

Changing Trends in the Incidence of Laryngeal Cancer

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The incidence of laryngeal cancer during the period 1962–1991 in the Tampere University Hospital area, with a population of 400 000, was evaluated. There were 302 (95%) male and 16 (5%) female patients. The mean annual age-adjusted incidence rate was 4.4 per 100 000 inhabitants for males and 0.2 for females. The incidence among males decreased significantly from 6.7 to 2.6 over the study period, the most prominent decline being in the age group 40–49 years. No distinct trend was detected in females. The frequency of the disease increased along with age in both sexes. One of the prominent phenomena was a distinct increase of the glottic to supraglottic incidence ratio from 0.5:1 to 1.9:1 in males.

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Laryngeal cancer is one of the most common malignant neoplasms of the head and neck. In Finland, it comes second after lip cancer, accounting for approximately 1.3% of all new cases of cancer in males and 0.2% in females (1). The incidence of the disease varies widely in different countries, and increasing trends have been found in many previous studies (2–8). The most important risk factors are (heavy) smoking and high alcohol consumption (2, 9). Squamous cell carcinoma is by far the most common histological finding, comprising some 95% of laryngeal cancers (9).

For clinical purposes, the larynx is divided into three anatomical regions: the supraglottis, the glottis and the subglottis. Subglottic tumours are rare, comprising only a few per cent of all laryngeal malignancies. Nowadays, glottic carcinoma forms the majority in most materials, while some earlier studies indicate supraglottic dominance (2, 10–14). Tumours arising from different regions of the larynx probably have different risk factors and show considerable difference in clinical behaviour and prognosis (2, 9, 15).

The accuracy of incidence studies requires that the recording of the patients covers all cases from a certain population in a given period. In Finland, all cases of cancer have been reported to the Finnish Cancer Registry since 1953. This results in a reliable nationwide data bank of all cancers. Furthermore, diagnostics and treatment of malignancies are highly centralized to bigger hospitals. So,

it is possible to perform accurate epidemiological studies on cancer diseases in this country.

We have reviewed records of all patients with laryngeal carcinoma treated in the Tampere University Hospital area during a period of 30 years, from 1962 to 1991. Because of the highly centralized health care system, practically all cases of laryngeal malignancy in this region, covering a population of approximately 400 000, are diagnosed and treated in our hospital. The aim of this study is to evaluate the changing trends in the incidence of laryngeal cancer, with special reference to the site distribution inside the larynx.

MATERIALS AND METHODS

The basic data collection was accomplished by reviewing the files of Tampere University Hospital, which were then supplemented by data recorded in the Finnish Cancer Registry. During the study period, altogether 318 patients with laryngeal carcinoma were diagnosed. Case histories of 309 patients were available in the hospital files and all of them were also reported to the cancer registry. Information of nine cases diagnosed in the 1960s was found only in the cancer registry. These patients were either treated elsewhere or the records were lost from the files of our hospital. The diagnosis was confirmed in all cases by histological examination. In the nine cases from which only cancer registry data were available, the localization inside the larynx and the extent of the tumour were not known. These cases were excluded from the respective analyses.

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For annual incidence estimations, the denominator was the population at the end of each year, derived from the official annual files of the Central Statistical Office of Finland. In incidence rates for periods of several years, the mean population of corresponding period was used. To allow for the change in the age distribution of the population during the study period and to enable adequate comparisons, the incidence rates were adjusted for age according to the world standard population by the direct method. To smooth out the reasonably heavy annual fluctuation, 5-year moving average incidences were used in the time trend figures. The statistical analyses were carried out by SPSS for Windows statistical software release 5.0.1. using the t-test to analyze differences in means and Spearman's rank correlation coefficient to verify incidence trends over time. p -value < 0.05 was accepted as statistically significant.

