

Primary Radiotherapy of Oropharyngeal Carcinoma:

Experience in Korea Cancer Center Hospital (1980. 1-1986. 12)

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Sixty-six patients with squamous cell carcinoma of the oropharynx were treated with radiation therapy and retrospectively analyzed to evaluate the treatment result in the Department of Therapeutic Radiology, Korea Cancer Center Hospital between January 1980 and December 1986.

There were 42 patients with carcinoma of the tonsil including the fossa and pillar, 9 patients with carcinoma of the base of tongue, 12 patients with carcinoma of the soft palate, and 3 patients with carcinoma of the posterior and lateral pharyngeal walls.

Considering all oropharyngeal sites of involvement together, response rates for T1, T2, T3, and T4 were 80%, 77%, 73%, and 40%, respectively, with a overall response rate of 70%. The response rate for N1, N2, and N3 were 69%, 63%, and 40%, respectively, with the overall regional response rate of 70%. In lower T status, undifferentiated carcinoma and primary tumor arising from the soft palate, higher response rates were obtained.

The 5 year overall and disease-free survival rate were 56%, 55%, respectively. A better prognosis was obtained in early T stage (T1+T2) ($p < 0.01$) and in patients without tumor extension into adjacent structures in carcinomas arising from tonsillar area ($p < 0.01$).

Through this study we suggest that, in terms of anatomical and functional preservation, radiation therapy seems to be an effective method for the primary treatment of patients with oropharyngeal carcinoma.

Key Words: Oropharynx, Squamous cell carcinoma, Radiation therapy

INTRODUCTION

The oropharynx anatomically consists of the tonsil (including fossa and pillar), the base of tongue, the soft palate and the posterior and lateral pharyngeal wall. It is important to assign, as the site of origin, an anatomical structure because spread pattern and natural history of the disease vary according to sites of origin.

The early lesions of the oropharynx are remarkably asymptomatic and many patients notice the onset of the disease by the presence of a lump on the neck. The lesions are characterized by extensive primary disease with a high incidence of cervical lymph node metastases, if midline are structures involved, bilateral lymph node metastases occur.

It is difficult to determine the exact primary site prior to presentation with involvement of multiple areas of the oropharynx and adjacent structures. Therefore, carcinomas of the oropharynx are rela-

tively lethal diseases associated with a poor prognosis in its advanced stage.

There has been a difficult problem hindering the successful treatment of oropharyngeal carcinoma. The pattern of growth often renders surgical resection difficult and ineffective due to propensity of marginal recurrence.

In carefully selected patients, however, armed with an understanding of exact staging of the lesion and an appreciation of its behavior, these tumors can be successfully treated. Radiation therapy has been proven to be very effective in the management of carcinoma of the oropharynx with salvage treatment such as surgery (including radical neck dissection), chemotherapy or radiotherapy being reserved for radiation failure since these carcinomas have usually attained advanced staging at the time of presentation.

The purpose of this study was to report the results of radiation therapy, to analyze the pattern of failure and to help improve future treatment results in squamous cell carcinomas of the oro-

pharynx.

MATERIALS AND METHODS

Between January 1980 and December 1986, a total of 86 patients with carcinomas of the oropharynx were treated with radiation therapy in the Department of Therapeutic Radiology, Korea Cancer Center Hospital. Among 86 presenting only with local diseases arising from the oropharyngeal areas or confined to the head and neck regions, 66 cases were included and 20 cases having not received a full course of radiation therapy were excluded from our analysis. The follow-up period of survivors ranged from 5 years to 10 years with a median follow-up period of 7.5 years. All patients were restaged according to the staging system of American Joint Committee (1988).

Histologic diagnoses were carried out by a tissue biopsy of the primary lesions, and all 66 cases were confirmed as squamous cell carcinomas of the oropharynx.

The ages ranged from 8 years to 76 years old with a median age of 52 years old, and the male to female ratio was 3.7:1 with 52 males and 14 females.

