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CARCINOMA OF THE TONGUE IN NORWAY AND WISCONSIN

I. Incidence and prognosis related to sex and age

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The results of treatment for carcinoma of the tongue have been analysed for a group of 503 patients admitted to The Norwegian Radium Hospital (NRH) and to the University of Wisconsin Hospitals, Division of Radiation Oncology (UW), during the years 1958 to 1972. The purpose was to compare the incidence and the influence of sex and age on the prognosis in the two hospitals.

According to The Cancer Registry of Norway (1975), 482 patients with tongue carcinoma were reported during a 15-year period from 1953 to 1967 among a total of 114 113 cases of malignant tumors at all sites. The incidence of tongue carcinoma was, therefore, 0.4 per cent of all reported malignant cases. During the same interval 3 592 patients with carcinoma of the buccal cavity and pharynx were reported. Included in the latter group were 2 436 patients with carcinoma of the lip, salivary glands and oropharynx. When these are excluded, 1 156 patients remained with carcinoma of the oral cavity proper. Thus, carcinoma of the tongue constituted 42 per cent of all malignancies of the oral cavity.

The total number of cases reported to the Cancer Registry of Norway (1973) has increased from 27 in 1958 to 42 in 1972.

Tongue carcinoma in males increased from 18 to 26 in a year and in females from 9 to 16 a year. The absolute 5-year survival rates were reported to be 27 per cent for males and 32 per cent for females, whereas the relative 5-year survival rates were 34 and 42 per cent, respectively. Essentially no change occurred in the survival rates over the 15-year period 1953 to 1967 (The Cancer Registry of Norway 1975).

In the United States, according to the Third National Cancer Survey covering the years 1969 to 1971, 1 236 patients with carcinoma of the tongue were reported among a total of 181 027 patients with malignant tumors of all sites (CUTLER & YOUNG 1975). The incidence of lingual carcinoma accounted for 0.7 per cent of all reported malignant tumors. During the same period 6 531 patients with carcinoma of the buccal cavity and pharynx were reported, but included in the latter group were 3 606 patients with carcinoma of the lip, salivary glands and pharynx. When these are excluded, a total of 2 925 patients with carcinoma of the oral cavity proper remained. Carcinoma of the tongue constituted therefore 42 per cent of all malignancies of the oral cavity.

According to the Vital Statistics Reports (1960–1972), an annual average of 6 774 deaths from various forms of malignant tumors occurred in Wisconsin during the period 1960 to 1972.

During the same period an annual average of 138 patients died from carcinoma of the buccal cavity and pharynx (2%).

The Public Health Department of Wisconsin

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(1980) reported an annual average of 44 patients with carcinoma of the tongue during the years 1958 to 1968, and an annual crude death rate of 1.2 per 100000.

The American Cancer Society has estimated that in 1980 approximately 4800 new cases with tongue carcinoma will be diagnosed in the United States (Cancer Statistics 1980).

Material

During the period 1958 to 1972 a total of 339 patients with infiltrating squamous cell carcinoma of the tongue were admitted to NRH, averaging 23 patients per year. During the same 15 years 533 cases of tongue carcinoma were reported to The Cancer Registry of Norway, averaging 35 patients a year. Thus, about 66 per cent of all patients with tongue carcinoma were admitted to NRH from a population which averaged approximately 3.7 million.

Four of these patients received no treatment because the tumor was too advanced or the patients were too old and feeble (3 were classified T4N2 and one was 91 years old). All died within 5 months. They were nevertheless included in the survival statistics. Patients with the diagnosis of carcinoma in situ, or carcinoma incipiens, were excluded. Excluded were also 11 patients with tumors of salivary gland origin, located in the base of the tongue. In 306 patients the infiltrating squamous cell carcinoma originated in the anterior two-thirds of the tongue (AT tumors) whereas in 33 patients the carcinoma was located in the posterior one-third or base of the tongue (BT tumors).

At UW 147 patients with infiltrating squamous cell carcinoma of the tongue were treated during the period 1958 to 1968, averaging 13 patients per year. They represented about 36 per cent of all patients with tongue carcinoma in Wisconsin, which has a population similar in size and age distribution to that of Norway. Added to this group were 17 patients treated during the years 1968 to 1972 under the supervision of the senior author, because they received essentially the same dosage with similar techniques. Excluded were 2 patients with tumors originating in the small salivary glands of the base of the tongue and one with lymphosarcoma. The total group consisted therefore of 164 patients with 131 patients having AT tumors and 33 having BT tumors. All these patients were given radiation therapy, although some received only an abbreviated course because of rapidly advancing cachexia. Patients, who because of medical or other reasons did not receive the entire treatment course planned for them, were nevertheless included in the analysis.

