DECENA - cervical cancer primary screening program in Vojvodina

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SUMMARY

Hc2 DNA test for detection of 13 oncogenic human papillomavirus genotypes (16/18/31/33/35/39/45/51/52/56/58/59/68) is a real partner to cytology, concerning improvement and better detection of premalignant and malignant cervical diseases. Reliable cytology combined with HPV testing is a useful parameter to gynecologists, in case of various dilemmas: questionable Pap test, follow up of patients with low-grade squamous intraepithelial lesions (LSIL) and also postoperative control of patients after the treatment of high-grade squamous intraepithelial lesions (HSIL). HPV status is important additional parameter, especially when making decision about the most adequate treatment protocols and in case of nullparae who have CIN2. In last few years, numerous studies indicate many advantages of using this molecular-diagnostic test in primary screening of cervical carcinoma. In the pilot study of DECENA (detection of cervical neoplasia) program we tested 980 women, in the period from August 2006 to April 2007. DECENA program is based on primary screening of cervical cancer. It is supported with segments of great importance: data base of examined women, data base and communication with all medical professionals included in cervical cancer screening, education of women and their partners, and public education.

Key words: *Uterine Cervical Neoplasms; Papillomavirus Infections; DNA Probes, HPV; Mass Screening; Precancerous Conditions; Cervical Intraepithelial Neoplasia*

Cervical cancer

Cervical cancer is the second common cancer among women worldwide, with almost half a million new cases each year. Almost 80% of the women affected are in the developing world. However, many of these cases could be prevented from progressing to invasive disease and potential death.

Among the east European countries with the increase of cervical cancer incidence Serbia is on the top of the list. Serbian data from year 2002 shows the standard incidence rate of 27/100 000 women, and in some regions even 41/100 000 women (Braničevo region). According to Vojvodina Register for Malignant Neoplasia we discover 280 new cases of cervical cancer in our region every year and 145 women die due to the consequences of the disease. The top place of our country on the list of all countries in Europe is related to the consequence of a longstanding increase of number of women with cervical cancer and ineffective measures that was carried out.

More than any other cancer, cervical cancer is a disease which lends itself to early detection and treatment. The effectiveness of cytology screening as a method to reduce the number of invasive cases and deaths resulting from cervical cancer in developed countries has already been demonstrated (1).

HPV infection

HPV is the most important known predisposing factor for the appearance of cancer of: cervix, vulva, anus, penis, and extragenital organs such as mouth and esophagus (2-9).The presence of some types of HPV in woman's genital system is connected with numerous diseases condiloma, Bowenoid papulosis, cervical, vaginal, and vulvar intraepithelial carcinoma. There is general acceptance that all types of sexual intercourse can be the main way in transmission of most HPV types.

Historically, HPV 16 and 18 have been regarded as high risk cancer associated HPV types. HPV types 31, 33 and 35 have been demonstrated to have an intermediate association with cancer. This intermediate association is due to the fact that these types are more frequently detected in cervical intraepithelial neoplasia CIN2 and CIN3 rather than in cancers. These five HPV types together account for about 80% of cervical cancers.

Additional high- and immediate-risk HPV DNA types, including types 39, 45, 52, 56, 58, 59 and 68, have been identified as the principal HPVs detectable in other cancers.

HPV testing in cervical cancer screening

Within the past 5 years, guidelines recognizing the value of HPV testing in both primary cervical screening and in the management of abnormal cervical cytology have been established in the US and are being considered in Europe (10-14). This trend has occurred because of the definitive association of high-risk human papillomavirus (HR HPV) with cervical cancer and the evidence that the sensitivity of HR HPV testing for neoplasia grade 2 or more severe (CIN 2+) is substantially higher than cytology testing (15,16). Higher sensitivity offers a number of advantages, including, most importantly, the potential of reducing cervical cancer rates while reducing the number of screens in a lifetime necessary to achieve this goal.

Underdeveloped and developing countries, which have the highest incidence of cervical cancer, traditionally uses Pap test and cervical visualization method using vinegar and iodine, as the most economical tests in cervical cancer screening (17). In our country, decision of using hc2 DNA test in a pilot project is recommended and is based on studies that confirm significant decrease in number of recurrent tests in woman with border Pap findings. It leads to less frequent need for Pap testing, even every 3-5 years for woman with negative HPV test, which results with significantly less costs of all cervical cancer screening (18-21).

The possibilities of new technologies in diagnostics and high incidence of cervical cancer in Vojvodina were the main reason to start the pilot program DECENA at the Oncology Institute of Vojvodina in 2006. In prescreening

phase of DECENA pilot program, we focused on how to increase efficacy of screening program.

