

# Modified T-classification of squamous cell carcinoma of lower gingiva

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## Abstract

T staging of squamous cell carcinoma of lower gingiva has been differently interpreted among many institutions because of ambiguous definition of T3 and T4 stages, therefore modified T-classification which adopt a clear definition of T3 and T4 stages is proposed. This modified classification includes the extent of mandibular bone involvement as well as the maximal diameter of the tumor. In this classification T3 stage is defined as tumor more than 4 cm in greatest dimension or invading to corpus mandibularis and T4 stage as tumor more than 4 cm in greatest dimension and massively invading to corpus mandibularis with destruction of mandibular canal or more extensively invading tumor. The usefulness of this modified classification is also studied, which may contribute to precise determination of tumor progression and prognosis.

## Introduction

The interpretation of the T4 stage shows a little difference between different institutions. According to the UICC TNM system 1987<sup>1)</sup>, T4 stage for oral cavity carcinoma is defined as tumor invading adjacent structures, e.g. through cortical bone, into deep muscle of tongue, maxillary sinus, skin. When this rule is applied to a case that tumor 2 cm or less greatest dimension and invading into cortical bone, this case is classified as T4 stage, not T1 stage. However there is a note in the classification of the Japanese Association for Head and Neck Tumors<sup>2)</sup> shown in table 1 that destruction of the lower alveolus only dose not indicate bone destruction in the lower gingiva and the case should not be classified in the T4 stage. Furthermore, the mandibular canal classification<sup>3)</sup> shown in table 2 where bone invasion to the depth of mandibular canal is defined as T4 stage is also

**Table 1** The classification of the Japanese Association for Head and Neck Tumors

T1:	tumor 2 cm or less in greatest dimension
T2:	tumor more than 2 cm but not more than 4 cm in greatest dimension
T3:	tumor more than 4 cm in greatest dimension
T4:	tumor invades adjacent structures, e.g. through cortical bone, deep into muscle of tongue, maxillary sinus, skin
note:	in lower gingiva destruction of lower alveolus only doesn't mean bone destruction and the case don't belong to T4 stage

**Table 2** The mandibular canal Classification

T1:	tumor 2 cm or less in greatest dimension
T2:	tumor more than 2 cm but not more than 4 cm in greatest dimension
T3:	tumor more than 4 cm in greatest dimension
T4:	tumor invades to the depth of mandibular canal, deep into muscle of tongue, maxillary sinus, skin

used to classify stages of these cases, since the mandibular canal is clearly defined anatomically from the point of imaging. If a clear definition of the T4 stage should be adopted, then T stage classification may provide indices for selecting treatment for prognosis. Firstly in this study what is the most useful classification was examined. Then we propose modified T-classifications that include the extent of mandibular bone involvement as well as the maximal diameter of the tumor, and also the usefulness of this modified classification was studied. Our modified T-classifications may contribute to precise determination of lower gingival carcinoma progression and its prognosis.

## Material and methods

Thirty-two completely curable cases of primary lower gingival squamous cell carcinoma treated in the Department of Oral and Maxillofacial Surgery I Hiroshima Uni-

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versity School of Dentistry between 1975 and 1988 are reviewed according to the UICC TNM system, the classification of the Japanese Association for Head and Neck Tumors, and the mandibular canal classification. Then it was examined which was the most useful classification correlating with prognostic factors, namely, pN positive rate, recurrence rate and/or metastatic rate, and the 5-year crude survival rate from the perspective of T stage. No classification showed a high correlation with these prognostic factors. Therefore a modified T-classification containing the extent of mandibular bone involvement in addition to the maximal diameter of the tumor is proposed. It was also studied whether this modified classification was useful or not.

## Results

### 1. Patient distribution at each stage

A summary of patients distribution at each stage by the three classifications is shown in table 3. According to the UICC TNM system, 2 cases in the T1 stage (6.3%), 4 cases in the T2 stage (12.5%), 2 cases in the T3 stage (6.3%), and 24 cases in the T4 stage (75.0%). By the classification of the Japanese Association for Head and Neck Tumors, there were 3 cases in the T1 stage (9.4%), 11 cases in the T2 stage (34.4%), 5 cases in the T3 stage (15.6%), and 13 cases in the T4 stage (40.6%). According to mandibular canal classification, there were 3 cases in the T1 stage (9.4%), 13 cases in the T2 stage (40.6%), 7 cases in the T3 stage (21.9%), and 9 cases in the T4 stage (28.1%).