Table 1

Sex distribution

	Norwegian Radium Hospital	University of Wisconsin	Total
Males	205	110	315
Females	134 (40%)	54 (33%)	188
Total	339	164	503
Ratio	1.5	2.0	

Table 2

Age distribution

	Norwegian Radium Hospital		University of Wisconsin	
	Median	Range	Median	Range
Males	68	31–93	68	27–90
Females	70	27–92	61	24–88

A predominance of males was noted in both hospitals, but slightly fewer women were encountered in the UW series (Table 1). The median age was the same for males, but for females it was 9 years lower at UW than at NRH (Table 2). The median duration of symptoms before diagnosis was about the same in both institutions: At UW 6 months for both males and females and at NRH the corresponding figures were 4 and 5 months. No difference could be detected in the clinical evolution of the disease.

Relatively fewer primary BT tumors were encountered at NRH (33/337=10%) than at UW (33/129=26%). BT tumors were less frequent in women in both institutions (only 6% at NRH as compared with 18% at UW) than in men (12% at NRH and 29% at UW; Table 2).

More tumors in early stages were encountered at NRH as evidenced by the number of T1T2N0 cases diagnosed: NRH 160/339 (47%) as compared with UW 27/164 (16%; Table 3).

The difference in the number of recurrent cases admitted after treatment at another hospital, was also striking: at NRH only 2/339 (0.6%) as compared with UW 25/164 (21%; Table 3).

Table 3

Distribution of clinical stages among men and women

	Norwegian Radium Hospital					University of Wisconsin				
	Men	Women	Total	Ratio	Per cent women	Men	Women	Total	Ratio	Per cent women
Ant. 2/3										
T1N0	45	49	94	0.9	52	7	5	12	1.4	42
T2N0	37	24	61	1.5	39	8	4	12	2.0	33
T3N0	25	11	36	2.3	31	14	5	19	2.8	26
T4N0	1	1	2	1		4	2	6	2	33
N1	48	26	74	1.8	35	14	12	26	1.2	46
N2N3	22	13	35	1.7	37	16	5	21	3.2	24
M1	1	1	2	1		0	0	0		
Base										
T1N0	3	0	3			2	0	2		
T2N0	2	0	2			1	0	1		
T3N0	7	1	8	7		4	1	5	4	
T4N0	2	0	2			0	0			
N1	5	6	11	0.8		7	2	9	3.5	
N2N3	6	1	7	6		11	3	14	3.7	
M1	0	0				1	1	2	1	
Recurrent	1	1	2	1		21	14	35	1.5	
	205	134	339	1.5	40	110	54	164	2.0	33
Summary										
Total										
Ant. 2/3	179	125	304	1.5	41	63	33	96	1.9	34
Base	25	8	33	3.1	24	26	7	33	3.8	21
Per cent base	12	6	10			29	18	25		

More women than men came to treatment with tumors in an earlier stage at NRH than at UW. Thus, the number of T1T2T0 tumors encountered at NRH among women was 73 of 134 (55%) as compared with 87 of 205 (42%) among men.

No similar difference was observed at UW where the incidence of T1T2N0 tumors was low in both sexes (17% in women, 16% in men).

Distribution of different clinical stages within various age groups. The earlier stages were most frequently found among the younger patients (Table 4). Considering the patients with AT carcinoma, 13 of the 16 patients under the age of 40 had T1T2N0 tumors (81%), as compared with 22 of the 39 patients aged 40 to 49 (56%).

The proportion of early tumors dropped even lower in patients over 50 years of age. In these age groups only 144 of 345 tumors were in T1T2N0 category (42%). Early BT tumors were rare with only 8 of 66 (12%) falling into the T1T2N0 category. Recurrent tumors were often advanced with 24 of 37 having metastases to nodes in the neck or distant sites (65%).

