DOI:http://dx.doi.org/10.7314/APJCP.2012.13.9.4521

RESEARCH ARTICLE

Improved Accuracy of Cytodiagnosis using the Kato Self-Collection Devise: the Usefulness of Smear Preparation in Liquid-based Cytology Methods

Kaori Okayama[1,2]*, Mitsuaki Okodo[1,2], Masahiko Fujii[1], Tomoko Kumagai[2], Hiromi Yabusaki[2], Yoshio Shiina[2], Fumihiro Iwami[3], Koji Teruya[3], Kenmei Hatta[4]

Abstract

Object: In the present study, we compared the positive cytodiagnostic test rates with discrepancies using self-collection devices for cervical cancer screening. We made this survey to examine whether or not our self-smear preparation method using the Kato self-collection device contributed to an improved rate of detecting atypical cells compared with existing recommended preparation methods. Methods: Specimens were collected at 14 facilities handling self-collection methods, and samples were collected by a physician in 2 facilities. The chi-squared test was performed using the SPSS ver. 20 statistical software to determine the relationships between the positive cytodiagnostic rate, specimen preparation methods, and self-collection devices. Results: Collecting cells using the Kato self-collection device and preparing liquid-based specimens, we obtained a significantly higher rate of positive cytodiagnosis and our results were equal to those obtained with the direct method. Conclusions: Taking into consideration increased needs for screening using the self-collection method in future, with even more improved test accuracy, a screening test that is acceptable to society needs to be established.

Keywords: Cervical cytology - Kato self-collection device - liquid-based cytology

Asian Pacific J Cancer Prev, **13 (9)**, 4521-4524

Introduction

Cytodiagnostic screening methods are highly accurate and are widely used in the diagnosis of cervical cancer (Aoki et al, 2012). Early detection and treatment is possible through regular cytodiagnostic testing because screening has contributed to a decrease in cervical cancer mortality rates (Lăără et al., 1987; Mitchell et al., 1996). However, the extremely low average of screening rate in Japan (23%) is a growing concern (WHO/ICO Information Center, 2010). Conversely, other Asian countries such as South Korea, Singapore, Hong Kong, and Taiwan have much higher screening rates of 70%, 70%, 63%, and 61%, respectively (WHO/ICO Information Center, 2010). To overcome the existing low screening rate in Japan, awareness-raising activities such as distribution of free-screening vouchers have been carried out to publicize the importance of cervical cancer screening. In recent years, new measures to raise the cervical cancer screening rate have included a drive to initiate cytodiagnostic testing by distributing self-collection devices and physicians directly collecting cervical swabs from patients. However, the accuracy of cytodiagnostic tests through self-collection is much lower than the direct method because the absolute number of cells on the smear is low and reports have indicated that there are several defective specimens due to sampling errors (Belinson et al., 2001; Belinson etal., 2003; Garcia et al., 2003; Salmerón et al., 2003). Consequently,cytodiagnostic tests using self-collected specimens are not recommended by the Japan Society of Obstetrics and Gynecology. In contrast, despite the awareness regarding the disadvantage of the selfcollection method, several women prefer this method because it is convenient, and also because they are either embarrassed or do not have time to visit a hospital.

Therefore, in the present study, we compared the positive cytodiagnostic test rates with the discrepancies in self-collection devices. Furthermore, we used the chi-squared test to examine whether or not our selfsmear preparation method contributed to an improved rate of detecting atypical cells compared with existing recommended preparation methods.

Subjects

Specimens were collected at 11 facilities (facilities A–K) handling self-collection methods listed in the Tokyo Metropolitan Sanitary Inspection Office

[1]*Department of Pathology,* [3]*Department of Public Health, Faculty of Health Sciences, Kyorin University,* [2]*I LABO Cyto-STD Laboratory Co. Ltd.,* [4]*Juno and Vesta Clinic, Tokyo, Japan* **For correspondence: okayaman0811@std.kyorin-u.ac.jp*

Report on quality control of sanitary survey. Three (Noguchi et al., 1982; Sachaisuriya et al., 2004) (facilities L–N), and samples were collected by a physician in 2 facilities (facilities O and P). We used the cytodiagnostic results reported over a 1-year period by each facility. Furthermore, at facility L (I-LABO Cyto STD Laboratory, Tokyo, Japan), specimens were prepared by smearing the cells attached to the sponge of the collection device after liquefaction (Figure 1). In addition, the smear preparations at facilities M and N were conducted using the recommended method of attaching the sponge to a glass slide.

