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Comparative statistical study of cancer of the tongue : its disposition and treatment

John Henry Knutzen
University of Nebraska Medical Center

A COMPARATIVE STATISTICAL STUDY OF CANCER OF THE TONGUE, ITS DISPOSITION AND TREATMENT

John Henry Knutzen

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INTRODUCTION

To review a series of cases of cancer of the tongue involving the charted statistics of 64 patients and to compare these statistically with the percentages established by other investigators, especially those conducted on a large scale in Sweden, is the purpose of this thesis.

This same writing will concern the treatment, disposition, and survival rate of patients with cancer of the tongue, on a local and national level, as well as that determined in the Scandinavian country.

Predisposing factors will also be studied and the histo-pathological features reviewed.

Methods of treatment, especially those of a more recent nature, have been reviewed and their results analyzed.

In the series of cases personally reviewed here at Nebraska Methodist Hospital, all of the information and statistics contained herein are derived solely from the charts presented on the cases treated.

An attempt will be made to determine the most effective type of treatment for cancer of the tongue, regardless of the presenting factors and other complications.

CANCER OF THE TONGUE

CLINICAL PATHOLOGICAL ASPECTS

Of all the oral malignancies, cancer of the tongue is the most frequent. Recent reports indicate the incidence is approximately two percent of all malignancies. Other associated factors which often are coexistent include syphylis, leukoplakia, Plummer Vinson syndrome, poor oral hygiene, sharp, ragged teeth, excessive alcohol consumption, pipe smoking and chronic trauma. Positive serology has been reported as high as 18 to 40 percent even though associated microscopic pathology is relatively scarce.

About one to two cases of tongue cancer per 100,000 have been reported in Scandinavia. The relation of cancer of the tongue to cancer of the oral cavity is found in 37 percent of 278 cases. (1)

INCIDENCE

The incidence of squamous cell carcinoma is highest between the ages of 50 and 70 years, while lymphosarcoma and lymphoepithelioma is found most frequently between the ages of 30 and 50 years. Only about 20 percent of the patients are women although this percentage varies from 35 to 50 percent in the Scandinavian countries. (1)

The anterior two-thirds of the tongue and the floor of the mouth are the principal sites of well-differentiated squamous cell carcinomas. Of all the areas, the lateral border of the anterior tongue is most often involved. Next in line is the base of the tongue, which is frequently the site of less well-differentiated lesions, primarily lymphoepitheliomas and lymphosarcomas. These lesions are either exophytic, infiltrative, or both. A tongue cancer may spread rapidly with infiltration of the floor of the mouth, alveolar margin, mandible, tonsil, or posterior pillars. About half these tongue lesions will cross the mid-line and invade the opposite half of the tongue.

AGE DISTRIBUTION

Cancer of the tongue is very rare in young people, with only a few cases being reported under the age of 20 years, with most of the cases occuring between the ages of 50 and 60 years of age. (1) In women the average age lies somewhere between 50 and 80 years, a fraction higher than in men. The highest incidence occurs at age 61.3 for all patients. (1)

In this series of 64 cases collected from the files at Nebraska Methodist Hospital, the following age distribution was found:

Age Group	No. of Cases
20 - 24	1
25 - 29	0

Age Group (cont')	No. of Cases (cont')
30-34	1
35-39	2
40-44	6
45-49	6
50-54	3
55-59	7
60-64	12
65-69	10
70-74	8
75-79	4
80-84	1
85-89	2
90-94	0

SEX DISTRIBUTION

In the 64 cases reviewed at Nebraska Methodist Hospital it was found that 61 percent of the cases presented were male and 39 percent of those same cases were female.

PREDISPOSING FACTORS AND PRE-CANCEROUS CONDITIONS

1. Heredity

In general, there does not seem to be much significance as far as the inherited tendencies of this disease are concerned. In one series of cases, 25 percent of the patients gave a family history of cancer in general. Of these, 30

percent of the women reported cancer in the family and only 19 percent of the male patients reported cancer in the family. (1)

2. Iron Deficiency Conditions

The symptoms associated with a low serum iron have been investigated as a predisposing cause of cancer of the tongue. This condition is most common between 15 and 50 years of age with the characteristic appearance of the patients being thin, pale, and with a narrow, inflexible opening of the mouth. The patients appeared distressed and were treated periodically since youth for anemia. Other symptoms include early loss of teeth, soft brittle nails, as well as atrophy of the lips and mucous membranes of the mouth, pharynx and esophagus. Fissures in the corners of the mouth and dysphagia are recorded. The age at which complaints usually begin is between 15 and 30 years. The mouth is usually edentulous when the patients have reached the age of 30 to 35 years. The tongue is often, but not always, smooth with marked papillar atrophy. Occasionally there are patches of denuded epithelium. Finally, it must be pointed out that some female patients, especially those who have passed the climacterium, can have several of the stigmata characteristic for sideropenia.