Methods

At NRH the less advanced tumors (T1T2N0) were routinely treated under local anesthesia with interstitial radium needle implantation followed usually 6 to 8 weeks later by partial glossectomy under general anesthesia. The radium available consisted of 5 mg and 10 mg needles with an active length of 1 to 4 cm, filtered by 0.5 mm or 0.6 mm of platinum. They were inserted in a single plane which covered the area of visible and palpable infiltration. The 5 mg needles were usually allowed to remain in position for 48 hours, and the 10 mg needles for 24 hours. The advantage of this method was its simplicity of application and short duration. The patients could be discharged back to their homes after only a few days of hospitalization. Since it required limited

Table 4

Distribution of clinical stages among patients in different age groups

	T1N0	T2N0	T3N0	T4N0	N1	N2N3	M1	Total	Per cent T1T2N0
Ant. 2/3									
<40 years	10	3	0	0	3	0	0	16	13/16 =81%
40–49	12	10	1	0	12	4	0	39	22/39 =56%
50–59	19	12	10	1	21	9	0	72	31/72 =43%
60–69	28	13	19	1	25	12	0	98	41/98 =42%
70–79	27	21	15	3	27	19	1	113	48/113=42%
>80	10	14	10	3	12	12	1	62	24/62 =39%
Total	106	73	55	8	100	56	2	400	179/400=45%
Base									
<40	0	0	0	0	1	0	0	1	0/1
40–49	0	0	0	0	6	3	1	10	0/10
50–59	2	0	4	0	2	5	0	13	2/13
60–69	2	2	3	1	4	8	0	20	4/20
70–79	0	1	4	1	5	4	1	16	1/16
>80	1	0	2	0	2	1	0	6	1/6
Total	5	3	13	2	20	21	2	66	8/66 =12%
Recurrent									
<40	0	1	0	0	0	1	0	2	1/2
40–49	0	0	0	0	1	3	0	4	0/4
50–59	0	0	0	1	1	4	1	7	0/7
60–69	0	1	1	1	0	6	0	9	1/9
70–79	0	2	1	0	2	2	0	7	2/7
>80	1	2	2	0	1	1	1	8	3/8
Total	1	6	4	2	5	17	2	37	7/37 =19%
Grand total	112	82	72	12	125	94	6	503	194/503=39%

resources, it proved to be a very economical method. Detailed dosimetry was not performed for the individual patient, and templates were not used. However, estimated dose at 0.5 cm distance from the center of the plane was frequently approximately 8000 R. Eighteen early cases with superficial tumors were treated with intraoral cone roentgen therapy.

The more advanced tumors (T3T4N1N2,3) were treated with a variety of external beam irradiation. A radium teletherapy unit was used during the first year, but was replaced by a 31 MeV Betatron in 1959 for photon therapy. A ^{137}Cs unit was used in some patients for treatment of metastatic lymph nodes in the neck. In 1965 ^{60}Co gamma rays became available and were used alternatively with an 18 MeV photon beam. In 1967 an electron beam of varying energy was introduced. Since 1971 a 7 MeV linear accelerator was employed for photon therapy. The dosages varied as follows: NRH 24 to 66 Gy (median 48 Gy), estimated median 1670 ret, UW 12.6 to 71 Gy (median 60 Gy), estimated median 1750 ret.

The treatments were usually given with a daily dose of 2 Gy at UW and with daily fractions varying from 2 to 4 Gy at NRH.

Bleomycin became an adjuvant to irradiation in 1969 and was also applied as the sole treatment without success in 5 patients with advanced tumors (median survival 3 months).

When the primary tumor appeared to be controlled, radical neck dissection was the operation of choice for patients with metastatic mobile lymph nodes in the neck. Only 14 hemiglossectomies were performed.

At UW the less advanced tumors (T1T2N0) were

commonly treated with low intensity radium needles according to the Manchester method (MEREDITH 1958).

The active length of the needles varied between 3 cm and 4.5 cm with 0.66 or 0.33 mg radium per cm. Double planes were often used and the dose calculated to the center midway between the 2 planes, which were separated by a distance varying between 1 and 2 cm. The Paterson-Parker tables were used in all cases. The dose rate was commonly 1 000 R per 24 hours and the total dose approximately 7 000 R. Templates were used whenever possible to insure proper positioning of the needles. Partial or hemiglossectomy was performed only infrequently and only upon clinically possible local recurrence. The advanced tumors were commonly treated with a combination of external and interstitial irradiation. The external radiation was administered either with a one-million volt roentgen therapy machine or with ^{60}Co gamma rays to the primary tumor and the lymph nodes in the neck, followed by an interstitial radium implant into the primary tongue tumor. The dosages were frequently 50 Gy given in daily doses of 2 Gy with the external beam and 20 to 40 Gy of interstitial radiation.