The patients' distribution by the degree of differentiation is shown in Table 1. The most frequent degree of differentiation was the moderately differentiated type (29%), followed by the undifferentiated type (26%) which was observed mostly in the tonsillar area (13/16). In particular, all patients with poorly differentiated carcinomas, had cervical node lesions (10/10, 100%).

The most common presenting symptom was a sore throat (62%), followed by a palpable cervical mass (14%) (Table 2). Mean interval between initial symptoms and diagnosis was 5 months.

In analyzing the primary site there were 42 patients (63.6%) with the tonsil including tonsillar

fossa & pillar, 10 patients with the base of tongue (15.1%), 11 patients with the soft palate (16.7%) and 3 patients with the posterior and lateral pharyngeal wall (4.6%).

The distribution according to T and N stage is shown in Table 3. The most common T status and N status were T3 and N2b, respectively.

Among the 66 patients, the total incidence of cervical node involvement was 73%. The site and incidence of initial involvement of cervical nodes are shown in Table 4. The most frequent involved node was the subdigastric lymph node followed by the submandibular node. The incidence of cervical

Table 1. Degree of Histologic Differentiation

Degree of Differentiation	No. of Pts (%)
Well differentiated	15 (23)
Mod. differentiated	19 (29)
Poorly differentiated	10 (15)
Undifferentiated	17 (26)
Unknown	5 (7)
Total	66 (100)

Table 2. Frequency of Clinical Symptoms

Symptom	No. of Pts (%)
Sore throat	41 (62)
Palpable neck mass	9 (14)
Foreign body sensation	7 (11)
Odynophagia	6 (9)
Dysphagia	5 (8)
Hoarseness	3 (5)
Otalgia	2 (3)
Dyspnea	2 (3)

Table 3. Distribution According to T and N Stage

T	N	N0	N1	N2			N3	Total	Incidence of node (%)
				a	b	c			
T1		4	1				5	1/ 5 (20)	
T2		9	4		7	2	22	13/22 (59)	
T3		4	6	6	9	1	3	25/29 (87)	
T4		1	2	2	1	2	2	9/10 (90)	
Total		18	13		30		5	66	48/66 (73)

Table 4. Site of Cervical Node Involvement

Cervical node	No. of Pts
Subdigastric	40
Submandibular	17
Midjugular	8
Posterior cervical	1
Supraclavicular	1

lymph node involvement increased as the T stage advanced. Initially, bilateral involvement of cervical nodes was seen in 7 patients and contralateral involvement of the cervical node in one patient.

External irradiation was used in all cases as a primary treatment modality for the primary lesion and the neck. All patients were treated using a Co-60 teletherapy unit with or without electron beams produced by MM-22 Microtron. One patient received neutron beam generated by KCCH cyclotron for control of the regional failure after primary conventional photon therapy. No patients received interstitial implant as boost or definitive treatment.

Treatment techniques varied according to the extent of the disease and consisted of parallel opposing lateral portals with equally loading, single or ipsilateral oblique wedged pair portals.

The doses to the primary sites were 5000 to 7000 cGy for T1, T2 lesions and 5560 to 7800 cGy for T3, T4 lesions delivered in a daily fraction of 180 or 200 cGy with a treatment of 5 days per week. The majority of patients with oropharyngeal carcinoma were irradiated through large parallel opposing lateral portals encompassing the primary tumors and adjacent areas as well as upper neck nodes including the first echelon nodes, and through a single anterior port including all the cervical lymph nodes to the clavicle, in a daily fraction size of 180-200 cGy, treating 5 days per week, up to 4500-5000 cGy/25-28 fractions, this was followed by a reduced field to the primary site and upper neck nodal area in order to exclude the spinal cord, with the additional dose of 1500-2000 cGy to deliver over total 6500 cGy to the primary site. Eleven patients received the intraoral cone therapy as the boost. No patients were treated with a combined modality of surgery and irradiation.

The response of the primary lesion and the cervical node metastasis following radiation therapy were assessed at a three month follow-up after the completion of treatment. The survival rates were calculated using the Life table method.