Methods

A cytodiagnosis of ≥LSIL (low-grade squamous intraepithelial lesion) was interpreted as positive. We calculated the positive cytodiagnoses rates and indeterminate rates in smears obtained using the direct and self-collection methods at each facility. Furthermore, the chi-squared test was performed using the Statistical Package for Social Sciences ver. 20 statistical software (SPSS, Inc., Chicago, IL, USA) to determine the relationship between the positive cytodiagnostic rate, specimen preparation methods, and self-collection devices.

Results

Table 1 depicts the number of positive cytological and indeterminate specimens obtained through self-collection and by physicians. At the 11 facilities dealing with selfcollected specimens, the positive cytodiagnostic rate was 0.00%-1.44%, with the majority showing a rate of approximately 0.5%. The indeterminate rate was 0.00%-1.30%, and facilities with a high positive cytodiagnostic rate tended to have a low indeterminate rate. Moreover, the facilities facilities used the Kato self-collection device O and P, where physicians collected specimens, recorded a positive cytodiagnostic rate of 1.47% and 0.90%, respectively. Table 2 depicts the number of positive cytological and indeterminate specimens in facilities using the Kato self-collection devise. The positive cytodiagnostic rate at facility L where specimens were prepared using liquid-based cytology methods was 2.24% (25/1114), while at facilities M and N where specimens were prepared using the recommended method the positive cytodiagnostic rates were 0.93% (101/10828) and 0.88% (5/556), respectively. The Kato self-collection devise showed a high positive cytodiagnostic rate compared with general self-collection methods, similar to those in facilities where samples were collected by physicians. Comparisons using the chi-squared test revealed that the number of positive cytology cases at facilities where specimens were collected using various self-collection methods compared with those where specimens were prepared on the basis of the recommended method using the Kato self-collection devise indicated a significant relationship between self-collection devices and cytodiagnostic evaluations. The rate of positive cytology was high when the Kato self-collection devise was used (Table 3). Moreover, using the chi-squared test, we compared the number of positive cytology cases in facilities L, M, and N where the Kato self-collection devise was employed, and found that the specimen preparation method at facility L and the rate of positive cytology had a significantly high correlation (Table 4).

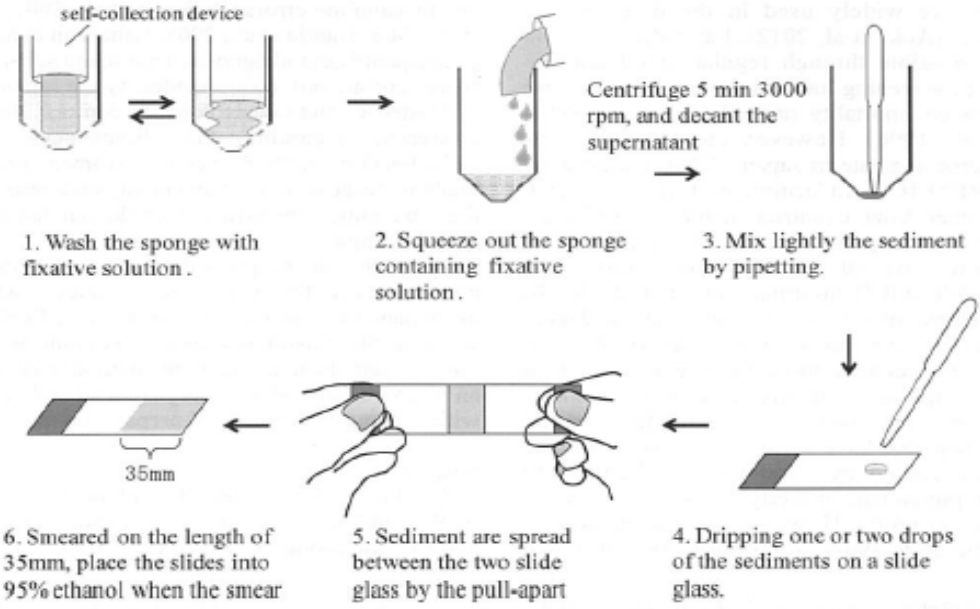

Figure1. Liquid-based method using the Kato self-collection devise.

