

Sampling devices (Pap smear) for cytological examinations – a comparative study

H. Sander, S. Sander, C. Walczak

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Introduction

As is generally known, the unsatisfactory sensitivity of the cytological single smear (40 to 80%) is highly smear-related: in about 70% of the false-negative cytological findings, even retrospectively no target cells of the histologically verified (pre)cancerous lesion in the cytological smear can be detected. Thus no substantial improvement in the cytological sensitivity must be necessarily expected from innovations of the cytology itself (e.g. thin-layer cytology). Particular attention should rather be given to the choice of suitable sampling devices and to the method of obtaining cells and taking a smear by the individual physician. In this respect we as cytologists are thus faced with a backlog demand as well as training needs.

In October 2005 the joint federal committee (GemBA) adopted a supplement to the “Krebsfrüherkennungs-Richtlinien Frauen” (early cancer diagnosis guideline for women), requiring that in future spatula and brush are to be used generally for the cytological smear.

As these are “guidelines” and not “recommendations”, the cotton swab that had hitherto been used in the Federal Republic of Germany (KBV communication) was also no longer applicable even from a forensic point of view, although numerous cytologists continued to favour the cotton swab for different reasons (incl. Prof. Link, “9 Golden Rules”).

Through submissions and the publication of expertises, even the work group of cytologically active physicians (AZÄD) tried to expand these guidelines to include other suitable sampling devices. The decision by the GemBA was based on a meta-analysis Cochrane data base (Martin-Hirsch et. al. 2006) and was thus not objectionable from a scientific point of view.

However it was frequently criticised that the “spatula” was not defined more narrowly. Strictly speaking it could not mean the Szalay spatula because, as a

simultaneous instrument for ectocervix and endocervix, it did not require the use of a brush. In contrast to a simple tongue depressor with convex ends, the spatula developed by Ayre in 1949 seemed most likely suitable because it largely adapts to the anatomical conditions in the ectocervix.

Besides cytologists, it was particularly gynaecologists who as users raised considerable protest, whereby criticism ignited primarily against the lack of practicability and acceptance by patients (iatrogenic bleeding, pain during sampling – see survey conducted within the scope of the PapCone study).

Due to this multilateral criticism, the GemBA signalled its willingness to expand the guideline if corresponding studies validated and recognised other sampling instruments as being equivalent to brush/spatula.

As far as thin-layer cytology is concerned, Cervix Brush, Endo-CervixBrush and CervixBrush-Combi have obviously become widely accepted as validated sampling devices. Substantiated studies regarding the conventional method of taking smears are currently not available for these instruments. It is doubtful whether CervixBrush with its staggered plastic bristles may really guarantee a qualitatively adequate and thus representative transfer of the gained cell material to the glass slide.

In principle, simultaneous devices that take sample cells from the endocervix and the ectocervix at the same time find higher acceptance amongst users than instruments with fractionated cell sampling. We know from experience that the separated cell sampling procedure from the cervical channel and the portio surface (spatula/brush) induces incidentally a large number of gynaecologists to make use of two glass slides involving this way a higher amount of work to be done by the cytological lab, but without providing a demonstrably better detection (sensitivity) of precancerous lesions.

What are the criteria according to which a sampling device can be generally assessed?

Gynaecologist:

- handling/convenience
- time needed
- costs
- disposal

Female patient:

- pain, bleedings

Cytology:

- assessability
- quantity of cells
- overlapping of cells
- crushed artefact
- degeneration
- fixation
- blood impurities
- “endocervical cells” (cervical glandular cells)
(as a surrogate marker for covering the transformation zone)
- specificity
(proportion of the findings that need to be repeated/are unclear/doubtful; Pap “IIW”, Pap III)
- sensitivity
(proportion/detection of precancerous lesions of the squamous epithelium and (!) the cervical/endometrial glandular epithelium)

The University Hospital Göttingen has developed a simultaneous instrument (PapCone) for taking cytological smears that prima vista appeared to meet a large part of the above-mentioned requirement profile. This new development consists of a round stick instrument with a compressible foam cone, two-thirds of which are inserted into the cervical channel, the proximal third covering at the same time the ectocervix. The specifically roughened surface samples the exfoliated glandular and squamous epithelial cells from the cervical channel without tearing the single-layer glandular epithelium from its desmosome-related adhesion or the basal lamina, respectively.

Based on the amended cancer screening guidelines, particularly the registered gynaecologists wanted to validate this sampling device within the scope of a study and to compare it with respect to the mentioned criteria with spatula/brush. After having been authorized by the ethics commission, 40 gynaecologists (including the outpatients’ clinic of the University Gynaecological Hospital Göttingen) took part in the study. Smears were taken during the period from May to August 2006 monthly alternating with spatula/brush and PapCone; a total of 31,000 smears were involved in this study.

Results

Information supplied by the sender (%):	S/B	PC
Ectocervical bleeding	7.5	1.3
Endocervical bleeding	5.5	1.2

Evaluation: reduced patient and doctor compliance due to iatrogenic bleeding when using S/B.