Anemia was a factor in 35 percent of the female patients studied by Jacobsson. The average age of the women with sideropenia was 60 years. There were no males with sideropenia in this series.

3. Tobacco

Habitual use of tobacco is regarded as an important predisposing factor in cancer of the tongue. It has been shown that patients with cancer localized at the base of the tongue were tobacco smokers. With this condition, the mucous membranes become dry, thickened, grayish, and usually show leukoplakic patches.

4. Alcohol in Excess

One investigator believes that people who are habitual users of 40 to 50 percent alcohol often complain of an irritating effect to the tongue. (2) It is also of note that patients with extrinsic cancer of the larynx and/or hypopharynx, frequently have a history of alcohol excess. (3)

5. Syphilis

Considering all the factors, the incidence of syphilis is higher in patients with cancer of the tongue. Therefore, there is a positive correlation between syphilis and lingual cancer.

6. Trauma

It has been reported that broken or jagged teeth rubbing on the smooth surface of the lateral border of the tongue may cause cancer. The same is true of dentures. Forty percent of tongue cancer patients give a history of repeated trauma either from ill-fitting dentures or from teeth. (1) There was a much higher incidence among those

patients appearing as or giving a history of sideropenia. The usual history included the presence of white patches along the lateral border of the tongue just opposite a roughened or jagged tooth.

7. Leukoplakia

Leukoplakia is a precancerous condition present in many cases of oral cancer. In cancer of the tongue, leukoplakia is usually localized to the dorsum and is often correlated with syphilis. With leukoplakia, many times there is a history of syphilis or habitual use of tobacco. In one series (4), leukoplakia was recorded in 20 percent of the cases, and in two-thirds of the males the Wasserman reaction was either positive on admission or there was a definite history of syphilis or both. In about 80 percent of all cases of leukoplakia, habitual use of tobacco was reported. In all cases with leukoplakia and evidence of syphilis, the leukoplakia was localized mainly to the dorsum. (1)

8. Duration

The average duration was 3.8 months. In men it was 3.6 months and in women, 4.3 months, in the study made by Jacobsson.

In the local study made at Nebraska Methodist Hospital, the duration of symptoms were as follows:

No. of Months	No. of Cases
1	13
2	6
3	14
4	1
5	4
6	7
7	0
8	2
9	0
10	0
11	1
12	6

THE PRIMARY TUMOR

1. Diagnosis

An early carcinoma of the tongue is seldom seen clinically. It may appear only as a slight thickening of the mucous membrane with or without superficial erosion and without any actual discomfort. In the anterior two-thirds of the tongue, the usual finding is a rounded or oval disk-shaped tumor slightly raised over the surface of the tongue. The surface is slightly irregular, coarsely granular, and is most often ulcerated. The degree of infiltration can often be misleading on inspection and is only ascertained with careful

palpation. Cancers of the base of the tongue are often diagnosed with the aid of palpation alone since they are frequently not visible to inspection. Many times, the first symptom of a carcinoma of the base of the tongue is a lymph node metastasis. Leukoplakia of the dorsum of the tongue may be difficult to distinguish from cancer and is especially difficult to differentiate when complicated by lues. Many cases present with papillomatous, exophytic type growths. Others may show only deep submucosal invasion. The consistency of the tumor is usually firm; however, on very few occasions, it may be rather soft. The differential diggnosis usually does not present a difficult problem and any suddenly appearing ulcer of the tongue which does not recede in a few days, should be biopsied. A tuberculous ulcer may cause some confusion, but this type of ulcer is rather superficial and painful.

2. Initial Site

Five sites of cancer of the tongue are recognized: the lateral borders, the superior surface, the tip, the inferior surface and the base. The lateral border is the most frequent. In one large series, the lateral border was the site in 61 percent; the base in 25 percent; dorsum of the tongue in 12 percent; and the tip and inferior surface in only two percent of the cases reported. (5)

In interpreting the cases on file at Nebraska Methodist Hospital, it was found that here too, the lateral border was the initial site in 46 percent of the cases. The base was

the site in 13 percent of the cases; the dorsum in 10 percent; and the tip and inferior surface in 32 percent.

3. Size and Extent

Lesions over three centimeters and still confined to the tongue, were reported in 15 percent of the cases reported in Sweden by Jacobsson. In 39 percent of the cases, the cancer had extended to adjacent tissue. In most cases where the lesion was larger than three centimeters, the lesion had already extended to the adjacent tissue.

