ACTA RADIOLOGICA

Vol. 21
Fasc. 4

ONCOLOGY

1982

CARCINOMA OF THE TONGUE IN NORWAY AND WISCONSIN

II. Influence of site and clinical stage on local control of the tumor

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Patients with carcinoma of the tongue present themselves with exophytic, ulcerating and infiltrating tumors, most often located on the lateral border of the anterior two-thirds of the tongue. The diagnosis is confirmed by microscopic examination of the biopsy specimen taken from the edge of the tumor. Unfortunately, most of the patients referred have advanced tumors which indicates that more effort should be made in educating both the public and the medical and dental profession about the importance of taking a biopsy of any ulcer in the oral cavity that does not heal within two weeks. Most tumors are readily accessible to inspection and palpation. The lesions that are located in the posterior one-third or the base of the tongue are best observed with a mirror, but palpation of a hard infiltration often leads to biopsy and a definite diagnosis.

The present report deals with the influence of the site, therapy before admission and the clinical stage on the prognosis of tongue carcinoma, as observed in the two institutions, The Norwegian Radium Hospital (NRH) and the University of Wisconsin Hospitals (UW), and to make a comprison.

Materials and Methods

The analysis was based on a retrospective review of the records of 503 patients treated for squamous cell carcinoma of the tongue during the years 1958 to 1972. Among these were 339 patients treated at NRH and 164 patients at UW. The median delay from onset of symptoms was recorded to be 4 months among men and 5 months among women at NRH, 6 months among both sexes at UW. Sixty-six patients (13%) had the primary tumor located in the base of the tongue (BT tumors), 33 patients in both institutions. The incidence of BT tumors was, therefore, lower at NRH (10%) than at UW (20%).

Clinical staging was carried out according to the TNM system (1978; Table 1). The methods of treatment were the same as described previously in Part I (VERMUND et coll. 1982). BT tumors were usually treated with external irradiation using opposing lateral beams. The total dose varied between less than 1 000 ret and more than 2 200 ret with a median of 1 600 ret at NRH and between less than 1 000 ret and 2 340 ret with a median of 1 860 ret at UW. Three patients received additional interstitial irradiation with a radium implant because of residual tumor infiltration.

Tumors of the anterior two-thirds (AT tumors) were at NRH routinely treated with interstitial radium implantation followed by partial glossectomy, whenever possible, with external irradiation alone reserved for the advanced tumors. At UW the smaller tumors were implanted with radium and a partial glossectomy or hemiglossectomy was carried out, only in patients with possible residual tumor. The

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more advanced tumors were treated with a combination of external and interstitial irradiation, or in the old and feeble patients with external irradiation alone.

Radical neck dissection was the treatment of choice for operable lymph node metastases at both hospitals. Inoperable neck nodes were treated with external irradiation mainly with the aim of palliation.

Clinical stage

The clinical stage distribution of the 66 patients with BT carcinoma is given in Table 2. Most of the patients had advanced tumor. Only 5 patients at NRH, and 3 at UW, had less advanced tumors classified as T1T2N0 and the majority of patients had clinically evident metastases upon admission: 18 (55%) at NRH, and 25 (76%) at UW.

Anterior two-thirds. The clinical stage distribution of 400 primary AT tumors is listed in Table 3. A relatively larger number of earlier stage tumors was admitted to NRH than to UW: 94/304 (31%) T1N0 tumors at NRH as compared with only 12/96 (13%) at UW, and with the T1N0 and T2N0 tumors added, the figures were 155/304 (51%) at NRH as compared with 24/96 (25%) at UW. The proportion of patients with lymph node metastases in the neck was higher at UW, 47/96 (49%), than at NRH, 109/304 (36%).

Added to these groups were the patients who had been treated in other hospitals and were admitted with recurrence, altogether 2 patients at NRH and 35 patients at UW. The analysis will be concerned with the patients who received their primary treatment at NRH and UW.

