

Radiotherapy of 180 cases of operable esophageal carcinoma

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Abstract

AIM: To compare the validity of radiotherapy and surgery for operable esophageal carcinoma in 180 patients with pathologically proven esophageal carcinoma who had been accepted for surgery, but for various reasons were given radical radiation therapy instead.

METHODS: The reasons for abandoning surgery were poor cardiac function ($n = 21$), poor pulmonary function ($n = 36$), poor general condition ($n = 9$), senility (age 69-81 years, $n = 32$), and refusal by the patient ($n = 82$). They were treated by the isocenter technique alone or anteroposterior plus isocenter irradiation at a total dose of 50-70 Gy/5-7 wk.

RESULTS: The 1-, 3-, and 5-year survival rates were 64%, 34%, and 23%, respectively. The 3- and 5-year survival rates showed that lesions in the upper third esophagus responded better than lesions in the middle and lower third ($P < 0.05$). The 5-year survival rate following radiation alone (44.5%) of upper third lesions was slightly better than that following surgery. The effect on lesions following radiation to middle third lesions was slightly inferior to that of surgery, and that for lower third lesions was even poorer.

CONCLUSION: The results from radiation treatment alone for operable esophageal carcinoma are similar to that of surgery.

Key words: Esophageal neoplasms/radiation therapy; Esophageal neoplasms/surgery

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INTRODUCTION

Surgery and radiotherapy have always been the main treatment methods for esophageal carcinoma. In general hospitals or cancer institutes, only patients with relatively good condition; younger age; good function of the heart, lung, and other internal organs; and earlier lesions would be accepted for surgery. On the other hand, radiotherapists are more liberal in selecting patients. Only those who have perforating lesions, distant metastasis, or cachexia are not accepted. The net result is that the radiotherapy department serves more or less as a waste paper basket, accepting all of the patients not accepted by surgeons. Naturally, the result of radiotherapy for advanced cancer would be inferior to that of surgery. Could this difference in validity be ascribed to the difference in indications instead of genuine effectiveness of the treatment method? Despite the reports of Earlam and Cunha-Melo^[2,3], who compiled the result of treatment of esophageal carcinoma in the literature before 1979, the 5-year survival rate of 8489 patients in 49 institutes who had received radiation therapy before 1979 was 6% ± 6%. In contrast, the 83, 783 patients in 122 institutes operated upon in the same interval had a 5-year survival rate of 4% ± 3%. However, in the past decade or so, surgery has been reported to yield better results than radiation therapy. If either of these two modalities were used to treat similar staging and similar lesions, what would be the outcome? For this purpose, we collaborated with our thoracic surgeons and collected 180 esophageal cancer cases treated with radical radiation therapy instead of surgery since 1958. The results of surgery and radiation therapy of the three esophageal segments were compared to provide some reference for oncologists.

MATERIALS AND METHODS

From January 1958 through 1987, 180 patients with pathologically proven esophageal carcinoma were seen at our thoracic oncologic outpatient department. The thoracic surgeons had accepted them for surgery after having evaluated their history data, including chest films and barium esophagograms. Yet, for the reasons stated in Table 1, radical radiation therapy was administered instead.

Of the 180 patients, 120 (66.7%) were male and 60 (33.3%) were female; age ranged 35-81 years, with a median of 63 years, and the male:female ratio was 2:1. According to the 1978 International Union Against Cancer (UICC) method of esophageal division, 27 patients (15%) had lesions in the upper third esophagus, 125 patients (69.4%) had middle third lesions, and 28 patients (15.6%)

Table 1 Reasons for administering radiotherapy to 180 patients with esophageal cancer accepted for surgery

Reason	No.	%
Poor cardiac function	21	11.7
Poor pulmonary function	36	20.0
Poor general condition	9	5.0
Senility (68-81 yr)	32	17.7
Refusal by patient or spouse	82	45.6
Total	180	100.0

Table 2 Results of radical radiation therapy for operable esophageal carcinoma

Follow-up	No. of patients	%
1-year	116/180	64
3-year	62/180	34
5-year	42/180	23

Table 3 Comparison of efficacy of surgery with radiotherapy for esophageal carcinoma

Treatment	Author	Year	5-year exploratory survival rate		
			No.	%	
Surgery	Li <i>et al</i> ^[9]	1980	59/213	28	26/82 (32%) from patients who refused operation
	Zhang <i>et al</i> ^[17]	1994	942/3603	26	
Radiotherapy	Present series		42/180	23	

had lower third lesions. The length of the lesions from 2-9 cm; 68 (37.8%) were < 5 cm and 112 (62.2%) were > 5 cm. The histopathology showed squamous cell carcinoma in 178 cases (99%) and adenocarcinoma in one case (1%). The X-ray typing showed medullary disease in 136 cases (76%), fungating disease in 38 cases (21%), and intraluminal disease in six cases (3%).