RESULTS

The number of male patients was 302 (95%) and that of females 16 (5%). The mean age of men at the time of diagnosis was 62.8 (range 20–87) years and that of women 60.8 (range 20–78) years. This difference was not significant. In 312 cases (98.1%) the histological finding was squamous cell carcinoma. Four verrucous carcinomas, one pseudosarcomatous and one adenosquamous carcinoma were found. Of the 309 evaluable patients with information in our hospital files, 129 (41.7%) had a supraglottic, 170 (55%) a glottic and 10 (3.2%) a subglottic tumour.

In males, the annual age-adjusted incidence rate of laryngeal cancer varied between 1.9 (95% CI 0.2–3.5) and 11.3 (95% CI 6.6–15.9), the mean value being 4.4 cases per 100 000 inhabitants. The rate of females was between 0 and 0.9 (95% CI 0.0–2.1), mean 0.2. Although the annual incidence among males showed a marked fluctuation, there was a significant ($p = 0.001$) decrease over the study period. The highest 5-year average incidence was 6.7 (95% CI 5.2–8.3) in 1967–1971 and the lowest was 2.6 (95% CI 1.7–3.4) in 1987–1991 (Fig. 1). In females, no trend was found in the incidence rates. However, due to the decrease of occurrence in men, the male to female incidence ratio

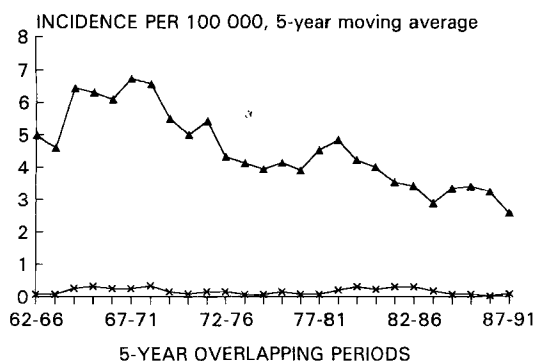


Fig. 1. Annual age-adjusted incidence rates of laryngeal cancer by sex. $\blacktriangle$ males; $\times$ females.

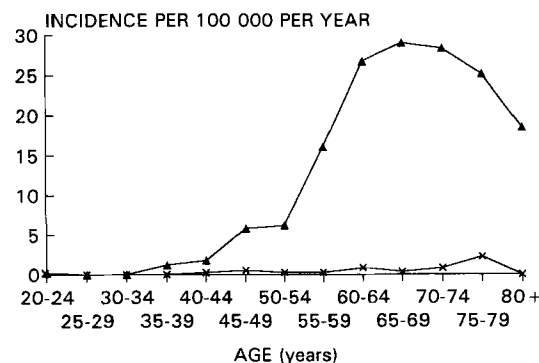


Fig. 2. Age-specific incidence of laryngeal cancer by sex. $\blacktriangle$ males; $\times$ females.

showed a marked decrement from 36.7:1 in 1962–1971 to 18.3:1 in 1982–1991.

The occurrence of the disease increased with age in both sexes, and the age specific incidence was higher among males than females in all age groups older than 35 years (Fig. 2). Only one male and one female patient were younger than 35 years (both 20 years) at the time of diagnosis. The peak incidence was in the age group 65–69 years in males and 75–79 years in females (Fig. 2). A descending tendency in the age-specific incidences was found in all age groups except in those older than 80 years. The most prominent decrease from 7.7 (95% CI 4.0–11.4) to 0.7 (95% CI 0.0–1.9) cases per 100 000 person-years between the first and the last 10-year period occurred among males aged 40–49 years (Table). This phenomenon was mainly due to the decrease of the supraglottic cases.