Table 5. Response Rate by T-Status

T-Status	Percent
T1	80 (4/ 5)
T2	77 (17/22)
T3	73 (21/29)
T4	40 (4/10)
Overall	70 (46/66)

Table 6. Response Rate by N-Status

N-Status	Percent
N0	89 (16/18)
N1	69 (9/13)
N2	63 (19/30)
a	75 (6/ 8)
b	59 (10/17)
c	60 (3/ 5)
N3	40 (2/ 5)
Overall	70 (46/66)

RESULTS

1. Sites of Tumor Extension

Thirty-three patients (48%) had tumors which were localized or confined to the primary site of the oropharynx without the extension of adjacent structures at the time of diagnosis. The most common site of tumor extension was the base of tongue (32%) in carcinomas of the tonsillar area, vallecula (30%) in carcinomas of the base of tongue, anterior tonsillar pillar (18%) in carcinomas of the soft palate, and nasopharyngeal wall (33%) in carcinomas of the posterior and lateral pharyngeal walls.

2. Response Rate

Response rates for T1, T2, T3 and T4 lesions were 80%, 77%, 73% and 40% respectively, with an overall response rate of 70% (Table 5). Response rate according to N stage were 89% for N0, 69% for N1, 63% for N2, 40% for N3, with overall regional response rate of 70% (Table 6). The response rate decreased as the T or N stage advanced.

Response rates by primary site of the oropharynx were as follows: 76% (32/42) in tonsillar areas,

Table 7. Response Rate by Degree of Differentiation

Degree of Differentiation	Percent
Well differentiated	73 (11/15)
Mod. differentiated	63 (12/19)
Poorly differentiated	70 (7/10)
Undifferentiated	82 (14/17)
Unknown	40 (2/ 5)

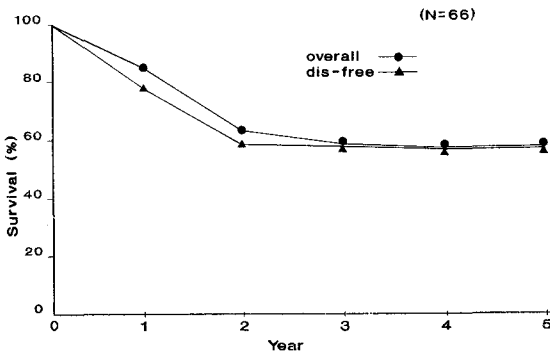


Fig. 1. Overall and disease-free survival.

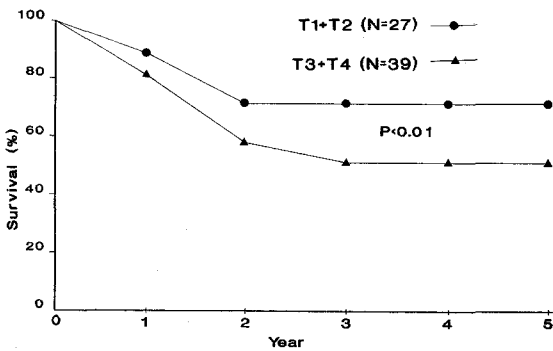


Fig. 2. Actuarial survival by T-stage.

33% (3/9) in bases of the tongue, 83% (10/12) in soft palates, in 33% (1/3) in the lateral and posterior pharyngeal walls. The highest response rate was seen in the soft palate ($p < 0.05$). In analysis of response rates according to degree of differentiation shown in Table 7, undifferentiated carcinomas appear to be more responsive to radiation therapy than the others.

3. Survival

The 5 year overall survival rate and disease-free survival rate were 55.7% and 54.8%, respectively (Fig. 1). The 5 year overall survival rates for T1+T2 and T3+T4 were 71% and 46%, respectively ($p < 0.01$) (Fig. 2).

