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TRANSVAGINAL SONOGRAPHY; ITS SPECIFICITY & SENSITIVITY IN ABNORMAL UTERINE BLEEDING

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ABSTRACT... Objective: (1) To evaluate predictive values of non-invasive transvaginal sonography in abnormal uterine bleeding. (2) Correlate results of transvaginal sonography with hysteroscopy and biopsy in abnormal uterine bleeding. **Design:** Descriptive study. (Validity study for TVS). **Setting:** Gyny/Obs Deptt, Military Hospital Rawalpindi. **Period:** One year - from January 2006 to December 2006. **Subjects & Methods:** Women of any age presenting with abnormal uterine bleeding. Total number of cases included were two hundred. Patients were evaluated in OPD by taking detailed gynaecological history. Clinical examination was carried out to find any local source of bleeding from genital tract. Pap smear was taken at that time. Transvaginal ultrasound was performed in OPD basis. The results were noted on a pre-designed proforma. Routine investigations were performed on outpatient basis at the time of patient selection which included complete blood picture, urine analysis, random blood sugar, renal function tests and hepatitis B and C screening. Then the patients were admitted for hysteroscopy and histopathology. Hysteroscopic findings were noted on the proforma. Later histopathology report was also entered into proforma. Hysteroscopy and biopsy were considered gold standard in our study. Thus the procedure was considered 100% accurate and sensitivity, specificity, PPV and NPV for TVS were calculated. **Results.** It was found that at less than 14 mm endometrial thickness no serious pathology was found. Sensitivity, specificity, negative predictive value and positive predictive value for TVS was found as follows; 1. For endometrial hyperplasia 100%, 93%, 100%, 79% respectively. 2. For endometrial polyp 100%, 97%, 100%, 25% respectively. 3. For carcinoma 100%, 99%, 100%, 33% respectively. 4. For proliferative endometrium 79%, 100%, 78% and 100%. 5. For secretory phase endometrium 100%, 96%, 100%, 79% respectively. 6. For sub mucus fibroid 100%, 98%, 100%, 60% respectively. **Conclusion:** Difference between values of hysteroscopy and TVS is not very significant so TVS should be used as 1st line investigation. At less than 14mm endometrial thickness no major pathology is detected.

Key words: Transvaginal sonography, Abnormal uterine bleeding, Hysteroscopy.

INTRODUCTION

Abnormal uterine bleeding (AUB) is the most common reason for gynaecological visits for both Pre-menopausal and Post-menopausal bleeding¹. Up to 33% of women referred to gynaecological outpatient clinics have AUB and this proportion rises to 69% in peri or post-menopausal group². Endometrial hyperplasia is considered to be frequent cause of AUB.

Traditionally diagnostic dilatation and curettage has been the method of choice for obtaining an endometrial sample however in studies comprising both pre and post-menopausal women with AUB, 43-66% of hyperplasia

was missed by D & C³. Also D & C alone or hysteroscopy and biopsy are invasive procedures⁴. Approximately 80% of all biopsies result in benign causes. Therefore non-invasive modality can be accurately used to determine endometrial thickness⁵.

Abnormal uterine bleeding is a common clinical problem

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with a list of causes. The difficulties encountered in identifying the specific cause often lead to medical and surgical strategies that focus on correcting the symptoms or providing treatment without first making a definitive diagnosis. Comparative studies between hysteroscopy and D & C showed endometrial hyperplasia detected in 52% of patients at hysteroscopy and in patients with normal hysteroscopy impression, 11% had hyperplasia on D & C demonstrating that hysteroscopy did not improve upon the sensitivity of D & C in detection of endometrial hyperplasia and carcinoma⁶. Also hysteroscopy and biopsy is an invasive procedure requiring in patient and general anesthesia in most units⁷. Approximately 80% of curettage performed result in benign diagnosis⁸. Therefore in this cost conscious era other less expensive, outpatient and apparently safer investigations have been advocated⁹. These include Transvaginal ultrasonography, Transvaginal hystero-graphy and hysterosalpingography etc¹⁰.