In the 64 cases reviewed at the Nebraska Methodist Hospital it was found that the primary tumor was confined to a maximum diameter of three centimeters in 63 percent of these cases.

In 22 percent of these same cases, the maximum diameter exceeded three centimeters, and in the remaining 15 percent of the cases, the cancer had extended to adjacent tissue.

METASTASES

1. Diagnosis

The spread of cancer from the primary tumor is through the lymphatics, and the adjacent lymph nodes are the earliest sites of metastases. Early detection of metastases is difficult unless there has been concurrent infection in the primary cancer site. Extra-capsular spread from the nodes is indicated by an early fixation of the lymph node

to the surrounding tissues.

2. Incidence

Jacobsson reports a 60 percent incidence of metastases with the nodes of the upper deep cervical lymph node group being the most frequently involved. The submaxillary glands were involved in about 34 percent of cases and in seven percent of cases bilateral nodes were involved.

3. Time of Appearance of Metastases After Admission

About 50 percent of the cases in foreign studies indicated definite signs of metastases after six months duration of the primary tumor and only a very few cases did not show signs in less than 20 months. Thus it is evident that there must be every effort made to follow the patients to at least 18 months following their admission to the hospital because there are usually a few cases that will not show evidence of metastases until a later period.

In 22 percent of the cases reported at Nebraska Methodist Hospital there was evidence of metastases on admission. Metastases appeared in 45 percent of these 64 cases after admission to the hospital and the total percentage of cases revealing metastases was 67 percent.

4. Incidence of Metastases in Relation to Size and Extent Of the Primary Tumor

In the series of cases reported in Sweden by Jacobsson there were more than 80 percent that showed metastases when the

original lesion extended over the midline and 20 percent of these involved bilateral nodes. In tumors localized to the base of the tongue there were metastases in 25 percent of the cases. When the lesion was not over three centimeters in size and did not extend into adjacent tissue, the incidence of metastases was only 27 percent.

The findings at Nebraska Methodist Hospital revealed 22 percent of the cases reviewed to have the primary tumor confined to the tongue with a maximum diameter less than three centimeters. In 14 percent of these cases, the diameter was over three centimeters and still confined to the tongue. In 17 percent of the 64 patients the primary tumor had extended to adjacent tissue.

5. Distant Metastases

In the Swedish study by Jacobsson only eight cases were observed to have distant metastases. Accurate statistics in the patients reviewed at Nebraska Methodist Hospital were unobtainable on this issue.

Other reports show that metastatic spread to regional lymph nodes is present in 50 percent of the cases. Fifty-six percent of those cases with metastases will involve the deep cervical chain; 34 percent will have submaxillary node invasion, and bilateral involvement will be present in seven percent of the cases. Approximately 80 percent of cases with lesions of the base of the tongue will show metastases when first seen.

Symptoms are dependent upon the severity of the lesion and the degree of metastases, infiltration, and infection. Death is the ultimate result if these lesions are untreated.

SYMPTOMS AND FACTORS

A lump or sore on the tongue was the initial symptom reported by 46 patients at Nebraska Methodist Hospital. One patient stated that hemorrhage was present and another complained of difficulty in speech. Six patients showed concern over difficulty in eating and swallowing and seven admissions were cognizant of great irritation by teeth and dentures.

Pain in the ear was revealed as a symptom by four patients and redness and swelling were reported by three others. Leukoplakia was the sign of ten patients. Incidental discoveries by family dentists were listed by two of the patients and a sore throat was the initial complaint of eight. Two patients reported having canker sores with no pain. Eye pain was the initial reason for two patients to seek medical attention, and loss of hearing was indicated by one other patient.

HISTOLOGY

1. Primary Tumor

Practically all cancers of the tongue are squamous cell carcinomas.

DIFFERENT TREATMENT METHODS

1. Treatment of the Primary Tumor

A. Surgery

In recent years it is almost impossible to

evaluate the results from surgical cases since the statistics derived include only those cases which are operable and excludes those cases which are inoperable. On the other hand, far advanced cases with an initially poor prognosis are treated with radium therapy and included in the statistics. Thus a fair evaluation of the two methods can not be compared statistically.

B. Roentgen

This type of treatment has been used mainly for palliation of advanced cases and it is often the only available method for treatment of cancer of the base of the tongue.

