



Self-sampling devices

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Self-Sampling



evalyn[®] brush



ilex
South Africa (Pty) Ltd



CuYo



ROVERS
MEDICAL
DEVICES BV



HOLOGIC[®]
The Science of Sure

QIAGEN

Benefits of self-sampling (1)

- * Opportunity to increase **cervical cancer screening coverage**

- > among non-responders in screening programs, those who are reluctant to undergo gynaecological examinations (embarrassment, discomfort, no time)

- > in low-resource settings, lacking medical services (rural areas)

- * Can decrease the burden on both clinics and women

- > less traveling to the clinic

- > no occupying of the clinician for speculum examinations

- > reduced cost: no consultation with a clinician

- > done at the women's convenience

Benefits of self-sampling (2)

- * Suitable for HPV testing, for assessing the risk of CIN2+
(sensitivity of cytology is low, specificity high)
- * Dry self-sampling device (no liquid-based storage or transport media)
-> more convenient, less expensive

Limitations of self-sampling

- * no pelvic examination, like usually done by physicians before smear taking
- * not customised to slight anatomical variation of female genital tracts (transformation zone in elderly is higher than in younger women, so more difficult to reach → unsatisfactory or inadequate samples)
- * minimum level of education in order to read and understand the manual (video)
- * traumatising/perforating mucosa of the vagina and cervix, when not following the instructions
- * anxiety to insert the device
- * Insecurity about proper use of the self-sampling test

Devices for self-sampling

Brush

Lavage

Spatula

Swab

Tampon

Devices for self-sampling: brushes (1)

Examples



Cervical brush



Cyto-Brush PLUS



Evalyn Brush



*Qiagen/Digene
cervical sampler*



Viba-Brush

Advantages

- easy to use, painless
- Flexible bristles of the brush
- safe, effective and reliable collection of (cervical and) vaginal cells
- fast collection
- dry transport via mail is feasible, dry storage
- processed like physician-taken samples
- participation higher compared to lavage device

Devices for self-sampling: brushes (2)

Limitation

- Low amount of collected cells (3x lower than Delphi lavage device)

Accuracy

- Compared to physician-taken sample, HPV testing for CIN2+
 - > overall HPV test: relative sensitivity of **0,89** (0,83-0,94) and relative specificity of **0,98** (0,97-0,99) (*Arbyn et al., 2014*)
 - > **HC2**: relative sensitivity **0,89** (0,82-0,98); relative specificity **0,97** (0,96-0,99) (*Arbyn et al., 2014*)
 - > **GP5+/6+ PCR**: relative sensitivity **0,95** (0,86-1,04); relative specificity **1,08** (0,93-1,25) (*Arbyn et al., 2014*)
 - > **Roche Cobas 4800**: relative sensitivity not <1; relative specificity not <1 (Evalyn Brush) (*Bekkers/Ketelaars*)
- Compared to other self-sampling device, CIN2+
 - > higher sensitivity than swabs (Dacron or cotton) (*Belinson et al., 2003; Szarewski et al., 2007; Gök et al., 2012b*)

Devices for self-sampling

Brush

Lavage

Spatula

Swab

Tampon

Devices for self-sampling: lavage (1)

Example



Advantages

- easy to handle, excellent user acceptance
- increased sampling surface area
- collection of a larger sample volume (fractions for various analyses)
- upper vagina and cervix

Limitations

- microscopic blood contamination
- long duration of collection (1-8h)
- disliked by some women because the liquid seemed messy and unsanitary
- dilution of the sample is necessary -> reduces sensitivity of most assays
- not convenient to sent by mail

Devices for self-sampling: lavage (2)

Accuracy

- Compared to physician-taken sample, HPV testing for CIN2+
 - > overall HPV test: relative sensitivity of **0,94** (0,85-1,03) and relative specificity of **0,95** (0,68-1,34) (*Arbyn et al., 2014*)
 - > **HC2**: relative sensitivity **0,82** (0,65-1,02); relative specificity **0,68** (0,35-1,33) (*Arbyn et al., 2014*)
 - > **GP5+/6+ PCR**: relative sensitivity **0,95** (0,85-1,06); relative specificity **1,23** (0,74-2,05) (*Arbyn et al., 2014*)
 - > **Abbott RT hrHPV**: relative sensitivity **1,00** (0,75-1,34); relative specificity **1,07** (0,65-1,78) (*Arbyn et al., 2014*)

Devices for self-sampling

Brush

Lavage

Spatula

Swab

Tampon

Devices for self-sampling: spatula (1)

Example



Qvintip

Advantages

- easy to use, painless
- fast collection (quick and simple)
- similar quality to a cervical smear collected by a gynecologist
- dry transport via mail is feasible

Limitation

- Only vaginal sample?