TVS is quick, convenient, inexpensive and comfortable for the patient. It can evaluate the endometrium utilizing grey scale, color or power Doppler, contrast media, or three dimensional ultrasound technology⁵. In addition TVS permits visualization of pelvic viscera and adnexa including cul-de-sac⁵. Optimal TVS evaluation includes endometrial measurements in the sagittal plane, with the bilayer thickness measured from the proximal to distal myometrial endometrial junctions. In the coronal view measurement should be from cervix to the fundus⁶. If intraluminal fluid is present, endometrial thickness should be measured separately (in single layer) and combined endometrial thickness should be expressed as the sum of two layers¹¹. The endometrium can be characterized as homogeneous, diffusely inhomogeneous, or associated with focally or diffusely increased echogenicity. Textural inhomogeneity is present in cases of endometrial carcinoma¹². A homogeneous endometrium less than 6mm is commonly associated with tissue insufficient for biopsy. Studies show that endometrium ranging from 3-10mm thickness, homogenous, thin endometrium and sonographically demonstrable central endometrium with symmetry were associated with absence of pathology¹². In contrast, heterogeneity and a high echogenicity were indication of pathology¹².

Novak introduced thin curette that did not require cervical dilatation¹³. Dilatation of cervix and endometrial curettage remained the most common gynaecological operation performed. Recently its efficiency has been called into question (Goldfarb & Loffer 1989) as it has been recognized that blind curettage may lead to unrepresentative biopsies¹⁴. In 60% patients who underwent dilatation and curettage, less than half of endometrial cavity was curetted. Although histology is valuable in diagnosing adenomatous hyperplasia, curettage is poor in diagnosing focal endometrial lesions as polyps, submucous fibroids and cannot detect adenomyosis¹⁵. Grimes published extensive literature review which showed high risk of perforation, infection, bleeding and greater expenses with quality of specimen not superior than other endometrial aspiration technologies available. Formal curettage and samples produced by pipelle produce the same results regarding the detection of endometrial biopsy¹⁶. Against such a background today in most of the units hysteroscopy and biopsy is becoming more popular and hysteroscopy & biopsy is considered Gold standard now a days¹⁷.

A recent meta analysis of uterine bleeding concluded that sensitivity of TVS compares favorably with biopsy. In this population a threshold of 5mm of endometrial thickness was associated with 96% sensitivity of cancer detection and 92% detection of endometrial disease. The false negative result of 8% compares favourably with 5% - 15% false negative result in endometrial biopsy¹⁸. Although endometrial biopsy is a sensitive test for identifying endometrial atypical adenomatous hyperplasia and carcinoma, it is a poor test for diagnosing fibroids, (intramural and subserous) polyps and adenomyosis which are far more common causes of bleeding¹⁹.

TVS techniques have superior sensitivity in identifying benign conditions²⁰. Hysteroscopy while accurate in diagnosing nearly all conditions is both expensive and invasive²¹. Studies show that TVS initiated substantial cost savings versus hysteroscopy and biopsy in evaluating typical population of peri and post menopausal age with AUB. Endometrial hyperplasia is an important cause of abnormal uterine bleeding with incidence of 3.9%²². Comparative studies between TVS and

hysteroscopy have been carried out by Dīaa EL-Mowafī at Zagagīg University Egypt. In his study he compared TVS with hysteroscopy and histopathology in postmenopausal women²³. Statistical analysis of his findings in TVS and histopathology revealed that TVS is 73.9% sensitive and it is 73.7% specific. Its PPV is 77.3% and its NPV is 70%. In his study, he concluded that although TVS is less sensitive than hysteroscopy but the difference is not very great and it is convenient, non-invasive, cheap and safe procedure so it should be implemented as first line investigation of AUB²³.

Syrup C and Sahakian V. demonstrated a sensitivity of 83.9% and specificity of 3.7% for TVS in endometrial pathology as compared to hysteroscopy for which sensitivity was found 88.3% and specificity of 94.2%²⁴. Another study done by Cacciatore et al in 1993 demonstrated a sensitivity of 73.9% and specificity of 95.7% for TVS as compared to hysteroscopy for which sensitivity was found to be 86.9% and specificity 91.7%. Cacciatore et al calculated positive predictive value 80% and negative predictive value 82% with overall efficiency for TVS 81%²⁵. These studies show TVS to be less sensitive than hysteroscopy but Goldstein (1994) stated that TVS can reach a higher sensitivity once endometrial thickness is taken in account in different phases of menstrual cycle. In addition presence of myometrial invasion of endometrial carcinoma and detection of other possible pelvic pathologies are taken in account²⁶.

