Dominant position of colorectal cancer in Slovakia: The old-new problem for cancer control

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The development of colorectal cancer in former Czechoslovakia and its successor states is illustrated using recorded mortality and from 1968 incidence rates retrieved from National Cancer Registry of Slovakia. The relatively high mortality rates in Czechoslovakia around 1950 contrasted with rates seen in other countries of central, southern and particularly of eastern Europe and were more close to those recorded in affluent countries of western Europe and northern America. Despite continuous stabilisation and decrease of this cancer in high risk countries from late 1970s the unexpected and gradual rise of incidence rates of colorectal cancer was recorded in Slovakia. During the period studied incidence rates rose by an annual mean percent change of 4,2 and 2,8 in colon and 2,2 and 1,0 in rectal cancer in males and females respectively. Beginning with the year 1995 colorectal cancer is the most common cancer in this country in both genders together. Study of the development of colorectal cancer at the level of subsites indicated the higher rates but decreasing proportion of rectal cancer and increasing proportion of cases occurring in proximal colon. The importance of this new priority in diagnostics, treatment and control programmes is stressed.

Key words: Colorectal cancer, Incidence and mortality trends, subsite distribution

The first international surveys of cancer mortality rates and trends in postwar period, around 1950 indicated the high rates of colorectal (mainly of colon) cancer in the affluent countries of northern America and Oceania and the low rates in poorer countries [1]. There were great differences in Europe, high mortality rates in western and central, moderate in northern and low rates in eastern Europe [1, 2]. It is of interest to note, that the only exception in eastern Europe displayed in that time period relatively high rates of colon and rectum cancer mortality in former Czechoslovakia in men and women. Also the overall cancer mortality rates as well as of main cancer sites in Czechoslovakia were similar to those seen in western Europe [3].

Further development of colorectal cancer mortality and incidence rates indicated very different evolution of this cancer site in various countries and regions of Europe and world. The rapid rise of incidence and mortality rates was observed in high risk countries but followed between 1970s to the mid 1990s by peaking, stabilisation and even their decline in both sexes [4]. On the other hand in the low risk countries these rates were increasing [4, 5]. Generally the rates of colorectal cancers were approaching each other [4].

The only unique and unusual exception to this general evolution is former Czechoslovakia, where mortality rates were high and rising in both sexes in all ages group and in the restricted 35-69 age range [4]. It seems therefore interesting to follow the persisting and gradual increase of incidence and mortality rates of colorectal cancer at the level of sites and subsites in Czechoslovakia and its succeeding states using the data from Slovakia.

Material and methods

For the study of time trends of incidence the data on the new cases of colon and rectum cancers occurring between

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1968 and 2001 in residents of Slovakia (as well as of lung and stomach cancer used for the indication of changing priorities during the given period) were retrieved from National Cancer Registry of Slovakia. A total of 60.550. incident cases of colorectal cancer were notified and registered in Slovakia between 1968-2001. From this number 30.466 patients had colon cancer (16 140 in men and 14 326 in women) and 30 084 patients rectal cancer (17 751 in men and 12 333 in women).

The main sites and subsites as well as morphology of cancers in the given registry were defined and coded according to the 1st Edition of International Classification of Diseases for Oncology (ICD-O-1) [6] during the period 1968- 1996, and by the codes of the 2nd Edition of ICD-O [7] for the remaining part of the period under study. Data on mortality from cancer were coded using 9th revision of International Classification of Diseases .(ICD-9) [8] till 1996 and of ICD-10 [9] for the following years. With regard to the similarity of the codes for colon and rectum in both classifications we had no problems to assess the comparability and continuity of data. The corresponding recorded numbers of deaths and the age structure of the population in the studied years were obtained from the Statistical Office of Slovak Republic and from Institute of Health Information and Statistics. During analysis and the presentation of results incidence data were converted to ICD-O-1 and those of mortality to ICD-9.