The overall incidence ratio of glottic to supraglottic tumours was 1.3:1 in men and 1.7:1 in women. In males, the proportion of glottic tumours was higher in all age groups except in the 40–49 year group (Fig. 3). Fig. 3. also shows that the highest incidence of glottic tumours was in the age group 75–79 years, while that of supraglottic tumours was in the age group 65–69 years. The site-specific incidence rates for males indicate that the decrease of occurrence was largely due to the significant ($p < 0.001$) diminishing of supraglottic cases (Fig. 4). The frequency of

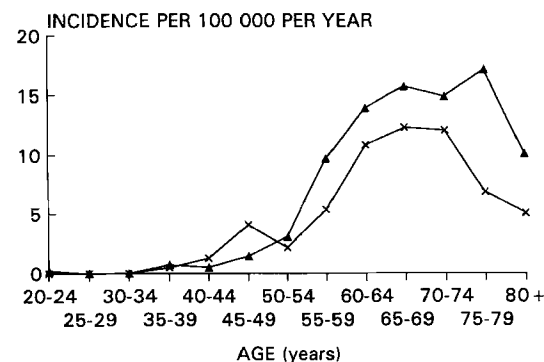


Fig. 3. Age-specific incidence of laryngeal cancer by tumour site in males. $\blacktriangle$ glottic; $\times$ supraglottic.

Table
Age-specific incidence rates* of laryngeal cancer for males by site and time period

Site	Years	Age group (years)							Total† (95%CI)
		20-29	30-39	40-49	50-59	60-69	70-79	80+	
Glottic	62-71	0.3	0.0	0.9	7.1	17.0	17.6	7.5	2.6 (1.9-3.3)
	72-81	0.0	0.7	1.7	6.4	13.3	18.0	10.8	2.4 (1.8-3.1)
	82-91	0.0	0.3	0.3	5.4	13.5	11.1	9.7	1.9 (1.4-2.5)
Supraglottic	62-71	0.0	0.8	6.4	5.0	15.6	10.6	0.0	2.7 (2.0-3.4)
	72-81	0.0	0.0	1.7	3.4	12.1	14.4	5.4	1.8 (1.3-2.4)
	82-91	0.0	0.0	0.3	2.7	7.0	5.0	6.5	1.0 (0.6-1.4)
All sites	62-71	0.3	0.8	7.7	14.1	36.0	31.7	7.5	5.9 (4.8-7.0)
	72-81	0.0	0.7	3.4	9.8	26.0	32.4	26.9	4.4 (3.6-5.3)
	82-91	0.0	0.3	0.7	8.9	21.1	17.1	16.2	3.1 (2.4-3.8)

* per 100 000 males per year

† age-adjusted incidence

glottic tumours was highest in 1968, and a significant ($p = 0.024$) decrease happened also in the incidence of glottic cancer after that year. In the first 5-year period 1962-1966, the glottic to supraglottic incidence ratio for males was 0.5:1, and had increased to 1.9:1 in 1987-1991. Due to the small number of female patients, the site distribution could not be evaluated among them. The mean age of the patients with glottic tumour was 63.3 and with supraglottic cancer 61.8 years. This difference was not significant.

DISCUSSION

Increasing incidences of laryngeal cancer have been observed in many countries and mostly in both sexes (2-8). Finland is the only western country with clearly declining occurrence in recent years, though in the 1960s our incidence figures for men were more than three times higher compared with other Scandinavian countries (8, 11). Since the Finnish Cancer Registry was established, the age-adjusted annual incidence rate of laryngeal cancer in males seemed to rise from 5.6 cases per 100 000 in 1953 so that the highest figure of 7.6 was found in 1968. However, it is

possible that in the early years both diagnostics and the recording of cancer cases were not enough accurate, and so some cases might have been missed. The most striking incidence decrease—from 7.4 to 5.2 cases per 100 000 person-years—occurred during the years 1970-1974. Thereafter, this favourable decline has slowed down, the annual age-adjusted incidence rate of 1993 was 2.8 (Finnish Cancer Registry 1995). In other words, the age-adjusted incidence of laryngeal cancer among males has diminished by 63% in 25 years. In females, the occurrence has remained unchanged over the 40-year period 1953-1993, the mean annual age-adjusted incidence rate being 0.3 cases per 100 000. In our material from Tampere University Hospital, the trend is parallel with the nation-wide figures, although the incidence numbers are somewhat lower.

