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Research Article

Diagnostic Accuracy of Endometrial Sampling Devices for Abnormal Uterine Bleeding in Egyptian Mature Woman

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Abstract

Objective: to compare the histological findings of different methods of diagnosis of abnormal uterine bleeding with histopathology after hysterectomy. ***Patients and methods:*** 100 patients above the age of forty with abnormal uterine bleeding was selected for the study, including all patients who underwent D&C , pipelle, ryle suction and hysteroscopic guided biopsy and within 2 months, hysterectomy. The sensitivity, specificity, positive and negative predictive values and accuracy of each diagnostic method were studied. ***Results:*** the accuracy for D&C, pipelle, ryle suction and hysteroscopic guided biopsy for diagnosing endometrial carcinoma was (81.5%) ,(71.2%),(73.1%), (83.4%) respectively and for diagnosing endometrial hyperplasia with atypia (78.2%), (69.22%), (74.7%),(81.2%) respectively and for diagnosing endometrial polyp (25.7%),(16%),(18.9%),(91.6%) respectively. ***Conclusion:*** D&C biopsy has better accuracy than pipelle and ryle suction biopsy in the diagnosis of endometrial pathologies in patient with abnormal uterine bleeding but all were not adequate method for focal endometrial pathologies determination whereas hysteroscopy is considered the gold standard and a valuable method for diagnosing abnormal uterine bleeding with accurate local uterine pathology determination .

Keywords: Uterine bleeding, D&c, pipelle, ryle suction and hysteroscopy, hysterectomy.

Introduction

Bacillary dysentery and enteric fevers continue to be Abnormal uterine bleeding (AUB) is frequently encountered in gynecology practice ***(Brenner 1996; Nicholson et al., 2001 and Albers et al., 2004).*** Determining the proper diagnosis for the cause of AUB and planning the treatment accordingly are essential. For many years, dilatation and curettage (D&C) has been the method of choice for diagnosing endometrial pathology in women with AUB. However, in 60% of the D&C procedures, less than half of the uterine cavity is curetted, thereby questioning the accuracy of this method ***(Stock and Kanbour 1975).***

Since 1958, studies have been published comparing histological findings on D&C with those on subsequent hysterectomy in patients with AUB ***(Bettocchi et al., 2001)***.These studies revealed the inadequacy of curettage for diagnosis of intrauterine disorders, especially endometrial polyps and sub-mucous myomas ***(Emanuel et al., 1997)***.

D&C is an invasive procedure that must be performed in the operating room with anesthesia. The procedure is not without risk ***(Bettocchi et al., 2001)***. Therefore, other less invasive, but effective screening methods are needed to approach this problem. No screening test exits for detection of precancerous lesion and endometrial carcinoma. D& C is consequently costly and time consuming, with potential complications from a general anaesthetic. For these reasons, several, mainly outpatient, procedures have replaced the

D & C, and are now performed routinely ***(Clark et al., 2002).*** Many outpatient endometrial sampling methods utilising disposable devices have been studied. not all studies include diagnostic correlation with hysterectomy thus precludes the diagnostic accuracy of endometrial sampling techniques ***(Bakour et al., 2000; Yang et al.,2000).***

Over years, the Pipelle endometrial suction curette has become a very popular device in outpatient endometrial sampling. Reasons for its popularity are that the Pipelle is easy to use, obtains supposedly enough tissue for diagnosis, and confers acceptable patient comfort ***(Rodriguez et al., 1993).***The technique has a tendency to fail because there can be difficulties in introducing the sampler particularly in the postmenopausal patient or that the specimen generated is inadequate for pathological reporting. Where outpatient sampling fails or the specimen is unsatisfactory, the gold standard assessment technique is hysteroscopy and curettage. ***(Kaunitz et al. 1988 and Manganiello et al.1998;)***

Hysteroscopic evaluation for abnormal uterine bleeding is an option providing direct visualization of cavitary pathology and facilitating directed biopsy. Hysteroscopy may be performed in an office setting with or without minor anaesthesia or in the operating room with regional or general anaesthesia. Directed biopsies under direct vision provide the main benefit over “blind” dilation and uterine curettage. ***(Sukhbir et al., 2013).***

Patients and methods

A prospective cross sectional study included 100 women above the age of forty complaining of abnormal uterine bleeding in the gynecological outpatient clinic in Al Maady Military Hospital during 2012-2014 were recruited for this study.