Our study is completed with the analysis of the development of the structure of individual subsites of colorectal cancer. From clinical and epidemiological point of view in many recent papers the individual subsites are distinguished and grouped [10, 11, 12]. From these reasons three colorectal subsites were evaluated in our study. The first combined subsite – the proximal or right colon consisted of cecum, ascending colon, hepatic flexure, transverse colon and splenic flexure. In the second group – distal or left colon- the descending and sigmoid colon were included and the third combined group consisted from rectal, rectosigmoid junction and anus cancers.. Excluded from analysis of the changes in subsite distribution were overlapping lesions, multiple sites and cancers of the appendix. With regard to the lower level of data in the period 1968-1977 showing great number of cases registered as unspecified [NOS] subsite and overlapping regions the analysis of subsite distribution of colon and rectal cancer was confined to the 8 three years periods from 1978 to 2001.

The incidence and mortality rates were age-adjusted using the world standard population as common denominator (13). Temporal trends in incidence and mortality rates were evaluated using the Poisson regression (14, 15). In this regression it is assumed that the observed numbers of cases have the Poisson distribution, The relation of standardised rates (R) and the calendar year (Y) is supposed in the following way:

$R = \exp(a + b(Y - 1968))$.

Parameters a, b in the model are estimated by the maximum likelihood method using Epicure software, model Amfit (16). The mean annual percent change (MAPC) is given by

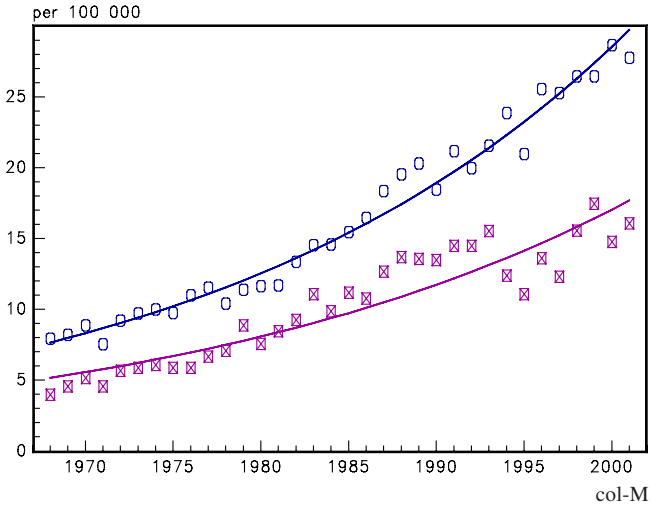

Figure 1. Trends in age-adjusted incidence (□) and mortality (⊠) rates of colon cancer in men , Slovakia , 1968-2001.

MACP= 100 (exp (b) – 1) and exp (a) is rate expected by the model in 1968.

Results

In the Table 1 the changing frequency of the cancer cases of the main sites is illustrated. As could be seen from this table the largest proportion of incident cases in both sexes altogether in the mid 1970s (as well as in previous years) had stomach cancer, later in the mid 1980s lung cancer, influenced by dramatic increase and extremely high annual number of incident cases and deaths from this site in males. Beginning with the year 1995 the leading and steadily increasing proportion attained the cases of colorectal cancer accounting for more than 13% of cancers in both sexes.

The evolution of overall age-adjusted incidence and mortality rates of colon cancer in males is indicated in Fig. 1 and in females in Fig.2. As could be seen from these figures both incidence and mortality rates of colon cancer displayed increasing trends with nearly double values of mean annual percent change [MAPC] in comparison with rectal cancer. Lower levels of MAPC of mortality as well as increasing distance between incidence and mortality rates in the second half of the studied period indicate the relatively good and improving prognosis of

Table 1. Changing numbers and proportions (%) of incidence of main cancer sites in Slovakia in both sexes together during recent decades

Year	Stomach		Lung		Colorectum	
	Abs. numbers	%	Abs. numbers	%	Abs. numbers	%
1968	2 251	18.2	1 459	11.8	989	7.8
1983	1 380	8.6	2 416	15.3	1 605	10.2
1998	1 061	4.9	2 307	10.7	2 758	12.8
2001	923	4.3	2 128	9.8	2 837	13.1