	S/B	PC
Cell overlapping	4.1	2.5
Cell degeneration	1.3	0.7
Blood overlapping	3.5	0.8
Small cell quantity	49.1	41.6
Great cell quantity	4.7	8.1

Evaluation: higher rate of cell overlay/degeneration and blood areas when using S/B = limited assessability; considerably greater cell quantities when using PC = more representative smear material.

Endocervical cells (%):	S/B	PC
	71	65

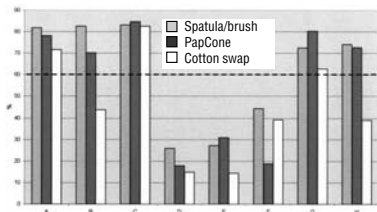
Evaluation: slightly reduced share of cervical channel cells when using PC, however "protective" value of cervical channel cell detection is not backed up.

Pap-group distribution (%):	S/B	PC
Need for repetition (II W) Doubtful (III)	2.1	2.6
Positive (Pap IIID-V)	1.0	1.1

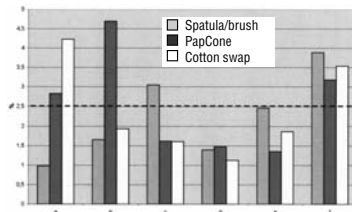
Evaluation: no fundamental difference with control smears, no different detection of (pre-)canceroses.

Individual scatter range (of sampling and smear quality depending on the sampling device):

Endocervical cells (%)

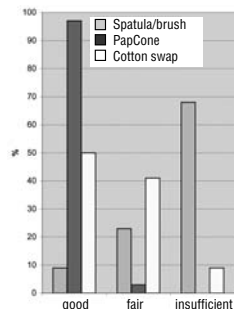


Pap II W (%) (rejected smears)

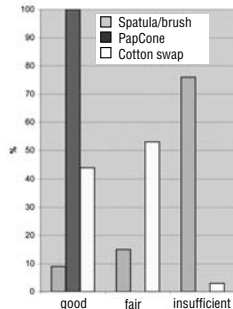


Interviewed attendants:

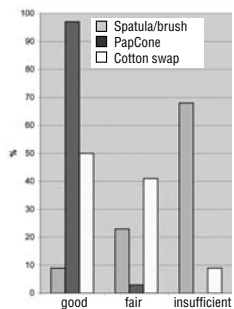
Convenience when smear is transferred



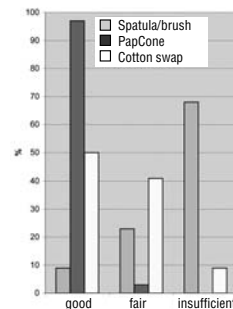
Convenience when sampling



Time needed for taking the smear



Patients' acceptance



Rating

Fundamental rejection

SB	PC	WT	S/B	PC	WT
4.7	1.5	2.5	76%	0%	3%

Discussion

The by far largest part of the participants in this study considered the combination of spatula and brush with respect to its handling/convenience to be mainly less positive in contrast to a clear preference for the PapCone. This clear vote could only remain disregarded if PapCone were inferior to spatula/brush as far as the named quality criteria are concerned.

In fact, the proportion of smears taken with “endocervical cells” is as expected about 6% less for the PapCone. Cervical glandular cells are considered usable surrogate markers for covering the transformation zone, the preferred localization of the cervical oncogenesis. On the other hand, the “protective” value of the endocervical cell detection is not sufficiently backed up in literature for single smears or is contradictory, respectively. A smear taken without having obtained cervical channel cells is not per se representative to a limited extent whereas a smear taken with cervical channel cells does not eo ipso prove that the transformation zone is covered completely.

Thus, the detection of cervical cells is mainly a statistical factor to assess a physician’s total smear quality.

The rate of IIW and III findings is certainly affected by the choice of the sampling devices.

Small cell quantities, application artefacts, cell overlays, etc. determine to a great extent the proportion of cytological findings that need control or are even doubtful. In this respect no statistically significant difference could have been found between PapCone and spatula/brush.

A sampling device that safely detects each precancerous lesion of cervix uteri and helps to show it under microscope would be considered as ideal instrument. However, even for anatomical reasons alone, such an invention cannot be realized.

However, a clear advantage would already be an increased detection rate of positive cytological findings (Pap IIID-V). Compared with the spatula and brush, PapCone has proved to be at least of equal quality.

Conclusion

Based on the large scatter range of sampling quality and smear quality obtained from the different senders, it can be documented in an impressive manner that a good sampling device is inefficient when handled carelessly by the physician. Vice versa, a partially suitable instrument may also be extremely effective when properly used. Discrediting of the cotton swab is not least the result of this problem. Spatula/brush and PapCone proved to be of equal quality with a clear preference being given to PapCone on the part of the users. In addition to the choice of suitable sampling devices, in my opinion, priority should be given to making gynaecologists positively responsive to obtaining a careful sampling and smear quality by paying tribute to individual anatomical facts, particularly if the intention is to sustainably improve the smear-related sensitivity of cytology.

As cytologists we consider it our responsibility to keep our senders informed in this respect and to train them. Quality assurance in cytology begins within the gynaecological practice.

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