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Original article

# Establishing patterns on hysteroscopy in abnormal uterine bleeding (AUB)

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ABSTRACT

*Introduction:* Pattern recognition of various phases of normal endometrium and endometrial pathologies during hysteroscopy has many advantages. It would help to triage women with AUB, so as to be selective with biopsies and curettages. Recognition of normal variant or benign lesion would reduce burden to the pathologist by decreasing the number of unnecessary sampling. It will also decreases anxiety of the patient as the report/prognostication can be instant in many cases.
*Material and methods:* This prospective, double blind, correlation study was carried out in the teaching hospital with a sample population of 70 women presenting with AUB who underwent hysteroscopy and endometrial sampling. We identified patterns of endometrium which can used to predict six endometrial pathologies which were later correlated with the final histological diagnosis.
*Results:* There was good correlation between hysteroscopic patterns and histopathology report, 33% of starry sky appearance correlated with atrophic endometrium, 87% of tongue shaped projections correlated with endometrial polyp, 44.4% of pebble stone appearance correlated with myomatous polyp, 50% of polypoidal pattern correlated with endometrial hyperplasia. 100% correlation was seen in strawberry appearance, pattern for secretory endometrium and cerebroid appearance which was pattern designated to endometrial carcinoma.
*Conclusion:* Hysteroscopic pattern recognition is a useful concept to triage women who require sampling for histopathological diagnosis.



## Introduction

Various endometrial pathologies contribute to a large proportion of cases of abnormal uterine bleeding (AUB) during the reproductive years as well as after menopause. Hysteroscopic visualization of endometrial cavity has revolutionized the detection and management of endometrial pathologies in last few decades.

Hysteroscopy is a simple, safe, well tolerated and reliable procedure in the diagnosis of AUB across all age groups.[1] It has the potential to drastically reduce the need for conventional curettage, thereby increasing patient satisfaction and lowering costs.[2]

Although several hysteroscopic features of endometrial hyperplasia or cancer have been established in the past, including uneven surface, irregularity of endometrial glands, polypoid pattern, papillomatous pattern, and abnormal endometrial vessels,[3–6] no study till date to our knowledge has focused on using a specific named pattern to establish a diagnosis.

Pattern recognition of various phases of normal endometrium and endometrial pathologies during hysteroscopy has many advantages. It would help to triage women with AUB, so as to be selective with biopsies and curettages. Recognition of normal variant or benign lesion would reduce burden to the pathologist by decreasing the number of unnecessary sampling. It will also decreases anxiety of the patient as the report/prognostication can be instant in many cases.

With this idea the present study was conducted to evaluate the role of pattern recognition on hysteroscopy in cases of AUB by correlating it with histopathology. The patterns which were thought of based on our experience were analysed to determine the

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efficacy (in terms of sensitivity, specificity, PPV, NPV) of pattern recognition on hysteroscopy for endometrial variants and pathologies.

## Material and methods

### *Patient selection*

This prospective, double blind, correlation study was carried out in the teaching hospital during a span of 20 months (one year and 8 months).The study protocol was approved by institutional ethics committee (IEC 260/2015). Study population was recruited from women attending the Gynaecological Outpatient Clinic with the complaint of abnormal uterine bleeding (AUB). The recruited cases included those where myometrial, cervical and endocrinological causes of AUB were ruled out and patients were planned for hysteroscopy and endometrial sampling. Thus a total of 74 women were included in the study. A written informed consent was obtained from all of them.[1]

### *Hysteroscopy*

All hysteroscopies were performed under regional analgesia, with a Hopkins II, 30-degree telescope and 2.9 mm working channel (Karl Storz, Tuttlingen, Germany). Glycine was used as a liquid distension medium. All examinations were video assisted.

### *Establishing patterns*

Based on our experience of one year in hysteroscopies and their histology follow up we identified patterns of endometrium which can used to predict six endometrial pathologies. These included: i) Starry Sky: Atrophic endometrium, ii) Strawberry: Secretory endometrium, iii) Tongue shaped projections: Endometrial polyps, iv) Pebble stones: Myomatous polyps, v) Polypoidal pattern: Endometrial hyperplasia (Simple), and vi) Cerebroid pattern: Endometrial carcinoma (Fig. 1). The examiner examining the pattern during hysteroscopy was not provided with the clinical details (like phase of menstrual cycle or pattern of bleeding).

