

Radiotherapy of Carcinoma of Maxillary Antrum

Chang Woo Moon, M.D., Tae Sig Jeung, M.D.
and Ha Yong Yum, M.D.

*Department of Therapeutic Radiology, Kosin Medical College and
Medical Center, Pusan, Korea*

Seventy-nine patients with carcinoma of maxillary antrum treated at the department of therapeutic radiology, Kosin Medical Center, between June 1980 and December 1986 were analyzed retrospectively for survival rate and treatment failure. Forty-three patients were treated with radiotherapy alone and thirty-six patients were treated with combination of surgery and radiotherapy.

The overall 5 year survival rate was 32%, patients that were treated with radiotherapy alone had a 5-year survival rate of 23%, and patients who were treated with combination of surgery and radiotherapy had a 5-year survival rate of 42%.

54 patients(68.4%) failed to be cured. Among these 54 patients, 37 patients(68.5%) had only locoregional failure, 16 patients(29.6%) had locoregional failure and distant metastases and 1 patient had only distant metastasis.

From above study combination of surgery and radiotherapy might be a better treatment modality for carcinoma of the maxillary antrum.

Key Words : Carcinoma of maxillary antrum, Radiation therapy, 5 year survival rate.

INTRODUCTION

Carcinoma of maxillary antrum is a rare neoplasm, which consists less than 0.5% of all human tumors¹⁻³⁾ and 3% of cancers of the upper respiratory and alimentary tract²⁾. The maxillary antrum is the most frequently involved sinus and represents 60~85% of the tumors of the paranasal sinuses²⁾. Squamous cell carcinoma is the most common histologic type. Early cancer within the maxillary antrum with a relatively good prognosis is rarely diagnosed since early symptoms of malignant tumor and inflammatory disease are indistinguishable. Many lesions are locally advanced and involve the structure around

the sinus, which makes effective treatment difficult⁴⁾.

Although combined surgery and radiotherapy usually play a role in locally advanced cases, surgery can be a curative treatment and have higher local control rate in early cases. Generally the five-year survival rate has been reported in range of 10~60% by surgery, radiotherapy or chemotherapy alone or in combination^{1,2,4~7)}.

Although these tumors are treated with surgery and pre or postoperative radiotherapy, it is still debatable whether primary treatment of maxillary carcinoma should be radiation or surgery. In a few reports, the advantage of preoperative radiation to reduce the bulky tumor and facilitate surgery has been emphasized in recent

periods^{1,2,5}). This report is a retrospective analysis of 79 patients with carcinoma of maxillary antrum treated with radiotherapy at Kosin medical college and medical center between June 1980 and December 1986.

MATERIALS AND METHODS

One-hundred patients with carcinoma of maxillary antrum treated with radiotherapy at the department of therapeutic radiology, Kosin medical center, between June 1980 and December 1986 were analysed retrospectively for survival rate and treatment failure. 15 patients were excluded because of total radiation doses of less than 4000cGy and 6 patients were excluded because of loss of follow-up. The duration of follow up was 6 to 12 years(average;9 years) and follow-up percentage was 94%(94/100 patients).

Their pretreatment characteristics are seen in Table 1. The histologic diagnosis of carcinoma of maxillary antrum was confirmed by biopsy with CaldWell-Luc procedure and CT or MRI was performed in every cases. Commonly presented signs and symptoms were nasal obstruction and facial pain with fullness/swelling. 21 patients(26.6%) had cervical lymph node metastases at the time of therapy(submandibular nodes-18 patients and subdiaphragmatic nodes-3 patients), 56 patients (70.9%) had suprastructure and 23 patients (29.1%) had infrastructure divided by Öhngren's line. The staging of 79 patients by AJC is shown in Table 2. 68 patients(86.1%) were in advanced stages; 35 patients(44.3%) in stage III and 33 patients(41.8%) in stage IV.