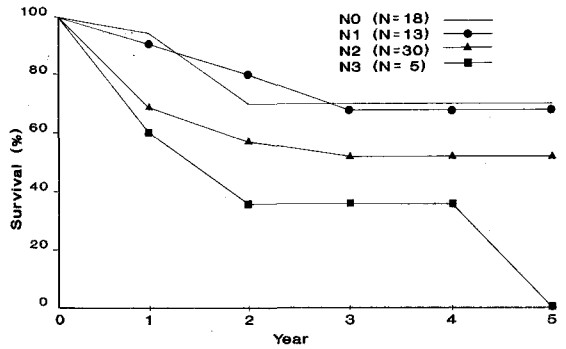


Fig. 3. Actuarial survival by N-stage.

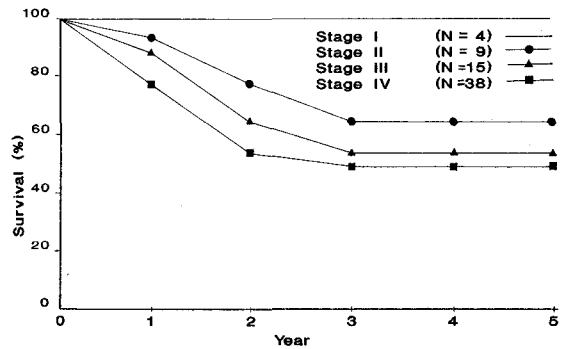


Fig. 4. Actuarial survival by stage.

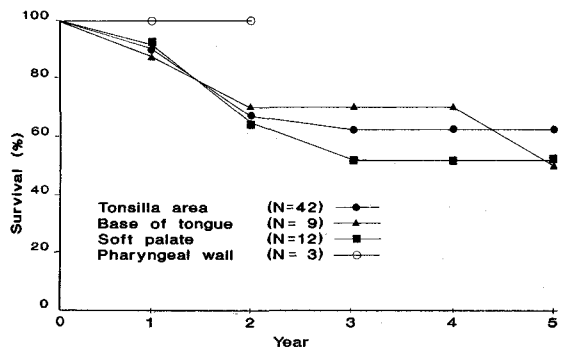


Fig. 5. Actuarial survival by primary site.

The 5 year overall survival rates for N0, N1, N2 and N3 were 69.1%, 67.3%, 51.7% and 0% (Fig. 3), respectively.

The 5 year actuarial survival rate according to stage was 100% in stage I, 63.1% in stage II, 63.6% in stage III and 44.4% in stage IV, respectively (Fig. 4).

The actuarial survival rates by primary site of the oropharynx are shown in Fig. 5. The 5 year actuarial survival rates were 63.7% in the tonsillar area, 50.4% in the base of tongue, 51.9% in the soft palate.

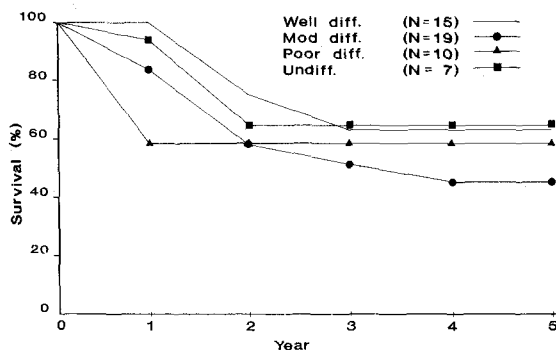


Fig. 6. Actuarial survival by degree of differentiation.

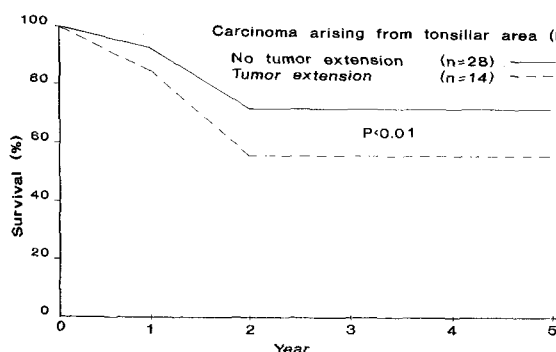


Fig. 7. Actuarial survival by tumor extension in tonsillar carcinomas.