### *Histology analysis*

Having noted down the pattern on hysteroscopic examination, a sample from the representative area of the endometrium was obtained and sends to the histopathologist for analysis. The histopathologist was also not made aware of the hysteroscopic pattern.

## Results

A total of 74 women who fulfilled the inclusion criteria were recruited for the study. However four samples had to be excluded from analysis as the final histopathology report was inconclusive.

The mean age of women in our study was 48.9 ± 10.9 years. Most of the women (95.7%) were multiparous, only 3 were nulliparous. A total of 14 (20%) women were menopausal in our study population (Table 1).

Fig. 2 represents the correlation between our hypothesized hysteroscopic patterns (discussed above) and the histopathology report of endometrial sampling. We found that out of 6 women who had starry sky appearance on hysteroscopy only 2 had atrophic endometrium while 4 endometrium among this group were reported as proliferative endometrium on histopathology. A total of 7 women had strawberry appearance on hysteroscopy and all of them had secretory endometrium on histopathology (100% correlation). Tongue shaped projections on hysteroscopy were noted in 23 cases, out of which 20 were histologically reported as endometrial polyp, while 3 reports said that the tissue biopsied were negative for polyp. Pebble stone appearance was seen in 9 women on hysteroscopy, 4 had fibroid, 4 had endometrial polyp and one was diagnosed as endometrial hyperplasia on histopathology. Polypoidal pattern was noted in 12 women, out of which 6 had hyperplasia, 2 had endometrial polyp, 2 had proliferative endometrium and 2 also had endometrial carcinoma on histopathology. All 4 women who had cerebroid appearance on hysteroscopy had endometrial carcinoma on histopathology.

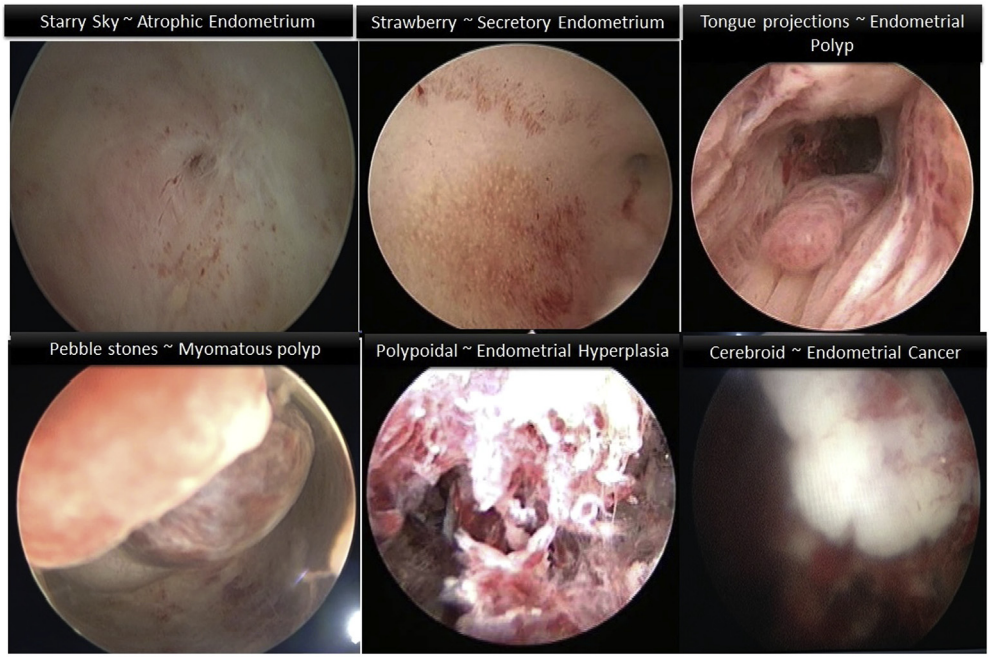


**Fig. 1.** Various hysteroscopic patterns seen on hysteroscopy.

**Table 1**
Demographic characteristics of the women studied.

| Total number of women included (n = 70) | | Final histopathological diagnosis | | | | | |
|---|---|---|---|---|---|---|---|
| | | Atrophic (2) | Secretory (7) | Endometrial polyp (28) | Myomatous polyp (4) | Simple hyperplasia (7) | Endometrial carcinoma (5) |
| Mean age (years) | | 52 | 39.25 | 47 | 38.25 | 48.8 | 68.5 |
| Parity | Nullipara | – | – | – | 1 | 1 | 1 |
| | Multipara | 2 | 7 | 28 | 3 | 6 | 4 |
| Menopausal status | | 2 (100%) | – | 5 (17.85%) | 1 (25%) | 2 (28.57%) | 4 (80%) |

