A comparison of cervical smear adequacy using either the cytobrush or the Ayre spatula: a practice audit

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Abstract

Background

To obtain an adequate cervical (Papanicolaou) smear, the transformation zone, including the squamo-columnar junction, should be sampled as carcinoma develops preferentially in this transformation zone. The Ayre spatula has been widely used but is not very effective. Other sampling devices have been developed to improve efficiency, including the cytobrush. The purpose of this study was to compare the adequacy of cervical smears taken with the Ayre spatula as opposed to the cytobrush.

Methods

This was a retrospective analytical study. One sampler, an experienced general practitioner, took the smears in the period 1990 to 2004. Initially, the Ayre spatula was used to consecutively sample the cervix and thereafter, a cytobrush alone was used. Two groups were thus formed for comparison. The presence of endocervical cells was accepted as an indicator of an adequate smear. A Cusco speculum was used to visualize the cervix. The sample was smeared onto a slide and fixated with an alcohol aerosol spray.

Results

A total of 4561 smears were taken and 247 had no endocervical cells. A further 34 smears were classified as unsatisfactory due to the presence of degeneration (19), insufficient squamous cells (7), inflammatory exudate (4), excess blood (3) and/or a thick slide (1).The cytobrush group was similar demographically to the Ayre spatula group: 1981 (99%) and 2490 (98%) respectively were non pregnant; 67 (3%) and 110 (4%) were nulliparous, 1008 (50%) and 1370 (54%) were para 1 – 5, and 931 (46%) and 1075 (42%) were para 6 or more; 0 (0%) and 2 (0.1%) were aged between 10 – 19 years, 1496 (75%) and 2012 (78%) between 20 – 49, and 510 (25%) and 541 (21%) were aged 50 years or more. Of 2006 smears taken with a cytobrush, 1955 (97.5%) contained endocervical cells compared with 2325 (91%) of 2555 smears taken with an Ayre spatula. The difference was significant with an Odds Ratio of 4.56 (95% Confidence Interval 3.42-6.42).

Conclusion

The cytobrush is significantly more efficacious than the Ayre spatula in obtaining adequate cervical smears. Use of the cytobrush will ensure less repeat smears with a consequent reduction in workload for samplers and laboratories. Although very few smears lacked sufficient squamous cells (an indicator of adequate ectocervical sampling), current best practice is that the cytobrush be used together with a wooden spatula to ensure adequate sampling of both the endocervical and ectocervical components of the transformation zone.

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Introduction

To obtain an adequate cervical (Papanicolaou) smear, it is necessary to sample the transformation zone (including the squamo-columnar junction) from where pre-malignant change arises.[1] The presence of endocervical cells is accepted as an indicator of an adequate smear, as endocervical-negative smears are less likely to detect any cytological abnormality that may be present, especially if the abnormality is severe.[2] Since the Ayre spatula was developed in 1947 it has been widely used, although up to 40% of smears may not contain endocervical cells.[3] Various sampling (cell collection) devices have been used to obtain a better yield from the transformation zone.[2] The cytobrush is commonly used.[2] This study was undertaken to check whether the cytobrush ensures a more adequate sample than that obtained with the Ayre spatula.

Methods

This was a retrospective analytical study. All cervical smears taken by one general practitioner in his practice between January 1990 and December 2004 were reviewed. From January 1990 until March 1998, the Ayre spatula was used to take cervical smears. From April 1998 to December 2004, the cytobrush (Cervi-brush® or Craig-brush®) was used. Thus, two groups were formed for comparison. The practice population is almost exclusively rural and low income. To visualise the cervix, a Cusco speculum (small, medium or large. according to patient anatomy) was used. A hand-held torch was used for illumination. If markedly excessive mucous or discharge was present, it was blotted away with cotton wool (held in a sponge forceps). When the cytobrush was used, care was taken to sample the endocervical canal and any visible transformation zone. Smears were fixed with commercial cytofixative spray. Smears were read at the Department of Pathology, Walter Sisulu University. One of the authors (L.B.) oversaw the cytology division during the study period and the criteria for reporting smear adequacy thus remained constant. The primary outcome variable was the presence or absence of endocervical cells in the Pap smears. Besides the absence of endocervical cells, smears were also reported by the laboratory as unsatisfactory for cytological examination due to excessive blood, degeneration (poor fixation), inflammatory exudate, inadequate squamous cell representation or being too thick. The data were analysed using JavaStat®. A comparison t-test of the proportion in both groups was performed and the odds ratio (OR) was calculated at a 95% confidence interval (CI) for the primary outcome variable.