43 patients(54.4%) were treated with radiotherapy alone and 36 patients(45.6%) with combination of surgery and radiotherapy. 25 patients(69.4%) received partial maxillectomy and 11 patients (30.6%) received total maxillectomy with or without orbit exentration. 21 patients with cervical lymph node metastases subsequently received modified radical neck dissection. The majority of patients were treated with 4-6 MV X-ray.

The treatment portals included only the primary tumor or tumor bed but the 21 patients included the regional lymph nodes. The two field technique(anterior and lateral portals with 45° or 60° wedge) was used to deliver uniform dose distribution to the maxillary sinus, nasal cavity,

Table 1. Patient Characteristics

	No. of Patients(%)
Sex	
Male	51(64.6)
Female	28(35.4)
Age	
< 29	1(1.3)
30-39	7(8.9)
40-49	15(19)
50-59	35(44.3)
60-69	16(20.2)
70 <	5(6.3)
Origin site	
Rt. side	46(58.2)
Lt. side	33(41.8)
Histology type	
well diff. squamous cell	71(89.9)
Poorly/undiff. cell	5(6.3)
Adenoid cystic ca.	3(3.8)
Total	79

Table 2. Stage

	No. of Patients(%)
T stage	
T2	11(13.9)
T3	38(48.1)
T4	30(38)
N stage	
NO	58(73.4)
N1	12(15.2)
N2	8(10.1)
N3	1(1.3)
Stage	
II	11(13.9)
III	35(44.3)
IV	33(41.8)
Total	79

Staging system : Manual for Staging of Cancer ; American Joint Committee on Cancer, 4th edition

ethmoid sinus and sphenoid sinus. 43 patients treated with radiotherapy alone received radiation doses of 5500–7500cGy to the primary tumor with median dose of 7200cGy. 36 patients treated with combined surgery and radiotherapy received radiation doses of 5000–6900cGy to tumor bed with median dose of 6500cGy (Table 3). 65 patients (82.3%) were treated with conventional radiation therapy (180–200cGy per day, 5 times per week), and 14 patients (17.7%) were treated with hyperfractionated radiation therapy (115cGy per fraction, 2 times per day, 4 to 6 hours interval, 10 times per week). Statistical significance was analyzed by Chi-square and survival rate was calculated by the Life Table Method⁸⁾.

RESULTS

Among 79 patients treated with radiotherapy, complete response was obtained in 32 patients (40.5%) and partial response in 29 patients (36.7%) (Table 4).

Table 3. Distribution of the Patients Received Different Radiation Doses

Radiation dose	No. of Patients(%)
RT alone	43(54.4)
less than 6000cGy	1(2.3)
6000–7000cGy	6(14.0)
more than 7000cGy	36(38.7)
OP+RT	36(45.6)
less than 6000cGy	2(5.6)
more 6000cGy	34(94.4)
Total	79

Table 4. Overall Response Rate of All Patients

Response	No. of Patients(%)
Complete Response	32(40.5)
Partial Response	29(36.7)
No Response	16(20.3)
Aggravation	2(2.5)
Total	79

The overall 5 year survival rate was 32%(Fig. 1). The 5 year survival rate in radiotherapy alone group was 23%, while combined surgery and radiotherapy group had survival rate of 42% (Fig. 2).