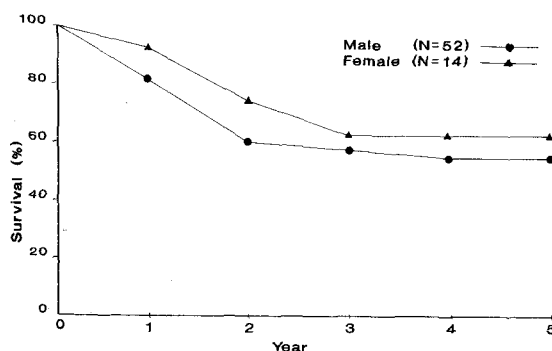


Fig. 8. Actuarial survival by sex.

There seems to be no significant difference in the 5 year actuarial survival rate according to degree of differentiation as shown in Fig. 6.

We found that there was a significant difference of overall and disease free survival rates between lesion confined to only the primary site of the oropharynx and lesions extended to adjacent or neighboring structures of the oropharynx, especially in the tonsillar lesion ($p < 0.01$) (Fig. 7).

In analysis of 5 year actuarial survival rates, these results were 54.1% and 55.1% in male, and

Table 8. Patterns of Failure

Pattern of Failure	No. of Pts (%)
Local recurrence alone	6 (38)
Regional recurrence alone	7 (44)
Locoregional recurrence	2 (12)
LR* + distant metastasis	1 (6)
Total	16 (100)

LR* : locoregional recurrence

62.4% and 48.4% in female, respectively ($p > 0.05$) (Fig. 8).

4. Recurrence and Salvage Treatment

Pattern of failures following radiotherapy is shown in Table 8. Of a total of sixteen patients with relapse, who had shown a complete response, only local recurrence developed in six patients and only regional recurrence developed in seven patients.

Local or regional recurrence was usually evident in a short period of time after the treatment, especially in the case of very large tumors. Regional recurrence occurred slightly later than local recurrence.

Of 30 patients who had received elective nodal irradiation, 2 patients failed in either side of the lower neck with or without control of the primary diseases. On the other hand, 8 of 23 patients who had not received elective nodal irradiation, failed on either side of the lower neck, among them three patients had subsequent recurrences in contralateral cervical lymph nodes. These nodes were submandibular, posterior cervical, and supraclavicular lymph nodes. One patient, who subsequently manifested the recurrence in both sides of the neck, was T2N1 lesion initially.

Among the five patients with T1 lesion, one had failed with initial radiotherapy and then was treated with a wedge resection of the primary site. In four relapsed patients with T2 lesions (4/22), successful salvages were achieved in two patients (2/4, 50% of salvage rate). In the T3 groups, 9 patients failed while 2 patients had successful salvage. Salvage treatment was successful in 3 patients with regional failure alone. The salvage rate for loco-regional failures was 33.3%, and the median survival after recurrence was 21 months.

Salvage treatment consisted of reirradiation (10/16) mainly, radical neck dissections for regional failures (2/16) mainly, and chemotherapy

(3/16; Bleomycin+Cisplatin or Cytoxan+Adriamycin+Cisplatin). Two patients did not receive salvage treatment.

Distant metastases occurred in 6 (9%) of the total 66 patients, distant metastases alone were seen in 5 patients and one patient had a distant metastasis plus local failure. Sites of metastases were as follows: liver-2, pleura-2, lung-1, and bone (pedicle of third thoracic vertebra)-1. Distant metastases occurred in only one patient (6%) of the 16 patients in whom the primary site and cervical lymph nodes had been controlled completely.

5. Complications

Complications which occurred following radiation therapy are shown in Table 9. Most complications developed as the radiation doses increased in advanced stages. There was a statistically significant difference of incidence in complications between early stage (I, II) and advanced stage (III, IV) ($p < 0.01$). In early stages treated with the relatively lower dose (5000~7000 cGy), xerostomia was the only complication in 3 out of the 13 patients. In advanced stage with a higher dose (5560~7800 cGy), 22 patients (41.5%) out of 53 patients had complications.

