
_____:	1990 9		1995 10			
56	3	11	4	13	가 21	6, 6, 5
	3	3		1	6 MV x-	1 2, 6
	1.2 Gy			64.4 Gy	76.8 Gy	72 Gy
	3	136		52		
_____:	3	5			66.7%, 52.4%	3 66.7%
5	47.6%		3	5	3	81.8%, 63.6%, 4 53.8%, 32.3%
					가 10	25%, 12.5%
	가					가 2
	가 3		3	1	2	1 2
		1		58		
_____:						가
	가				가	

가, , , , ,

가 2

가

가

가 15%

가^{3~6)}

가^{7,8)}

1

2003 1 20 2003 4 30

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1990 9 1995 10
 3 136 52
 24
 38
 71 56
 3 11, 4 13 6
 6, 5, 3, 3
 1 .20 4
 (Table 1).
 6 MV
 X- 5, 1 1.2 Gy, 1 2
 6
 64.4 Gy 76.8 Gy
 72Gy 43.2Gy
 50.4 Gy
 가
 1

Table 1. Patient characteristics

	No.
Age (year, mean)	38 ~ 71 (56)
Sex	Male 20 Female 4
Primary site	Nasopharynx 6 Hypopharynx 6 Oropharynx 3 Larynx 5 Paranasal sinus 3 Oral cavity 1
Pathology	Squamous cell ca* 20 Undifferentiated ca. 4
Stage	III 11 IV 13
Nodal status	N0 8 N1 6 N2 7 N3 3

*Carcinoma

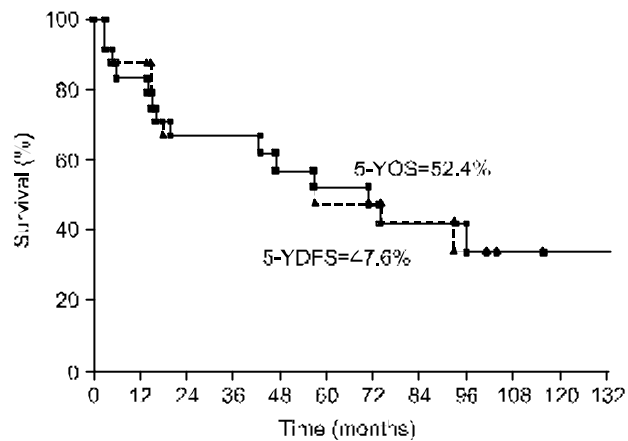


Fig. 1. Five-year disease free survival and overall survival curve in all patients.

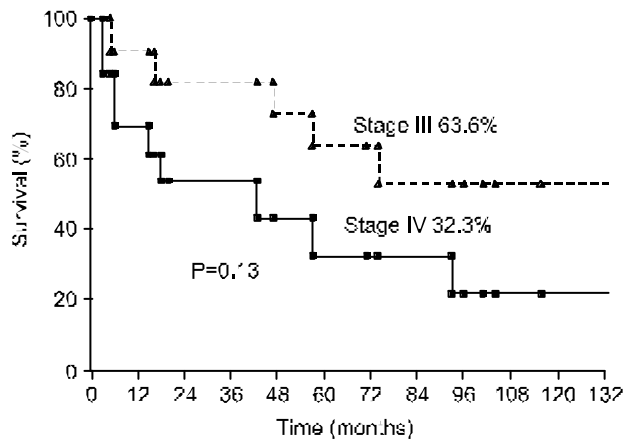


Fig. 2. Five-year disease free survival curve by stage.

Table 2. Failure Patterns

Failure pattern	No (%)
Local recurrence	3 (12.5)
Distant metastasis	6 (25)
Unknown failure	2 (8)
Intercurrent disease	2 (8)
2 ^o malignancy	1 (4)

Table 3. Local Failure

Patient	Stage (Primary)	Time to recurrence (post RTx*)	Status (post RTx*)
1	III (Oropharynx)	Unknown (LR [‡] at time of death)	DOD [†] (74)
2	III (Oropharynx)	15	DOD (16)
3	IV (Hypopharynx)	12	DOD (15)

*Follow-up period after radiation (months), [†]Death of disease, [‡]Local recurrence

anemia) 1
 . 40 66 45
 . 3 136 52
 3 5
 66.7%, 52.4% 3
 66.7%, 5 47.6% (Fig. 1).
 3, 5 3 81.8%, 63.6%, 4
 53.8%, 32.3% (Fig. 2).
 14
 가 3 (12.5%), 가 6
 (25%) 가
 가 3
 1 42 2
 (Table 2). 3 1
 2 12, 15
 16, 15 (Table 3).
 6 (3), (2), (1)
 39 가 45
 (Table 4).