The 5 year survival rates by stage were 66.7

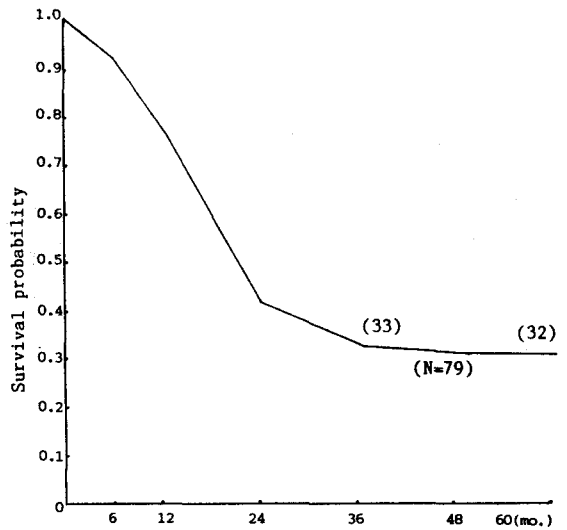


Fig. 1. Overall 5 year survival rate of maxillary antral carcinoma

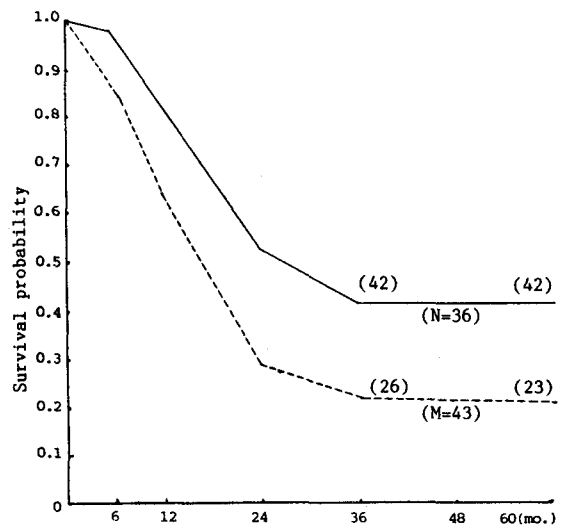


Fig. 2. 5 year survival rate of maxillary carcinoma by RT alone and combined OP and RT
 — : Combined OP+RT
 - - - : RT alone

%, 38.5% and 4.2% for stage II, III and IV in radiotherapy alone group and 20%, 36.4% and 66.7% for stage II, III and IV in combined surgery and radiotherapy group. The 5 year survival rates by T stage were 60%, 37.5% and 4.5% for T2, T3 and T4 in the radiotherapy alone group and 33.3%, 36.4% and 62.5% for T2, T3 and T4 in combined surgery and radiotherapy group. The 5 year survival rates by node positive and node negative patients were 9.5% and 39.6%. The 5 year survival rates by radiotherapy alone and combined therapy were 6.7% and 16.7% in node positive patients and 32.1% and 46.7% in node negative patients. There was significant difference in node positive patients ($P < 0.001$) (Table 5) but no significant in node negative patients. The 5 year survival rates in the suprastructure and infrastructure were 26.8% and 43.5%. There was no significant difference. The 5 year survival rates by total radiation dose were 100%, 33.3% and 19.4% in doses less than 5999cGy, doses of 6000cGy to 6999cGy and doses more than 7000cGy in radiotherapy alone group, and 100%, 38.2% in doses less than 6000cGy and doses more than 6000cGy in combined therapy group (Table 6). There were no significant differences in survival rates by age, sex, original site(right/left) and histology type (Table 7).

Of 54 patients who had failed after treatment, 37 patients(68.5%) had locoregional failure, 1 pa-

Table 5.5 Year Survival Rate(%) by Treatment Modalities

T, N stage	RT alone (N=43)	OP+RT (N=36)	Total (N=79)
T2	60	33.3	45.5
T3	37.5	36.4	36.8
T4	4.5	62.5	20
N(+)	6.7	16.7	9.5
N(-)	32.1	46.7	39.6
II	66.7	20	45.5
III	38.5	36.4	37.1
IV	4.2	66.7	21.2

tient(1.9%) had distant metastasis and 16 patients(29.6%) had locoregional failure and distant metastases(Table 8.). The most common distant metastatic site was lung. Among 32 patients who had showed complete response by initial treatment, 12 patients(37.5%) had relapsed; 7 pa-

Table 6. 5 Year Survival Rate by Radiation Doses

Total dose	5YSR(%)
RT alone	
less than 6000cGy	100
6000-7000cGy	33.3
more than 7000cGy	19.4
OP+RT	
less than 6000cGy	100
more than 6000cGy	38.2

Table 7. 5 Year Survival(%) by Sex, Origin Site, Age and Histology Type

	RT alone (N=43)	RT alone (N=36)	Total (N=79)
Sex			
male	25	39.1	31.4
female	20	46.2	32.1
Age			
-29	0	-	0
-39	0	50	28.6
-49	10	20	13.3
-59	31.3	42.1	37.1
-69	12.5	50	31.3
70-	60	-	60
Origin site			
Rt.	20.7	58.8	34.8
Lt.	28.6	26.3	27.3
Histology type			
Well diff.	24.4	43.3	32.4
squamous cell			
Poorly/ undiff. cell	0	66.7	40
Adenoid	-	0	0
cystic ca.			

