and the only case of endometrial carcinoma was not the largest one. It measured 24 x 16mm.

Timmerman and his colleagues proposed visualization of the pedicle artery on color Doppler imaging as a sign of polyps. In their study the pedicle artery test had an apparent sensitivity for detection of endometrial polyps of 76.4%, specificity of 95.3%, positive predictive value (PPV) of 81.3% and negative predictive value of 93.8%. When extending the test to the prediction of any focal intracavitary pathology the PPV was 94.2%. They conclude that the pedicle artery test has a very high PPV for intracavitary pathology. The test may replace more invasive established second-stage tests, such as saline contrast sonohysterography and office hysteroscopy [7]. We agree with them as in this study pedicle vascular sign is high sensitivity 94% while specificity and PPV was 100%.

Ghate et al., in their study to determine the value of adding 3D multiplanar sonography to 2D sonohysterography, they concluded that three-dimensional reformations improve visualization of the uterine fundus and aid in identification or exclusion of a fundal contour abnormality but do not add value in the detection of endometrial abnormalities. In this study we have done 3&4D US which showed better visualization of polypoidal lesion, endometrial myometrial interface at their base, the degree of protrusion of submucous fibroid could be assessed, also 3D colour Doppler showed arrangement and arborization of feeding vessels [9].

In the study done by Jorizzo and his colleagues. Although none of the polyps showed malignant
foci, they stated that a small percentage (0.5-3%) [10] may contain adenocarcinoma and concluded that removal of polyps is therefore necessary for exclusion of malignancy as well as treatment of bleeding [8]. We agree with them as we had one case out of 34 cases (2.9%) showed malignant cells on histological examination. In another study the prevalence of malignancy and dysplasia in cervical polyps removed over a 7-year span was 0.1 % and 0.5%, respectively. Cervical polyps can harbor disease from sources beyond the cervix. Because there were no cases of primary malignancy in this large series of cervical polyps, it appears unlikely that cervical polyps progress to malignancy [11]. In this study no malignant cases was encountered.

Lee and his colleagues studied the intraobserver and interobserver reproducibility of measurement of the percentage of protrusion of submucous fibroids into the uterine cavity using three-dimensional saline contrast sonohysterography (3D-SCSH). They concluded that 3D-SCSH is a reproducible method for the quantification of the percentage of a submucous fibroid protruding into the uterine cavity [12]. In this study the percentage of protrusion of submucous fibroids could be done using 3&4D US using hyperechoic endometrium as contrast, the percentage was more than 50% in all cases and so they enter in differential diagnosis with endometrial polyps.

**Conclusion:**

The sensitivity on TVUS in detection of polypoidal masses was 100%, but the specificity of mass characterization for endometrial polyps was 95.2%, the use of colour Doppler (pedicle artery sign in polyps, vessel arrangement in submucous fibroids) and 4D US increased the specificity to 97.5%.

**References**


