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Diagnostic Accuracy of Pipelle Aspiration versus Dilatation and Curettage in Endometrial Hyperplasia: a Structured Narrative Review in Women Examines the Relationship between Age and Risk of Atypia

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ABSTRACT. Endometrial hyperplasia (EH) is a common precursor of endometrial cancer and requires precise diagnostic techniques. Pipelike endometrial biopsy has become popular as a minimally invasive outpatient procedure, but its diagnostic reliability in comparison to Dilatation and Curing (D&C), the historical gold standard, is still under debate, particularly among populations such as Iranian women. This study compared the diagnostic accuracy of Pipelle with D&C for EH, focusing on the performance in relation to age and risk stratification based on atypia. A systematic review and a comparative analysis using data from peer reviewed studies involving cohorts from Iran and from international cohorts has been performed. Diagnostic metrics - including sensitivity, specificity, positive and negative predictive values, adequacy of the sample and histopathological concordance - have been extracted and analysed for the age groups and subtypes of hyperplasia. Pipelle demonstrated a high overall concordance with D&C (94.6) and sensitivity and specificity of more than 94 percent for the detection of atypical hyperplasia and carcinoma of the cervix. However, there were significant limitations in postmenopausal women with an inadequate rate of 63 percent and in non-typical EH, where Pipelle showed a higher rate of progression to carcinoma (27.3% vs. 15.0%, p = .022) compared to D&C. The accuracy of the diagnosis was also affected by endometrial thickness (5 mm decreased from Pipelle adequacy to 27%) and patient age (>50 years associated with higher co-morbidity). Pipelle is a reliable first line tool for the evaluation of abnormal uterine bleeding in premenopausal and postmenopausal women, especially to exclude atypical hyperplasia or tumour. However, D&C is still preferable for definitive diagnosis in postmenopausal women, in cases of endometrial thinness or in the presence of suspected non-atypical hyperplasia. Clinical decision-making should integrate age, menopausal status, body mass index and imaging findings in order to optimise diagnostic results and patient outcomes

Keywords: Pipelle biopsy, Dilatation and curettage, endometrial hyperplasia, diagnostic accuracy, atypia, Iranian women, age correlation

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Introduction

Up to 30% of women experience abnormal uterine bleeding (AUB) during their reproductive years, which frequently leads to testing for endometrial pathology, such as hyperplasia and cancer (Wright et al., 2017). A well-known precursor to endometrioid adenocarcinoma, endometrial hyperplasia (EH), especially when atypical, has a progression risk of 1-3 percent in non-atypical forms and 25-40 percent in atypical cases (Kurman et al., 2014; Emons et al., 2020). Therefore, a precise histopathological diagnosis is essential for the right kind of treatment, from hysterectomy to hormonal therapy.

Historically, Dilatation and curettage (D&C) under general anaesthesia has served as a reference standard for endometrial sampling because of its ability to obtain complete tissue samples (Clark et al., 2021). However, its invasiveness, costs and need for hospitalisation have fuelled interest in alternative office settings. Pipelle - a flexible, suction-based endometrial sampler - offers a minimally invasive, cost-effective and well tolerated procedure that can be performed without anaesthesia (Smith et al., 2018).

Although many studies support the efficacy of Pipelle, concerns remain about its reliability in specific clinical settings, including postmenopausal conditions, thinning of the endometrium and focal lesions such as polyps (Ghaemmaghami et al., 2017; Dueholm et al., 2019). Furthermore, despite possible ethnic and demographic variations that could affect diagnostic performance, there is still a dearth of data from Middle Eastern populations, particularly Iranians.

The study aims to critically evaluate the diagnostic accuracy of Pipelle aspiration in comparison with DandC for the diagnosis of endometrial hyperplasia in Iranian women, by looking at age-related differences, atypia risk, suitability of samples and clinical implications of individualised gynaecological care.

Material and methods

This report is based on a structured summary of the published literature comparing Pipelle endometrial biopsy with D&C, focusing on studies in cohorts from Iran. A targeted search was performed using the databases PubMed, Scopus and Google Scholar, focusing on articles published between 2017 and 2025 that reported quantitative diagnostic metrics (sensitivity, specificity, concordance and improvement rates) and included analyses stratified by age.

Inclusion criteria included: (1) comparative studies of Pipelle vs. D&C for endometrial pathology; (2) reporting of histopathological outcomes (hyperplasia with/without atypia, carcinoma); (3) data on patient age, menopausal status, or endometrial thickness. Exclusion criteria were: case reports, narrative reviews without original data, and studies lacking D&C as the reference standard All references were formatted according to the 7th edition of the Publication Manual of the American Psychological Association (APA, 2020).