Table 8. Patterns of Treatment Failure

	No. of Patients(%)
locoregional failure	37(68.5)
Distant metastasis	1(1.9)
locoregional & distant metastasis	16(29.6)*
Total	54/79(68.4)

* One case with persistent cancer and fistula formation had distant metastasis.

Table 9. Complication of Radiation/Combination with Surgery

	No. of Patients(%)
loss of vision/cataract	4(5.1)
Chronic sinusitis/ osteradionecrosis	7(8.9)
Face & cutaneous fistula/necrosis	6(7.6)
Oral cavity(gingiva/ palate) necrosis	7(8.9)
Total	24/79(30.4)

Table 10. Results for Treatment of Maxillary Carcinoma

Authours / Hospitals	5year survival rate	
	RT only	OP+RT
Seoul University ¹	22.1%	65.3%
Shibuya ²	21%	34%
Amendola ³	35%	31%*
Frich JR ⁴	—	60%
Kondo ⁵	33.8%	48%
Spratt ¹³	25%	50%
Kosin Medical Center	23%	42%

OP only case

* 10 year survival rate

tients relapsed within 12 months and 5 patient relapsed within 24 months.

Radiation complication was shown in Table 9.

DISCUSSION

Carcinoma of maxillary antrum is characterized by late diagnosis and advanced status of the dis-

ease. Aggressive surgical treatment for advanced maxillary antral tumor is associated with severe functional and cosmetic morbidity. Higher dose radiotherapy is also resulted in severe radiation complications.⁹⁾ Generally the results of each type of therapy were unsatisfactory, and the incidences of local recurrence and complication were very high.

The results of this study showed that combined surgery and radiotherapy was a better treatment modality for carcinoma of the maxillary antrum. The 5 year survival rate was 23% in radiotherapy alone group and 42% in combined surgery and radiotherapy group. These results were similar to those reported in the literatures (Table 10). In the reported series the 5 year survival rate from 21%–35% in radiotherapy alone^{1,2,4,6,7,9)} and 31%–65.3% in combin surgery and radiotherapy^{1,2,4–7,9)}.

Controversy remains whether radiotherapy should be given preoperatively or postoperatively. No significant difference between preoperative and postoperative radiotherapy has been found by some authors^{7,10)}, however others^{9,11–13)} prefer preoperative radiotherapy. Sato et al¹⁰⁾ reported that conventional trimodal combination therapy composed of minor operation, radiotherapy and chemotherapy has been introduced to achieve improvement in the local control rate and to reduce the complications associated with the radical surgery. As for the tumor control, conventional trimodal therapy did not give a good survival rate, and this therapy sometimes resulted in a lack of local control and recurrences only in the region where it was poorly vascularized⁹⁾.

In ours, the 5 year survival rates by radiotherapy alone were 60%, 37.5% and 4.5% for T2, T3 and T4 lesions, respectively. The survival rate in early staged disease was found to be similar to others^{1,6,13–15)}, however for advanced lesions (T3 and T4) our result was obviously inferior to that reported by Yun et al¹⁾. Badib et al¹⁴⁾ also reported inferior 5 year survival rates by stage with 35%, 18% and 10% in stage I, II, III

and IV, respectively. The survival rates were found to fall rapidly as the disease has progressed in stage, particularly it was very poor in T4 disease. The survival rate of early staged T2 lesion was better in the group of radiation alone than in combination therapy. The survival of T3 lesion was same in both modalities. The advanced T4 lesion showed much superior survival rate by combined treatment. The bulky tumor mass would be insufficient to eradicate by conventional radiation dose.¹³⁾ Although survival rates were different according to stage, we could not make a conclusion due to insufficient study population, particularly in combined treatment group (Table 5).