During TVS, the absence of full bladder(which compresses the uterus) enhances improvement and allows measurement of the atrophic endometrium as well as detection of intracavity lesions²⁷. Smith BR studies correlation between TVS alone, TV hydrosonography (saline infusion) and hysteroscopy. He demonstrated a TVS sensitivity of 85.1% and specificity of 55.7%. Hysteroscopy was more specific (79.2%) but not significantly more sensitive (89.7%) than TVS²⁸. When women with abnormal TVS findings were further examined with hydrosonography the sequential combination of TVS + HSG became more specific 77.1% than TVS alone without a significant decrease in sensitivity²⁹.

Using a threshold endometrial thickness of 4mm Gull B, evaluated TVS for detection of endometrial carcinoma and obtained a sensitivity of 10% and specificity of 60% with PPV 25% and NPV 100%²⁹. Investigators have also compared the accuracy of TVS and hysteroscopy in detecting submucous fibroids and intramural fibroids and determining their sizes. TVS most accurately predicted size and myometrial ingrowth of fibroids³⁰. Hysteroscopy was less accurate in detecting the myoma's size perhaps because of optical reference index with which it is associated³¹.

Bradley found a sensitivity of 94% for sub-mucus fibroid in pre menopausal women. The corresponding value for hysteroscopy was 92%²⁸. Abu-Ghazzeḥ and Barqawī found sensitivity of 100% and specificity 98% with positive predictive value 50% and NPV 100% for TVS in abnormal uterine bleeding³². Symonds M. also carried out a comparative study for TVS and hysteroscopy³³. In his study, he concluded that hysteroscopy is quick, convenient and more accurate; also biopsy if needed can be done at the same time so hysteroscopy is preferable to TVS examination. Nabil E. conducted a study at Cairo University Egypt where he compared TVS, sonohysterography (TV-SH), hysterosalpingography (HSG) and hysteroscopy with biopsy in patients with AUB³⁴. In this study he found that traditional TVS is comparatively less sensitive and specific but its accuracy can be increased by improving the traditional method e.g., by saline infusion.

It is a general consensus that TVS could be implemented as a routine first step technique in the evaluation of patients with AUB and that further diagnostic procedure preferably hysteroscopy and biopsy could be indicated in cases of an abnormal or inconclusive sonogram. By this approach number of invasive diagnostic procedures could be reduced to approximately 50%³⁵. Present study was aimed to establish the accuracy of TVS in relation to hysteroscopy and biopsy in depicting endometrial changes in AUB.

SUBJECTS AND METHODS

OPERATIONAL DEFINITIONS

Abnormal uterine bleeding includes: -

Menorrhagia;	Excessive bleeding with normal length of cycle
Polymenorrhagia;	More frequent cycles with excessive bleeding
Metrorrhagia;	Irregular cycles.

SAMPLE TECHNIQUE

Convenience non-probability

SAMPLE SELECTION

Inclusive Criteria: Women of any age with abnormal uterine bleeding.

Exclusive Criteria: Unmarried Ladies, patients with perineal or vaginal bleeding & bleeding associated with pregnancy.

STUDY DESIGN

Descriptive study (validation study for TVS)

DATA COLLECTION

The study variables were

- ▶ Type of bleeding
- ▶ Endometrial thickness
- ▶ Histopathological type of endometrium

The patients with inflammatory pap smear were given complete course of antibiotics.

PROCEDURE

TVS procedure was performed while the patient was lying down on table. The transducer (a long multi-frequency convex probe) was inserted directly into the vagina (using aseptic technique). The examination was carried out on empty bladder. The uterus was scanned in three major planes, long axis, and oblique plane and short axis (transverse view) to obtain images in varying directional planes. Endometrial thickness was measured and its characteristics noted. Pouch of Douglas visualized. Other pelvic abnormalities noted.