Table1. The number of positive cytological and indeterminate specimens obtained through self-collection

Collection method	Self-collection methods											Direct collected by a physician	
Facility	A	B	C	D	E	F	G	H	I	J	K	O	P
Year	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010
Total number of specimens	911	1,200	9,236	1,596	910	346	19,763	6,239	979	2,167	7,869	unclear	19,634
The number of determinate specimens	911	1,197	9,228	1,594	908	346	19,732	6,232	979	2,154	7,767	65,722	19,626
The number of positive cytological specimens	7 (0.77%)	3 (0.25%)	133 (1.44%)	9 (0.56%)	1 (0.11%)	0 (0.00%)	72 (0.36%)	28 (0.45%)	8 (0.82%)	6 (0.28%)	23 (0.30%)	966 (1.47%)	176 (0.9%)
The number of indeterminate specimens	0 (0.00%)	3 (0.25%)	8 (0.09%)	2 (0.13%)	2 (0.22%)	0 (0.00%)	31 (0.16%)	7 (0.11%)	0 (0.00%)	13 (0.6%)	102 (1.30%)	unclear	8 (0.04%)

Table2. The number of positive cytological and indeterminate specimens in facilities using the Kato self-collection devise.

Collection method	Liquid-based cytology method	Recommended method	
Facility	L	M	N
Year	2010	2008	2005
Total number of spec	1,119	unclear	566
The number of determinate specimens	1,114	10,828	566
The number of positive cytological specimens	25(2.24%)	101(0.93%)	5(0.88%)
The number of indeterminate specimens	5(0.45%)	unclear	0(0.00%)

Table3. The relationship between self-collection device and the rate of positive cytology.

	Negative	Positive cytology
Kato self-collection devise	11,288	106
Various self-collection devise	50,758	290
	P<0.001	

Table4. The relationship between the specimen preparation method and the rate of positive cytology in facilities where the Kato self-collection devise.

	Negative	Positive cytology
Liquid-based cytology method	1,089	25
Recommended method	11,288	106
	P<0.001	

Discussion

The rate of cervical cancer screening in Japan is poor compared with that in other countries because women either "will not" or "cannot" get screened or "have difficulty" in getting screened. Unless these issues are resolved, it is difficult to improve the declining screening rates. For women who "will not" be screened, various awareness-raising programs have been initiated to understand the importance of screening. Recently, a human papillomavirus vaccination has been made available along with a presentation on the importance of screening. For those who "cannot" get screened, the Ministry of Health, Labour and Welfare distributed promotional vouchers for cervical cancer screening to women aged 20, 25, 30, 35, and 40 years. Free screening vouchers created an opportunity for women to consult a physician for cervical cancer screening, which should overcome any probable financial problems faced by these women. However, the rate of voucher usage was poor (approximately 20%). Therefore, even after increasing the awareness of cervical cancer screening and reducing the burden of screening costs, the problem of "difficulty to get screened" remains. Being embarrassed or busy, which are the common reasons given by women who won't get screened for cervical cancer may be also valid in women who have "difficulty in getting screened." Therefore, self-collection is an accessible method because over 50,000 cervical cancer screening cases are examined in Japan every year. Moreover, self-collection methods can be implemented in conjunction with those offered by employers and mobile cancer screenings. Consequently, increasing the availability of the self-collection method may enhance the frequency of cervical cancer screening. However, unless cervical cancer screening through selfcollection is fully developed as a screening test, this cannot be accomplished.