Complications such as osteoradionecrosis were never seen in spite of treating 12 patients with the ipsilateral portal. However, trismus frequently occurred, and paralysis of cranial nerves was observed in 4 patients (hypoglossal nerve; 2, recurrent laryngeal nerve; 1, facial nerve; 1) as shown in Table 9.

We experienced complications consisting mainly of minor side effects such as xerostomia and loss of taste requiring conservative managements; no

complications requiring surgical interventions were observed.

6. Second Primary Tumors

A second primary malignant disease was observed in 3 patients. One patient had carcinoma of the stomach (adenocarcinoma), one had lung cancer and one had skin cancer (squamous cell carcinoma).

DISCUSSION

While not a common disease, carcinomas of the oropharynx not only appear to be increasing in frequency, but also are being diagnosed increasingly in younger patients and females whose lifestyle includes both alcohol and tobacco abuse.

The oropharynx anatomically consists of the tonsil including fossa and pillar, the base of tongue, the soft palate, and the posterior and lateral pharyngeal wall. The most common site of tumor origin in the oropharynx is the tonsillar area.

The oropharyngeal carcinomas generally tend to extend into adjacent structures. Early detection of the carcinoma of the oropharynx is difficult due to the lack of obvious symptoms. Most of patients are diagnosed in advanced stages. In carcinoma of the oropharynx, involvement of cervical lymph nodes has been reported as high as 65 to 70% when the patients are first seen¹⁻³. Incidence of nodal metastases tend to increase as tumor stage advances.

In our report 80% of the total of 66 patients were in stage III and IV, and 73% of all patients had cervical lymph nodes metastases at the time of diagnosis, and in a analysis of distribution of cervical lymph node involvement, ipsilateral subdiaphragmatic lymph nodes were involved most commonly (59%), followed by submandibular lymph nodes (35%). Bilateral lymph nodes metastases were found in 11% of all patients at initial presentation; these results are similar to other reports⁴⁻⁷. Distant metastases were observed in six patients after the completion of therapy. Many authors^{1,2,6} reported metastases were found in 10 to 15% of patients, and the most common site was the lung, followed by liver, and bone.

It has been generally accepted that external radiation would be the treatment of choice for carcinoma of the oropharynx in early stage, although there were similar treatment results or survival rates in patients treated with radiation and with surgery, as reported in many series⁷⁻⁹.

Table 9. Complications Following Treatment

Complication	No. of Pts (%)
Trismus	14 (21)
Xerostomia	11 (17)
Soft tissue ulceration and Necrosis	5 (8)
Cranial nerves paralysis	4 (6)
hypoglossal	2
recurrent laryngeal	1
facial	1
Hearing loss	3 (5)
Oropharyngeal bleeding	2 (3)
Subcutaneous fibrosis	2 (3)

Many authors disagree on treatment modality of advanced diseases. Generally, many authors^{5,10-14)} have agreed that the combined modality of surgery and radiation therapy was effective as a method of initial treatment in advanced stages, therefore, it has been attempted in many institutes^{5,10-13)}. However, oropharyngeal carcinomas would be treated with radiation therapy in hope of easily encompassing both primary and cervical lymph nodes without anatomical and functional deficits. Surgical resection presents a difficult problem as a initial treatment modality due to the propensity of marginal recurrence in terms of the pattern of tumor growth, surgery would be reserved for radiation failure.

Many authors^{9,15-17)} suggested that survival was related mainly to the extent and the size of the primary lesion, and this could be associated with increased prevalence of nodal metastases in large primary tumor, related to local control of tumor and to the site of tumor origin in oropharyngeal carcinoma. The actuarial 5 year survival rates were 100% in T1, 64% in T2, 53% in T3, and 23% in T4, with an overall survival rate of 49% in this study. In analysis of survival rates according to staging, actuarial 5 year survival rates of stage I, II, III, and IV were 100%, 63%, 64%, and 44%, respectively. Survival rates would be the composite results of local control of the primary tumor, neck and distant disease-free status.