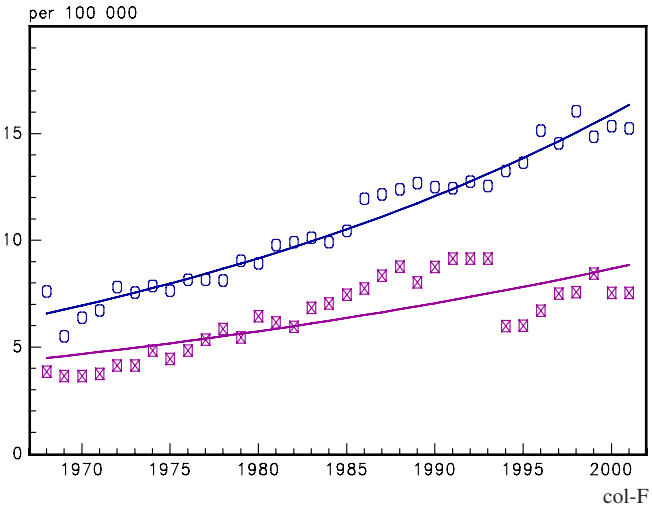

Figure 2. Trends in age-adjusted incidence (□) and mortality (☒) rates of colon cancer in women, Slovakia 1968-2001.

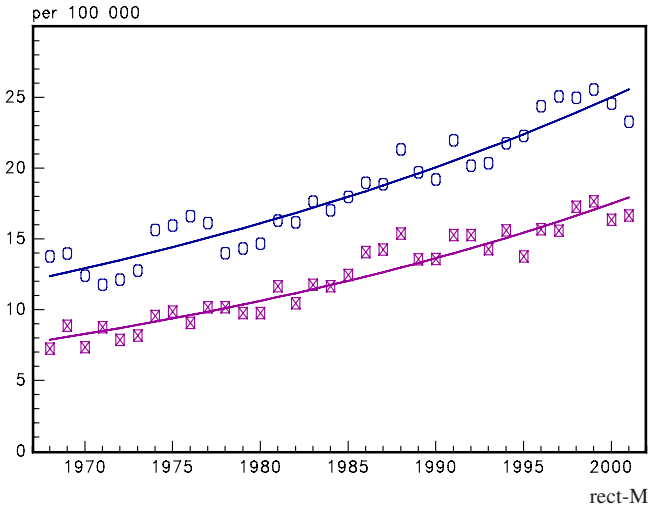

Figure 3. Trends in age-adjusted incidence (□) and mortality (☒) rates of rectal cancer in men, Slovakia, 1968-2001.

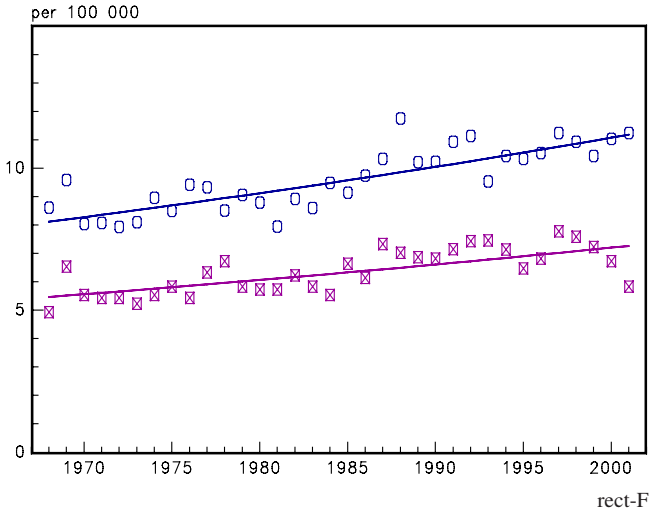

Figure 4. Trends in age adjusted incidence (□) and mortality (☒) rates of rectal cancer in women, Slovakia, 1968-2001.

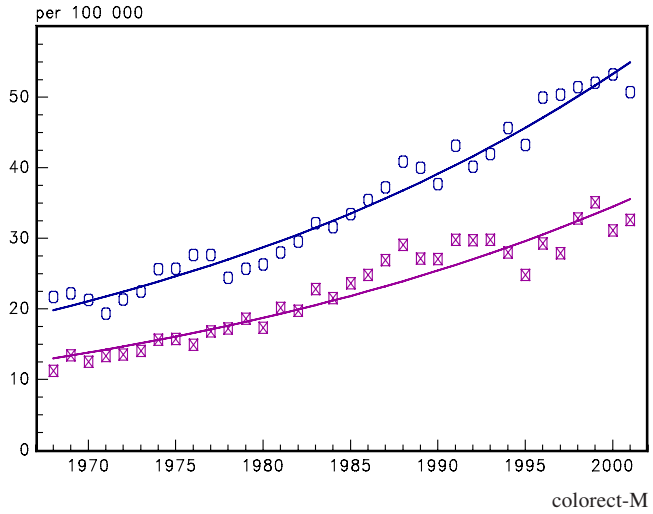

Figure 5. Trends in age-adjusted incidence (□) and mortality (☒) rates of colorectal cancer in men, Slovakia, 1968-2001.