Results

The results are given in terms of percentage of local control of tumors in the region of the tongue and in the neck, with an indication of the number of patients who developed distant metastases (Table 3). Those with known failure at the primary site in the tongue and in the regional lymph nodes in the neck were subtracted from the total number treated. Among the controlled cases were those who had died from intercurrent disease and at the time of death had no clinical evidence of tumor in the tongue or the neck. Some of these patients might have developed recurrence at these sites if they had lived longer. A few patients who died without recorded cause of death, have been counted as dead of tongue carcinoma without local control.

Table 1

Clinical staging according to the TNM system (UICC 1978)

Primary tumor	
T1	2 cm or less in its largest dimension
T2	2 to 4 cm in its largest dimension
T3	More than 4 cm in its largest dimension
T4	Extension to bone, muscle, skin or multiple anatomic sites in the oral cavity or pharynx
Neck nodes	
N0	No nodes clinically involved with metastases
N1	Unilateral, movable metastatic nodes
N2	Bilateral, or contralateral, movable metastatic nodes
N3	Metastatic nodes that are fixed to surrounding tissues
Distant metastases	
M1	

Local control of tumor in posterior one-third of the tongue. The local control rate of the BT tumors was 8/33 (24%) at NRH and 19/33 (58%) at UW (Table 4). Local control of the neck was obtained in 18/33 (55%) at NRH and in 24/33 (73%) at UW. However, some patients with local control in the tongue developed recurrence in the neck or vice versa. Therefore, the number of patients who remained free of recurrence in both the tongue and neck was lower, 18 per cent at NRH and 36 per cent at UW. The differences were tested using the chi-square method and found to be significant only for the tongue with a p-value of 0.01 (Table 6). The local control rates diminished with advancing clinical stage from a high of 80 per cent for T1N0 tumors to 0 for T4N0 lesions, 20 per cent for N1 and 14 per cent for N2N3 tumors (Table 5).

Local control of tumor in anterior two-thirds of the tongue. At NRH, good correlation was demonstrated between the clinical stage and the incidence of local control, but it was less striking at UW. In patients with T1N0 tumors at NRH, the local control rate of the tongue tumors was 85 per cent, declining to 56 per cent in those with T2N0, and 19 per cent in those with T2N0 tumors. Similarly, the local control rate for the neck decreased from 69 per cent in the group with T1N0, to 57 per cent in patients with T2N0, and 50 per cent in those with T3N0 tumors. The overall control rate in both the tongue and the neck was 60 per cent in stage T1N0, 43 per cent in T2N0, and 17 per cent in T3N0.

At UW the number of patients was so small that

Table 2

Distribution of clinical stages of patients with squamous cell carcinoma of the posterior third of the tongue

	T1N0	T2N0	T3N0	T4N0	N1	N2N3	M1	Total
Norwegian Radium Hospital	3	2	8	2	11	7	0	33
University of Wisconsin	2	1	5	0	7	16	2	33

Table 3

Local control of squamous cell carcinoma of the anterior two-thirds of the tongue. Per cent in parentheses

Stage	Treated	Controlled			Distant metastases
		Tongue	Neck	Both tongue and neck	
T1N0					
NRH	94	80 (85)	65 (69)	56 (60)	9 (10)
UW	12	10 (83)	9 (75)	7 (58)	1 (8)
T2N0					
NRH	61	34 (56)	35 (57)	26 (43)	3 (5)
UW	12	11 (92)*	9 (75)	7 (58)	1 (8)
T3N0					
NRH	36	7 (19)	18 (50)	6 (17)	3 (8)
UW	19	12 (63)*	18 (95)*	11 (58)*	0
T4N0					
NRH	2	0	2	0	0
UW	6	4	6	4	0
N1					
NRH	74	17 (23)	23 (31)	11 (15)	5 (7)
UW	26	15 (58)*	18 (69)*	10 (38)*	1 (4)
N2N3					
NRH	35	1 (3)	1 (3)	1 (3)	4 (11)
UW	21	3 (14)	3 (14)	1 (5)	6 (29)
M1					
NRH	2	0	0	0	2
UW	0	0	0	0	0
Total					
NRH	304	139 (46)	144 (47)	100 (33)	26 (9)
UW	96	55 (57)	63 (66)	40 (42)	9 (9)

* Significant at the p=0.05 level or lower.