C. Combination of Methods

1. Treatment of Metastases

Block dissections of the contents of the submaxillary triangle, the sternocleidomastoid muscle, and the internal jugular vein and all the nodes, fat, and connective tissues which are in contact with these structures, from the midline to the anterior border of the trapezius muscle and from the lower jaw to the clavicle, have been done by many surgeons. It is the opinion of most that before undertaking this type of radical surgery, the primary site of the tumor must be controlled by irradiation. Other factors must also be taken into consideration, such as general health of the patient, size and extent of spread of the original lesion and whether or not there is a chance that the lesion may be metastatic to the opposite side of the neck. It is also of widespread opinion that cancer of the lymph nodes of the neck are

not sensitive to irradiation, and five year cures are limited in number with this type of treatment. When the lymph nodes are not clinically involved, most clinics at present seem to be satisfied with a careful follow-up of the patients and if the lymph nodes become involved a block dissection is performed.

NEW METHODS OF TREATMENT

Radiation therapy is usually indicated for cancers of the base of the tongue since these patients usually are not good candidates for surgery. However, surgery would be the treatment of choice in patients with pre-existing glossitis; patients with edema or sepsis; those who have metastatic involvement of the mandible, and, in most patients with recurrent or persistent cancer. Recurrent lesions following surgery may be treated with radiation, but persistent cancer should be resected surgically. Squamous cell carcinomas of the tongue are not highly radiosensitive and the proliferative or exophytic lesions are more highly radiosensitive than the infiltrative types.

Extended surgical procedures such as hemiglossectomy and total glossectomy have excellent cure rates as far as the cancer is concerned, but only initiate other problems of deglutition. This extreme measure is not recommended except in unusual cases. Partial glossectomy, followed by irradiation, has proved successful in lesions under two cm. According to

Cade and Lu (1957), papillomas and chronic superficial glossitis should be treated as malignant if there is even slight evidence of a malignancy ascertained from biopsy.

Metastases should be treated by block dissection unless there are clinical manifestations to indicate otherwise. Radiation of the primary tumor should be done a few weeks prior to the dissection of the neck allowing preservation of the blood and lymphatic tissue of the tumor. A partial glossectomy is usually accompanied by dissections of the contiguous jaw and neck.

RADIATION THERAPY

Before any type of radiation is undertaken, all septic teeth and sources of infection should be controlled. Any teeth in the direct pathway of the irradiation should be extracted with the only exception being those teeth in the bed of cancer tissue. In this way, the risk of radionecrosis and osteomyelitis are diminished. The problem, in general, is to radiate the tissue concerned and prevent excessive radiation to the mandible. Certain types of cancer do not respond well to radiation. Included in this category are carcinomas arising in syphilitic glossitis, lesions associated with massive edema and lesions fixing the tongue to the mandible. Also certain authors feel there are more bone complications when there is preradiation extraction and it is their contention that post-radiation extraction should be followed with antibiotic drugs.

According to Patterson and Parker, the most successful treatment of the anterior two-thirds of the tongue is interstitial irradiation with radium needles. Small anterior lesions can often be irradiated with the peroral cone. This method is especially effective if the patient is able to remain sufficiently long in position and if the lesion is surrounded by a satisfactory margin. Two hundred kv. radiation is sufficient and malleable lead cones are used depending on the individualization of field size. Tissue doses of 5500 to 6000 r in four weeks are tolerated and highly successful.

Radium needle implants alone or a combination of external irradiation plus an implant are used in most carcinomas which are more advanced. External irradiation permits a more homogeneous distribution of the dose. The radiation tolerance of the mandible does not permit complete treatment by this means. Supervoltage beams lessen the risk of excessive mandibular irradiation, but the danger of late necrosis is still sufficiently high to require other techniques. With radiations produced at 220 kv and filtered with 1 mm Cu, only about one-half of the required tissue dose can be given before the risk of late mandibular necrosis becomes prohibitive. The very nature of interstitial implants enable the radiologist to irradiate these carcinomas without delivering high dosages to the mandible. Low intensity needles should be used if possible. The combined technique provides the maximum homogeneity permitted.

In addition, if widespread leukoplakia is encountered, only the cancer site is irradiated, and the surrounding tissue carefully watched for more extensive spread. When the cancer and leukoplakia are confined to the same area, the total area should be irradiated. Lymph nodes are irradiated when surgical excision is contraindicated, and radiation is best done with low intensity radium needle implants combined with teleradiation. The best results are obtained when only upper cervical metastatic lesions have to be treated. The skin of the neck is more tolerant when small volume irradiation is used than when the entire neck region has to be irradiated. Four thousand to 5000 rads within 35 to 40 days is suggested when it is necessary to treat the entire neck region.