this cancer site in Slovakia. On the other hand nearly parallel trends of incidence and mortality of rectal cancer in men (Fig. 3) and particularly in women shown in Fig. 4, as well as nearly similar MAPC of both indicators (Table 2) does not show some progress obtained in treatment and diagnostics of rectal cancer. The trends of incidence and mortality rates of these both sites combined, with increasing distance between both rates shown in Fig. 5 and 6 for males and females respectively are obviously positively influenced by the corresponding mortality rates of colon cancer. It is evident that colon and rectal cancer incidence and mortality rates as well as the corresponding trends of both indicators for colorectal cancer showed during this period steady increase without tendency to the peaking and stabilization. The estimated parameters of the Poisson regression and the mean annual percent changes [MACP] for incidence and mortality rates together with 95% confidence intervals are presented in the Table 2.

The distribution of colorectal cancer among men by groups of subsites and three years period of diagnosis is given in the Table 3. for men and Table 4. for women. Among men the proportion of right sided colon cancer was 18,5 % during the first three years period 1978-1980 and increased to 29.3 % in the last period studied (1999-2001). The percentage of men with left sided colon cancer increased from 18,8 % in the first period to 25,3% in the last period studied. In the same time period the percentage of unspecified cases decreased from

6,2 to 3,7 %. Among women the proportion of right sided colon cancer increased from 20,4 % in the first three years period to 27,5% in the last one, while left sided colon cancers increased from 20,4 to 23,9% in corresponding time period. The proportion of unspecified colorectal cancers decreased from 8,5 to 6,1%. In the same time the decrease of rectal cancer could be confirmed from 56,5 to 41,7 % in men and from 50,7 to 42,7% in women. The evolution of age adjusted incidence rates of colorectal cancer by anatomical subsites in men are shown in Fig. 7 for men and in Fig.8 for women. While the rectal cancer shows gradual increase in men, the tendency for peaking and stabilisation could be seen in women. Increasing trends are seen for left and right sided colon cancers with prevailing rates of right colon cancers in both sexes during the last four three years periods of study.

Discussion

Colorectal cancer is the forth most common site of cancer which occurs worldwide in both sexes and the second in developed and affluent countries. 943 000 new cases and 510 000 death from this cancer site were registered yearly around the year 2000 [5]. But during the last two decades of the previous century there have been in highly developed countries either peaking, stabilisation or even decrease in incidence, mainly in younger age-groups. On the other hand there have been more or less rapid increase in incidence in developing countries [4, 5]. As mentioned above data on mortality from the mid of previous century indicated that colon cancer was a rare disease also in the majority of countries of Central, Eastern and Southern Europe [2]. The only exception presented the relatively high rates of colon and rectal cancer in former Czechoslovakia. Analyses of long lasting incidence and mortality trends of colorectal cancer in former Czechoslovakia and later in Czech Republic and Slovakia indicated, despite high initial rates of both indicator their steadily increase during recent decades, overshadowed partially by rapidly increasing and persisting high rates of lung cancer in men. Also the overall tendency for rates of incidence of rectal cancer to be high or low in areas similar to those for colon cancer is not valid for the countries forming former Czechoslovakia [4]. In European cancer registry regions the highest rates of rectal cancer incidence has been reported

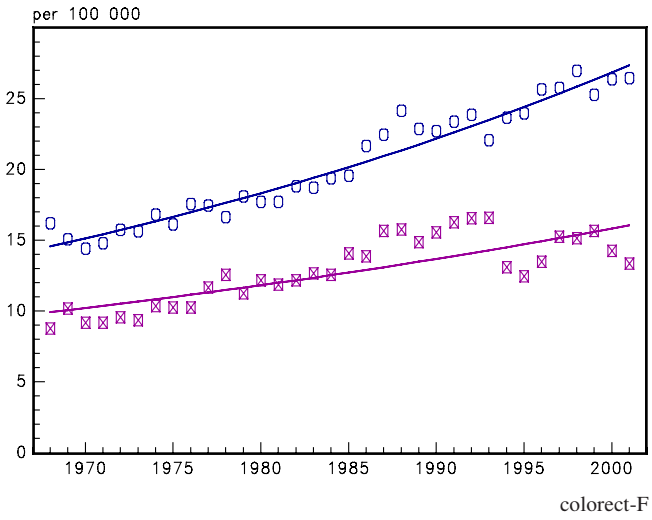

Figure 6. Trends in age-adjusted incidence (□) and mortality (☒) rates of colorectal cancer in women, Slovakia, 1968-2001.