Results

The high overall level of agreement between Pipelle and DandC has been confirmed in several studies. Ahmadi and Others. in Iranian women. (2020) found 88 percent agreement on the adequacy of the sample and 94 percent agreement on the pathologies. So did Rahimi et al. (2019) found that Pipelle has a failure rate of less than 5 percent and a precision of over 97 percent. Smith and Associates. (2018) reported 97.6 percent of diagnostic approvals worldwide, with 94.1 percent sensitivity, 99.8 percent specificity, 99.6 percent penetration, and 99.5 percent net present value.

Table 1. Comparative operational, patient tolerance and economic metrics for Pipelle versus D&C

Metric Category	Specific Metric	Unit	Pipelle Aspiration	Dilatation and Curettage (D&C)	Statistical Significance (p-value)
Diagnostic Accuracy	Overall Concordance	%	97.6%	100%	Not applicable
	Sensitivity (Carcinoma)	%	100%	100%	Not applicable
	Sensitivity (Atypical Hyperplasia)	%	81–100%	83–84%	Not applicable
	Sensitivity (Non-atypical Hyperplasia)	%	20–67%	55.6–92.3%	Not applicable
	Sensitivity (Polyps)	%	12.5–42.9%	87.5%	Not applicable
	Inadequate Sample Rate	%	6.55–24%	0%	0.1524 – 0.247
Operational & Patient Tolerance	Mean Procedure Duration	Minutes	3.65 – 3.92 min	11.28 – 12.07 min	<0.0001
	Mean Pain Score (VAS/NRS)	Score (0-10)	1.64 – 2.6	5.81 – 7.9	<0.0001
	Patient Satisfaction Rate	%	96% – 98%	61.6% – 68%	<0.001
Economic & Safety	Average Procedure Cost	₹ (Indian Rupees)	₹322.48	₹1387.40	<0.0001
	Complication Rate	%	4%	15.2%	0.003

Diagnostic Accuracy and Performance Metrics of Pipelle Aspiration versus Dilatation and Curettage

A remark. Information collected from a number of studies, such as Smith et al. Ahmadi and Others. (2018) Rahimi and Others. (2020) (2019), and Lee et al. (2020) The ranges or amounts reported for the different cohorts are represented by values.NRS stands for numerical rating scale, and VAS stands for visual analogue scale. The source literature does not provide statistical comparisons of these specific diagnostic sensitivity values.

Pipelle demonstrated 100 percent sensitivity and specificity for endometrial cancer and atypical hyperplasia in an Iranian cohort (Rahimi et al., 2019). However, performance varied by hyperplasia subtype.

Accuracy by Hyperplasia Type

DandC showed better diagnostic stability in non-atypical EH. Lee and Associates. (2020) found that the rate of cancer progression in patients with Pipelle diagnosis was significantly higher (27.3 percent) than in patients with D&C diagnosis (15.0 percent; p =.022). Similarly, the probability of progression to any of the advanced pathological conditions was higher after Pipelle (36 percent vs. p = .008; 21.0 percent). The improvement rate for non-atypical EH itself was 12.5 percent (D&C; p =.028) compared with 29.0 percent (Pipeline) indicating that D&C provides a more representative tissue sample for diffuse but low grade EH pathology.

Age and Menopausal Status

Diagnostic response is strongly affected by age. Ghaemmaghami & Co. (2018) found that 30 per cent of EH cases were in women aged 30-39 years, while 52 per cent of EH cases were in women aged 40-49 years. Concurrent carcinoma was more frequent (~15 percent) and occurred more frequently in postmenopausal women (aged >50 years) (Zhang et al., 2021). Importantly, 63 percent of the missing Pipelle samples were from postmenopausal women with endometrial atrophy and cervical stenosis (Ghaemmaghami et al., 2017).

The median age of women with atypical hyperplasia who developed cancer was significantly older (59.5 versus 47.5 years; p = .02), which highlights age as a major risk factor (Zhang et al., 2021).

Sample Adequacy and Endometrial Thickness

Pipelle obtained adequate samples in 92.1 to 97.9 percent of the cases with adequate endometrial thickness (Clark et al., 2021; Smith et al., 2018). However, the adequacy decreased to only 27 percent when the thickness of the endometrium was less than 5 mm (Dueholm et al., 2019). On the other hand, irrespective of thickness, DandC produced sufficient samples in 96 to 100 percent of the cases (Rahimi et al., 2019; Ghaemmaghami et al., 2017). Ahmadi et al. (2020) reported inadequate sample rates of 4.4% for Pipelle versus 2.2% for D&C.