At present, cytodiagnostic testing using the selfcollection method is not recommended for cervical cancer screening because of insufficient the amount of cells for cytodiagnosis and the test sensitivity is extremely inferior to that of the direct method of collection by a physician, resulting in many indeterminate specimens (Belinson et al, 2001) (Belinson et al, 2003) (Garcia et al, 2003) (Salmerón et al, 2003). However, for accurate cervical cancer screening, regardless of the screening method, the following three points must be followed: (1) an appropriate sample must be collected; (2) the specimens must be prepared correctly; and (3) a cytotechnologist should observe the specimens. In the present study, we focused on points (1) and (2), improved positive cytodiagnostic rates and sample Compared with general self-collection devices, the sponge for cell collection in the Kato self-collection devise is wider; therefore, if the specimen is collected according to the instruction manual, the number of cells should be sufficient to satisfy the Bethesda system criteria (2001) for reporting cytological

diagnoses, resulting in a decrease in the number of indeterminate specimens and a much higher positive cytology rate. Furthermore, we devised a method of specimen preparation to increase the rate of atypical cell detection using the Kato self-collection devise. By collecting cells using this devise and preparing liquid-based specimens, we obtained a significantly higher rate of positive cytodiagnosis and our results were equal to those obtained with the direct method.

If an insufficient number of cells are collected via the recommended method, the specimen will be indeterminate, whereas if too many cells are collected, they can pile up easily on the specimen and atypical cells may be overlooked. Therefore, the adequacy of the specimen depends on the number of cells collected. However, using the liquid-based method, several cells can be recovered by rinsing the specimen attached to the sponge. In addition, cells can be smeared evenly without piling up. Therefore, we believe that the cytotechnologist overlooking the atypical cells can be decreased, and thus, the rate of atypical cell detection can be increased. Ideally, both the direct and self-collection methods should be performed on the same patient to compare the positive rates. However, our study results demonstrated that the accuracy of self-collection may be improved by the examiner washing out cells and perfecting skills of specimen preparation without burdening the patient with further stress or costs. In Japan, despite the low rate of cervical cancer screening, the mortality rate of cervical cancer is low (WHO/ICO Information Center, 2010), indicating that cytodiagnostic tests and the follow up system in Japan are highly accurate. Furthermore, it is expected that increasing the screening rate can decrease the low cervical cancer mortality rate even further. Taking into consideration an increased need for screening using the self-collection method in future, with even more improved test accuracy, a screening test that is acceptable to society needs to be established.

Acknowledgement

We/The authors thank Crimson Interactive Pvt. Ltd. (Ulatus) for their assistance in manuscript translation and editing.

References

Aoki D, Saito E, Tominaga E (2012). Cervical cancer screening. Gan To Kagaku Ryoho, 39, 23-6.

Belinson J, Qiao YL, Pretorius R, et al (2001). Shanxi Province Cervical Cancer Screening Study: a cross-sectional comparative trial of multiple techniques to detect cervical neoplasia. Gynecol Oncol, 83, 439-44.

Belinson JL, Qiao YL, Pretorius RG, et al (2003). Shanxi Province cervical cancer screening study II: self-sampling for high-risk human papillomavirus compared to direct sampling for human papillomavirus and liquid based cervical cytology. Int J Gynecol Cancer, 13, 819-26.

Garcia F, Barker B, Santos C et al (2003). Cross-sectional study of patient- and physician-collected cervical cytology and human papillomavirus. Obstet Gynecol, 102, 266-72.

Lăără E, Day NE, Hakama M (1987). Trends in mortality from cervical cancer in the Nordic countries: association with organised screening programmes, Lancet, 30, 1247-49.

Mitchell MF, Tortolero-Luna G, Wright T et al (1996). Cervical human papillomavirus infection and intraepithelial neoplasia: a review. J Natl Cancer Inst Monogr, 21, 17-25.

Noguchi M, Nakanishi M, Kato K (1982). Appraisal of a newly developed self-collection device for obtaining cervical specimens. Acta Cytol, 26, 633-35.

Salmerón J, Lazcano-Ponce E, Lorincz A et al (2003). Comparison of HPV-based assays with Papanicolaou smears for cervical cancer screening in Morelos State, Mexico. Cancer Causes Control, 14, 505-12.

Sanchaisuriya P, Pengsaa P, Sriamporn S et al(2004). Experience with a self-administered device for cervical cancer screening by Thai women with different educational backgrounds. Asian Pac J Cancer Prev, 5, 144-50.