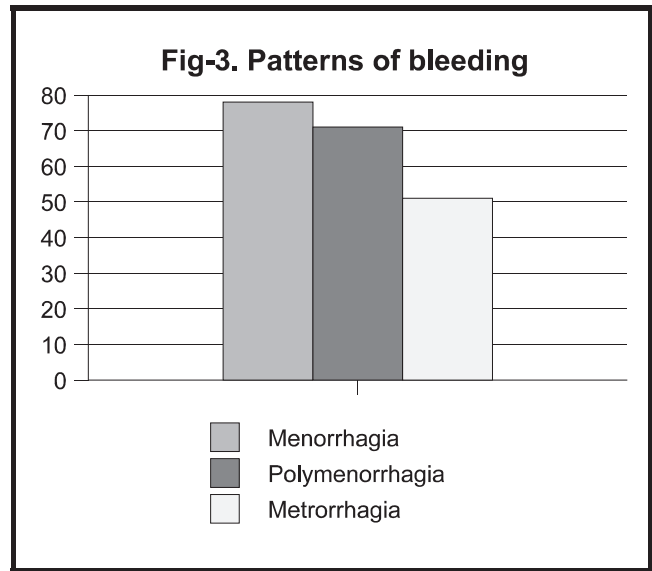
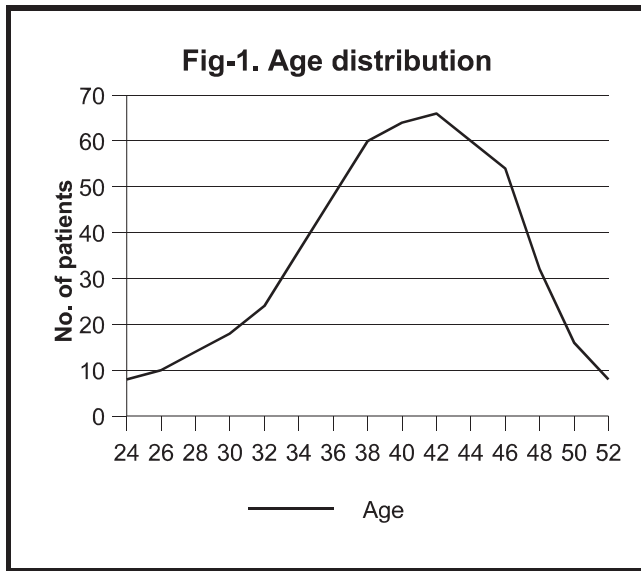
Hysteroscopy was performed in major operation theatre under short general anesthesia in all the patients. The procedure was performed by rigid hysteroscope, Normal saline was used as distension media. Patient was examined in lithotomy position. Intravenous Line maintained with Lactated ringer's solution. Clinical examination including per speculum and per vagina was performed. Volsellum's forceps was used to hold anterior lip of cervix. Cervical dilatation was usually required up to Hegar 6. Light source and distension media were attached to hysteroscope which was then introduced into the cervical OS. Further advancement inside the cervical canal and uterine cavity was done under direct vision. A systematic inspection of cavity was performed starting from ostia. To see right ostium, light cable was kept on left side. The opposite ostium was visualized by turning the scope to 180 degrees. The fundus was visualized between the two ostia and scope was withdrawn slowly to see all the four walls of uterus, by turning light cable to 360 degrees for this purpose. Internal Os and cervical canal was seen by slowly withdrawing hysteroscope. After hysteroscopy was completed, sharp curettage was performed from all the uterine walls, with specific emphasis to any suspicious area and specimen obtained was sent for histopathology in formalin. Patient was then shifted to ward. Care of general anesthesia was taken and she was discharged on next day.