5-fluorouracil was introduced as an adjuvant to radiation therapy in 1961, first as preliminary tests, later in a controlled clinical trial (ANSFIELD et coll. 1970, GOLLIN et coll. 1972).

Radical neck dissection was the operation of choice for mobile neck node metastases in patients with local control of the primary tumor.

Statistical methods. Patients who died of intercurrent diseases with signs of residual tumor, were recorded as dead of carcinoma of the tongue. At NRH only one patient was lost to follow-up when she moved out of the country. She has been treated for a T1N0 AT tumor, and was free of recurrence on the last follow-up examination 28 months after the treatment. At UW all the patients were followed for a minimum of 5 years or to their demise. Patients who died of secondary primary tumors were recorded as dead of intercurrent disease.

The observation times from diagnosis until death or withdrawal, were grouped in one-year cohorts, up to a total observation time of 10 years. When calculating the absolute cumulative survival, no discrimination as to the cause of death was made, while the relative cumulative survival was based on counting only patients registered as dying from malignant tumor as deceased, while deaths from intercurrent disease were counted as patients withdrawn from observation.

The one-year cohorts in the life table were also used when comparing 2 groups of patients by the log-rank test. This was a modification of the method of PETO et coll. (1977) allowing for equal ranking of patients belonging to the same cohort. This method evaluates the expected number of deaths in each group, which are then compared with the observed number through a chi-square test giving the level of significance. The probability that the difference should be due to chance is expressed as the p-value. A p-value of less than 0.05 is accepted as statistically significant. By a multivariate regression analysis the observed survival is corrected for skewness with respect to selection. Skewness is measured as the difference between the observed numbers of patients with a certain diagnostic parameter value in a specific subgroup, and the total population.

Results

Survival as a function of sex. The survival of men and women was analysed separately according to different stages and locations and compared at the 2 institutions. No significant differences could be found (Table 5). The pooled data showed a 3 and 6 per cent difference in the 5-year and 10-year survival in favor of women, but these differences were not statistically significant either ($p=0.3$; Fig. 1).

The corrections obtained from the multivariate analysis of absolute and relative survivals at 5 and 10 years led to no substantial change in the values. The age distribution of the men favored them slightly when compared with the women, but this led to a difference of only between 2 and 3 per cent in the survival. This contribution was nearly exactly cancelled by the fact that the women had a more favorable staging on the average.

Survival as a function of age. The survival decreased with advancing age. This difference was apparent, not only in comparing the absolute survival, but also in the relative survival. Even after subtracting the patients who died of intercurrent diseases, the difference persisted for certain groups (Table 6, Fig. 2). A preponderance of less extensive tumors was observed among younger patients with correspondingly better survival.

By multivariate analysis it was found that the observed survival deviations of the young and the old patient groups from the average survival in Fig.

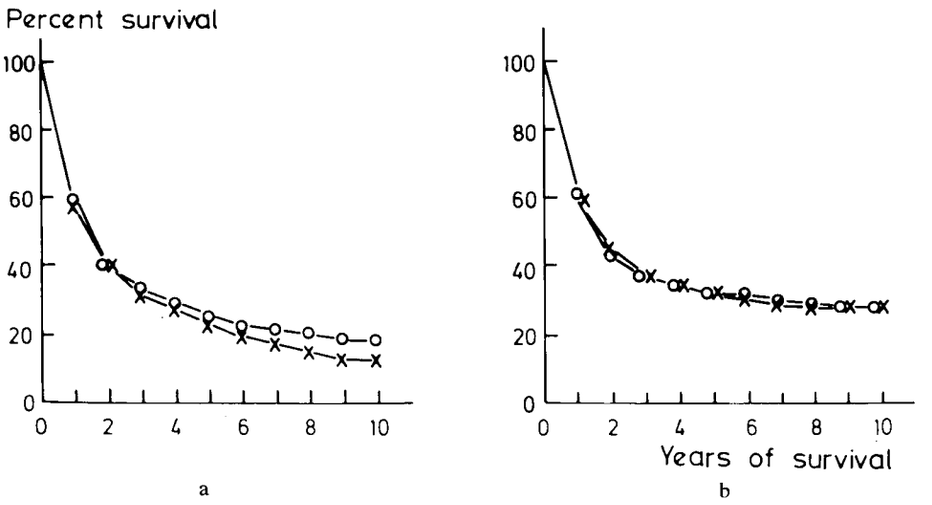

Fig. 1. Survival as a function of sex of 315 men (×) and 188 women (○) with squamous cell carcinoma of tongue. a) Absolute survival. p=0.3. b) Relative survival. p=0.9.