METHODS OF IRRADIATION

1. Interstitial Method

The patient should be fully informed as to the effects following the implantation and the discomfort in swallowing. Intra-tracheal anesthesia should be used with the posterior pharynx packed. X-ray films should be taken to establish the accuracy of the implants, and if indicated, some of the needles should be replaced. Patterson considered 6500 r within seven days as a standard implant dose for a moderate volume or area in good oral tissue.

Standard Mouth Implants (after Patterson)

5500 r	96 hr.
6000 r	156 hr.
6500 r	168 hr.
7000 r	204 hr.
7500 r	240 hr.

For small implants, add 500 to 750 r.
For large implants or poor tissue, deduct 500 to 1000 r.

When the patient is regaining consciousness, he or she should be watched to prevent pulling out the needles. Atropine should be given to diminish the oral secretions. The patient should communicate by writing and should be ambulatory. If any of the needles are pulled out, they should be replaced immediately using anesthesia if necessary. A liquid should be ordered and if necessary, nutrition should be supplied by intravenous methods. The mouth should be rinsed with an oral antiseptic daily and if edema should commence, termination of the treatment should be contemplated. Pain can be controlled with Demerol immediately following the implantation and aspirin will usually suffice after the first 24 hours, following withdrawal of the needles. Oral hygiene should be carefully undertaken until all clinical evidence of reaction is minimal.

About 24 hours after the insertion of radioactive needles or seeds, the tissue becomes slighly edematous, and is more marked in older patients. About the third to eighth day following the insertion, a diminution in the size of the tumor or ulcer may be apparent. In another few days, the tissue begins to

blanch and becomes covered by a whitish, fibrinous membrane which takes on a yellowish cast. At this time, the edges of the tumor are usually clearly demarcated by this tissue reaction. During the next four to six weeks, this reactive area gradually recedes more or less toward the center of the lesion as epithelization progresses from the borders.

Occasional patients have prolonged periods of healing phase which may last up to several months during which time extreme diligence must be taken to promote the very best oral hygiene. If submucosal induration persists, the possibility of residual cancer should be investigated.

A. Radium Needles

1. Single Plane Implant

For lesions of the dorsum and the middle and posterior lateral border, a single plane implant is indicated. According to the Patterson and Parker system, a maximal dose of 5500 to 7500 rads within approximately 168 hours is used. A border of at least 1 to 1.5 cm. of apparently normal tissue should be included. Lesions up to about 20 sq. cm. would receive 7500 rads; larger than 9 sq. cm. and up to about 20 sq. cm. would receive 6500 rads; and still larger lesions would get 5500 rads.

The needles are arranged in horizontal fashion when treating a lesion in the dorsal surface. Alternate needles should be placed from opposite sides with the ends of the

needles crossing. It is important to bury the needle completely in the tongue in order to prevent areas of superficial necrosis around the protruding ends. These needles are then sutured in place with a single suture to prevent unequal strain on any one suture. A soft rubber tube is then inserted in conjunction with the sutures to prevent irritation of the corners of the mouth.

When inserting needles in the vertical implant for middle and posterior lateral lesions, the posterior needle is placed first to serve as guide for the remaining needles. It is not inserted to the hilt until the tongue is relaxed in its normal position. All needles should be directed down and under the mucous membrane of the floor of the mouth. A tenting effect is used when placing the needles by crossing the superior ends of the needles and by directing the inferior end of the needle to the posterior. The anterior needle should then be placed with its inferior needle directed well forward.

2. Two Plane Implant

A two plane implant can be used for a lesion which is too large for a single plane implant; one that is larger than 1.5 cm. thick. The maximum distance between the various rows of needles should be 2.5 cm. because, according to Patterson and Parker, a distance of only 1.5 cm. will create a low dose zone in between the rows of the needles. The maximal dose is usually 7000 rads within 168 hours. Patterson has stated that the central low dose should not fall much below

5000 r.

3. Volume Implant

The Patterson and Parker dosage system indicates that volume implants should be used in lesions that have extended deeply into the tongue or where the lesions have involved both the tongue and the floor of the mouth. Doses of 6500 r for a small volume and 5000 r for a large volume are recommended by Patterson for a period of 144 to 192 hours. This type of treatment demands careful attention to the amount of the dosage since the patient usually suffers much trauma from the implants. Tissue tolerance must not be overstepped at this time.

RADON SEED IMPLANT

These are especially effective for small, superficial lesions and for patients who are poor risks for any other type of needle implants. The maximal dose is 6000 to 7000 rads. It is usually considered an inferior type of treatment as compared to the needle implants and was often used in the past to allow for early ambulation of the patient or when there was lack of hospital facilities.