Telecobalt or 8-MV X-ray was administered by routine three-field isocenter irradiation or anteroposterior (A-P) irradiation followed by three-field isocenter irradiation. For the latter, 40 Gy/4 wk was first administered by A-P opposing irradiation. Afterwards, the one anterior/one posterior isocenter technique was used to administer a further 10-30 Gy to bring the total dose to a radical level (50-70 Gy/5-7 wk). The radiation was administered routinely as 2 Gy/session, five sessions a week. The total dose administered was 50-59 Gy in eight patients, 60-69 Gy in 30 patients, and 70 Gy in 142 patients (79%). The width of the portal was 5-6 cm in most patients. Only in isolated cases were 4.5 cm wide portals used. The upper and lower border of the portal was set 3-4 cm beyond the margin of the lesion as seen on the simulator.

RESULTS

All 180 patients were followed for more than five years after irradiation. Four patients lost to follow-up were counted as dead from the day they were missing. The overall 1-, 3-, and 5-year survival rates were 64% (116/180), 34% (62/180), and 23% (42/180), respectively (Table 2). Within five years of treatment, 138 patients died. The causes of death were local recurrence or uncontrolled, 60.5% ($n = 109$, among whom 21 succumbed to fatal hemorrhage or esophago-tracheal fistula), regional lymphatic metastasis ($n = 9$), distant metastasis ($n = 13$), and causes other than cancer ($n = 7$).

The necessity of using the exploratory survival rate when comparing the efficacy of surgery and radiotherapy

Surgeons usually report their treatment result as the resectional survival rate (number of survivors divided by the number of patients resected) and not as the exploratory resectional survival rate (number of survivors divided by the number of patients explored), which is commonly lower than the former. The survival rate of this series is equivalent to the exploratory survival rate of surgery. Therefore, exploratory survival rates should be used when comparing the effectiveness of surgery with other treatment methods. Our data show that surgery and radiation therapy are equally effective for esophageal carcinoma (Table 3).

Table 4 Comparison of results of resectional 5-year survival rates with the present series

Treatment	Author	Year	Operation year	5-year survival rate	
				No.	%
Surgery	Wu ^[18]	1962	1940-1960	18/76	23.7
	Gu ^[6]	1964	1953-1957	21/91	23.1
	Wu ^[19]	1979	1957-1973	276/1040	26.6
	Li ^[10]	1979	1957-1973	164/664	24.7
	Li ^[9]	1980	1969-1973	59/201	29.4
	Zhang ^[21]	1980	1952-1978	303/1290	23.5
	Giuli ^[5]	1980	1970-1979	375/1870	20.1
	Shao ^[14]	1987	1965-1985	958/2032	47.1 ¹
	Jauch ^[8]	1992	1982-1989	17/86	19.8
	Elias ^[4]	1992	1982-1990	30/128	23.4
	Vigneswaran ^[16]	1993	1985-1991	27/131	20.6
	Zhang ^[20]	1994	1958-1992	942/3099	30.4
	Radiotherapy	Present series		1958-1987	42/180

¹Including some very early lesions as discovered by cytology in public screening.

Table 5 Comparison of surgery with radiotherapy for esophageal cancer in different esophageal segments