Pipelle and ryle suction sampling were taken in the outpatient clinic and enough sample were obtained. Inpatient hysteroscopy was done for visualization of the endometrial cavity under general anaethesia with subsequent sampling and biopsy taking. D&C was carried out under general anesthesia on an inpatient basis. After 2 months a hysterectomy was performed in all patients because of histological finding, persistence of symptoms or failed medical treatment.

All histological slides were examined and interpreted by the same expert pathologist.

Statistical analysis:

The sensitivity, specificity, positive and negative predictive values for each diagnostic tool were calculated. The accuracy in the diagnosis of histological type was also determined.

Results

The mean age of the patients was 50.9 years (range 41–77), 27% of patients were urban while 62% were rural.51% were with low parity (0-3) while 49% were with high parity $\geq$ 4. 58 % premenopausal and 42% post-menopausal. All patients underwent transvaginal sonography before endometrial biopsy. 42% patients had abnormal uterine bleeding for 3 - 6 months duration. 50% of patients presented after 6 months duration of Abnormal Uterine Bleeding, 8% presented before 3 months duration. 37% of the study group had pelvi-abdominal mass by clinical examination. In each patient, the histological diagnosis after hysterectomy was compared with that obtained by D&C, pipelle, ryle suction or hysteroscopic guided biopsy (table 1,2).

Discussion

Abnormal uterine bleeding (AUB) is one of the most common reasons for gynecological referrals **(*Bettocchi et al.,2001*)**.The correct diagnosis of a woman with AUB is the most Significant step in management. During the reproductive years, hysteroscopy with endometrial biopsy is the gold standard investigation forAUB ***(Revel and Shushan,2002).*** For decades, the universal standard procedure for diagnosis of intrauterine disorders was D&C. In recent years several studies, have reported that the accuracy of D&C is limited, citing false negative rates as high as 10***%. (Stovall et al.,1998)*** Cervical cytology has been found to be of some use in detecting endometrial disease. The Pap smear is not designed for the diagnosis of endometrial cancer; the sample is taken from the cervix and not from the endometrium. However, a few cases of endometrial cancer are initially diagnosed in routine cervical screening smears that revealed glandular neoplasia with cellular features suggesting an endometrial origin. The sensitivity of cervical cytology for detection of endometrial pathology is relatively low,

Table 1: Diagnostic accuracy of each device finding in comparison to hysterectomy finding

Findings	D&C biopsy Accuracy	Pipelle Accuracy	Ryle suction Accuracy	Hysteroscopic guided biopsy Accuracy
Irregular uterine shedding	71.33%	68.67%	63.17%	45.6%
Sub mucus fibroid	36.5%	??	31.7%	93.43%
Intra mural fibroid	---	--	--	8.7%
Subserous fibroid	--	--	--	--
Endometrial polyp	25.7%	16%	18.9%	91.6%
Adenomyosis	--	--	--	--
Atrophic endometrium	72.3%	61.35%	54.35%	74.5%
Endometrial hyperplasia with atypia	78.2%	69.22%	74.7%	81.2%
Endometrial hyperplasia with no atypia	74.2%	77.9%	79.9%	71.3%
Endometrial carcinoma	81.5%	71.2%	73.1%	83.4%
Uterine sarcoma	59.3%	38.7%	39%	53.2%

Table 2: Diagnostic accuracy of each device finding in comparison to hysterectomy finding in post-menopausal patients

Findings	D&C biopsy Accuracy	Pipelle Accuracy	Ryle suction Accuracy	Hysteroscopic guided biopsy Accuracy
Irregular uterine shedding	62.5%	68.5%	51.3%	47.5%
Sub mucus fibroid	31%	??	28.4%	91.4%
Intra mural fibroid	--	--	--	9%
Subserous fibroid	--	--	--	--
Endometrial polyp	21.4%	--	--	92.5%
Adenomyosis	--	--	--	--
Atrophic endometrium	72.3%	62.4%	48.9%	69.5%
Endometrial hyperplasia with atypia	72.7%	73.2%	74.7%	89.3 %
Endometrial hyperplasia with no atypia	67.8%	91.4%	84.6%	73%
Endometrial carcinoma	81.5%	71.3%	73.1%	83.4%
Uterine sarcoma	59.3%	38.7%	39%	53.2%

