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Diagnostic Accuracy of Dilation and Curettage for Endometrial Pathology in Abnormal Uterine Bleeding

Omaima Hassan Getlawi[1], Hajer Jummah Abraheem[2]

[1,2]Department of Obstetrics and Gynaecology, faculty of medicine, University of Benghazi, Benghazi, Libya.
Omaima Hassan Getlawi: omima.algetlawi@uob.edu.ly.
Hajer Jummah Abraheem: Hajeriomajoma@gmail.com
Corresponding author: Omaima Hassan Getlawi: OmaimaGetlawi2@gmail.com

ABSTRACT:

Background: Dilation and curettage (D&C) remains an endometrial sampling method in settings where hysteroscopy or office biopsy is unavailable, unsuitable, or inconclusive. This study evaluated agreement and diagnostic performance of D&C histopathology against subsequent hysterectomy histopathology in women with abnormal uterine bleeding (AUB).

Methods: A cross-sectional diagnostic-accuracy study included 100 consecutive women who underwent hysterectomy for AUB at Benghazi Medical Center from April 2023 to August 2024 and had a documented previous D&C. Clinical characteristics and paired histopathology findings were recorded. Agreement was assessed using Cohen's kappa, and hysterectomy histopathology was used as the reference standard for malignancy.

Results: Mean age was 55.35 ± 8.14 years and 57% of participants were postmenopausal. Agreement was moderate for detailed histopathological findings ($\varkappa$ = 0.505) and for grouped lesion type ($\varkappa$ = 0.487). For malignancy, D&C identified 24 of 31 malignant cases and produced no false-positive malignant diagnoses ($\varkappa$ = 0.826). Sensitivity was 77.4%, specificity 100%, positive predictive value 100%, negative predictive value 90.8%, and accuracy 93%.

Conclusion: In this selected hysterectomy cohort, D&C showed high specificity but imperfect sensitivity for malignancy and only moderate agreement across broader endometrial pathology. A negative D&C should therefore be interpreted with the clinical and imaging findings when suspicion of malignancy persists.

INTRODUCTION

Abnormal uterine bleeding (AUB) is a common reason for gynecologic assessment and may be associated with benign endometrial changes, endometrial hyperplasia, or carcinoma. Histological assessment is particularly important in women with persistent bleeding, postmenopausal bleeding, or other clinical features that increase concern for endometrial malignancy. Endometrial sampling methods include office-based biopsy, hysteroscopy-directed sampling, and conventional dilation and curettage (D&C) (Restaino et al., 2023; Sakna et al., 2023).

D&C has historically been used for both diagnostic and therapeutic purposes. Although less invasive sampling techniques and hysteroscopy are now widely used, D&C continues to be performed in selected patients and in settings where alternative techniques are unavailable or do not provide an adequate diagnosis. Its diagnostic performance can vary because the procedure samples only part of the endometrium and because focal lesions may be missed. Comparison with the

hysterectomy specimen provides an opportunity to assess the concordance between preoperative sampling and the final uterine histopathology (Hemida et al., 2013; Hwang et al., 2021).

Evidence on the concordance of D&C with hysterectomy has varied across populations and pathological categories. Local data from Benghazi are limited. Therefore, this study aimed to evaluate the agreement between D&C and hysterectomy histopathology in women undergoing hysterectomy for AUB and to estimate the diagnostic performance of D&C for detecting malignant endometrial pathology.

MATERIALS AND METHODS

Study design and setting

This cross-sectional diagnostic-accuracy study was conducted at Benghazi Medical Center from April 2023 to August 2024. The study population consisted of women undergoing hysterectomy because of abnormal uterine bleeding who had previously undergone D&C.

Participants

Women were eligible if they underwent hysterectomy for AUB during the study period and had a documented D&C histopathology result available for direct comparison with the hysterectomy specimen. Women with AUB who did not proceed to hysterectomy were not included by design. Hysterectomies performed for indications other than AUB and cases without documentation of a previous D&C were excluded. Eligible cases were enrolled consecutively until 100 women were included. Accordingly, the study population represents a surgically selected cohort rather than all women presenting with AUB.

Data collection and pathology classification

A semi-structured data collection form was used to record age, parity, menopausal status, contraceptive history, bleeding pattern and duration, local and general comorbidities, the interval between D&C and hysterectomy, hysterectomy type and route, and histopathological findings from the D&C and hysterectomy specimens.