The analysis of the possibilities for maintaining better efficiency in diagnostic of premalignant diseases shows limitations of cytology methods. In most European countries, there was noticed even more than 30% of false negative Pap test in the group of all diagnosed cervical cancer cases, and the additional 10% is due to mistakes in analyzing the atypical cytology findings (22,23). Despite of all these limitations, there is nevertheless the significant decrease in number of cervical cancer diagnosed woman, thanks to Pap test, still the "golden standard" in all traditional screening programs. After analyzing the costs of standard screening, a few national screening committees recommended:

– to decrease the frequency of screening in woman with regular cytology testing

– new cytology methods, like liquid-based cytology, for higher sensitivity

– new testing methods of HPV HR, as this virus is the main cause of cervical cancer

Principles of Hybrid Capture 2 DNA test

HPV testing along with a Pap test is emerging as the standard of prescreening and is acknowledged in clinical guidelines developed by major medical groups including the American College of Obstetricians and Gynecologists (ACOG), the American Cancer Society (ACS), the Association of Reproductive Health Professionals (ARHP), and the American Society for Colposcopy and Cervical Pathology (ASCCP) (24).

The Hybrid Capture 2 HPV DNA test using Hybrid Capture 2 technology is a nucleic acid hybridization assay with signal amplification that utilizes microplate chemiluminescent detection. Specimens containing the target DNA hybridize with a specific RNA probe cocktail. The resultant RNA: DNA hybrids are captured onto the surface of a microplate well coated with antibodies specific for RNA: DNA hybrids, and detected with a chemiluminescent substrate. Several alkaline phosphatase molecules are conjugated to each antibody. Multiple conjugated antibodies bind to each captured hybrid resulting in substantial signal amplification. As the substrate is cleaved by the bound alkaline phosphatase, light is emitted, which is measured as relative light units (RLUs) on a luminometer. The intensity of the light emitted denotes the presence or absence of target DNA in the specimen.

Hybrid Capture technology is illustrated below (Figure 1).

DECENA program

Hc2 DNA test for determination of 13 oncogenic human papillomavirus genotypes was introduced in the Oncology Institute of Vojvodina in August 2006. Another four systems for hc2 DNA test were installed in Health Centers in Senta, Sombor, Sremska Mitrovica, and Zrenjanin. Education for specialist of genetics, molecular biologists, and pathologists working on this topic was also provided.

During August 2006 to April 2007 we tested 980 women. They were included into the pilot study of the primary screening procedure. This is a first study of this kind in our country.

Criteria for inclusion in DECENA program were:

– women aged from 30 to 44 years

– women with no previous treatment of cervical cancer

(a) (b)

(c)

(d) (e)

Figure 1. Hybrid Capture technology. a) Release and denature nucleic acids, b) Hybridize RNA probe with target DNA, c) Capture RNA: DNA hybrids onto a solid phase, d) React captured hybrids with multiple antibody conjugates, e) Detect amplified chemiluminescent signal (ref. 24)

– women with no previous hysterectomy

– pregnant women

– women who gave a birth 8 weeks before

– women in assisted reproduction procedures

The main objective of DECENA pilot study was to estimate whether HPV DNA test application together with Pap test will increase sensitivity of cervical cancer primary screening.

All included patients were provided with a detailed explanation of the procedure. After giving their written consent and completing the questionnaire, the patients were examined for Pap test, vaginal discharge, and colposcopy according to decision of the gynecologist. The obtaining the results of Pap and HAPV tests the patients were treated according to institutional protocol.

High risk types of HPV are the main risk factors for development of cervical cancer. Even 10% of women with normally epithelialized cervix are HPV DNA positive, and real incidence of HPV positivity depends on age and some demographic specificity (25,26). Prospective research studies show that 15% to 28% of women with positive HPV DNA test develop squamous intraepithelial neoplasia (SIL), comparing to only 1% to 3% of women negative to HPV DNA. It

is noticed that women positive to HPV 16, 18 have much higher SIL risk, comparing with those who are positive to other HPV types (21,27). These types of studies are important because they are connected with a lot of questions related to genotyping and application of preventive vaccines in everyday practice. Molecular-microbiological methods present the best choice in diagnostics of HPV infection. The most reliable methods used for detection of various genotypes are: In Situ Hybridization, Southern Transfer Hybridization, Hybrid Capture, Dot Blot, Filter Hybridization, and Polymerase Chain Reaction (PCR). Hc2 DNA test is the only method approved by FDA (United States Food and Drug Administration).

It is necessary to emphasize the importance of good communication with women. Each woman has to be well informed about high prevalence of this infection, especially among those younger than 30 years; possibility of spontaneous elimination of virus from the body; longstanding evolution of premalignant and malignant lesions, and also that the presence of HPV infection does not mean persistence of cervical disease.