**Table 3** Patient Distribution at Each Stage (number of case)

	T1	T2	T3	T4
The UICC TNM system	2	4	2	24
The Japanese Association for Head and Neck Tumors	3	11	5	13
The mandibular canal Classification	3	13	7	9

### 2. pN positive rate

A summary of pN positive rates in each classification is shown in table 4. According to the UICC TNM system, all pN positive cases were classified into the T4 stage. The pN positive rate gradually increased as the tumor progressed, that is, the pN positive rate of the T1 stage was 0%, that of the T2 stage was 0%, that of the T3 was

**Table 4** pN Positive Rate (%)

	T1	T2	T3	T4
UICC TNM system	0	0	0	45.8
The Japanese Association for Head and Neck Tumors	0	0	20.0	76.9
The mandibular canal Classification	0	15.4	14.3	88.9

stage 20%, and that of the T4 stage was 76.9% according to the classification of the Japanese Association for Head and Neck Tumors. The mandibular canal classification showed no difference in rates for the T2 stage and T3 stage.

### 3. Recurrence rate and/or metastatic rate

Recurrence rate and/or metastatic rate in each classification is shown in table 5. According to the UICC TNM system, the T3 stage showed a high recurrence rate and/or metastatic rate. For the classification of the Japanese Association for Head and Neck Tumors, T stages showed a high correlation with tumor progression. While according to the mandibular canal classification recurrence rate and/or metastatic rate in the T3 stage was lower than those of the T2 stage.

**Table 5** Recurrence Rate and/or Metastatic Rate (%)

	T1	T2	T3	T4
UICC TNM system	0	0	100.0	41.7
The Japanese Association for Head and Neck Tumors	0	9.1	20.0	69.2
The mandibular canal Classification	0	23.1	14.3	77.8

### 4. 5-year crude survival rate

The 5-year crude survival rates in each classification are listed in table 6.

According to the UICC TNM system, 5-year crude survival rate of the T3 stage was the lowest and there was no rate difference between the T2 stage and T4 stage. For the classification of the Japanese Association for Head and Neck Tumors, the rate of the T2 stage was 81.8% and that of the T3 stage was 80.0%. According to the mandibular canal classification, there was an inconsistency between the rate of the T2 stage and that of the T3 stage, since in the T3 stage the tumor must have progressed further.

**Table 6** 5-Year Crude Survival Rate (%)

	T1	T2	T3	T4
UICC TNM system	100.0	75.0	50.0	70.8
The Japanese Association for Head and Neck Tumors	100.0	81.8	80.0	53.9
The mandibular canal Classification	100.0	69.2	85.7	55.6

#### 5. Correlations between maximal diameter of the tumor and recurrence rates and/or metastatic rate

pN positive rates, recurrence rates and/or metastatic rate against maximal diameter of tumor are summarized in table 7. As the maximal diameter of the tumor increased, so were higher pN positive rates and recurrence rates and/or metastatic rate.

**Table 7** pN Positive Rate and Recurrence Rate and/or Metastatic Rate against Maximum Diameter of Tumor (%)

Maximum diameter of tumor	pN positive rate	Recurrence rate and/or metastatic rate
≤2 cm	0.0	0.0
2 cm < ≤4 cm	14.3	21.3
4 cm <	60.0	53.3

#### 6. Correlation between pN positive rates and recurrence rates and/or the metastatic rate against the extent of mandibular bone involvement

The correlation between pN positive rates and those of recurrence and/or the metastatic rate is listed in table 8.

**Table 8** pN Positive Rate and Recurrence Rate and/or Metastatic Rate against Bone Involvement (%)

Bone involvement	pN positive rate	Recurrence rate and/or metastatic rate
No evidence of bone involvement	0.0	12.5
Lower alveolus	16.7	16.7
Corpus mandibularis	57.1	57.1
Circumference of mandibular canal	100.0	80.0

Here a case of a tumor slightly extending to the upper wall of the mandibular canal as bone involvement of the corpus mandibularis is classified. pN positive rate and recurrence rate and/or metastatic rate increased (16.7% to 57.1%) as the tumor extended from alveolar bone to the corpus mandibularis. Furthermore, when the tumor widely invaded to the bone including the lower wall of the mandibular canal, the pN positive rate increased from 57.1% to 100.0%, and recurrence rate and/or metastatic rate from 57.1% to 80.0%.