Detailed histopathological categories were transcribed from the source pathology reports using the terminology recorded at the time of diagnosis: normal pattern, proliferative endometrium, secretory endometrium, atrophic endometrium, polyp, simple hyperplasia, adenomatous hyperplasia, atypical complex hyperplasia, and malignancy. For the grouped analysis, normal lesions comprised normal pattern, proliferative endometrium, secretory endometrium, and atrophic endometrium; benign lesions comprised polyps; premalignant lesions comprised simple hyperplasia, adenomatous hyperplasia, and atypical complex hyperplasia; and malignant lesions comprised diagnoses recorded as malignancy. This grouping was used for statistical comparison of paired D&C and hysterectomy findings and should not be interpreted as indicating identical biological risk among diagnoses within the same group. Because some source reports used older or local terminology, the original labels were retained rather than retrospectively mapped to a contemporary two-tier endometrial hyperplasia classification.

For the diagnostic-accuracy analysis, D&C was treated as the index test and hysterectomy histopathology as the reference standard. A malignant D&C result was considered test-positive for malignancy.

Statistical analysis

Data were analyzed using SPSS version 27.0 (IBM Corp., Armonk, NY, USA). Categorical variables are presented as frequencies and percentages. Continuous variables are summarized using mean ± standard deviation and median (range), as appropriate. Agreement between D&C and hysterectomy findings was assessed using Cohen's kappa (κ). Diagnostic performance for malignancy was summarized using sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy, with hysterectomy histopathology as the reference standard. Exact binomial 95% confidence intervals (CIs) were calculated from the 2 × 2 contingency table. A two-sided p value < 0.05 was considered statistically significant.

Ethics statement

The study received ethical approval from the Institutional Review Board of Benghazi Medical Center. Informed consent was obtained from all participants after explanation of the study objectives and procedures. Confidentiality was maintained, and the study was conducted in accordance with the principles of the Declaration of Helsinki.

Results

Participant characteristics

The 100 participants were 36-75 years old, with a mean age of 55.35 ± 8.14 years. Fifty-seven percent were postmenopausal. Eight percent were nulliparous, whereas 49% had a parity of 4-6. The most frequently reported contraceptive method was oral contraceptive pills (34%). Thyroid disorders (15%) and diabetes mellitus (12%) were the most frequently reported general comorbidities.

Bleeding duration ranged from 1 to 26 months, with a median of 5.5 months. Postmenopausal bleeding was the most frequent bleeding pattern (57%), followed by menorrhagia (38%). Urogenital prolapse was recorded in 22%, cervical lesions in 17%, and atrophic vaginitis in 6%. The median interval between D&C and hysterectomy was 1 month, although the range extended to 24 months. All hysterectomies were performed by the abdominal route, and 81% were total hysterectomies (Table 1).

Table 1. Clinical and operative characteristics of the study population (n = 100).

Variable	Category/statistic	n or value	%
Age (years)	Mean ± SD	55.35 ± 8.14	
Age (years)	Range	36-75	
Menopausal status	No	43	43
Menopausal status	Yes	57	57
Parity	0	8	8
Parity	1-3	10	10
Parity	4-6	49	49
Parity	7-9	17	17
Parity	10-13	16	16
Contraception	None	57	57
Contraception	Oral pills	34	34
Contraception	Depot progestin	0	0
Contraception	IUCD	8	8
Contraception	Natural/barrier	1	1
Bleeding duration (months)	Mean ± SD	6.75 ± 6.16	
Bleeding duration (months)	Median (range)	5.5 (1-26)	
Bleeding pattern	Menorrhagia	38	38
Bleeding pattern	Polymenorrhea	3	3
Bleeding pattern	Hypermenorrhea	2	2
Bleeding pattern	Postmenopausal bleeding	57	57

Variable	Category/statistic	n or value	%
Local comorbidity	Cervical lesion	17	17
Local comorbidity	Atrophic vaginitis	6	6
Local comorbidity	Urogenital prolapse	22	22
Local comorbidity	Other	55	55
D&C-to-hysterectomy interval (months)	Mean ± SD	2.35 ± 3.05	
D&C-to-hysterectomy interval (months)	Median (range)	1 (1-24)	
Type of hysterectomy	Subtotal	19	19
Type of hysterectomy	Total	81	81
Route of hysterectomy	Abdominal	100	100
Route of hysterectomy	Transvaginal	0	0

The age distribution and predominance of peri- and postmenopausal women are broadly consistent with previous AUB series, although the age profile varies across studies because of differences in referral patterns and inclusion criteria (Pandey et al., 2020; Sarwat and Roohi, 2011; Saraswathi and Thanka, 2011; Vijayaraghavan et al., 2022). The high proportion of postmenopausal bleeding in the present cohort is clinically plausible because only women who subsequently underwent hysterectomy were included, producing a surgically selected population rather than an unselected AUB population.