Table 4

Local control of squamous cell carcinoma of the posterior one-third of the tongue. Per cent in parentheses

	No. of cases	Tongue	Neck	Both tongue and neck	Distant metastases
Norwegian Radium Hospital	33	8 (24)	18 (55)	6 (18)	4 (12)
University of Wisconsin	33	19 (58)	24 (73)	12 (36)	10 (30)

the variance in the percentages of local control in the different groups was of less significance. Testing the differences observed between NRH and UW using the chi-square test, significant values ($p<0.05$) were obtained only for local control of the tongue, stage T2N0 and T3N0, and for the neck stage T3N0, and for both tongue and neck stage T3N0 (Table 6).

No local control was obtained in 2 T4N0 tumors at NRH, but did result in 4 patients at UW. None of these developed neck node metastases.

Discussion

Site. BT and AT carcinomas represent 2 separate clinical entities, being derived from tissues of different embryologic origin. Carcinoma of the tongue is most frequently an AT tumor.

Base of tongue

Incidence. The incidence of BT tumors was only 33/339 (10%) of all tongue carcinoma at NRH. Only one reported series with a lower incidence has been found (LANE & CLAYPOOL 1930, 40/551, 7%).

The reported series from NRH was unselected and represented the majority of patients from one geographic region. Low incidence figures were also reported from Hong Kong 8/65 (12%; LAM et coll. 1980) and from Sweden 33/207 (16%; JACOBSSON 1948). In Wisconsin the relative incidence of BT carcinoma was higher 33/164 (20%), which is more in line with previous reports from some parts of the United States, where the incidence has varied between 41/247 (17%; MARCHETTA & MATTICK 1956) and 40/120 (33%; MARTIN & MARTIN 1956).

Higher incidence of BT tumors has been reported from France 41 per cent (FLAMENT 1964), from Connecticut 45 per cent (WAWRO & BABCOCK 1958) and from Illinois 48 per cent (GIBBEL et coll. 1949). In India, BT tumors are much more frequent; thus PAYMASTER & SHROFF (1957) reported an incidence of 520/700 (74%).

BT tumors are frequently well advanced when first diagnosed since they are hidden from direct inspection and often overlooked in their earlier stages. They may remain asymptomatic for some time, growing in tissues poorly supplied with nerve fibers. They frequently cross the midline and into the oral tongue or along the posterior extensions of the floor of the mouth, laterally into the tonsils and pharyngeal walls, or downward into the vallecula, hypopharynx and epiglottis. These are usually poorly differentiated tumors which can grow freely without anatomic barriers and invade the tissue spaces and the lymph vessels at an early stage. The incidence of lymph node metastases from BT carcinomas is therefore high.

This was confirmed in the present series: at NRH 18/33 (55%) and at UW 23/33 (70%) had neck node metastases on admission. Others have reported even higher incidence of lymph node metastases in BT tumors. Thus, JESSE & FLETCHER (1963) reported that 54/75 (72%) had metastases to neck nodes on first examination, and more than half of them had bilateral or fixed node metastases (30/54). SCANLON et coll. (1969) reported neck node metastases in 81/116 (70%), which were fixed or bilateral in 52/81 (64%). BERGER et coll. (1971) reported that 74/98 (76%) had neck node metastases and in 34/74 (46%)

Table 5

Local control of the tongue and the neck in different clinical stages of carcinoma of the posterior one-third of the tongue

	Norwegian Radium Hospital	University of Wisconsin	Total	Per cent
T1N0	2/3	2/2	4/5	80
T2N0	1/2	0/1	1/3	33
T3N0	1/8	3/5	4/13	31
T4N0	0/2	0/0	0/2	0
N1	3/11	6/9	9/20	20
N2N3	0/7	4/14	4/21	14
M1	0/0	0/2	0/2	0
Total	7/33 (21%)	15/33 (46%)	22/66	33

Table 6

Significance of differences for local control of squamous cell carcinoma of the tongue at The Norwegian Radium Hospital and University of Wisconsin. p-values determined by chi-square method

	Tongue	Neck	Both tongue and neck
Anterior 2/3			
T1N0	NS	NS	NS
T2N0	0.04	NS	NS
T3N0	0.003	0.003	0.003
N1	0.002	0.002	0.02
N2,3	NS	NS	NS
Posterior 1/3	0.01	NS	NS

the nodes were fixed. DUPONT et coll. (1978) emphasized that patients who had extranodal connective tissue infiltration had a poor prognosis. Recurrence developed in 7 of 12 such patients after operation.