Table I. Demographic characteristics of the participants

	Ayre Spatula (N=2555)	Cytobrush (N=2006)
Age groups – no. (%)		
10 - 19:	**2 (0.1)**	**0 (0)**
20 - 29:	**332 (13)**	**74 (4)**
30 - 39:	**1004 (39)**	**722 (36)**
40 - 49:	**676 (26)**	**700 (35)**
50 - 59:	**265 (10)**	**246 (12)**
60 +	**276 (11)**	**264 (13)**
Parity – no. (%)		
0	**110 (4)**	**67 (3)**
1 - 5	**1370 (54)**	**1008 (50)**
6+	**1075 (42)**	**931 (46)**
Pregnant – no. (%)		
Yes	**62 (2)**	**25 (1)**
No	**2493 (98)**	**1981 (99)**

Table II. The presence of endocervical cells according to age group and sampling device

	Number with endocervical cells divided by number of smears (%)	
Age group	**Ayre spatula**	**Cytobrush**
0 – 19	2/2 (100)	0/0
20 – 29	298/332 (90)	73/74 (99)
30 – 39	916/1004 (91)	702/722 (97)
40 – 49	626/676 (93)	686/700 (98)
50 – 59	237/265 (89)	240/246 (98)
60 +	246/276 (89)	254/264 (96)
Totals	2 325/2555 (91)	1 955/2006 (97)

Results

Of the 4 686 smears taken, 125 smears were excluded from analysis due to incomplete demographic data. A total of 4 561 thus were analysed. Table I shows the demographic characteristics of the two groups, one in which the Ayre spatula was used to obtain smears, and the second in which the cytobrush was used.

Table II shows that smears obtained with the cytobrush contain significantly more endocervical cells than those obtained with the Ayre spatula (OR 4.56, 95% CI 3.24 to 6.42). It also shows that the cytobrush had superior adequacy across all age groups (excluding the 0-19 age group, which was too small for analysis).

Table III lists the reasons for unsatisfactory smears as stated in the laboratory reports. Squamous cells were deemed to be insufficient if they constituted less than 10% of the cells on the smear. The numbers in the groups were too small for comparative analysis.

Figure 1 shows the percentage of adequate smears for each year of the study. From 1990 to 1997, when the Ayre spatula was used, there was wide variation in the percentage adequacy. From 1998 to 2004, when the cytobrush was used, there was little variation and high percentages of adequacy.