Multiparity was common, with nearly half of participants having a parity of 4-6. Previous studies have also reported a predominance of multiparous women among AUB cohorts (Patil et al., 2013; Pilli et al., 2000; Shukla et al., 2018). However, these descriptive characteristics should not be interpreted as causal risk estimates because the present study was not designed to compare women with and without AUB.

Agreement of detailed histopathological findings

The observed agreement for the detailed histopathological categories was 64%. Cohen's kappa was 0.505 (95% CI 0.390-0.619), indicating moderate agreement between D&C and hysterectomy histopathology. The contingency table also shows that several lesions classified as nonmalignant or premalignant on D&C were classified as malignant at hysterectomy (Table 2).

Table 2. Agreement between D&C and hysterectomy for detailed histopathological findings.

D&C finding	Norm	Prolif	Secr	Atroph	Polyp	Simple H	Adenom H	Atyp H	Malig	Total
Normal pattern	1	0	0	0	3	5	1	0	1	11
Proliferative endometrium	0	0	0	0	0	1	0	0	0	1
Secretory endometrium	1	0	0	0	1	0	0	0	0	2
Atrophic endometrium	0	0	0	0	0	0	0	0	0	0
Polyp	0	0	0	0	4	4	1	1	0	10

D&C finding	Norm	Prolif	Secr	Atroph	Polyp	Simple H	Adenom H	Atyp H	Malig	Total
Simple hyperplasia	2	0	1	1	3	32	0	2	1	42
Adenomatous hyperplasia	0	0	0	1	0	0	0	0	0	1
Atypical complex hyperplasia	1	0	0	0	0	0	0	3	5	9
Malignancy	0	0	0	0	0	0	0	0	24	24
Total	5	0	1	2	11	42	2	6	31	100

Note: Norm = normal pattern; Prolif = proliferative endometrium; Secr = secretory endometrium; Atroph = atrophic endometrium; Simple H = simple hyperplasia; Adenom H = adenomatous hyperplasia; Atyp H = atypical complex hyperplasia; Malig = malignancy. Cohen's $\kappa = 0.505$ (95% CI 0.390-0.619), $p < 0.001$.

Agreement by lesion group and diagnostic performance for malignancy

When histopathological findings were grouped as normal, benign, premalignant, or malignant, overall observed agreement was 67%, with moderate agreement beyond chance ($\kappa = 0.487$, 95% CI 0.353-0.621; $p < 0.001$) (Table 3).

Table 3. Agreement between D&C and hysterectomy by grouped lesion type.

D&C group	Normal	Benign	Premalignant	Malignant	Total
Normal	2	4	7	1	14
Benign	0	4	6	0	10
Premalignant	6	3	37	6	52
Malignant	0	0	0	24	24
Total	8	11	50	31	100

Note: Normal = normal pattern + proliferative + secretory + atrophic endometrium; benign = polyp; premalignant = simple hyperplasia + adenomatous hyperplasia + atypical complex hyperplasia; malignant = malignancy. Cohen's $\kappa = 0.487$ (95% CI 0.353-0.621), $p < 0.001$.

For malignancy, hysterectomy identified 31 malignant and 69 nonmalignant cases. D&C classified 24 cases as malignant; all 24 were confirmed as malignant at hysterectomy. Seven hysterectomy-confirmed malignant cases had been classified as nonmalignant on D&C. Thus, D&C had a sensitivity of 77.4% (95% CI 58.9-90.4), specificity of 100% (95% CI 94.8-100), PPV of 100% (95% CI 85.8-100), NPV of 90.8% (95% CI 81.9-96.2), and overall accuracy of 93.0% (95% CI 86.1-97.1). Binary agreement was strong ($\kappa = 0.826$, 95% CI 0.703-0.948; $p < 0.001$) (Table 4).

Table 4. Diagnostic performance of D&C for malignancy using hysterectomy histopathology as the reference standard.