A large percentage of bilateral or fixed node metastases was also found in the present series: 7/18 (39%) at NRH and 14/23 (61%) at UW.

Local control in both the tongue and the neck is difficult to achieve in tumors of the base of the tongue. RICHARDS (1942) reported local control in 17/42 (40%). BLUMBERG et coll. (1979) obtained local control in 32/62 (52%). Local control in the tongue was obtained in 24 per cent at NRH and 58 per cent at UW, whereas the neck was controlled in 55 and 73 per cent, respectively. The difference may be related to a dose dependence factor (median dose 1600 ret at NRH versus 1860 ret at UW) or to more extensive use of 5-fluorouracil in connection with the irradiation at UW.

BLUMBERG et coll. noted that most of the recurrences were observed in the tongue rather than in the neck. The diminishing local control rate with advancing clinical stage was also observed by BLUMBERG et coll. who controlled all 7 T1, 16 of 25 (64%) T2, 8 of 23 (35%) T3 and 1 of 7 (14%) T4 tumors. Similar observations were made in the present material with control rates varying from 80 per cent in stage T1N0 to 14 per cent in stage N2N3 and none in stage T4N0 (Table 5).

Anterior two-thirds of tongue

Since these tumors are readily accessible to inspection and palpation, they can be accurately measured and classified according to the TNM system (Table 1). This system has been of value in defining separate groups of tumors of varying extent and prognosis. Using the TNM staging the results of different treatment programs in separate institutions can be better evaluated and compared. The earliest tumors are described as superficial with a diameter of 2 cm or less. Before the TNM system was introduced, some authors used different diameters, varying from 1.5 cm (RICHARDS, SHARP & SPICKERMAN 1947, ASH & MILLAR 1955) to 3 cm (JACOBSSON, PERZIK et coll. 1958, FLETCHER et coll. 1960, ROYSTER et coll. 1961, TULENKO et coll. 1966, FAYOS & LAMPE 1967, HOOPES et coll. 1969). When comparing the results, these differences must be taken into account.

Incidence of early tumors (stage T1N0). RICHARDS reported that 10 of 167 patients (6%) had tumors less than 1.5 cm in diameter, whereas 66 (40%) had tumors between 1.5 and 3 cm. HOOPES et coll. found that 76 of 89 (85%) had tumors less than 3 cm. In between these extremes numerous reports give different incidence figures, which are difficult to compare unless the authors have adhered strictly to the UICC rules for clinical staging. Some authors report on tumors located within the tongue as a whole, others select specific groups suitable for special types of treatment. In the present series also a marked difference was found in the 2 institutions regarding the distribution of the different stages. For example, at NRH 94/304 (31%) AT carcinomas were stage T1N0 as compared with 12/96 (13%) at UW.

Local control of stage T1N0. The local control rates and the clinical stage of AT tumors are closely related. The best control rates are, therefore, observed in the early stages. At least 3 reports indicate 100 per cent control of early tumors in the tongue. RICHARDS reported on 20 patients with tumors not exceeding 1.5 cm in diameter, and all 19 patients who completed radiation therapy obtained local control. PIERQUIN et coll. (1971 b) reported on 9 patients with carcinoma of AT and floor of the mouth less than 2 cm in diameter, and in all 9 local control was obtained on examination 4 years after interstitial radiation therapy with ^{192}Ir. DEL CLOS et coll. (1976) reported on 18 patients with AT carcinoma less than 2 cm in diameter, treated with interstitital irradiation alone or with external irradiation. In all except one, local control was obtained following the initial therapy. The one who developed local recurrence, was successfully treated with surgical resection. FLETCHER & JESSE (1973) have also reported on a series of 52 patients with tumors of the oral tongue less than 3 cm in diameter, with local control in 49 after radiation therapy. One additional patient was successfully treated with surgical resection, so that the total number of patients who obtained local control was 50 of 52 (96%).