In our study, in spite of high proportion of the advanced diseases, i.e., 86.1% had T3 and T4 tumors, the incidence of neck node metastasis (26.6%) on initial examination was similar to others^{1,12,16,17)}. Yun et al¹⁾ and Batani et al⁶⁾ reported that initial cervical node metastasis does not influence prognosis but Kondo et al⁶⁾ and Pezner et al⁷⁾ reported that initial cervical node metastasis influences prognosis adversely. We found much superior 5 year survival rates of 39.6% in node negative patients vs 9.5% in node positive patients, though it was not statistically significant because of small population. Statistically significant but same results were reported in 3 year and 5 year survival rates by Kondo et al⁶⁾ and Cheng et al²⁾. Elective irradiation of neck nodes has been controversial. Kondo et al⁶⁾ and Pezner et al⁷⁾ reported they could not find any subgroup of patients with a high risk of developing nodal metastases. Our 5 year survival rate in node negative patient was 32.1% in radiotherapy alone group and 46.7% in combined surgery and radiotherapy, but there was not statistically significant. Elective neck irradiation for the patient with clinically negative node has not been adopted in our institution

Boone et al⁹⁾ reported that 5 year survival rates in infrastructure and suprastructure were 66.7% and 50%, and recurrent rates were significantly less in infrastructure. Jesse et al¹¹⁾ also re-

ported that infrastructure was more favorable prognosis than suprastructure. We found better 5 year survival rates of 43.5% in infrastructure than 26.8% in suprastructure because the suprastructural lesions are known to be more advanced staging.

The radiation dose required for the sterilization of the carcinoma of the maxillary antrum was not well established. Yun et al¹⁾ reported that more than 7000cGy was needed for tumor control by radiotherapy alone and 6000c Gy was optimal for postoperative irradiation. Others^{3,12,15,18,19)} reported that total radiation dose for tumor control was similar to Yun et al¹⁾. In our study we found that more than 7000cGy for radiotherapy alone or more than 6000cGy for combined surgery and radiotherapy were not beneficial for tumor control, but we currently treated the patients with the carcinoma of maxillary sinus with doses more than 7000cGy in radiotherapy alone group because majority of these patients had far locally advanced disease and dose of 6000cGy in combined group.

The analysis of treatment failure showed locoregional failure 68.5%, distant metastasis 1.9% and locoregional failure with distant metastasis 29.6%. All treatment failure occurred within two years. The local failure was a dominant pattern in Table 7 as in literatures^{1,-5,7,9-16,18)}. Unsatisfied survival rate was found to be due to poor local control.

Complication of radiation shown in Table 8 was 30.4% and as high as in literatures^{9,12,15)}. The most serious complication was bone necrosis. From above study combination of surgery and radiotherapy might be a better treatment modality for carcinoma of the maxillary antrum.

REFERENCES

1. Yun HG, Park CI, Kim KH : Radiotherapy of squamous cell carcinoma of maxillary antrum. J Korean Soc Ther Radiol 8 : 45-50, 1990
2. Amendola BE, Eisert D, Hazra TA, et al : Carcinoma of the maxillary antrum; surgery or radiation