Table 5

Probabilities of significance of differences between survival of men and women with different stages of carcinoma of the tongue (log-rank method)

	Absolute survival (per cent±SD)				p	Relative survival (per cent±SD)				p
	Men		Women			Men		Women		
	5 years	10 years	5 years	10 years		5 years	10 years	5 years	10 years	
T1N0	56±7	41±7	48±7	36±7	0.5	77±6	65±8	61±7	48±8	0.1
T2N0	40±7	19±6	29±9	23±9	0.6	50±8	35±10	37±10	37±10	0.6
T3N0	15±6	6±4	31±12	25±11	0.3	24±7	24±7	37±12	37±12	0.5
T4N0	20±11	0	33±27	33±27	0.7	60±22	60±22	33±27	33±27	0.6
N1	13±4	9±4	15±6	9±5	0.9	19±15	19±5	21±7	21±7	0.6
N2N3	5±4	0	0	0	1.0	6±4	0	0	0	1.0
M1	0	0	0	0		0	0	0	0	
Base	20±6	8±4	27±11	0	0.9	29±7	23±7	36±13	12±14	1.0
Recurrent	9±6	9±6	0	0	0.4	9±6	0	9±6	0	0.4
Total	24±2	13±2	27±3	19±3	0.3	33±3	28±3	34±4	29±4	0.9

2 were more marked than they otherwise would appear due to the fact that the young patients had a more favorable staging. This contribution, however, was only between 15 and 20 per cent of the total effect. Differences in the sex distribution gave only negligible contributions.

Discussion

Incidence. The annual incidence of carcinoma of the tongue has been shown to be relatively lower in Norway, 0.4 per cent of all registered cases with malignant tumors (The Cancer Registry of Norway 1972, 1973, 1975) than in the United States, 0.7 per cent (CUTLER & YOUNG).

In certain American hospitals the incidence has been reported even higher: At the Tumor Registry of the University of Pennsylvania Hospital in Philadelphia the annual incidence was 1.6 per cent (WHITEHURST & DROULIAS 1977) and at the Memorial Hospital in New York City the figure was as high as 4.8 per cent (PACK & LEFEVRE 1930). These data may reflect a skewed referral pattern and may, therefore, not be directly comparable to those published by cancer registries.

Expressed as the crude annual incidence rates,

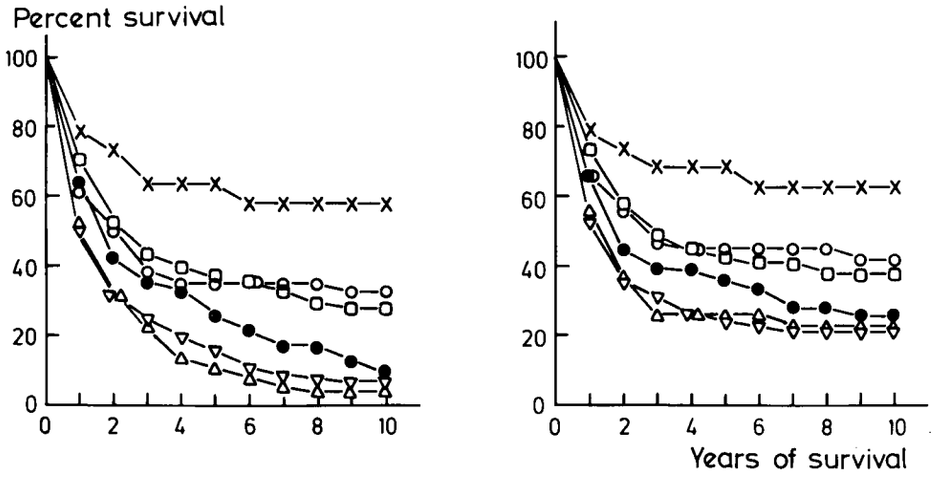

Fig. 2. Survival as a function of age. All cases (n=503). <40 years (×, n=19), 40–49 (○, n=52), 50–59 (□, n=93), 60–69 (●, n=127), 70–79 (▽, n=136) and > 80 years (△, n=76). a) Absolute survival, b) Relative survival.