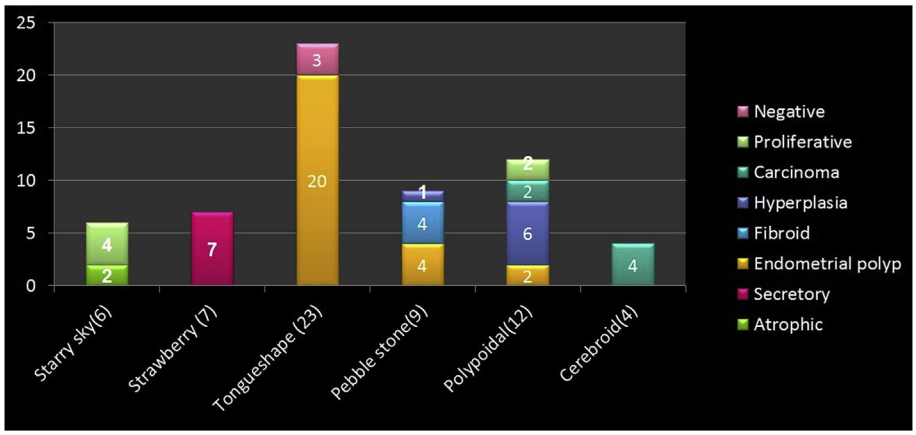


**Fig. 2.** Correlation between hysteroscopic pattern and histology report.

On calculating the percentage correlation between hysteroscopic patterns and histopathology report, 33% of starry sky appearance correlated with atrophic endometrium, 87% of tongue shaped projections correlated with endometrial polyp, 44.4% of pebble stone appearance correlated with myomatous polyp, 50% of polypoidal pattern correlated with endometrial hyperplasia. 100% correlation was seen in strawberry appearance, pattern for secretory endometrium and cerebroid appearance which was pattern designated to endometrial carcinoma (Fig. 3).

Table 2 showcases the efficacy of various patterns in terms of sensitivity, specificity, PPV and NPV in cases of individual hysteroscopic patterns. Starry sky pattern had 100% sensitivity and NPV with 94% specificity and low PPV of 33.3% for detecting atrophic endometrium. Strawberry pattern had 100% sensitivity, specificity, PPV, NPV in detecting secretory endometrium. Tongue shaped appearance had 76.9% sensitivity, 93.1% specificity, 86.9% PPV and 87.2% NPV for detecting endometrial polyp. Pebble stone appearance had 100% sensitivity and NPV with 92.4% specificity and PPV of 44.4% for detecting myomatous polyp. Polypoidal pattern had 85.7% sensitivity, 90.4% specificity, 98.2% NPV with PPV of 50% for detecting hyperplasia of endometrium. Cerebroid pattern had 100% specificity and PPV with NPV of 96.9% and sensitivity of 66.6% for detection of endometrial carcinoma.

## Discussion

The need for hysteroscopic assessment of endometrium is being emphasized more and more in evidence based medicine.[7–11]

Present study is the first one to establish patterns for various endometrial variants and pathologies in cases of AUB on hysteroscopy. We found that hysteroscopic pattern recognition can be used detect secretory endometrium, polyps and malignancy with good efficacy.

Ultrasound (transvaginal to be more specific) has been very helpful as a non-invasive diagnostic modality in diseases related to ovaries and myometrium. In routine practice ultrasound examination doesn't yield enough to diagnose endometrial pathologies except for determining endometrial thickness.[12] Ultrasound