- therapy?. *Int J Radiat Oncol Biol Phys* 7 : 743–746, 1981
3. **Marchetta FC, Sako K, Mattick W, et al** : Squamous cell carcinoma of the maxillary antrum. *Am J surgery* 118 : 805–807, 1969
 4. **Shibuya H, Horiuchi JI, Suzuki S, et al** : Maxillary sinus carcinoma; Result of radiation therapy. *Int J Radiat Oncol Biol Phys* 10 : 1021–1026, 1984
 5. **Frich JC Jr** : Treatment of advanced squamous cell carcinoma of the maxillary sinus by irradiation. *Int J Radiat Oncol Biol Phys* 8 : 1453–1459, 1982
 6. **Kondo N, Ogawa K, Inuyama Y, et al** : Prognostic factors influencing relapse of squamous cell carcinoma of the maxillary sinus. *Cancer* 55 : 190–196, 1985
 7. **Spratt JS Jr, Mercado P** : Therapy and staging in advanced cancer of the maxillary antrum. *Am J surgery* 110 : 502–509, 1965
 8. **American Joint committee on cancer** : Reporting of cancer survival and end results. In manual for staging of cancer 4th(ed) philadelphia JB Lippincott company 11–23, 1922
 9. **Boone MLM, Harle TS, Higholt HW, et al** : Malignant disease of the paranasal sinuses and nasal cavity; Importance of precise localization of extent of disease. *Am J Roentgen* 102 : 627–637, 1968
 10. **Sato Y, Morita M, Takahashi H, et al** : Combined surgery, radiotherapy and regional chemotherapy in carcinoma of the paranasal sinuses. *Cancer* 25 : 571–579, 1970
 11. **Jesse HR** : Preoperative versus postoperative radiation in the treatment of squamous cell carcinoma of the paranasal sinuses. *Am J Surgery* 110 : 552–556, 1965
 12. **Cheng VST, Wang CC** : Carcinomas of the paranasal sinuses; A study of sixty-six cases. *Cancer* 40 : 3038–3041, 1977
 13. **Wang CC** : Carcinoma of the paranasal sinuses. In radiation therapy for head & neck neoplasms. Littleton, John Wright, PSCT Inc 213–221, 1983
 14. **Badib AO, Kurohara SS, Webster JH, et al** : Treatment of cancer of the paranasal sinuses. *Cancer* 23 : 533–537, 1965
 15. **Bush SE, Bagshaw MA** : Carcinoma of the paranasal sinuses. *Cancer* 50 : 154–158, 1982
 16. **Batain JP, Ennuyer A** : Advanced carcinoma of the maxillary antrum treated by cobalt therapy and electron beam irradiation. *Br J Radiol* 44 : 590–598, 1971
 17. **Pezner RD, Moss WT, Tong D, et al** : Cervical lymph node metastases in patients with squamous cell carcinoma of the maxillary antrum; The role of elective irradiation of the clinically negative neck. *Int J Radiat Oncol Biol Phys* 5 : 1977–1980, 1979
 18. **Salem LE, Zaharia M, Travezan R** : Carcinoma of the paranasal sinuses. *Am J surgery* 106 : 826–830, 1963
 19. **Weymuller EA Jr, Reardon EJ, Nash D** : A comparison of treatment modalities in carcinoma of the maxillary antrum. *Arch Otolaryngeal* 106 : 625–629, 1980

= 국문초록 =

원발성 상악동 암의 방사선 치료

고신대학교 고신의료원 치료방사선과학교실

문창우 · 정태식 · 염하용

1980년 6월부터 1986년 12월까지 고신의료원 치료방사선과에서 방사선 치료를 받았던 상악동 암환자 79예에서 생존율과 치료실패에 대해 후향적으로 비교 분석하였다. 43예에서는 방사선 단독 치료를 하였고, 36예에서는 수술과 방사선 치료를 병용 하였다.

전체 환자들의 5년 생존율은 32% 였으며 방사선 단독 치료만을 받았던 환자들의 5년 생존율은 23% 였으며 수술과 방사선 치료를 병용한 환자들의 5년 생존율은 42% 였다.

전체 환자 79예중 54예(68.3%)였고 국소치료 실패 및 원격전이가 동시에 나타난 경우가 16예(29.6%)였으며 원격전이 단독으로 인한 경우가 1예였다.

상기와 같은 치료결과에서 상악동 암의 국소치료율을 높이고 생존율을 증가시키기 위해서는 방사선 단독 치료보다는 수술과 방사선 치료의 병용 요법이 필요할 것으로 사료된다.