Devices for self-sampling: spatula (3)

Accuracy

- Compared to physician-taken sample
 - processed with PCR assay:
 - self-sample+**HC2**: agreement of 70% (kappa 0.36)
 - processed with cytology:
 - self-sample+**HC2**: agreement of 67% (kappa 0.27)

(Stenvall et al., 2007)

Devices for self-sampling

Brush

Lavage

Spatula

Swab

Tampon

Devices for self-sampling: swabs (1)

Examples



Cotton swab



Dacron swab

Advantages

- small
- easy to use
- fast collection
- processed like physician-taken samples
- cervical and vaginal cells
- transport via mail is feasible

Devices for self-sampling: swabs (2)

Limitations

- microscopic blood contamination -> may disturb HPV DNA results
- Cotton swab can miss 50% more cancers than physician sampling
- Dacron swab (wet swab): impractical because of leakage and cold chain

Accuracy

- Compared to physician-taken sample, HPV testing for CIN2+
 - > overall HPV test: relative sensitivity of **0,86** (0,80-0,92) and relative specificity of **0,95** (0,90-1,01) (*Arbyn et al., 2014*)
 - > **HC2**: relative sensitivity **0,82** (0,86-0,90); relative specificity **0,95** (0,89-1,01) (*Arbyn et al., 2014*)

Devices for self-sampling

Brush

Lavage

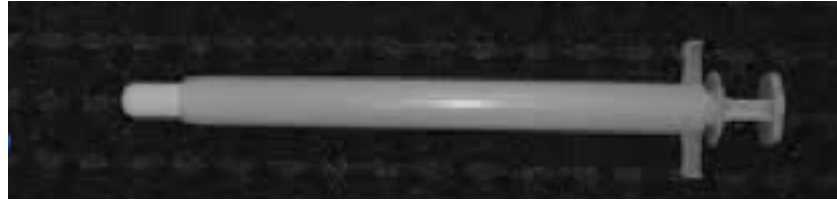
Spatula

Swab

Tampon

Devices for self-sampling: tampon (1)

Example



Fournier self-sampling device



Advantage

- Women are more familiar and comfortable with tampons than with other self-sampling devices.

Limitations

- duration of collection variable (10 sec – overnight)
- mainly collect squamous epithelial cells from the wall of the vagina together with shed cervical cells.
- toxic shock syndrome
- more extensive processing for DNA extraction (time consuming and inefficient)
- mailing not convenient

Devices for self-sampling: tampon (2)

Accuracy

- Compared to physician-taken sample, HPV testing for CIN2+
 - > sensitivity of only 60%, kappa of 0,55 (HC2)
(*Jones et al., 2007*)
 - > **HC2**: relative sensitivity of **0,71** (0,62-0,83) and relative specificity of **1,01** (1,00-1,02)
(*Arbyn et al., 2014*)

HPV test system and self-samples

Test	Number of studies (number of test-device combinations)	Relative sensitivity	Relative specificity
HC2	18	0.85 (0.81–0.90)*	0.96 (0.93–0.98)*
PCR GP5+/6+	5	0.95 (0.89–1.01)	1.11 (0.95–1.29)
CareHPV (at RLU \geq 0.5)	1	0.90 (0.79–1.04)	0.98 (0.95–1.00)
CareHPV (at RLU \geq 1)	1	0.86 (0.73–1.03)	1.00 (0.98–1.02)
PCR-SPF10	2	0.96 (0.89–1.02)	1.10 (0.85–1.41)
Abbott Real Time hrHPV Test	1	1.00 (0.75–1.34)	1.07 (0.65–1.78)
Cervista	1	0.76 (0.70–0.83)*	0.95 (0.94–0.96)*
APTIMA	1	0.64 (0.46–0.90)*	0.99 (0.98–1.01)
DNAchip	1	1.03 (0.89–1.19)	0.88 (0.55–1.42)
Modified GP5+/6+ PCR with Luminex reading	1	0.96 (0.75–1.24)	0.94 (0.67–1.33)
Linear Array	1	0.79 (0.54–1.16)	1.00 (0.89–1.12)
MALDI-TOF	1	1.00 (0.95–1.05)	0.98 (0.97–0.99)*
Other nonGP5+/6+ PCR	7	0.82 (0.66–1.01)	1.02 (0.97–1.07)

Conclusions Self-sampling

Sampling device (compared with clinician-taken samples)

- No obvious collection device effects
 - Screening with an HPV test on self-samples, to detect CIN2+:
 - > *Absolute accuracy*: pooled sensitivity of 76%, pooled specificity of 86%
 - > *Relative accuracy*: pooled sensitivity statistically significantly lower, pooled specificity 4% lower
- => HPV testing on self-samples is less sensitive than HPV testing on clinician-taken samples**

Test system: obvious test effects!

Conclusions Self-sampling

Superior clinical accuracy for samples taken by a medical professional rather than self-samples

However:

- Self-sampling can be suggested as an additional strategy to reach **women not participating in the regular screening program**
- Self-sampling can be considered in **areas lacking high-quality cytopathology labs** and in **low-resource settings**

Mind:

- adequate transport of samples
- good communication with test-positive women
- HPV test used (availability, costs, ...)
- population compliance with self-collection device
- clinical performance of the combination of self-collection device and hrHPV test