Limitations in Detecting Focal Lesions

Both approaches have problems with the identification of focal pathology, but the Pipelle blind sampling method is significantly less successful in the identification of endometrial polyps (Clark et al., 2021; Ghaemmaghami et al., 2017). Hysteroscopically directed biopsy remains superior for such cases (AUC = 0.957 vs. 0.858 for Pipelle; p < .001) (Dueholm et al., 2019).

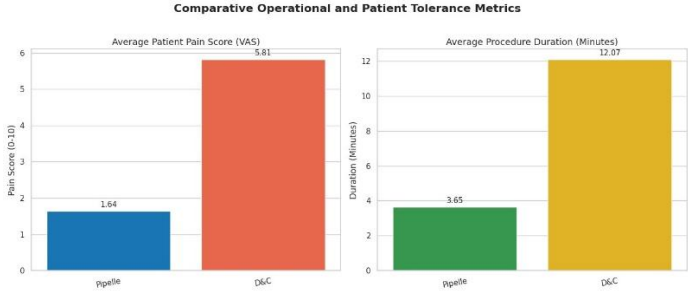

Figure 1. Economic comparison: average cost of procedure

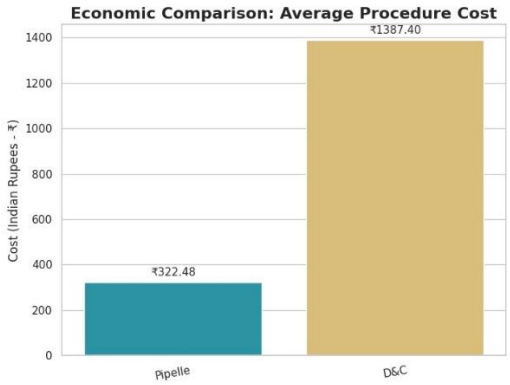

Figure 2. Safety profile: comparison of the complication rates

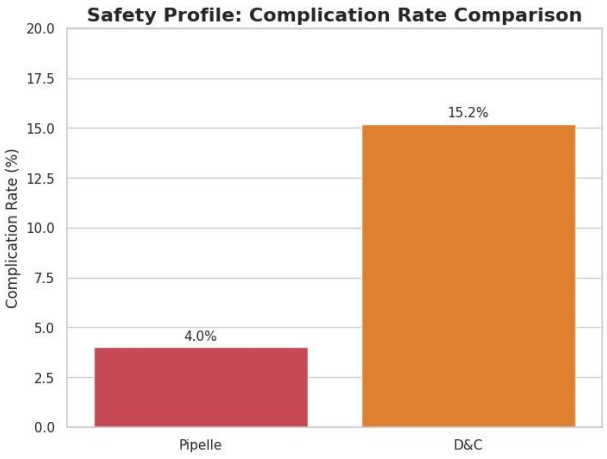

Figure 3. Metrics to compare patient tolerability and surgery

Clinical Risk Factors

Multipartite was protective (OR = 0.877 per unit increase; p = .029), but a higher BMI increased the risk of hyperplasia and malignancy (OR = 1.054 per unit increase; p = .005) (Park et al., 2020). The shorter duration of response to conservative treatment was associated with a younger age (HR = 0.95; p =.021) (Park et al., 2020).

Table 2. Pathological improvement following endometrial hyperplasia diagnosis prior to surgery: pelvisectomy versus D&C

Diagnostic Category	Outcome Measure	Pipelle Aspiration (%)	Dilatation and Curettage (D&C) (%)	p-value	Reference
All Endometrial Hyperplasia	Upgrade to any advanced pathology	36.7	21.0	.008	Lee et al. (2020)
	Upgrade to endometrial carcinoma	27.3	15.0	0.022	
Non-atypical Hyperplasia	Upgrade to atypical hyperplasia or carcinoma	29.0	12.5	.028	

Pathological Upgrade Rates Following Preoperative Diagnosis of Endometrial Hyperplasia: Pipelle Aspiration versus Dilatation and Curettage
Note. The number of patients whose final pathology after hysterectomy revealed a more serious diagnosis than their initial office or operative biopsy is reflected in the figures.