EXTERNAL RADIATION BEAM METHOD

1. Transoral X-Ray

When the patient is able to hold his or her tongue in a steady position during the course of the treatment, this method is especially effective for irradiating superficial

lesions by treatment cone. Many times the patient will be able to hold his or her tongue with his fingers and the scattered irradiation of the patients fingers is minimal. The mouth of the patient is usually completely anesthetized and the head immobilized once the cone is positioned.

The quality of radiation can vary from H. V. L. 1.25 mm. Al to 1.5 cm. Al (100 K. V. P.) to H. V. L. 1.0 mm Cu (200 or 250 K. V. P.). For a very thin, superficial lesion, the softer beam is used; and for a thicker or more indurated lesion, an H. V. L. of 0.5 mm Cu or 1.0 mm Cu (140 K. V. P. to 250 K. V. P.) is used. Focal tumor distance is about 37 cm. Daily surface dose increments of 435 to 480 rads (500 r) for 15 treatments are customarily used.

EXTERNAL RADIATION BEAM THERAPY THROUGH SKIN FIELDS

For lesions of the base of the tongue or inextensive lesions of the anterior aspect where the neighboring tissue has been involved, this is the recommended procedure. Depending upon the presence or absence of metastases in the nodes, several fields are radiated. An HVL of at least 3 to 5 mm Cu (250 K. V. P. and up) should be used. Cobalt - 60 sources and mef voltage x-ray generators have been used with great advantage. A multiple field technique is used for lesions well localized at the base of the tongue. However, the skin or entrance fields should be well marked and the accuracy of the set-up checked radiographically. The use of casts with port docks and back pointers

are advised to enable accurate treatment of small fields.

The average total tumor dose is usually about 5800 to 6000 rads within 40 to 42 days. If very small fields are being irradiated (e.g. 5x5 cm), the tumor dose could be raised to 6800 to 7000 rads. Most base-of-jaw fields lesions must be irradiated through the lateral upper cervical-angle-of-jaw fields of 8x10 cm. or larger in order to cover the nodes often involved by metastases. Both fields should be irradiated daily so that the daily tumor dose is about 250 to 275 rads. The patient may experience some discomfort to this type of radiation, usually at about the level of 4000 rads. In these cases, the dosage may be reduced mementarily and when irradiation is resumed, the daily dosage should be approximately 100 to 150 rads to eliminate overstepping the tolerance dosage. Dysphagia is not uncommon for those patients who are undergoing treatment in the pharyngeal region and it may be necessary to provide codeine prior to eating or X ylocaine Viscous to swirl around the mouth before swallowing food. A catheter is recommended for tube feeding if necessary to lessen the irritation when a nasogastric tube is chosen.

COMBINED TRANSORAL AND EXTERNAL RADIATION BEAM THERAPY THROUGH SKIN FIELD

This type of radiation may be used to combat localized and superficial lesions, especially those lesions that are situated in the posterior lateral aspect of the tongue. It is also used

in treating lesions of the anterior and lateral floor of the mouth. The recommended dosage, since the mandible is in the pathway of the beam, is at least H. V. L. 2.5 cm Cu (250 K. V. P.). Harder radiation may be obtained with H. V. L. 5.0 mm Cu (400 K. V. P.) or even higher. The transoral minimal beam should be at least H. V. L. 0.5 mm Cu (140 K. V. P.). A total minimal tumor dose of 6000 to 7500 rads should be delivered within a perior of about 26 to 33 days. This could be given in 300 rads tumor dose increments equally divided between sources of radiation. Approximately 5000 rads within 33 to 40 days should be applied to both the primary lesion and involved nodes. It is not the usual circumstance to arrive at a definite result in these cases, but only to provide palliative treatment. If it is thought that there was limited cervical metastases, radium needle implant could be applied to both the primary lesion and to the metastatic cervical lymph node region.

RADON SEED IMPLANT COMBINED WITH TRANSORAL X-IRRADIATION

By in large, the low intensity radium has replaced this type of therapy. However, the radon seed transoral method is still used when the therapist does not have access to the newer radium needles or he does not possess the necessary skill in the latter's application. The needles are used when treating extensive lesions of the under surface tongue, which have invaded the anterior floor of the mouth, and indurated lesions of the lateral

margin of the tongue, especially toward the lingual-faucial angle. The radon seeds are applied first and transoral x-ray treatment follows within one to two weeks. The maximal dose from the radon seeds should be approximately 6000 rads. The total surface dose from the external radiation source has usually been about 5700 to 6000 rads fractioned daily (five times a week) over a period of 18 to 22 days. (6) (7)

TREATMENT RESULTS

INTRODUCTION

In the following report, the cases reviewed have been those who have undergone treatment, regardless of the method employed. Those cases that were not considered to be treatable, were not included in the following statistics. Thus the absolute cure rate of cancer of the tongue is not obtainable in this series. There are other factors to be considered. Since this is a series of cases collected by another observer, it is difficult to establish definite and precise sets of standards in describing primary lesions.