In a review of 18 publications, the median local control rate in patients with T1N0 tumors was 79 per cent, varying between 45 per cent (23/51; FU et coll. 1976) and 100 per cent (RICHARDS, DEL CLOS et coll., PIERQUIN et coll. 1971 b). In the present series the local control rate for AT carcinoma was 80/94 (85%) at NRH and 10/12 (83%) at UW. This similarity in the local control rates was achieved in spite of quite different treatment methods. The old question, whether all patients should be operated

'on principle' after preoperative irradiation, or 'on demand' when clinical signs suggest renewed growth at the tumor site, cannot be answered on the basis of these data. However, with meticulous technique of placement of radioactive sources in the tumor of the tongue and precise dosimetry, a high degree of local tumor sterilization may be expected in early stages. Perhaps fewer partial glossectomies might become necessary provided the patients can be examined regularly by the same examiner, preferably at monthly intervals. However, the difficulties in deciding if there is viable tumor remaining after irradiation are so great that many surgeons prefer to resect the residual infiltrate to obtain the histopathologic diagnosis. It appeared that residual malignant cells in the resected specimens after preoperative interstitial irradiation signified a serious prognosis with a high risk of development of metastases in the lymph nodes of the neck (14/18, 78%). Such metastases occurred in spite of the fact that the operation on the tongue was successful in preventing local recurrence in the tongue in 16 of 18 (89%) of the patients with residual malignant cells. A negative finding of malignant cells in the surgical specimen after interstitial irradiation did not completely prevent recurrence either in the tongue (4/46, 9%) or in the neck (13/46, 28%), but the chances of local and regional control were better.

Incidence of moderately advanced tumors (stage T2N0). The incidence of T2N0 is in many reports greater than that of T1N0 tumors. The numbers included depend on the staging system and the degree of selection of patients. Some authors have included tumors less than 2 cm in diameter with a minimal infiltration, as recommended by UICC in 1962 (SAXENA 1970, HORIUCHI & ADACHI 1971, ELBRØND et coll. 1973). These tumors should be classified as T1 according to UICC 1978 recommendations. Others include in the stage T2 tumors which measure between 1.5 and 3 cm (The Canadian System; RICHARDS, SHARP & SPICKERMAN, ASH & MILLAR). Some authors have grouped tumors measuring 2 to 3 cm together (WAWRO & BABCOCK, GUISS & MACDONALD 1960). Still others include in the T2 stage, tumors measuring between 3 and 5 cm in diameter (FLETHCHER & JESSE 1962, KINSEY & JAMES 1962, FAYOS & LAMPE 1967).

Most authors now use UICC 1978 definition of T2 tumors as those which measure between 2 and 4 cm in largest diameter.

In a review of some 20 publications the incidence of moderately advanced tumors varied between 4 per cent (3/69; KINSEY & JAMES) to 71 per cent (507/717; BAUD 1950) with a median of 40 per cent.

The incidence of AT tumors stage T2 in the present series was 61/304 (20%) at NRH and 12/96 (13%) at UW.

Local control of stage T2N0. With increasing size of the primary tumor the local control rates diminish. However, FLETCHER et coll. reported on 13 patients with AT tumors stage T2 (3–5 cm) irradiated with local control in 11. The 2 patients with local recurrence were successfully operated upon. One patient treated with primary surgery was also controlled, so that final control was obtained in all patients. In later reports FLETCHER & STOVALL (1962) have reported 26/32 (81%) and FLETCHER & JESSE (1973) 83/100 (83%) local control rates with primary irradiation with an additional 5 patients controlled by subsequent surgery to bring the latter figure up to 88 per cent.

In a review of 18 publications a median local control rate of 78 per cent was found, varying between 58 per cent (14/24; FAYOS & LAMPE 1969) and 100 per cent (14/14; FLETCHER et coll.). The present series showed a local control rate of 34/61 (56%) at NRH and 11/12 at UW.