DATA ANALYSIS

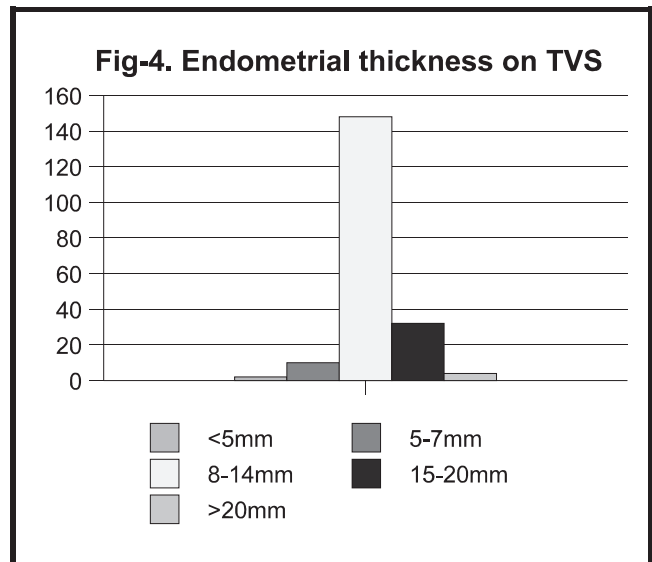
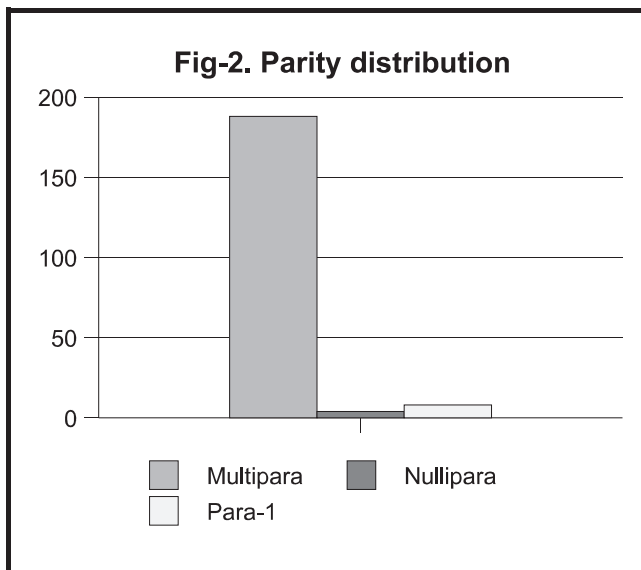
Relevant descriptive statistics are applied according to variable i.e. Frequencies & percentages are calculated for type of bleeding and parity of the patients. Minimum and maximum age of the study group is described and mean age is calculated. SPSS version 10.0 is used for the purpose. Sensitivity, specificity, positive predictive value, and negative predictive value of sonographic findings i.e. proliferative phase endometrium, secretory endometrium, Submucous fibroid, adenocarcinoma, endometrial hyperplasia and polyps were calculated.

RESULTS

200 patients were included in the study with an average age of 40.825 ± 6.71 (ranging from 24 to 54) years (Graph-I).



Most of the patients (94%) were multipara (Para \geq 1) as shown in Graph-II. Menorrhagia was the commonest type of bleeding that was found in 78(39%) patients (Graph-III).



Regarding validation of transvaginal sonography for proliferative endometrium, out of 129 TVS positive patients, 102 cases were confirmed on hysteroscopy & biopsy and none of false negative case was seen.

Therefore, sensitivity and specificity of TVS in diagnosis of proliferative endometrium were respectively 79% and 100%. Regarding validity of TVS for secretory phase endometrium, all 27 suspected cases were confirmed on hysteroscopy but there were 7 false positive cases. No false negative case was found in the series. Therefore, 100% sensitivity and 96% specificity was yielded. There were 5 positive and 195 negative cases for submucous fibroid out of which 3 were confirmed by gold standard. Sensitivity 100% and specificity 98% were yielded. Sensitivity for adenocarcinoma, endometrial hyperplasia

and endometrial polyp was 100%.

Out of 200 patients, 148(74%) fall in 7-14 mm endometrium thickness. Common histopathological findings according to different endometrial thickness were proliferative, secretory, hormonal imbalance and polyp. Slight discomfort was seen in 1% cases on TVS and 4% on hysteroscopy and biopsy in preoperative situation. After the operation, vomiting, pain and hypotension were faced in the procedure of hysteroscopy and biopsy. There was no complication on TVS procedures.

DISCUSSION

Abnormal uterine bleeding is one of the commonest gynecological problems encountered in gynecology OPD. Evaluation of patients with abnormal uterine bleeding involve ultrasonography, hysteroscopy, and endometrial biopsy as major modalities. However the value of curettage has been questioned, especially in women under 40 years of age as risk of malignancy in these patients is less than 1%. It has been recognized that blind biopsies may lead to unrepresentative tissue¹⁰. In 60% of cases who underwent dilatation and curettage less than half of endometrial cavity was curetted. Although histology is valuable in diagnosing adenomatous hyperplasia curettage is poor in diagnosing focal endometrial lesions as polyps, fibroids and can not detect adenomyosis¹¹.