It is also a fact that in these cases more than one person has described the lesions and it is therefore unlikely that two people have described gross pathology in the same manner or have employed the exact same standards of measurement. Consequently, an attempt was made to divide the primary lesions into three basic groups. Any primary lesion greater than 3 sq. cm. was put in one category and all those lesions which apparently had

extended into the surrounding tissue, other than the tongue, were grouped into a second category. Lesions less than 3 sq. cm. were placed in the third general group.

It should also be stated that much of the information included herein regarding the history of some cases was either incomplete or totally absent altogether. Some charts were complete as to detail while still others were deficient in even the most general information. In retracing this series of 25 years or more, it was found that the system of cartography had been completely altered several times.

In the following report, a three or five year cure indicates freedom of signs and symptoms of cancer of the tongue, after admission and treatment, for that respective period of time. In some of the cases studied, recurrences or metastases developed and were successfully treated during the period in question. Any cause of death before the respective three to five year period, and not due to cancer of the tongue, have not been included in the statistical three or five year cure rate. In the case of no direct evidence of cancer of the tongue as the cause of death, [when the patient died before the three or five year time limit,] a statistical cure was not reported. The follow-up system was only partially successful because a few of the patients either did not return questionaires given them or could not be located. These cases were not listed as a cure even if the earlier prognosis was very favorable at the onset of therapy or if the

patient responded to treatment from the inital therapy. Thus only the patients definitely known to have survived three or five years were listed as cures. It is feasible that the statistical cures may have been even higher if all patients could have been contacted on the follow-ups.

TREATMENT REPORTED IN LITERATURE

1. Surgical Treatment

Most of the statistical surgical reports in the past have been reported as only those patients that have been considered operable. Those patients who were inoperable have been excluded from the statistics. Figures varying from 12 percent (8) to 41 percent (9) for five year cure rates have been reported by different surgical series. The higher figures have been those series with fewer number of cases initially.

2. Radiological and Surgical Treatment

In the statistics dealing with cancer of the tongue treated with both irradiation and surgery, inoperable cases were also included. One of the variables here is the fact that the size, extent and site of the primary lesion should be standardized to make comparative statistics valid. These findings also show a more valid result as to the curability of cancer since all of the inoperable surgical cases are included here.

In averaging statistics from one series of treatments used in cancer of the tongue, it was found that the figures

ranged from six percent (10) to 31 percent (11) for cure rates. In conclusion, it is deduced that the average five year cure rate in cancer of the tongue in recent years is approximately 25 percent. In cases without metastases, the five year cure rate was a maximum of about 50 percent and in cases with metastases the best cure rate has been reported at 18 percent.

FACTORS INFLUENCING THE FIVE YEAR CURE RESULTS IN CANCER OF THE TONGUE

1. Age

In five year cure rates there is universally a falling cure rate with advancing age. Most patients over 75 usually have impaired general health conditions and are not in the best condition to undergo the treatment. However, it is considered by many radiologists that old age is not necessarily a contra-indication for treatment for it is possible to cure cancer at this age, especially if the primary lesion is treated early.

2. Sex

In most series of cases there is a better chance of a five year cure in women than in men. There has been no definite established fact as to the reason for this other than the fact that women generally outlive men on a universal statistical basis.

3. Duration

The patients delay in seeking medical advice after

the appearance of cancer of the tongue has been considered as one of the main factors responsible for poor results in treatment of this disease. The results, as reported in this regard, are variable, but it is difficult to consider this factor valid because there is statistical evidence that delay in seeking medical advice does not reduce the chance of cure. This can be better understood if the nature of the disease is evaluated. In some cases, symptoms may not be evident until the disease is far advanced. In other cases, symptoms may appear early, and yet the disease may not be actually far advanced in relation to the severity of the symptoms.

Statistics from files at Nebraska Methodist Hospital show that an average of two months elapses before the average patient consults medical advice. Needless to say, it is true that the earlier medical attention is sought, the better is the chance of achieving a five year cure.

4. Sideropenia and Syphilis

It is the general opinion that syphilis in people who have cancer of the tongue have a poorer prognosis. This is partly due to the fact that luetic tongues have less resistance. There is an increased incidence of developing multiple carcinomata in the leukoplakic, glossitic tongue.

5. Site of the Primary Tumor

A poor five year cure rate in carcinoma of the base of the tongue is evident because there is increased incidence

of metastases plus the fact that it is more difficult to treat lesions at the base of the tongue.