Preliminary results of our pilot study are very encouraging for continuation of our work. Obtained information is the same as we predicted: 16% of women are HR HPV positive, which is in correlation with the data from surrounding countries. HR HPV status is important in group of nullipara with cervical biopsy CIN 2 changes especially when making decision about their adequate treatment. In this group there is even 89% of positive HR HPV test (values ranged between 470 and 2020 RLU/CO).

We point out to women's very good response to the screening test, and also to the fact that they were well informed about cervical cancer and HPV. The most of them were completely informed about this subject through media, and only 8% from medical professionals. It is necessary for additional activities, which have to be inserted in our future work plans. The most important problems during realization of DECENA screening program were related to inadequate communication between health workers and women. Medical professionals should be trained how to adequately inform women about HPV infection and cervical cancer genesis. Detailed questionnaire, adapted to socio-cultural characteristics of our women, will surely enable epidemiologists, social workers, and psychologists to give us important and useful information.

New screening study (TOMBOLA group) points out another problem - a psychology problem in some women, due to the border Pap findings (28). In spite of fast treatment procedure after the positive biopsy findings, two of our patients with detected H-SIL changes, needed consultation with clinical psychologist and therapy.

Until today, there is yet no absolutely certain and reliable way to distinguish women with the high risk of developing cervical cancer. So, identifying that group of women is important, because it makes better chances for prevention and treatment.

Information of HR HPV status is of great help for clinician who makes decisions for observing or treating the patient, even though this fact also pretend to be potentially upsetting information for woman. Described molecular-diagnostic method requires laboratories with modern equipment, and well educated medical professionals.

Conclusion

The results obtained from the use of DECENA program are:

1. With this program we made possible diagnosis of premalignant lesions in women with accurate Pap test.

2. The program made possible to set up histopathological diagnosis in shorter period than it was before, without repeating Pap test

3. Giving of informative booklet about Pap test and oncogenic human papillomavirus testing is adequate tool for instigating women to involve in screening program and for hold on in procedure. Women informing is necessary tool in primary screening of cervical cancer.

4. Women answers to questions from the questionnaire (their knowledge about cervical cancer genesis, HPV vaccines) give us possibility to create further strategy in informing of women and their partners about cervical cancer prevention.

Serious analysis of medical findings and epidemiologic data will surely give us good direction for applying and using new technologies in cervical cancer prevention. It is recommended to make testing only by indications that are confirmed by clinical study, and also status of oncogenic human papillomavirus should be used only in context of other diagnostic procedures (cytology, colposcopy). Application and using of new methods in cervical cancer screening program should be well observed and controlled.

Conflict of interest

We declare no conflicts of interest.

REFERENCES

1 Cervical Cytology Screening. ACOG Practice Bulletin, vol. 45. Washington, DC: American College of Obstetricians ad Gynecologists; 2003.

2 `Lerma E, Matias-Guiu X, Lee SJ, Prat J. Squamous cell carcinoma of the vulva: study of ploidy, HPV, p53, and pRb. *Int J Gynecol Pathol* 1999;18:191-7.

3 Tilston P. Anal human papillomavirus and anal cancer. *J Clin Pathol* 1997;50:625-34.

4 Palefsky JM, Holly EA, Ralston ML, Jay N. Prevalence and risk factors for human papillomavirus infection of the anal canal in human immunodeficiency virus (HIV)-positive and HIV-negative homosexual men. *J Infect Dis* 1998;177:361-7.

5 Maden C, Sherman KJ, Beckmann AM, Hislop TG, Teh CZ, Ashley RL, et al. History of circumcision, medical conditions, and sexual activity and risk of penile cancer. *J Natl Cancer Inst* 1993;85:19-24.

6 Varma VA, Sanchez-Lanier M, Unger ER, Clark C, Tickman R, Hewan-Lowe K, et al. **Association of human papillomavirus with penile carcinoma: a study using** polymerase chain reaction and in situ hybridization. *Hum Pathol* 1991;22:908-13.

7 Cuzick J. Human papillomavirus infection of the prostate. *Cancer Surv* 1995;23:91-5.

8 Herrero R, Castellsague X, Pawlita M, Lissowska J, Kee F, Balaram P, et al. Human papillomavirus and oral cancer: the International Agency for Research on Cancer multicenter study. *J Natl Cancer Inst* 2003;95:1772-83.

9 Syrjanen KJ. HPV infections and oesophageal cancer. *J Clin Pathol* 2002;55:721-8.

10 Wright Jr TC, Cox JT, Massad LS, Twiggs LB, Wilkinson EJ, ASCCP-Sponsored Consensus Conference. 2001 Consensus guidelines for the management of women with cervical cytological abnormalities. *JAMA* 2002;287:2120-9.