Table 3: Diagnostic accuracy of each device finding in comparison to hysterectomy finding in premenopausal patients

Findings	D&C biopsy Accuracy	Pipelle Accuracy	Ryle suction Accuracy	Hysteroscopic guided biopsy Accuracy
Irregular uterine shedding	91.2%	69.2%	70.1%	41.2%
Sub mucus fibroid	47.8%	??	34.5%	95.6%
Intra mural fibroid	--	--	---	5.7%
Subserous fibroid	--	--	--	--
Endometrial polyp	29.2%	16.7%	18.9%	91.7%
Adenomyosis	0%	0%	--	--
Atrophic endometrium	0%	57.3%	63%	81.3%
Endometrial hyperplasia with atypia	79.3 %	67.4%	0%	77.6%
Endometrial hyperplasia with no atypia	76.9%	57.4%	71.4%	71.9%
Endometrial carcinoma	--	--	--	--
Uterine sarcoma	--	--	--	--

ranging from 25% to 55% ***(Canfell et al.,2008)*** .A number of studies have reported increased detection of cervical squamous neoplasia with liquid-based cytology (LBC) compared with conventional Pap smear (CPS) **(Corkill et al.,1998).** However,***Obwegeser et al***. did not demonstrate any statistically significant difference in sensitivity and specificity between these two techniques(***Obwegeser et al.,2001).***

Studies comparing D&C with hysterectomy are not completely accurate, because D&C is an invasive technique that may alter the uterine cavity. The rate of false positive results on D&C could thus be overestimated if endometrial polyps are completely removed by curettage ***(Emanuel et al.,1997)*** .

In this study we have investigated the accuracy of histological diagnosis by D&C, Pipelle, Ryle suction, Hysteroscopic guided biopsy in 100 patients above the age of fourty with abnormal uterine bleeding and investigated also in the premenopausal and post menopausal groups. This study shows that D&C biopsy have better accuracy than pipelle and ryle suction biopsy in the diagnosis of endometrial pathologies in patient with abnormal uterine bleeding and are not adequate method for focal endometrial pathologies and hysteroscopic guided biopsy is the gold standard investigation for abnormal uterine bleeding**.**

Stock and Kanbour 1975 reported the inaccuracy of prehysterectomy curettage, both as a sampling technique and as a means of diagnosing endometrial carcinoma.On histological examination of 50 hysterectomy specimens after D&C, they found that only seven cancers were detected by curettage, for a false-negative rate of 82.5%.***Lerner 1984*** reported on 181 patients who underwent curettage immediately before hysterectomy for benign disease. Only one of the five cases of endometrial carcinoma found at hysterectomy had been detected by curettage. The sensitivity of D&C was only 20%, and the positive predictive value was 50% .***Ceci et al.2002*** evaluated the diagnostic accuracy of D&C in a cohort of 397 patients who then underwent hysterectomy based on the histologic findings or persistence of symptoms.In 248 of the 397 cases (62.5%), D&C failed to detect intrauterine disorders that were subsequently found at hysterectomy, yielding a sensitivity of 46%, specificity of 100%, positive predictive value of 100%, and negative predictive value of 7.1%.

In 407 patients who had a D&C, ***Stovall et al***.,***1989*** reported missed endometrial hyperplasia or carcinoma found on hysterectomy in 23 cases (5.7%). For 411 patients undergoing curettage before hysterectomy for suspected uterine fibroids, ***Möller and Berget 1993*** reported that curettage revealed two cases of endometrial cancer and four cases of cervical intraepithelial neoplasia (CIN),but it missed two cases of CIN, one case of endometrial carcinoma and one case of fibromyosarcoma .***Bettocchi et al., 2001*** confirmed the inadequacy of D&C as a diagnostic tool for all uterine disorders; major intrauterine diseases (not only myomas and polyps, but also hyperplasia and adenocarcinoma) were missed in 62.5% of patients.