6. Size and Extent of the Primary Tumor

If the primary lesion does not extend over 3 sq. cm. the cure rate can be expected to be in the neighborhood of 55 to 65 percent in all series of cases reviewed. Tumors extending over the midline have an expectancy or cure rate of less than ten percent and have a high rate of future metastases.

7. Metastases

Those patients with metastases on admission have a five year cure rate of approximately 15 percent. In contrast, patients who have no metastases on admission have a cure rate of nearly 55 percent. Metastases developing after admission also have a much reduced five year cure rate. Cases with bilateral metastases have statistically no chance of cure.

8. Different Treatment Methods

Cases treated with radiotherapy only show less cure rate than if the combination of radiotherapy and surgery were used. When the lesion is confined to a smaller area than 3 sq. cm. the cure rate is much higher.

RECURRENCE

Recurrence of the primary lesion may appear any time but most patients return to the doctor between six months and two years.

1. Recurrence of Metastases

When metastases are treated radiologically, there are certain changes in the surrounding tissue that make it almost impossible to detect changes in regional lymph nodes until it is late in the development. Most of the recurrences will appear in one to three years.

COMPLICATIONS

1. Hemorrhage

2. Radionecrosis in the Tongue

This is possible if the radiation dosage is not properly controlled.

3. Radionecrosis of the Skin

In many series of cases this has appeared usually anywhere from one to five years after admission. This is caused by improper radiation dosage.

4. Radio-osteomyelitis of the Lower Jaw

This usually develops as a complication to heavy irradiation. Infection and trauma are also considered to be related factors in the production of this complication. Some investigators have reported an incidence of osteomyelitis as high as ten percent. This disease may take as long as 11 or 12 months to cure.

CONCLUSIONS

Treatment of the Primary Tumor

Radium is one effective means of obtaining a good five year cure rate in treatment of the primary tumor. The cure of tumors which are radiosensitive and respond to treatment can not be predicted with any assurity from pathological diagnosis nor from the size, extent, or location of the lesion. Posterior lesions have an even poorer prognosis. It is also difficult to predict which primary lesions will metastasize.

The original size of the lesion, in the cases studied, indicates larger primary lesions will be more apt to metastasize and have less chance of a five year cure. In the cases reviewed, the largest percentage of primary lesions were treated with radium.

Treatment with a combination of radiotherapy and surgery seems effective in a high percentage of primary lesion cases. The use of interstitial radium needles again has come into popular use and are employed with good results. Surgery alone was used in only four of the patients treated.

TREATMENT OF THE CERVICAL METASTASES

Cervical metastases are treated with radiotherapy after the presence of a palpable tumor. Thereafter they are treated with surgery in an attempt to reduce the metastases. In far advanced cases beyond any hope of cure, radiotherapy is still employed in an effort to slow down the rate of metastases and

for palliation of the patient's symptoms. Regional lymph nodes not involved with cancer are also treated with radiotherapy.

SUMMARY

The purpose of this thesis is to compare the incidence, associated factors, treatment and results of cancer of the tongue in a case series of 64 patients from Nebraska Methodist Hospital with a similar series of cases conducted in Sweden. It was found that the lateral border of the tongue was the most common site involved and the base of the tongue was the second most common site. The age group most often involved was the 60 to 70 year old age group, and it was more prevalent in males than in females. Heredity was not an important predisposing factor. Other factors of minimal importance are habitual use of tobacco, alcohol in excess, syphilis, trauma, and leukoplakia. The average duration of symptoms was found to be about two to three months before consulting medical advice.

The diagnosis of cancer of the tongue is made on inspection and biopsy but the degree of infiltration may be difficult to determine at the onset. Cervical metastases may often be the presenting symptom. The lateral border of the tongue is the most common initial site and in 63 percent of the cases reviewed the original lesion was still confined to an area less than 3 cm sq. in the Nebraska Methodist Hospital series of cases. Metastases are most often to the upper deep cervical lymph node group may appear between six months and 20 months. There were metastases in 67 of the cases studied

with indefinite correlation as to the initial site. A sore tongue or lump on the tongue was the most common symptom.

The various methods of treatment were then discussed with emphasis on the newer methods of irradiation. Treatment results in the literature were also reviewed. Factors influencing the five year cure rate, such as age, sex, duration of symptoms, anemia, syphilis, site of primary tumor, metastases and different treatment methods were then discussed. The tumor may also re-occur usually up to two years. Various combinations of radiation are used depending on the site, size and extent and evidence of metastasis. Five year cures are also related to the above factors.

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