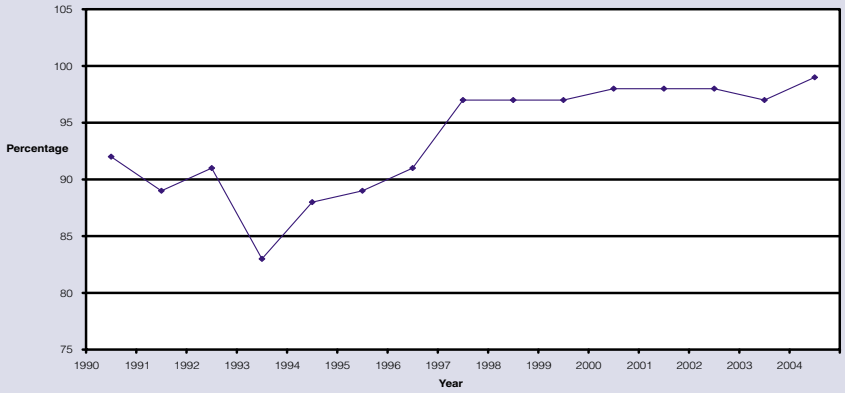
Discussion

In this study, the cytobrush used alone was significantly superior to the Ayre spatula in obtaining adequate smears for analysis. While it was not a randomised controlled trial, the setting made it unlikely that there was bias toward one device or the other. Whether using the Ayre spatula or cytobrush, it was in the GPs best interests to obtain an adequate smear for patient convenience and satisfaction. Also, the use of one sampler with many years of experience should ensure that the devices were used effectively. It is recognised that the most important factor in taking satisfactory cervical smears is the ability of the practitioner to perform the test accurately.[4,5] It could be argued that the sampler became more profi-

Table III. The reasons for unsatisfactory cervical smears

Reason	Ayre spatula	Cytobrush	No.
Degenerate	13	6	19
Squamous cells <10%	3	4	7
Inflammatory exudate	3	1	4
Excess blood	2	1	3
Thick slide	1	0	1
	22	12	34

Figure 1. Percentage of adequate smears per year of study



cient with experience during the study. However, the results in Figure 1 show no evidence of a linear improvement in smear adequacy over time. Hence, the improved adequacy in the group sampled with the cytobrush is most likely due to the effectiveness of the device itself.

No details were recorded of other possible confounding factors, such as hormonal status and menopause. However, in the authors' experience, very few women in this rural population are on postmenopausal hormone replacement therapy. Also, there is no reason to expect a difference between the two groups as regards hormonal contraception and age of menopause. Table II shows that, considering each device separately, the proportion of adequate smears is similar between the age groups. This argues against the presence of such confounding variables.

The groups had similar demographic characteristics, although the Ayre spatula group had significantly more women in the 20 to 29 age group. This was because, from the year 1999 onwards, the sampler made an effort to preferentially screen women over 30 years old in line with national guidelines.[6] The Ayre spatula group was screened before 1999.

These results confirm those of many studies, namely that the Ayre spatula should not be used alone and that an endocervical sampling device is necessary to obtain an adequate smear.[2,3,7,8] Although few smears in this study were inadequate due to the absence of squamous cells, there is concern that the cytobrush may not adequately sample the squamous cells of the ectocervix and miss dysplasia or carcinoma in this region.[7,8] It is recommended that the ectocervix adjacent to the transformation zone, the transformation zone and the endocervix be sampled.[2] The most cost-effective method of sampling appears to be the combination of a cytobrush with an extended tip spatula.[2] Single devices that effectively sample both the endocervix and ectocervix, like the Cervexbrush, Baynebrush and Profilebrush, are expensive. While it has been said that the Ayre spatula should no longer be used,[9] it can be useful for women who have large transformation zones.[10] GPs should not be locked into using a single device; they should choose a technique based on patient anatomy.[10]

If endocervical and ectocervical sampling are done, the ectocervical sample should be done first.[11] When the spatula is used first, fewer smears are obscured by blood and more squamous dysplasia is found.[11] One slide can be used for both samples.[12,13] This ensures that there is no extra workload for the analysing laboratory and no extra costs for patients who are billed per slide examined.

The South African National Department of Health recommends the Aylesbury spatula, a wooden spatula with an extended tip.[6] A single device is advantageous in busy outpatient clinics. However, studies are needed to compare the efficacy of the extended tip device with the current optimal combination of cytobrush and spatula.[2] Cost analyses should also be done to determine if the extra cost of the cytobrush would be offset by the reduction in the workload of patients needing repeat smears and the number of smears to be analysed.

In conclusion, the cytobrush is superior to the Ayre spatula in obtaining adequate smears. Use of the cytobrush will ensure that there are fewer repeat smears. However, a review of the literature indicates that the cytobrush should be used with a spatula to properly sample both the endocervix and the ectocervix.

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