Hysteroscopic visualization of endometrial cavity is regarded as an adjunct to curettage in both peri and post menopausal patients. The value of hysteroscopy in detecting benign lesion like endometrial and cervical polyp, fibroids and RPOCs had been well documented which can be treated by operative hysteroscopy.

Ultrasonography has its own important place because it is non invasive and low cost procedure performed on outpatient basis. Transvaginal mode has better image and is considered superior to transabdominal sonography in pelvic diseases. It has also been observed that TVS techniques have superior sensitivity in identifying benign conditions²¹.

In our study it is observed that study group was found between 24-55 years with a mean age 40 years.

From the results of study it was found that TVS is less accurate than hysteroscopy and biopsy but difference is not significant. In the study it was observed that TVS has a very good diagnostic value and finding normal endometrium i.e proliferative phase and secretory phase because all cases of secretory phase were correctly picked by TVS and only seven false positive cases were found on TVS. Endometrial hyperplasia is a common cause of AUB. In our study TVS picked up 10 false positive cases while no false negative case was detected.

It can be observed that TVS is found to be more sensitive and specific in our study. As regarding endometrial polyp TVS picked up 8 endometrial polyps in our study out of 2 detected on hysteroscopy. In case of Adenocarcinoma, the sensitivity of TVS as compared to histopathology was 100% while specificity was 99%. Sensitivity and specificity were 100% and 99% which correspond favorably with the result of Yaser Abu Ghazze. He observed sensitivity of 100% and specificity of 98% for TVS³³.

It is observed during the study that at a lesser endometrial thickness no major pathology was found. At less than 14 mm thickness most of patients have proliferative and secretory endometrium. Most cases of endometrial hyperplasia were found at endometrial thickness more than 14 mm and all cases of endometrial carcinoma were found at even higher endometrial thickness range. Goldstein stated that TVS can reach a higher sensitivity once endometrial thickness is taken in account in different phases of menstrual cycle²⁷. In addition presence of myometrial invasion of endometrial carcinoma and detection of other possible pelvic pathologies were taken in account.

Complications of procedures were also observed during the study. TVS was found to be a comparatively safe procedure as it has no side effects other than slight discomfort in only 01% of the patients. It was due to failed hysteroscopy that 22 patients were dropped of the study. Complications of general anesthesia were added to disadvantages of hysteroscopy because in our unit hysteroscopy is performed under anesthesia.

Complications of anesthesia may be avoided where hysteroscopy is carried out as an out patient procedure. But studies show, it is carried out under general anesthesia in most of the units¹⁵. While approximately 80% of the curettage performed resulted in benign diagnoses.

It is observed that TVS is less sensitive and specific than hysteroscopy. Also it is a fact that now always hysteroscopy is not only used for diagnostic purposes but also for management of different causes of abnormal uterine bleeding e.g. for removal of sub-mucous fibroid, and polyp etc. So hysteroscopy has an important place in obstetrics and gynaecology but TVS also has its own important role. TVS is superior to transabdominal scan as it was greatly improved ultrasound image resolution due to the proximity of the endovaginal probe to the endometrium. The absence of full bladder which compresses the uterus, enhances this improvement and allows the measurement of atrophic endometrium as well as detection of intracavity lesions. Thus the results of study indicate that TVS is as sensitive and specific as hysteroscopy so TVS can be used as a first choice diagnostic test in the investigation of women with abnormal uterine bleeding. TVS can select those cases in which likelihood of endometrial pathology is high. In these cases hysteroscopy and D&C should be used for achieving a proper diagnosis.

It is the need of hour that every gynaecologist must have knowledge and practice regarding use of TVS, because a studies carried out show that ultrasound is used 40% by radiologists and 60% in other fields which mainly include gynaecology and cardiology.

CONCLUSIONS

It is concluded that although sensitivity & specificity of TVS is slightly lower than hysteroscopy & histopathology, the difference between them was not statistically significant so TVS should be used as first line investigation of AUB because it is a simple outdoor procedure.

When endometrial thickness on TVS was less than 14mm, no significant endometrial pathologies were

detected on hysteroscopy or histopathology but when endometrial thickness was more than 14mm significant pathologies were detected on hysteroscopy and histopathology.

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