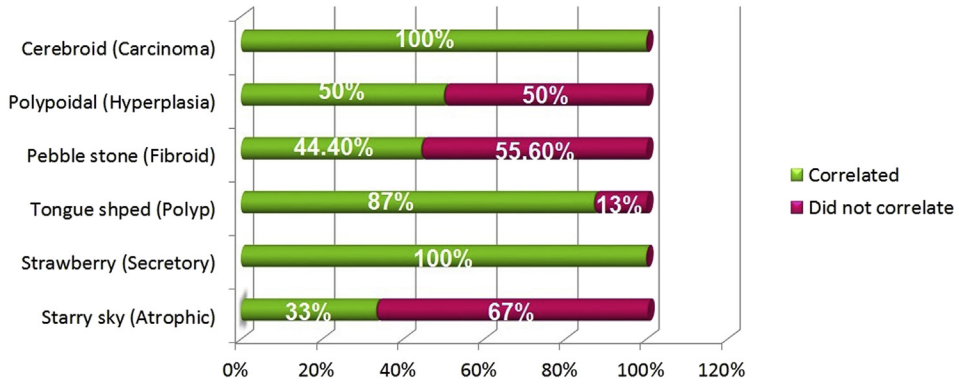


**Fig. 3.** Percentage correlation between hysteroscopic pattern and histology report.

**Table 2**
Efficacy of pattern recognition for various endometrial lesions.

| | Starry sky (atrophic) | Strawberry appearance (secretory) | Tongue shaped (endometrial polyp) | Pebble stone (myomatous polyp) | Polypoidal (simple hyperplasia) | Cerebroid (carcinoma) |
|---|---|---|---|---|---|---|
| Sensitivity | 100 | 100 | 71.4 | 100 | 85.7 | 80 |
| Specificity | 94.1 | 100 | 90.3 | 90.9 | 88.4 | 100 |
| PPV | 33.33 | 100 | 86.9 | 44.4 | 50 | 100 |
| NPV | 100 | 100 | 77.7 | 100 | 97.8 | 98.1 |

variables with clinical and laboratory parameters has been studies to predict endometrial cancers in various studies.[13,14] However benign endometrial lesions and normal endometrial variants are difficult to diagnose with grey scale ultrasonographic examination alone. Study comparing Saline Infusion Sonography (SIS) and hysteroscopy for detection of uterine abnormalities concluded that these abnormalities were significantly less likely to be identified with SIS compared to hysteroscopy ($P = 0.002$).[15]

As has been suggested the use of blind endometrial sampling to evaluate the uterine cavity, is an inaccurate technique for diagnosing pathologies commonly associated with AUB, such as endometrial polyps, submucous myomas, and focal endometrial abnormalities including adenocarcinoma and its precursors.[16] The use of hysteroscopy with directed biopsy ensures the recognition of these lesions. Furthermore assigning a specific pattern to a diagnosis will help triage the patterns which will need to be sampled from those which can be left alone decreasing the burden on the pathologist and the unnecessary anxiety for the patient waiting for the biopsy report. A study done in 1500 women showed that hysteroscopy imaging can be used to differentiate normal and abnormal endometrium. They recognised endometrium as functional, dysfunctional, atrophic, endometritis, polyps, hyperplasia and carcinoma with high accuracy (sensitivity, specificity, NPV, and PPV of 94.2%, 88.8%, 96.3%, and 83.1%, respectively, in predicting normal or abnormal histopathology of endometrium).[3] In our study we went one step further ahead and gave these pictures a name so as to associate the image with a commonly seen thing in day to day life. We have earlier publish data showing how a specific pattern can help to prognosticate endometrial cancer and can be used as a novel marker for risk stratification.[17] The novel idea used in the present study will help even the beginners to identify the pathologies with accuracy while to learn how a particular pathology looks like on hysteroscopy takes a year of experience. A recent study was conducted to assess inter-observer agreement and reproducibility of hysteroscopic diagnosis among experts (>500 hysteroscopies), seniors (20–499 procedures) and junior (≤19 procedures) gynaecologists. This study concluded that sensitivity improves with the observer's experience, but inter-observer agreement and reproducibility of hysteroscopy are not satisfying no matter the level of expertise.[18]

We could detect secretory endometrium with the highest accuracy with strawberry pattern on hysteroscopy. With our patterns we couldn't very well differentiate an endometrial polyp with a myomatous polyp, while Garuti G. et al found highest accuracy in diagnosing endometrial polyps (sensitivity, specificity, NPV, and PPV of 95.3%, 95.4%, 98.9%, and 81.7%, respectively).[3] This might be due to the fact that they did not take myomatous polyps into consideration in their study.

The first limitation of our study was a small sample size. The other issue which might have interfered with our results was that all the hysteroscopic patterns were not noted by a single observer. Rather the person who did the hysteroscopy was asked about the pattern that best fitted in the given six patterns. However it's a novel concept that should be studied in bigger sample populations with more named patterns on hysteroscopy, as sometimes one histology may give more than one picture on hysteroscopic analysis.

## Conclusion

Hysteroscopic pattern recognition is a useful concept to triage women who require sampling for histopathological diagnosis. Diagnosis based on pattern recognition can reduce the unnecessary burden on the pathologist and also the anxiety for the patient during the waiting period to get the final histopathology report.

## Funding source

None.

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