#### 7. Modified T-classification

In summary of these results it is needed to consider a modifying the T-classification system to include two prognostic factors, namely maximal diameter of tumor and the extent of mandibular bone involvement. Therefore modified T-classification containing the idea of a new border, that is, the lower wall of mandibular canal and corpus mandibularis shown in table 9 is proposed. The patient distribution, pN positive rates, recurrence rates and/or metastatic rates, and the 5-year crude survival rates were analyzed by T stage and the results are summarized in table 10. Cases at each stage were equally distributed according to this modified T-classification. The pN positive rate of the T1 stage was 0%, that of the T2 stage was 0%, that of the T3 stage was 30.0%, and that of the T4 stage was 100.0%. Recurrence rates and/or metastatic rates gradually increased as T stages progressed. That is, the recurrence rate and/or metastatic rate of the T1 stage was 0%, that of the T2 stage was 9.1%, that of the T3 stage was 30.0%, and that of the T4 stage was 87.5%. Moreover, 5-year crude survival rates were gradually decreased as T stage progressed. That is, 5-year crude survival rate of T1 stage was 100.0%, then that of the T2 stage was 81.8%, that of the T3 stage was

**Table 9** Modified T-classification

T1:	tumor 2 cm or less in greatest dimension and bone involvement confined to lower alveolus
T2:	tumor more than 2 cm but not more than 4 cm in greatest dimension and bone involvement confined to lower alveolus
T3:	tumor more than 4 cm in greatest dimension or invades to corpus mandibularis
T4:	tumor more than 4 cm in greatest dimension and massively invades to corpus mandibularis with destruction of mandibular canal, or more extensive tumor invading pharyngo-fauces, skin, and neck

**Table 10** Patients Distribution, pN Positive Rate, 5-year Crude Survival Rate, and Recurrence Rate and/or Metastatic Rate of Each Stage according to Modified T-classification

	T1	T2	T3	T4
Patients distribution (number of case)	3	11	10	8
pN positive rate (%)	0	0	30.0	100.0
Recurrence rate and/or metastatic rate (%)	0	9.1	30.0	87.5
5-year crude survival rate (%)	100.0	81.8	70.0	50.0

70.0%, and that of the T4 stage was 50.0%.

### Discussion

The T4 stage of lower gingival carcinoma has not been clearly defined with regard to the extent of mandibular bone involvement. Therefore, the T4 stage has been tried to classify according to the UICC TNM system, the classification of the Japanese Association for Head and Neck Tumors, the mandibular canal classification, and the other classifications in each institution. Since a case which is classified into T1 stage may be classified into the T4 stage according to other classification systems, it is difficult to select appropriate treatment, to determine the prognosis, or to compare the results of treatment among different institutions, which may limit the clinical value of the classification. Therefore, it is necessary to examine what classification is the most useful in selecting treatment and prognostic indication of clinical course. First 32 lower gingival squamous cell primary carcinoma cases were studied with regard to pN positive rates, recurrence rates and/or metastatic rates, and 5-year crude survival rates according to the UICC TNM system, the classification of the Japanese Association for Head and Neck Tumors, and the mandibular canal classification, then our modified T classification were evaluated which include the extent of mandibular bone involvement. Many reports have shown that most cases were diagnosed as the T4 stage according to the UICC TNM system<sup>4-7</sup>. In this study twenty-four out of 32 cases were classified into the T4 stage according to the UICC TNM system. Because all pN positive cases were classified into the T4 stage and the inconsistency that recurrence rate and/or metastatic rate of stage the T3 was higher than that of the T4 stage,

the T classification of the UICC TNM system was inappropriate. T classification of the Japanese Association for Head and Neck Tumors showed good correlation with stage about pN positive rates and recurrence rates and/or metastatic rates, but the patient distribution in the T3 stage cases was small as Kudo et al<sup>8</sup>. reported previously, and there was no difference between the T3 stage and the T4 stage in the 5-year crude survival rates, therefore T classification of the Japanese Association for Head and Neck Tumors is also inappropriate. According to the mandibular canal classification patient distribution of T2 stage showed large population, but an imbalance between the population of T2 stage and those of other stages was corrected comparing with the UICC TNM system and the classification of the Japanese Association for Head and Neck Tumors. And the pN positive rate, recurrence rate and/or metastatic rate, and 5-year crude survival rate of T2 stage were greater than those of T3 stage. So the mandibular canal classification was also inappropriate. As it was pointed out previously that there were some problems in these classifications. Both the maximal diameter of tumor and the extent of mandibular bone involvement correlated with the pN positive rate, recurrence rate and/or metastatic rate, and the 5-year crude survival rate, therefore modified T classification was proposed. In our modified T classifications T stages correlated well with pN positive rates, recurrence rates and/or metastatic rates, and 5-year crude survival rates. And patients in each stage were equally distributed. This modified T classification including not only maximal diameter of tumor but also the extent of mandibular bone involvement appears to be useful in the correct determination of lower gingival carcinoma progression and its prognosis.

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