It is generally recognized that the local and/or regional control rate decrease as the T or N stage advance. Local response rates following radiation therapy were 80%, 77%, 73% and 40% for T1, T2, T3 and T4, respectively in our report. Many authors^{7-8,19-20)} reported local control rates of 80 to 100% in T1, 65 to 85% in T2, 50 to 70% and 20 to 40% in T4. These unsatisfactory results of local control in T4 may be attributable to the biological aggressiveness of the tumor and the relative high proportions of the hypoxic cells in large lesions, as suggested by other authors.

In patients with T4 lesions, many residual diseases remained at the completion of radiotherapy. Therefore, boost dose, through intraoral cone or employing interstitial implant with Ir-192 seeds, is worth active consideration for persistent primary lesions following external photon radiotherapy. It is possible that the use of Ir-192 seeds implant, which allow the delivery of high dose of irradiation to a limited volume, may improve the control of primary diseases without a parallel increase in complications. This method was not carried out during the period involved in our analysis, but recently has

become the common practice at our hospital.

We obtained lower response rates of clinically involved cervical nodes with 66% in N1, 63% in N2 and 40% in N3, in spite of higher response rates of primary site in our review. These lower regional response rates seem to be associated with only involved nodal irradiation in early phase of period in our analysis.

The expected high incidence of late nodal metastases was decreased by elective irradiation of cervical lymph nodes in many reports²¹⁻²³⁾. Elective radiation therapy for the clinically negative neck has been advocated in place of elective radical neck dissection, on the basis of the ability of radiation therapy to eliminate suspected nodal disease. There was a significant difference of regional failure between patients with and without elective nodal irradiation in our analysis ($p < 0.05$). Three patients with initially N0, N1 and N2b lesions, who subsequently showed contralateral nodes metastases in the neck, were observed and all three patients had not received whole nodal irradiation in spite of having advanced lesions.

In analyzing the failure pattern following radiation therapy, the vast majority of failures were local and/or regional failure (94%). Regional recurrence alone was the most common pattern (44%), and the local failure rate was 37%. Perez⁹⁾, Parson²⁴⁾ and Gelinas²⁵⁾ reported that failure rates following irradiation were less than 25% in T1, 10 to 35% in T2, 25 to 40% in T3 and 40 to 60% in T4 in tonsillar carcinomas. In our report, failure rates were 50% in T1, 14% in T2, 27% in T3, and 25% in T4 in tonsillar carcinomas. There was only one case of primary failure plus regional failure out of a total of 16 failures in our review (6%) as compared to the results of other reports (30 to 45%). More than 90% of all failures occurred within 2 years following radiation therapy.

Many authors^{7,23,26)} suggested that the treatment of regional disease was affected by various factors, such as control of the primary tumor, size and numbers of neck nodes, extent of primary tumors, and the use of elective nodal irradiation. Many report that the most relevant prognostic factor has been the extent of the diseases either at the primary site or in the neck^{5,9,15-16)}. Tumor extension into the adjacent structures was associated with decreased survival; for example, extension to the base of the tongue in cases of tonsillar carcinomas play a critical role in predicting tumor response to treatment.

Complications which occurred following radio-

therapy were associated with TDF (time-dose factor), higher total dose according to advanced T or N stage, the size of port, field technique, use of brachytherapy and combined treatment modality of radiotherapy and surgery, as reported by many authors. Weller⁴⁾ suggested the volume size irradiated as a very important factor in the development of complications. Mendenhall et al reported that there was no difference in the incidence of soft tissue and/or bone complication by fractionation group (once-a-day versus twice-a-day fractionation). In analysis of different techniques used for oropharyngeal cancers, Grant²⁷⁾ found a 45% incidence of bone exposure and a 13% incidence of osteoradionecrosis when the wedged pair technique was used. However, no osteoradionecrosis was seen in spite of having used the ipsilateral wedged pair or single ipsilateral techniques in 12 patients, most experienced only mild complications requiring conservative management in our study. On the other hand, severe complications, such as subcutaneous fibrosis or oropharyngeal bleeding occurred in patients in this study being treated with high fraction size (250-300) in the early phase.