The limited value of D&C for the diagnosis of endometrial polyps and submucous myomas has been reported however, all of these blind endometrial sampling procedures have some intrinsic diagnostic limitations, especially in cases with a nonhomogeneous endometrium.Concordant with our study, ***Saygılı 2006*** found that the preoperative D&C endometrial pathology findings were positively correlated with the postoperative hysterectomy pathology. Our study agrees with ***Yarandi et al.2010*** who reported that D&C is an inadequate diagnostic tool for uterine focal lesions, but the accuracy of D&C in the detection of endometrial hyperplasia and carcinoma is relatively high (92.1%).Also ***Saadia et al.,2011*** reported that D&C was found most accurate in diagnosing endometrial carcinoma. Sensitivity of D&C was found to be 33% whereas specificity and positive predictive value was found to be 100% each. Negative predictive value was found to be 93.1%.Our study also agrees with ***Barut et al., 2012*** who reported that High sensitivity (87.8%), specificity (100%), positive (100%) and negative (98.7%) predictive values,and accuracy (98.8%) were observed for all malignant endometrial pathologies obtained at dilatation and curettage.

A meta-analysis of 39 studies reviewing 7914 premenopausal and postmenopausal women with endometrial Pipelle biopsy noted that the detection rate of endometrial cancer in postmenopausal women was 99.6% and 91% in premenopausal women. The detection rate for atypical hyperplasia was 88%, and

the specificity was 98% to 100%.***Guido et al., 1995*** performed pipelle biopsy prior to hysterectomy in 65 cases which were diagnosed as endometrium carcinoma previously. In this series, sufficient material was obtained in 97 % of cases with pipelle biopsy.However, concordance rate between pipelle and hysterectomy was 83 %. Carcinoma was found on a focal lesion in 5 of 11 cases; furthermore, carcinoma was confined to <5 % of endometrial surface in other 3 of 11 cases. These data show that diagnostic reliability of pipelle biopsy is controversial in patients with focal endometrial pathology.In a study, 306 patients with endometrial cancer underwent preoperative endometrial sampling prior to hysterectomy. The authors concluded that sensitivity and diagnostic accuracy rates of preoperative pipelle biopsy are as high as that for curettage for the diagnosis of high-grade endometrial tumors, but not for low-grade tumors. Also, it was found that the concordance of histopathology and grade with final pathology were 80.6 and 62.8 % for pipelle and curettage, respectively. Although there are some diagnostic problems related to office endometrial sampling, pipelle is a convenient and acceptable outpatient method for evaluating endometrial pathology.***Fuat et al., 2012*** sugested that Pipelle biopsy and D&C showed almost equal success rate in the diagnosis of endometrial pathologies. Neither pipelle nor D&C is adequate method for focal endometrial pathologies. Both biopsy methods are not perfect, but pipelle biopsy is a cheaper and easy technique compared with D&C, and ultrasonographic findings of endometrium should be considered prior to endometrial biopsy.

Hong-lan et al., 2010 who studied the value of hysteroscopy and directed biopsy in the diagnosis of endometrial carcinoma and stated that the accurate rate of the pathology diagnosis for endometrial carcinoma before staging surgery was 97.8% for Group A (hysteroscopy), but only 88.8% for Group B (D&C). The between-groups difference was statistically significant.The data confirmed that hysteroscopy diagnosed endometrial carcinoma more accurately and with greater sensitivity than D&C.This agreed with our results as accuracy of hysteroscopy was 83.4% while accuracy of D&C was 81.5 % for diagnosis of endometrial carcinoma.

These results are similar to those of ***Bedner et al,2007*** who compared the effectiveness of D&C with hysteroscopy and guided biopsy in perimenopausal women at a risk of developing endometrial hyperplasia or cancer. They found that hysteroscopy with disrected biopsy was more sensitive than D&C for detecting all types of uterine lesions.It is acceptable to conclude that hysteroscopy is an accurate method for diagnosing endometrial carcinoma.

Patil et al., 2009 stated that patients with abnormal uterine bleeding, hysteroscopy provides more accurate diagnosis than dilatation and curettage.

Loverro et al.,1996 stated the hysteroscopic sensitivity, specificity, positive predictive value and negative predictive value as 98, 95, 63 and 99%, respectively, for endometrial hyperplasia.

In conclusion, D&C biopsy have better accuracy than pipelle and ryle suction biopsy in the diagnosis of endometrial pathologies in patient with abnormal uterine bleeding and are not adequate method for focal endometrial pathologies.However, if there is a suspicion of focal endometrial pathology by ultrasonography, hysteroscopy should be performed. Both biopsy methods are not perfect, but pipelle biopsy is cheaper and easy technique compared with D&C and ultrasonographic findings of endometrium should be considered prior to endometrial biopsy.
Hysteroscopy is a valuable method for diagnosing AUB due to local uterine pathology and although many other alternatives are introduced in the past decades but still hysteroscopy is the gold standard.
Although being the gold standard it has its own drawbacks which limits its use, being an invasive procedure make it difficult to use it liberally and limits its use for selected cases.