Therefore, it appeared that the local control rate was lower in T2N0 than in T1N0 tumors at NRH, but a similar trend was not noticeable at UW. It is interesting to note that these differences which were tested statistically and found significant, were obtained in spite of the fact that relatively fewer patients were operated upon at UW than at NRH. Differences in the radiation techniques and dosages might account for these observed results (the use of templates, double plane interstitial implants with a slower dose rate and greater use of external beam irradiation at UW versus single plane, high intensity interstitial irradiation alone at NRH).

Among the patients who obtained local sterilization of the tongue lesion by preoperative radium implantation at NRH, still a high incidence of metastases occurred in the neck (9/19; 47%). Many of these patients probably had occult metastases in the neck at the time of the initial treatment. External irradiation of the neck might eradicate some of these tumor cells and prevent clinically manifest neck node metastases. Recurrence in the tongue developed in 6 of the 19 patients (32%). In those patients with malignant cells at histopathologic examination after preoperative interstitial irradiation it is more

difficult to obtain a local control both in the tongue and the neck (57% local tongue recurrence rate and 57% regional recurrence rate in the neck nodes; 12/21).

Incidence of locally advanced carcinoma of the anterior two-thirds of the tongue (stage T3N0). Patients with locally advanced AT carcinoma have a serious prognosis even though palpable neck metastases may not be present. Thus, residual tumor is often left at the margins of the resection and the irradiation frequently fails to sterilize the local tumor, which is usually deeply infiltrating, ulcerating, and necrotic due to poor vascularity and oxygenation.

The incidence of T3N0 tumors varied depending on the definition of the dimensions of the tumor and on the selection of patients for a certain type of treatment. The reports which deal with operable patients usually indicate a lower incidence than those which include all cases within a geographic area. In a review of 13 publications defining stage T3 from tumors exceeding 2 cm in diameter and deeply infiltrating to tumors in excess of 5 cm in diameter, a median incidence of 21 per cent was found. The lowest incidence was reported by SPIRO & STRONG (1971), 13/185 (7%) in a surgical material and the highest by RICHARDS, 65/167 (39%), who reported on tumors of the tongue without specifying site to the oral or the basal part. In the present series the incidence of T3N0 tumors was 36/304 (12%) at NRH and 19/96 (20%) at UW.

Local control of T3N0 tumors. FLETCHER & JESSE (1973) treated 66 patients with AT tumors stage T3N0 with irradiation and controlled 39 (59%). Subsequent surgery was performed in 27 patients with residual or recurrent tumor in the tongue and 6 were controlled. Therefore, the total control rate was 45/66 (68%). In a previous publication FLETCHER & STOVALL reported that the local control rate was 21 of 25 (84%) with both interstitial and external irradiation in high doses. These results were obtained at the expense of a high incidence of necrosis, but such lesions could be treated conservatively and healed. INOUE et coll. (1976) reported that control was obtained in 7 of 11 tumors larger than 4 cm in diameter (64%). ELBRØND et coll. using the 1962 UICC staging system reported local control in 16 of 38 (42%) tumors larger than 2 cm, but with deep infiltration. GILBERT et coll. (1975) obtained local control in 13 of 36 patients (36%) with tumors of the oral tongue exceeding 4 cm. In a review of 17 publications on AT tumors stage T3, a median control rate of 72 per cent was reported, varying between 36 per cent (13/36; GILBERT et coll.) and 92 per cent (24/26; PIERQUIN et coll. 1971 a) for 3 to 5 cm tumors.

In the present series the local cure rate for AT tumors stage T3N0 was 7/36 (19%) at NRH and 12/19 (63%) at UW. The local control rates for the neck were 18/36 (50%) at NRH and 18/19 (95%) at UW. Surgery was performed in 14 of the 36 patients at NRH (39%) and in 4 of the 19 patients at UW (21%). High doses of both external and interstitial radiation are necessary to sterilize the advanced tongue carcinomas, and a certain number of complications have to be accepted in order to achieve the optimum local control rates. Surgery may be able to cure only a few of those who still have residual tumor after preoperative irradiation. Surgery was resorted to in a limited number of patients in this group, because the majority of them had a number of other medical problems associated with old age and infirmity.