Table 2. Estimated parameters (a,b) of the Poisson regression and the MAPC for incidence (I) and mortality (M) data in the period 1968-2001

	Incidence/ Mortality	a	b	MAPC	95% CI
	males				
colon	I	2.036	0.0411	4.2	4.0 – 4.4
	M	1.642	0.0373	3.8	3.6 – 4.0
rectum	I	2.515	0.0220	2.2	2.1 – 2.4
	M	2.065	0.0249	2.5	2.3 – 2.7
colorectum	I	2.987	0.0309	3.1	3.0 – 3.3
	M	2.565	0.0305	3.1	3.0 – 3.2
	females				
colon	I	1.883	0.0276	2.8	2.6 – 3.0
	M	1.500	0.0206	2.1	1.9 – 2.3
rectum	I	2.094	0.0097	1.0	0.8 – 1.2
	M	1.699	0.0086	0.9	0.6 – 1.1
colorectum	I	2.679	0.0191	1.9	1.8 – 2.1
	M	2.294	0.0146	1.5	1.3 – 1.6

MAPC = mean annual percent change, 95% CI = 95% confidence interval

Table 3. Distribution of the combined subsites of colon and rectum cancers in different three years periods between 1978-2001 in males

Time period	Proximal colon		Distal colon		Rectum		Colorectum NOS	
	Abs. nos.	%	Abs. nos.	%	Abs.nos.	%	Abs. nos.	%
1978-1980	383	18,5	389	18,8	1169	56,5	129	6,2
1981-1983	490	20,0	449	18,3	1398	57,1	114	4,6
1984-1986	625	21.8	590	20,6	1559	54,5	88	3,1
1987-1989	794	23,4	755	22,4	1745	51,6	87	2,6
1990-1992	831	23,6	748	21,3	1802	51,2	138	3,9
1993-1995	967	24,9	835	21,6	1943	50,1	131	3,4
1996-1998	1078	23,8	1005	22,2	2260	49,8	193	4,2
1999-2001	1412	29,3	1218	25,3	2008	41,7	177	3,7

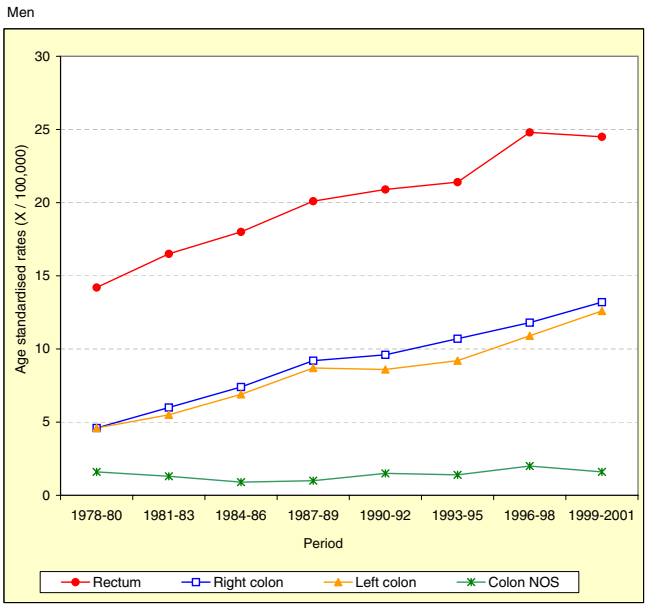

Figure 7. Trends in age-adjusted incidence rates for colorectal carcinoma subsites diagnosed in eight tree-years periods between 1968 and 2001 in men.