There are still circumstances where D&C is indicated. If an endometrial biopsy cannot be done, if the sample is insufficient,if patients' bleeding persists after negative biopsy results or patient is at high risk of endometrial cancer, she requires D&C.

References

Albers JR, Hull SK, Wesley RM. Abnormal uterine bleeding. *Am Fam Physician* 2004; 69: 1915–1930.

Bakour S, Khan K, Gupta J. Controlled analysis of factors associated with insu¯ cient sample on outpatient endometrialbiopsy. Br J Obstet Gynecol.

2000;107:1312-1314. Method. J Reprod Med. 2000;45:109-114.

Barut A,Barut F, Arikan I,Harma M,Harma M and Bayar U. Comparison of the histopathological diagnoses of preoperative dilatation and curettage and hysterectomy specimens *J. Obstet. Gynaecol. Res. Vol. 38, No. 1: 16–22, January 2012*

Bedner R, Rzepka-Gorska I. Hysteroscopy with directed biopsy versus dilatation and curettage for the diagnosis of endometrial hyperplasia and cancer in perimenopausal women. Eur J Gynaecol Oncol 2007; 28: 400-402.

Bettocchi S, Ceci O, Vicino M, Marello F, Impedovo L, Selvaggi L. Diagnostic inadequacy of dilatation and curettage. *Fertil Steril* 2001; 75: 803–805.

Bettocchi S, Ceci O, Vicino M, Marello F, Impedovo L, Selvaggi L. Diagnostic inadequacy of dilatation and curettage. *Fertil Steril* 2001; 75: 803–805.

Brenner PF. Differential diagnosis of abnormal uterine bleeding. *Am J Obstet Gynecol* 1996; 175 (3 Pt 2): 766–769.

Canfell K, Kang YJ, Clements M, Moa AM, Beral V. Normal endometrial cells in cervical cytology: Systematic review ofprevalence and relation to significant endometrial pathology.*J Med Screen* 2008; 15: 188–198.

Ceci O, Bettocchi S, Pellegrino A, Impedovo L, Di Venere R, Pansini N. Comparison of hysteroscopic and hysterectomy findings for assessing the diagnostic accuracy of office hysteroscopy. *Fertil Steril* 2002; 78: 628–631.

Clark TJ, Mann CH, Shah N, et al. Accuracy of outpatient endometrial biopsy in the diagnosis of endometrial cancer: a systematic quantitative review. Br J Obstet Gynaecol. 2002;109:313-21.

Corkill M, Knapp D, Hutchinson ML. Improved accuracy for cervical cytology with the ThinPrep method and the endocervical brush-spatula collection procedure. *J Low Genit TractDis* 1998; 2: 12–16.

Dijkhuizen FP, Mol BW, Brolmann HA, Heintz AP. The accuracy of endometrial sampling in the diagnosis of patients with endometrial carcinoma and hyperplasia: A meta-analysis.*Cancer* 2000; 89: 1765–1772.

Emanuel MH, Wamsteker K, Lammes FB. Is dilatation and curettage obsolete for diagnosing intrauterine disorders in premenopausal patients with persistent abnormal uterine bleeding? *Acta Obstet Gynecol Scand* 1997; 7: 65–68.

Farquhar C,ArrolB,EkromaA.furnessS.asystemic review of transvaginal ultrasonography, and hysteroscopy for the investigation of abnormal uterine bleeding in premenopausal women.Acta Obstetric and Gyecol Scan 2003;82:493-504.

Fuat Demirkiran,Evrim Yavuz,Hakan Erenel,Tugan Bese,Macit Arvas,Cevdet Sanioglu 2012. Which is the best technique for endometrial sampling? Aspiration(pipelle) versus dilatation and curettage (D&C) Arch Gynecol Obstet.

Fukuda K, Mori M, Uchiyama M *et al*. Preoperative cervical cytology in endometrial carcinoma clinicopathologic relevance. *Gynecol Oncol* 1999; 72: 273–277.