Table 6

Probability of significance of differences between survival of various age groups

Age	40–49	50–59	60–69	70–79	<80
Absolute survival					
<40	0.04	0.02	<0.00001	<0.00001	<0.00001
40–49		0.9	0.02	0.0006	0.0004
50–59			0.005	0.00001	0.00001
60–69				0.02	0.007
70–79					0.5
Relative (determinate) survival					
<40	0.11	0.09	0.008	0.002	0.003
40–49		0.9	0.09	0.01	0.03
50–59			0.07	0.0008	0.005
60–69				0.06	0.13
70–79					0.9

the figures for males in Norway have varied from 1.3 to 1.5 per 100000 between 1958 and 1972 (The Cancer Registry of Norway 1972), wereas the figure of 2.8 per 100000 was reported in the Third National Cancer Survey from the United States (CUTLER & YOUNG). Still higher incidence rates were reported from the Connecticut State Registry (3.3 per 100000 males; SHEDD et coll. 1968) and from Puerto Rico (3.9 per 100000 males; MARCIAL 1959).

For females the average annual incidence was lower in these reports, varying from 0.6 per 100000 females in Connecticut (SHEDD et coll. 1968) to 1.2 per 100000 females in the Third National Cancer Survey (CUTLER & YOUNG) and 1.5 per 100000 in Puerto Rico (MARCIAL).

In Norway the crude annual incidence has varied from 0.5 to 1.1 per 100000 females between the years 1958 and 1972, and is, thus, similar to the incidence in the United States (CUTLER & YOUNG, The Cancer Registry of Norway 1972). In Norway the age adjusted annual incidence rates varied between 0.7 and 1.4 per 100000 males and 0.6 and 0.8 per 100000 females (The Cancer Registry of Norway 1972).

Carcinoma of the tongue is the most frequent type of carcinoma within the oral cavity, varying from 21 per cent at Roswell Park Memorial Hospital in Buffalo (MARCHETTA & MATTICK 1956) to 50 per cent at Massachusetts General Hospital and Huntington Memorial Hospital in Boston (SIMMONS 1930).

In Norway carcinoma of the tongue constituted 42 per cent of all oral tumors, a figure that is identical to that published in the Third National Cancer Survey of the United States (CUTLER & YOUNG).

Sex. According to most reports carcinoma of the tongue is more frequent in men than in women, but the relative frequency varies in different countries.

JACOBSSON (1948) noted that in the Nordic countries women accounted for a larger percentage of all patients with tongue carcinoma than in southern Europe.

BERG (1881) had even noted a preponderance of women in a series of 21 patients with tongue tumor in Stockholm, Sweden.

ELBRØND et coll. (1973) reported a series of 94

patients with carcinoma of the tongue from Denmark with 54 women (57%) which is the highest recorded incidence of women in the literature reviewed.

MUSTAKALLIO (1948) recorded a 49 per cent incidence of women in a series of 202 patients with tongue tumors in Finland, whereas JACOBSSON found that 45 per cent of his 277 patients with tongue tumors from Sweden were women.

These figures are in sharp contrast to those reported from southern Europe. Thus EHRLICH (1909) found only one woman in his series of 64 patients from Austria; SEBILEAU (1932) from France reported 5 per cent women; SCHINZ & ZUPPINGER (1937) from Switzerland 7 per cent; and SIMEONI (1934) from Italy 10 per cent. These data may be derived from selected materials in different hospitals and may not be comparable to data from cancer registries.

Reports from the United States indicate that the incidence figures of women with tongue carcinoma fall in between these extremes. Thus, MARTIN et coll. (1940) reported 13 per cent women among 556 patients with tongue carcinoma at Memorial Hospital in New York; SHEDD et coll. (1968) found 17 per cent women among 973 patients with tongue tumor reported to the Connecticut Cancer Registry. More recent reports from Memorial Hospital indicate an increasing percentage of women. STRONG (1979) found that, whereas the percentage of women was only 13 per cent in the period 1927 to 1934, it had increased to 26 per cent during the period 1957 to 1963. SPIRO & STRONG (1971) who reported on a selected group of 185 operable patients with epidermoid carcinoma of the mobile tongue, found that 40 per cent (73 patients) were women.

In India where oral carcinoma is a major problem, 20 per cent of the patients with tongue tumor were women (PAYMASTER & SHROFF 1957).