1 가 2 (8%), 2
 가 13 (54%), 3 가 6 (25%), 4 가 3 (12.5%)

가

Table 4. Distant Metastases

	Stage Patient (Primary)	Site (post RTx*)	Status (post RTx*)
1	III (Larynx)	Lung (56)	DOD [†] (71)
2	IV (Nasopharynx)	Bone (18)	DOD (20)
3	IV (Hypopharynx)	Liver, stomach (6)	DOD (14)
4	IV (Larynx)	Lung (93)	DOD (96)
5	IV (Nasopharynx)	Liver (6)	DOD (9)
6	IV (Nasopharynx)	Lung (57)	DOD (60)

* Follow-up period after radiation (months), [†]Death of disease

Table 5. Complications

	Acute*	Chronic
Grade 1	2/24 (8%)	5/24 (20%)(Edema)
Grade 2	13/24 (54%)	13/24 (54%)(Xerostomia)
Grade 3	6/24 (25%)	
Grade 4	3/24 (12.5%)	1/4 (4%)(Osteo - radionecrosis)

*Mucositis

. 2 가
 14 (58%) 1 5 (20%), 1
 1 (4%)
 7380cGy 1
 58 (Table 5).

RTOG
 58 ~ 68%

9)

(redistribution) 가 (self sensitization) , 가 (reoxy - generation) 가 가 , 6 15.4% 4.5 1, 2, 3 4.5 5.5%, 9.8%, 1.7% 4.5 4,15) 6 OER (oxygen enhancement ratio) 15) 6 가 Grade 4 가 1 . Parsons 419 1.2 Gy, 2 , 5 74.4 Gy 79.2 Gy 0~12) 가 가 .1 가 4% 4~6 3) 가 1980 가 13) 1 , 2 70 Gy 356 T2, T3, N0, N1 1.15 Gy 1.1 ~ 1.2 Gy 2 2 80.5 Gy 가 5 59%, 40% T3N0, T3N1 가 76.8 Gy . Wendt 4) 1.2 Gy, 2 , 5 16) 가 15 ~ 20% Datta T2,T3 , , 1.2Gy, 2 , 5 79.2 Gy Therapy Oncology Group) Cox III, IV 2 Gy, 2 , 5 66 Gy 63%, 33% 67.2 Gy 76.8 Gy 가 RTOG 가 가 5) Pinto III, IV 2 Gy 6.5 66 Gy 가 가 14) 1.1 Gy, 2 , 5 70.4 Gy Cox 가 1.2 3.5 Gy, 2 , 5 , 67.2 Gy, 72Gy, 76.8 6) 가 Radiation Therapy Oncology Group (RTOG) 90 - 03 가 3 33 ~ 41%, 4 4.5 3 2 Gy, 5 70 Gy 가 4.5

1.2 Gy, 2, 5, 81.6 Gy
 가 가

17)
 Gy, 1 2, 5, 1 1.2
 6

64.4 Gy 76.8 Gy
 52 3

5 66.7%, 52.4% 3
 66.7%, 5 47.62%
 3, 5 3 81.8%, 63.6%, 4
 53.8%, 32.3%

가
 III, IV

가 3 (12.5%),
 가
 가 2
 가 가
 가
 가 가
 가 가

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Abstract

Hyperfractionation Radiation Therapy in Advanced Head and Neck Cancer

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Purpose: The effects of hyperfractionation radiation therapy, such as the failure pattern and survival, on the treatment results in advanced stage head and neck cancer were studied.

Materials and Methods: Between September 1990 and October 1998, 24 patients with advanced stage (III, IV) head and neck cancers, were treated using hyperfractionation radiation therapy in the Department of Radiation Oncology at the Keimyung University Dongsan Medical Center. The male to female ratio was 7 : 1, and the age range from 38 to 71 years with the median of 56 years. With regard to the TNM stage, 11 patients were stage III and 13 were stage IV. The sites of primary cancer were the nasopharynx in six, the hypopharynx in 6, the larynx in five, the oropharynx in three, the maxillary sinus in three, and the oral cavity in one patient. The radiotherapy was delivered by 6 MV X-ray, with a fraction size of 1.2 Gy at two fractions a day, with at least 6 hours inter-fractional interval. The mean total radiation doses was 72 Gy, (ranging from 64.4 to 76.8 Gy). Follow-up periods ranged between 3 and 136 months, with the median of 52 months.

Results: The overall survival rates at 3 and 5 years in all patients were 66.7% and 52.4%. The disease-free survival rates at 3 and 5 years (3YDFS, 5YDFS) in all patients were 66.7% and 47.6%. The 3YDFS and 5YDFS in stage III patients were 81.8% and 63.6%, and those in stage IV patients were 53.8% and 32.3%. Ten patients were alive with no local nor distant failures at the time of analyses. Six patients (25%) died due to distant metastasis and 12.5% died due to local failure. Distant metastasis was the major cause of failure, but 2 patients died due to unknown failures and 3 of other diseases. The distant metastasis sites were the lung (3 patients), the bone (1 patient), and the liver (2 patients). One patient died of second esophageal cancer. There were no severe late complications, with the exception of 1 osteo-radionecrosis of the mandible 58 months after treatment.

Conclusion: Although this study was performed on small patients group, we considered hyperfractionated radiation therapy for the treatment of advanced stage head and neck cancer might improve the disease free survival and decrease the local failure with no increase in late complications despite of the slight increase in acute complications.

Key Words: Head and neck cancer, Hyperfractionation, Radiation, Disease free survival, Failure, Complication