Discussion

According to this analysis, Pipelle is a very accurate and patient-friendly substitute for DandC in the initial AUB evaluation, particularly in premenopausal women who may have atypical hyperplasia or carcinoma of the thyroid gland. It is excellent for excluding malignancies in low-risk populations because of its almost perfect net present value (Clark et al., 2021; Rahimi et al., 2019).

But the data warns against replacing DandC with anything else. The failure rate for Pipelle is significantly higher in women who have gone through the menopause and often have cervical stenosis and a thin endometrium (Ghaemmaghami et al., 2017). Moreover, its tendency to underestimate the severity of the disease in non-typical EH patients (Lee et al., 2020) could delay definitive treatment. These results support the risk stratification approach: hysteroscopy or DANDC in postmenopausal women, in patients with thin endometrium or in case of suspected focal lesions in younger, low-risk women.

a high percentage of women with atypical hyperplasia with concomitant cancer (23-40 percent) (Trimble et al., 2012; Kurman et al., 2014) further justifies confirmatory sampling—preferably via D&C or hysteroscopy—before initiating fertility-sparing therapy.

From a health policy point of view, Pipelle is ideal for settings with limited resources, such as many Iranian regions, because of its low costs, outpatient availability and low complication rates (Ahmadi et al., 2020). However, to reduce variability for operators, fair access requires training and quality control.

Finally, patient guidance is crucial. Some women consider office biopsies insufficient, even though they score lower on pain (Ghaemmaghami et al., 2017). Compliance and satisfaction are enhanced when testing restrictions and follow-up procedures are openly communicated.

Limitations

Although this structured narrative review is thorough and based on recent data, there are a number of important limitations to be noted: heterogeneity of included studies: the design of the reviewed studies varied widely (prospective versus retrospective), the sample size, the definition of the outcome, and the demographics of the patients (particularly age and menopause).

This diversity may affect the generalizability of pooled estimates and limit the ability to perform formal meta-analysis.

Geographical and ethnic bias Despite efforts to include data from the Iranian population (e.g. in the context of the study), most of the high quality comparative studies are from high income countries. G. North America, Europe and South Korea (South Korea). The prevalence of endometrial pathology and the performance of the sampling may be influenced by biological, genetic and lifestyle changes, which may limit the applicability of the findings in a context of scarcity or in the Middle East.

The imperfection of the reference standard: Dilatation and curettage (DandC) is widely accepted as a reference standard, but D&C is imperfect. As this is a blind procedure, the accuracy of the procedure is dependent on the operator and may miss the focal lesions. In some cases, there may have been a bias towards classification, as not all patients had access to the definitive histopathology after hysterectomy, which is considered the gold standard.

Impleteness of the reference standard: Dilatation and curettage (DandC) is generally accepted as the reference standard, but D&C is not fully satisfactory. As this is a blind procedure, the accuracy of the procedure depends on the operator and may be affected by the presence of a focal lesion. In some cases, there may be bias in the classification as not all patients had access to the definitive histopathology after hysterectomy, which is considered to be the gold standard for post-hysterectomy histopathology.

Under-representation in some subgroups: There is insufficient information on the effect of Pipelle in important subgroups, including women with severe cervical stenosis, very thin endometrium (<5 mm) or women undergoing fertility treatments. This limits the ability to draw reliable conclusions on the reliability of the diagnostic in these complex or high-risk clinical situations.

Publication bias: studies showing high correlation between Pipelle and DandC are more likely to be published than studies showing poor correlation, which may exaggerate the perceived accuracy of the literature.

Lack of patient-oriented outcomes and cost-effectiveness: Although diagnostic metrics have been extensively studied, there have been only a few studies that have looked at quality of life metrics, long-term patient outcomes, and formal cost-effectiveness analysis comparing the Pipelle and DandC systems, particularly in Iran.

These limitations highlight the need for future large-scale, multicentre prospective studies with standardised protocols, diverse population coverage and the integration of endometrial pathology as a reference standard to further improve clinical guidelines for endometrial sampling.

Conclusion

For Iranian women with endometrial hyperplasia, a pipelike endometrial biopsy is a reliable first-line diagnostic technique with low morbidity and high accuracy for both malignant and atypical lesions. However, its use should be cautious due to the limitations in postmenopausal women, endometrial thinning and non-typical hyperplasia. If clinical suspicion is high despite a negative or inconclusive Pipelle result, DANDC remains critical for the definitive diagnosis. Endometrial evaluation is safer and more efficient when age, BMI, menopausal status and sonography are integrated into a tailored diagnostic algorithm.

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