The present series shows that among 339 patients with tongue carcinoma treated at NRH, 40 per cent were women, whereas among the 164 patients treated at UW, 33 per cent were women.

CADE & LEE (1957) reported a striking change in the sex ratio among patients with tongue tumor in England. Over a 25-year period the ratio of males/females decreased from 10 : 1 to 2 : 1. A steady fall in the death rate from carcinoma of the tongue was noted, but only among men. A similar change in the sex ratio has been observed by RUSSELL (1955), and with oral carcinoma by BHANSALI (1961). In Canada, ASH (1962) reported a decrease in the male/female ratio from 4 : 1 to 2 : 1 during the last decade of a period which extended from 1929 to 1958. He ascribed this change to improved oral hygiene in males, reduction in the habits of tobacco chewing, and alcohol consumption, and a lower incidence of syphilis. STRONG who observed a decrease in the male/female ratio from about 8 : 1 to about 4 : 1 over a 36-year period, explained this change as due to an altered life style among women with increasing alcohol and tobacco usage. WHITAKER et coll. (1972) also observed in the University of Pennsylvania Hospital a steadily decreasing male/female difference among their patients with tongue tumor and believed that this change was a result of increasingly similar habits in relation to known carcinogenic factors such as persistent oral sepsis, and the use of alcohol and tobacco.

FLAMENT (1964) could find no apparent decrease in the sex ratio in the recent years in his series of 904 cases of tongue carcinoma in France. He reported only 13 per cent women, quite consistent with the low incidence of women reported earlier by SEBILEAU.

Neither is there a change in the sex ratio when comparing the present series from NRH with a previous series covering the period 1932 to 1957 (ALSOS 1960). There were 558 patients with tongue carcinoma admitted during that period and 218 of these were women (39%), a percentage almost indentical to that observed in the present material from NRH, covering the years 1958 to 1972.

A difference is also found in the male/female ratio depending on the localization of the tumor within the tongue. RUSSELL (1954) found that there were relatively fewer women with BT carcinoma. In her series of 673 cases from the Christie Hospital and Holt Radium Institute, Manchester, England, 522 patients had AT carcinoma: among them were 100 women (18%). For comparison, among 151 patients with tumors of the posterior third only 13 were women (9%).

UHLMANN & WEINER (1960) observed even larger differences. In a group of 27 patients with tumors located to the anterior third, 19 were women (37%), as compared with a group of 29 patients with tumors of the middle third with 6 women (21%), and finally in a group of 30 patients with tumors of the posterior third of the tongue only 2 were women (7%).

Similar figures have been published by FLAMENT: in his group of 94 patients treated at the Gustave-

Roussy Hospital in France, the ratio of male to female patients increased from 1.7 for tumors at the tip to 4.6 for tumors at the borders and dorsal surface, and finally 13.4 for tumors at the ventral surface and the base of the tongue.

The present series shows a similar male preponderance for location of BT tumors: among the 33 patients a NRH with BT tumors 8 were women (24%). The corresponding figure for UW was 7 women among 33 patients (21%). The percentage of females was higher for AT tumors (41% at NRH, 34% at UW).

Sex and survival. Several authors have reported that women with carcinoma of the tongue survive longer than men. However, the statistical significance of the differences observed have been tested only in a few series and found to be significant for certain groups and stages of the disease (RUSSELL 1954, CADE & LEE, SHEDD et coll. 1968).

Other authors have reported that a statistical difference could not be attached to the differences observed because of the small numbers of patients treated (SCANLON et coll. 1969, FU et coll. 1976). FLAMENT commented that sex had no prognostic value by itself, and that the reason for the better survival of women in certain series was that they had proportionately fewer BT tumors, and that they also presented for treatment with a larger number of tumors in an earlier clinical stage. This was also demonstrated in the present series from NRH. EDERER & MOSS (1961) and PERZIK et coll. (1958) also stated that the prognosis among women was better because they presented themselves with tumors in an earlier stage. RUSSELL (1954) observed that men were more susceptible to neck node metastases. The difference in survival in favor of women was significant only for patients with tongue tumor without neck node metastases. SHEDD et coll. (1968) found that the difference in survival in favor of women was significant for patients who were only irradiated, but it was not significant for other groups of patients with tongue carcinoma treated with surgery alone or with a combination of surgery and radiation therapy.