All published studies indicate a pronounced male predominance among laryngeal cancer patients. However, according to recent reports from Canada (3), Denmark (5), England (7) and the United States (16), the incidence is rising faster in women, but, in our hospital material and in Finland as a whole, the female incidence has remained unchanged, whereas among males a prominent decrease has taken place. On the other hand, the relative frequencies of laryngeal cancer according to the localization inside the larynx reveal that the occurrence of glottic tumours did not differ much between Sweden and Finland in the 1950s and early 1960s (11). Hence, the considerably higher incidence in Finland seemed to be mainly due to the higher number of supraglottic cases. However, reliable information about the site distribution is not available for the whole country because it is unfortunately not systematically recorded in the Finnish Cancer Registry. The finding that two-thirds of the cancer cases were supraglottic in Finland was based on material from Helsinki University Central Hospital (10, 12). In a newer Finnish material from the period 1980-1990, the proportion of glottic cases

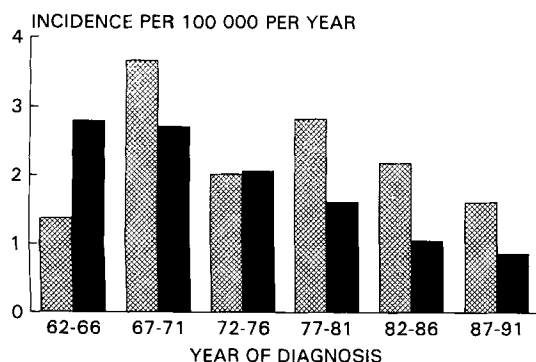


Fig. 4. Age-adjusted incidence of laryngeal cancer by tumour site and 5-year period in males. ▨ glottic; ■ supraglottic.

was 60% (14). Thus, there seems to have been a distinct alteration in the glottic to supraglottic ratio along with time in Finland. Also in our material, two-thirds of the Laryngeal tumours in males were supraglottic in the first 5-year period 1962–1966 and thereafter the glottic to supraglottic ratio has gradually reversed (Fig. 4).

The relative frequency of supraglottic cancer has often been found to be higher in females (2, 15, 17, 18). This is not in agreement with our finding, but the number of our female patients is so low that any definite conclusions cannot be drawn. Nor could we confirm the findings in several previous reports that women are affected earlier in life than men (2, 10, 17). In parallel with previous studies (19, 20), most tumours (98%) were squamous cell carcinomas and the histological distribution remained unchanged during the study period.

In our material, the mean age of patients with supraglottic tumour was somewhat lower than that of patients with glottic lesion. However, the difference was not significant. Among men aged 40–49 years, the occurrence of supraglottic cancer was higher than that of the glottic disease. In addition, the peak incidence for glottic cancer in males occurred in older patients than that for supraglottic cases. This is in agreement with findings of some earlier reports indicating that supraglottic tumours occur more frequently among younger age-groups (10, 17).

Smoking and high alcohol consumption are generally accepted as the major risk factors of laryngeal cancer (2, 9). Also the tobacco quality seems to have some influence (13, 21). Occupational, environmental and dietary factors may also play some role in the etiology of cancer of the larynx (2, 22, 23). Although the total tobacco consumption in Finland increased until the early 1970s (24), the percentage of daily smokers among Finnish males has decreased from 58 to 37 during the period of 1960–1981 while smoking among females has slightly increased (25). In addition, the carcinogenicity of cigarettes has most probably diminished. The total alcohol consumption was low (2–3 l of 100% alcohol per inhabitant) until in the late 1960s, but after that about 3-fold increase has taken place (24). Thus, changes in smoking habits are the most obvious explanation for the favourable trend in the incidence of laryngeal cancer among males in Finland. This is in line with the fact that pulmonary cancer—which is also strongly tobacco related—has shown similar occurrence trend in our country.

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