Incidence of massive carcinomas of the tongue (stage T4N0). The more advanced the tumor becomes, the higher the frequency of metastases to the lymph nodes in the neck. Therefore, few patients present with a T4 lesion without neck nodes. JESSE & FLETCHER found only one such patient among 71 with AT carcinoma. VERMUND & GOLLIN (1973) observed 2 patients with stage T4N0 among 92 patients and HORIUCHI & ADACHI described 2 patients with T4N0 tumors among 102 patients.

T4 tumors with neck node metastases are more frequent. CHU & FLETCHER (1973) reported 30 T4 tumors among 248 patients with AT carcinoma (12%). SAXENA (1970) reported an incidence of 191/440 (44%). FLETCHER & JESSE (1962) defined a T4 lesion as one which has extended to more than one-half of the tongue or with massive infiltration of the floor of the mouth or with involvement of the mandible, whereas SAXENA (1970) used complete fixation of the tongue or extension to more than one neighbouring region as the definition of the T4 stage. The frequency of truly T4N0 lesions in the present material was also low. Two of 304 (0.7%) at NRH and 6 of the 96 (6%) at UW qualified for this stage. If the T4N1 tumors, 8 and 5, respectively, and also all the patients with N2N3 nodes in the neck, are added, an incidence figure for the truly massive tumors was 15 per cent (45/304) at NRH and 33 per cent (32/96) at UW.

Local control of T4 tumors. The combination of

local hypoxia and extensive infiltration of the carcinoma into musculature, bone, and neighbouring regions has made it extremely difficult to control T4 tumors of the tongue. ELBRØND et coll. reported on 9 such patients and obtained no controls. FAYOS & LAMPE (1967) treated 26 and only one was cured. However, with the use of high doses of external high energy radiation, properly fractionated, and with addition of interstitial irradiation, properly placed with a low dose rate, CHU & FLETCHER were able to control 10 of 30 (33%) AT tumors stage T4. The 20 patients who still had residual tumor, were operated upon and local control was obtained in 2 of them. The total control rate was, therefore 12/30 (40%). In the present series, both patients with T4N0 tumors at NRH died of their tumor, whereas in 4 of 6 patients at UW local control of both the tongue and the neck was obtained.

Conclusion

Squamous cell carcinomas of the base of the tongue, frequently treated with external beam irradiation alone, require a relatively high dose for local control. Whereas a median dose of 1 600 ret yielded a 24 per cent local control rate at NRH, an increased median dose of 1 860 ret achieved a 58 per cent local control rate at UW.

Squamous cell carcinoma of the oral tongue, when superficial and less than 2 cm in diameter, can be controlled in over 80 per cent of the cases with irradiation alone. Tumors measuring from 2 to 4 cm in diameter are also successfully treated with irradiation alone, but careful attention to dosimetry and adequate coverage of the entire tumor area with interstitial and external irradiation is necessary. Tumors exceeding 4 cm in diameter, and usually deeply infiltrating, are more difficult to control and require external irradiation, supplemented with interstitial implantation of residual tumor.

Therefore, the clinical stage of the tumor and the local control rate are associated.

The frequency of the occurrence of the different stages varies in different institutions and must be taken into account when comparisons are made regarding results of therapy.

SUMMARY

The local control rates in patients with squamous cell carcinoma of the tongue, treated between 1958 and 1972, were determined by retrospective analysis of the records of 339 patients at the Norwegian Radium Hospital and of 164 patients at the Univesity of Wisconsin Hospitals. The correlation between the clinical stage and the local control rate was good in Norway, less striking in Wisconsin. As the tumor grew in size it generally became increasingly difficult to control. Irradiation and surgery appeared relatively satisfactory in patients with tumors in early stages, but were often inadequate in the advanced tumors. The differences observed between Norway and Wisconsin were statistically significant only for the tumors of the base of the tongue and T2N0, T3N0 and TxN1 tumors of the anterior two-thirds of the tongue.

ACKNOWLEDGEMENT

The investigation was supported in part by the National Cancer Institute, Wisconsin Cancer Center Grant No. CA-19278.

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See Part I; Acta radiol. Oncology 21 (1982), 155.