11 Wright TC Jr, Schiffman M, Solomon D, Cox JT, Garcia F, Goldie S, et al. Interim guidance for the use of human papillomavirus DNA testing as an adjunct to cervical cytology for screening. *Obstet Gynecol* 2004;103:304-9.

12 Cuzick J, Clavel C, Petry KU, Meijer CJ, Hoyer H, Ratnam S, et al. Overview of the European and North American studies on HPV testing in primary cervical cancer screening. *Int J Cancer* 2006;119:1095-101.

13 Cuzick J, Szarewski A, Cubie H, Hulman G, Kitchener H, Luesley D, et al. Management of women who test positive for high-risk types of human papillomavirus: the HART study. *Obstet Gynecol* 2004;103:797-8.

14 von Knebel Doeberitz M. New markers for cervical dysplasia to visualize the genomic chaos created by aberrant oncogenic papillomavirus infections. *Eur J Cancer* 2002;38:2229-42.

15 Mayrand MH, Duarte-Franco E, Coutlee F, Rodriques I, Walter SD, Ratnam S, et al. Randomized controlled trial of human papillomavirus testing versus Pap cytology in the primary screening for cervical cancer precursors: design, methods and preliminary accrual results of the Canadian cervical cancer screening trial (CCCaST). *Int J Cancer* 2006;119:615-23.

16 Sasieni PD, Cuzick J, Lynch-Farmery E. Estimating the efficacy of screening by auditing smear histories of women with and without cervical cancer. *Br J Cancer* 1996;73:1001-5.

17 International Agency for research on Cancer. Cervix cancer screening. IARC handbook of cancer prevention. Lyon: IARC; 2005.

18 Clifford GM, Smith JS, Plummer M, Munoz N, Franceschi S. Human papillomavirus types in invasive cervical cancer worldwide: a metaanalysis. *Br J Cancer* 2003;88:63-73.

19 Franceschi S, Clifford GM. Re: A study of the impact of adding HPV types to cervical cancer screening and triage tests. *J Natl Cancer Inst* 2005;97:938-9.

20 Castle PE, Schiffman M, Burk R, Wacholder S, Hildesheim A, Herrero R, et al. Restricted cross-reactivity of Hybrid Capture 2 with nononcogenic human papillomavirus types. *Cancer Epidemiol Biomarkers Prev* 2002;11:1394-9.

21 Khan MJ, Castle PE, Lorincz AT, Wacholder S, Sherman M, Scott DR, et al. The elevated 10-year risk of cervical precancer and cancer in women with human papillomavirus (HPV) type 16 or 18 and the possible utility of type-specific HPV testing in clinical practice. *J Natl Cancer Inst* 2005;97:1072-9.

22 Arbyn M, Buntinx F, Van Ranst M, Paraskevaidis E, Martin-Hirsch P, Dillner J. Virologic versus cytologic triage of women with equivocal Pap smears: a metaanalysis of the accuracy to detect high-grade intraepithelial neoplasia. *J Natl Cancer Inst* 2004;96:280-93.

23 Davies P, Arbyn M, Dillner J, Kitchener HC, Meijer C, Ronco G, et al. A report on the current status of European research on the use of human papillomavirus testing for primary cervical cancer screening. *Int J Cancer* 2006;118:791-6.

24 DML 2000 version 4. 02 Manual hc2 high-risk HPV DNAtest Digene Corporation; 2006.

25 Schiffman M, Khan MJ, Solomon D, Herrero R, Wacholder S, Hildesheim A, et al. A study of the impact of adding HPV types to cervical cancer screening and triage tests. *J Natl Cancer Inst* 2005;97:147-50.

26 Castle PE, Solomon D, Schiffman M, Wheeler CM. Human papillomavirus type 16 infections and 2-year absolute risk of cervical precancer in women with equivocal or mild cytologic abnormalities. *J Natl Cancer Inst* 2005;97:1066-71.

27 Bulk S, Berkhof J, Bulkmans NW, Zielinski GD, Rozendaal L, van Kemenade FJ, et al. Preferential risk of HPV16 for squamous cell carcinoma and of HPV18 for adenocarcinoma of the cervix compared to women with normal cytology in The Netherlands. *Br J Cancer* 2006;94:171-5.

28 Gray NM, Sharp L, Cotton SC, Masson LF, Little J, Walker LG, et al on behalf of the TOMBOLA group. Psychological effects of a low-grade bnormal cervical smear test result: anxiety and associated factors. *Br J Cancer* 2006;94:1253-62.