Several authors have presented survival data which indicate no difference in prognosis in men and women. Thus, BLUMBERG et coll. (1979) who reported on 42 men and 20 women with BT carcinoma treated in San Francisco, found no significant difference in prognosis with respect to sex. Similar conclusions were reached by SPIRO & STRONG and by WHITEHURST & DROULIAS who reported on AT carcinoma. No sex difference in prognosis was reported by LANGDON & RAPIDIS (1979).

The present series included more women than men with earlier tumors at NRH (55% women with T1T2N0 tumors as compared with only 42% men). At UW the percentage of patients with T1T2N0 tumors was much lower and about the same in the two sexes (17% women, 16% men).

The relative survival was identical in men and women, and a slight difference in the absolute survival was not significant. Therefore, the large surplus of women with earlier stage tumors at NRH did not sufficiently influence the survival.

Age and survival. The median or mean age of patients with carcinoma of the tongue has frequently been reported to be between 50 and 70 years. In India this tumor appears to develop at an earlier age. Thus, PAYMASTER & SHROFF reported the highest incidence between 40 and 45 years of age.

SHEDD et coll. (1968) observed that the incidence of tongue carcinoma increased steadily with age for both sexes. A similar increase is also evident in Norway: The Cancer Registry of Norway (1978) reported that for the year 1955 the age specific rate for carcinoma of the tongue among men in the age group 45 to 50 years was 1.5 per 100000, but increased to 9.6 per 100000 for those over 80 years.

RUSSELL (1954) observed that women developed tongue carcinoma earlier than men. UHLMANN & WEINER stated that with few exceptions, most authors agreed that tongue carcinoma develops in men at a more advanced age than in women, the difference in the mean age is between 2 and 10 years. MARCIAL reported that in his series of 439 cases, the maximum age frequency was from 60 to 64 years in men and from 50 to 54 years in women. CADE & LEE found a smaller difference in the average age between men and women and ASH and JACOBSSON found no difference at all in the average age or the age distribution of men and women.

In the present series, the median age of women from UW was 61 as compared with 68 for men, but at NRH the median age was about the same, 70 for women and 68 for men.

Many authors (MARTIN et coll., JACOBSSON, GIBBEL et coll. 1949, BERVEN 1950, ELKINS 1952, WAWRO & BABCOCK 1958, RAFLA 1968, SPIRO & STRONG, FU et coll., WHITEHURST & DROULIAS) have reported better survival among the younger patients.

The present series confirms these observations both with regard to the absolute and the relative survival. Therefore, the lower survival among elderly patients is not simply due to increased death rate from intercurrent diseases, but also from carcinoma of the tongue. This may be due to more advanced clinical stages among elderly patients and less radical treatment due to poorer tolerance. FLAMENT found fewer patients with advanced tumors among younger patients. GIBBEL et coll. observed a smooth curve of decreasing survival with increasing age. ELKINS found a similar declining curve of survival until the end of the sixth decade, but in elderly patients a slight upswing was found in the percentage surviving. He believed this improvement of survival among the elderly to be due to the more extensive use of radium alone, avoiding external irradiation which, before the introduction of supervoltage irradiation, was associated with a high incidence of complications and poor tolerance in elderly patients.

However, some authors have found no influence of age on the prognosis. BLUMBERG et coll. and PERZIG et coll. found a lower cure rate for patients under 50 years of age. BRAUND & MARTIN (1941) reported that at autopsy of 60 patients with tongue carcinoma, the average age for those with distant metastases was 52 years as compared with 59 years for those in whom the lesions remained localized. They did not report on the clinical stages in the different age groups. Therefore, the discrepancies may well be explained as resulting from differences in the clinical stages among patients of different ages.

SUMMARY

The records of 503 patients with carcinoma of the tongue diagnosed between 1958 and 1972 were reviewed. The preponderance of tongue carcinoma among men was confirmed both in The Norwegian Radium Hospital (NRH) and the University of Wisconsin Hospitals (UW), but it was relatively more frequent among women in NRH and in UW than in southern Europe. More women had on presentation less advanced tumors at NRH than at UW. The incidence of tongue carcinoma in Norway increased steadily with age for both sexes. The sex ratio did not change in Norway such as in England, Canada and the United States. Tumor of the posterior one-third of the tongue was relatively infrequent in women both in NRH and UW, in agreement with reports from other countries. The length of survival was analysed and no significant sex difference was demonstrated. The younger patients had less advanced tumors and a better prognosis.

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