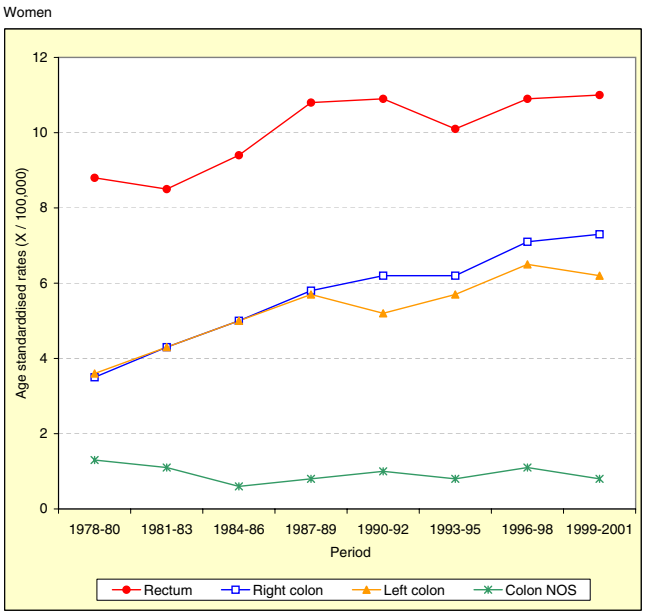

Figure 8. Trends in age-adjusted incidence rates for colorectal carcinoma subsites diagnosed in eight tree-years periods between 1968 and 2001 in women.

in Czech men and Slovak women while the incidence rates of colon cancer were intermediate in both genders in Czech Republic and Slovakia (4, 17, 18). Moreover the birth cohort examinations indicate an increase in incidence rates in successive birth cohorts and therefore the possibility of gradual increase of colorectal cancer also in future years [4]. The favourable evolution of incidence and mortality trends of colon cancer in both sexes corresponds to the increasing 5 years survival of the last decade of previous century. On the other hand the survival of patients with rectal cancer remained low also when compared with the survival rates in other four eastern European countries [19]. The gap between high rates of incidence and mortality of colon and rectal cancer in western Slovakia and extremely low rates in eastern part of this country seen in the period 1975-1984 diminished in recent two decades in relation with the decrease of stomach cancer in eastern regions of Slovakia [20].

This unexpected, unique but interesting evolution of the trends of colorectal cancer in Slovakia and Czech Republic indicates the changing priority in the orientation of cancer control program. Primary prevention oriented mainly to the change of diet, in reducing the intake of calories and of animal fats, including red meat and increasing consumption of fresh fruits and vegetables as well as the increase of physical activity is of greatest importance but connected with the complete changes of life style and particularly of dietary habits. It could present some results only after relatively long period. Therefore of actual importance is the introduction of well organized screening program with adequate equipment, funding and resources together with introduction of optimal and rapid treatment of ascertained cases. Screening program based on fecal occult blood testing (FOBT) and subsequent colonoscopy of positive FOBT cases was introduced in Slovakia in 2002. Despite its premature introduction, without adequate educa-

Table 4. Distribution of the combined subsites of colon and rectum cancers in different three years periods between 1978-2001 in females

Time period	Proximal colon		Distal colon		Rectum		Colorectum NOS	
	Abs. nos.	%	Abs. nos.	%	Abs. nos,	%	Abs. nos.	%
1978-1980	363	20,4	362	20,4	902	50,7	151	8,5
1981-1983	475	23,9	434	21,8	938	47,2	141	7,1
1984-1986	570	25,2	544	24,0	1053	46,5	97	4,3
1987-1989	705	26,2	615	22,8	1252	46,5	120	4,5
1990-1992	751	26,8	602	21,5	1309	46,7	143	5,0
1993-1995	812	27,7	678	23,1	1299	44,3	144	4,9
1996-1998	941	27,7	793	23,1	1400	44,3	183	4,9
1999-2001	954	27,5	828	23,9	1472	42,5	213	6,1

tion of the public as well as insufficient financial and personal resources the program was successful in confined numbers of participants. The positive evaluation of results of this program especially in demonstrating the better survival of patients with early stages connected with lower price of their treatment as well as prevention of this disease by the resection of adenomatous polyps containing severe dysplasia or intramucosal carcinoma may stimulate the local health policy makers and insurance companies to support this program in future years [21] Of particular importance is also adequate treatment and follow–up of former patients because of better prognosis and consequently of high prevalence of this disease.

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