D&C result	Hysterectomy malignant	Hysterectomy nonmalignant	Total
Malignant	24	0	24
Nonmalignant	7	69	76
Total	31	69	100

Sensitivity = 77.4% (95% CI 58.9-90.4); specificity = 100% (94.8-100); PPV = 100% (85.8-100); NPV = 90.8% (81.9-96.2); accuracy = 93.0% (86.1-97.1); Cohen's $\varkappa = 0.826$ (95% CI 0.703-0.948), $p < 0.001$.

The moderate agreement observed for detailed pathology is consistent with the general finding that preoperative sampling does not always reproduce the final hysterectomy diagnosis. Hemida et al. (2013) reported a 79.5% concordance rate between D&C and hysterectomy, whereas Hwang et al. (2021) reported an overall concordance of 51% for D&C in women with endometrial hyperplasia. Kleebkaow et al. (2008) also reported limited preoperative-postoperative agreement in endometrial hyperplasia. Differences across studies may reflect case mix, histological classification, sampling technique, and the interval between sampling and surgery.

For malignancy, the present study found no false-positive D&C diagnoses, but 7 of 31 malignant hysterectomy specimens were not identified as malignant by D&C. This makes the perfect specificity and PPV reassuring when D&C is positive for malignancy in this cohort, but the sensitivity of 77.4% means that a negative D&C cannot reliably exclude malignancy. Moradan et al. (2017) similarly found that D&C performed better for endometrial cancer than for several other endometrial pathologies, while a recent systematic review found generally high diagnostic accuracy for conventional D&C but with uncertainty around pooled sensitivity estimates (Sakna et al., 2023).

These findings have direct implications for clinical decision-making. In this selected cohort, a sensitivity of 77.4% meant that 7 of 31 hysterectomy-confirmed malignant cases had a nonmalignant D&C result. Thus, while a malignant D&C result provided strong confirmatory evidence in this cohort, a negative or nonmalignant D&C result should not be used as a stand-alone test to exclude malignancy when clinical concern persists. The moderate agreement for detailed and grouped histopathological categories also indicates that D&C may not reliably define the final lesion category in every patient, particularly when pathology is focal or heterogeneous. Clinical management should therefore integrate D&C histopathology with the bleeding pattern, menopausal status, relevant risk assessment, and imaging findings. Persistent or discordant clinical or imaging suspicion may justify additional evaluation, including repeat endometrial sampling or hysteroscopy-directed assessment, before reassurance or definitive management decisions are made (Restaino et al., 2023; Sakna et al., 2023).

The main strength of this study is the availability of paired D&C and hysterectomy histopathology in 100 women, allowing direct within-patient comparison. Several limitations should be considered. First, only women who ultimately underwent hysterectomy were included, creating a selected surgical population with a relatively high prevalence of premalignant and malignant pathology; therefore, PPV and NPV should not be generalized to all women presenting with AUB. Second, the interval between D&C and hysterectomy ranged from 1 to 24 months, allowing the possibility of biological progression, treatment effects, or repeated clinical events between specimens. Third, the study was conducted at a single center and the sample size limits precision for individual histological subtypes. Finally, some source pathology labels reflect older or local terminology and do not map directly onto current two-tier systems for endometrial hyperplasia. Future multicenter prospective studies should use standardized contemporary pathology criteria, prespecified intervals between index and reference tests, and blinded pathology review where feasible.

CONCLUSION

In this selected cohort of women with AUB who proceeded to hysterectomy, D&C demonstrated high specificity but imperfect sensitivity for detecting malignant endometrial pathology and only moderate agreement with hysterectomy across broader histopathological categories. A malignant D&C result was highly predictive of malignancy in this cohort, whereas a negative D&C did not exclude malignancy. These findings support D&C as a useful diagnostic component, but not as a stand-alone rule-out test for malignancy or a definitive classifier of broader endometrial pathology. Persistent clinical or imaging suspicion should therefore prompt further evaluation despite a nonmalignant D&C result. Larger prospective studies with standardized pathology terminology and shorter, predefined intervals between D&C and hysterectomy are recommended.

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Author contributions

Conceptualization; O.H.G.; methodology O.H.G., H.G.A; data curation; O.H.G., H.G.A.; formal analysis, O.H.G., H.G.A; writing - original draft, O.H.G., H.G.A; writing - review and editing O.H.G., H.G.A; supervision, O.H.G.

Conflict of interest

The authors declare no conflicts of interest related to this work.

Data availability

The datasets used and/ analyzed during the current study are available from the corresponding author on reasonable request.

Generative AI and AI-assisted technologies statement

OpenAI ChatGPT (GPT-5.6 Sol) was used for language editing

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