Guido RS, Kanbour-Shakir A, Rulin MC, Christopherson WA (1995) Pipelle endometrial sampling. Sensitivity in the detection of endometrial cancer. J Reprod Med 40(8):553–555

Hong-lan Z,Xu-dong L,Jian-liu W, Heng C and Li-hui W. Hysteroscopy and directed biopsy in the diagnosis of endometrial carcinoma.Chin Med J 2010;123(24):3524-3528.

Huang GS, Gebb JS, Einstein MH, Shahabi S, Novetsky AP, Goldberg GL (2007) Accuracy of preoperative endometrial sampling for the detection of high-grade endometrial tumors. Am J Obstet Gynecol 196(3):243.e1–243.e5

Kaunitz AM, Masciello A, Ostrowski M, Rovira EZ. Comparison of endometrial biopsy with the endometrial Pipelle® and Vabra® aspirator. J Reprod Med. 1988; 33:427-431.

Lerner HM. Lack of efficacy of prehysterectomy curettage as a diagnostic procedure. *Am J Obstet Gynecol* 1984; 148: 1055–1056

Loverro G, Bettocchi S, Cormio G, Nicolardi V, Porreca MR, Pansini N, et al. Diagnostic accuracy of hysteroscopy in endometrial hyperplasia. Maturitas. 1996;25:187–91.

Manganiello PD, Burrows LJ, Daln BJ, Gonzales J. Vabra® aspirator and Pipelle® endometrial suction curette. J Reprod Med.1998;43:889-892.

Møller LM, Berget A. Prehysterectomy curettage in women with uterine fibromyomata is not worthwhile. *Acta Obstet Gynecol Scand* 1993; 72: 374–376.

Nicholson WK, Ellison SA, Grason H *et al*. Patterns of ambulatory care use for gynecologic conditions: A national study. *Am J Obstet Gynecol* 2001; 184: 523–530.

Obwegeser JH, Brack S. Does liquid-based technology really improve detection of cervical neoplasia? A

prospective, randomized trial comparing the Thinprep Pap test with the conventional Pap test, including follow-up of HSIL cases. *ActaCytol* 2001; 45: 709–714.

Patil S G, Bhute S B, Inamdar S A, Acharya N S, and Shrivastava D S. Role of Diagnostic Hysteroscopy in Abnormal Uterine Bleeding and its Histopathologic Correlation J Gynecol Endosc Surg. 2009 Jul-Dec; 1(2): 98–104.

Revel A, Shushan A. Investigation of the infertile couple: Hysteroscopy with endometrial biopsy is the gold standard investigation for abnormal uterine bleeding. *Hum Reprod* 2002; 17: 1947–1949.

Rodriguez GC, Yaqub N, King ME. A comparison of the Pipelle® device and the Vabra® aspirator as measured by endometrial denudation in hysterectomy specimen: the Pipelle® device samples signi. cantly less of the endometrial surface than the Vabra® aspirator. Am J Obstet Gynecol. 1993;168:55-9.5.

Saadia A,Mubarik A,Zubair A,Jamal S, Zafar A. Diagnostic Accuracy of Endometrial Curretage in Endometrial pathology. J Ayub Med Coll Abbottabad 2011;23.

Saygili H. Histopathologic correlation of dilatation andcurettage and hysterectomy specimens in patients with postmenopausal bleeding. *Eur J Gynaecol Oncol* 2006; 27: 182–184.

Stock RJ, Kanbour A. Prehysterectomy curettage. *Obstet Gynecol* 1975; 45: 537–541.

Stovall TG, Solomon SK, Ling FW. Endometrial sampling prior to hysterectomy. *Obstet Gynecol* 1989; 73 (3 Pt 1): 405–409.

Sukhbir Singh ,Carolyn best ,Sheila Dunn, Nicholas Leyland ,Wendy Lynn Wolfman. Abnormal Uterine Bleeding in Pre-Menopausal Women. J Obstet Gynaecol Can 2013;35:S1–S28.

Word B, Gravlee LC, Wideman GL. The fallacy of simple uterine curettage. *Obstet Gynecol* 1958; 12: 642–648.

Yarandi F, Izadi-Mood N, Eftekhar Z, Shojaei H, Sarmadi S. Diagnostic accuracy of dilatation and curettage for abnormal uterine bleeding. *J Obstet Gynaecol Res* 2010; 36: 1049–1052.