Second primary carcinomas in the head and neck cancers were reported and this problem has been addressed by many authors^{7,19)}. Amornmarn et al⁷⁾ reported that 24% of second primary cancer included cancers of the esophagus and other sites of the head and neck. But they did not elucidate the reasons for the high rate of multiple primary cancers and suggested that chronic irritation from heavy smoking and drinking might have been the causes.

Advanced stage of oropharyngeal carcinomas will continue to be the biggest challenges to successful treatment, and control of these lesions will be the subject for radiation oncologists to pursue in the future. The major causes of local failure in patients treated with radiotherapy alone, were associated with the inability to control the extensive local diseases, the large number of advanced stage cancers at the time of diagnosis, and the use of the involved portal, lack of application of brachytherapy and lack of aggressive salvage treatment in the period of early involvement in our analysis. Therefore, prospective clinical trials should be carried out to identify the therapeutic approach with which we can obtain the highest survival and local control rates with the lowest morbidity or complications including anatomical functional deficits in the future.

CONCLUSIONS

Through the retrospective analysis of 66 patients with squamous cell carcinoma of the oropharynx who were referred to our department between January 1980 and December 1986, we obtained treatment results following radiation therapy.

The results were as follows:

1. The 5 year overall survival and disease-free survival rate were 56% and 55%, respectively.
2. The 5 year actuarial survival according to stage were as follows:
stage I ; 100%, II; 63%, III; 53%, IV; 44%.
Stage I > II, III, IV ($p < 0.05$).
3. The 5 year actuarial survival rate of early T stage (T1+T2) was higher than that of late T stage (T3+T4) ($p < 0.05$).
4. There was a significant difference in survival between absence and presence of tumor extension in carcinomas arising from the tonsillar area ($p < 0.01$).

In conclusion, radiation therapy is an effective method as the primary treatment of patients with oropharyngeal carcinoma in terms of the anatomical or cosmetic effect and functional preservation. Also, brachytherapy using Ir-192 seeds and aggressive salvage treatment are needed for higher ultimate control rate because the majority of failure was local and/or regional failure.

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== 국문초록 ==

구강인두 종양의 방사선 치료 성적

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저자들은 1980년 1월부터 1986년 12월까지 원자력병원 치료방사선과에서 방사선 치료를 받은 66명의 구강인두 편평상피 종양 환자들을 대상으로 한 후향적 분석을 통하여 다음과 같이 결과를 얻었다.

구강인두 종양의 원발 부위별 환자분포를 보면 편도부위 종양이 42예로 가장 많았고 연구개 종양이 12예, 구강저 종양이 9예 그리고 측인두 및 후인두벽 종양이 3예순이었다.

구강인두 부위에 침범한 병소들을 총체적으로 분석한 경우 원발병소의 병기에 따른 국소관해율은 T1과 T2 그리고 T3와 T4 병기에서 각각 80%와 77% 그리고 73%와 40%였고 전체적으로 70%의 국소관해율을 보였다. 국소관해율은 원발병소의 병기가 낮을수록, 또한 원발부위로 볼때 연구개부위 종양에서, 그리고 분화도상에 미분화된 세포를 가진 경우에 가장 높았다. 국소적 임파선의 병기에 따른 국소임파관해율은 N1과 N2 그리고 N3 병기에서 각각 96%와 63% 그리고 40%였으며 전체적으로 70%의 국소임파관해율을 보였다.

원발병소의 병기에 따른 5년 생존율은 T1과 T2에서 71%, T3와 T4에서 46%였다($p < 0.05$). 또한, 편도부위에 생긴 종양의 경우 5년 생존율은 주위조직으로의 침범이 없는 군이 있는 군보다 통계적인 유의차로 높았다($p < 0.01$).

결론적으로 볼때 방사선 요법이 해부학적 형태 유지 및 기능적인 보존측면에서 구강인두 종양에 대한 일차적인 치료방법으로서 효과적인 것으로 사료된다.