Treatment	Author	Year	5-year resection survival rates					
			Upper segment		Middle segment		Lower segment	
			No.	%	No.	%	No.	%
Surgery	Wu <i>et al</i> ^[18]	1962	0/4	0	5/33	15.2	13/39	33.3
	Gu <i>et al</i> ^[6]	1964	0/6	0	11/55	20.0	10/29	34.5
	Su <i>et al</i> ^[15]	1965	2/12	16.6	7/33	21.2	6/24	25.0
	HebaiMed.Univ. <i>et al</i> ^[12]	1973	10/84	11.9				
	Wu <i>et al</i> ^[19]	1979	3/28	11.7	87/327	26.6	72/220	32.7
	Li <i>et al</i> ^[9]	1980		26.0		30.0		34.0
	Giuli <i>et al</i> ^[5]	1980		14.0		15.0		24.0
	Akiyama <i>et al</i> ^[11]	1980			7/28	25.0	7/24	29.2
	Lin <i>et al</i> ^[11]	1983	9/43	20.9	89/388	17.8	80/288	27.8
	Elias <i>et al</i> ^[4]	1992		6.4		17.2		28.9
	Vigneswaran <i>et al</i> ^[17]	1994	9/49	18.4				
	Cancer Hosp. CAMS		93/311	29.9	398/1303	30.5	169/577	39.3
	Radiotherapy	Present series ²		12/27	44.4	28/125	22.4	4/28

¹Material of Dept. Thoracic Surgical Oncology to be published. ²Exploratory 5-year survival rates.

Comparison of resectional survival rate in the literature with the results of this series

As we were unable to obtain the resectional rate in most reports, we had to compare our results with their 5-year resectional survival rates, which was inevitably higher (Table 4). Even so, the 23% 5-year survival rate by radiotherapy may be comparable to that achieved by surgical resection, which ranged 20%-30.4%. The extraordinarily good result of Shao and associates^[12] could be ascribed to the fact that some of their patients had very early lesions pathologically, *e.g.*, carcinoma *in situ* or pathologically early infiltrating carcinoma. Hence, their results cannot be considered typical esophageal cancer established in clinical practice.

Comparison of surgery and radiotherapy on the three esophageal segments

As we were unable to obtain the resection rate of the various segments, we had to compare the lower exploratory 5-year survival of the present series with the higher resectional 5-year survival as we tried to assess the relative merits of either regimen for each esophageal segment. From Table 5, there is an obvious tendency for the survival to decline as we proceed from the upper to lower segment when surgery is considered: It is lowest in the upper segment, moderate for the middle segment, and highest in the lower segment. By contrast, the result for radiotherapy was best in the upper segment, moderate in the middle segment, and poorest in the lower segment. It can be concluded from Table 5 that radiotherapy surpasses surgery for treating upper segment esophageal cancer, according to the 13 reports published in the past 35 years, except for the pathologically very early lesions^[11]. In contrast, surgery should be first considered for lower segment lesions, as radiation therapy yielded a 5-year survival rate only half of that following surgery. The same is true for middle-segment cancer, except the very early cases.

Influence of lesion length on treatment result

Table 6 shows the influence of lesion length in the three segments on the radiotherapy results for operable esophageal cancer. Due to the limited number of patients, it appears that length does not have

Table 6 Influence of lesion length of operable esophageal cancer on result of radiotherapy

Segment	Lesion length (cm)	5-year survival rate	
		No.	%
Upper ¹	< 3	4/9	44.4
	3-4.9	3/6	50.0
	> 5	5/12	41.7
Mid	< 3	2/7	28.6
	3-4.9	6/33	18.2
	> 5	18/85	21.2
Lower	< 3	1/4	25.0
	3-4.9	1/9	11.1
	> 5	2/15	13.3
Total		42/180	23.3

¹Including four lesions in the cervical esophagus

any appreciable influence on the final outcome. Moreover, the crucial factor is the segment in which the lesion is found. To draw a clear conclusion, further studies are needed, preferably a strict prospective randomized trial.

Influence of causes for cancelling surgery on treatment result

Table 7 shows the influence of reasons for canceling surgery on the radiation therapy results in operable esophageal carcinoma. On the one hand, it is apparent that a good general condition is very important to ensure a satisfactory outcome, as none of our nine debilitated patients survived. On the other hand, if a patient who fits every physical aspect should refuse an intended operation, he is deemed to enjoy a similar good result, if not a better one, after radiation therapy—a 32% 5-year survival rate, which is unsurpassed by any of the surgical results reported (Table 4). This finding may further support the notion that radiation therapy may finally be proven a sound alternative to surgery for operable esophageal carcinoma.

DISCUSSION

Comparison of surgery with radiotherapy

The choice of treatment for esophageal cancer has always been inclined towards surgery, performed whenever possible. Radiation therapy is resorted to only when the patient is not accepted by surgeons. The principle "... for advanced cases, radiation is called forth for palliation," is presented in the textbooks and has been carried out accordingly in many hospitals and tumor centers. During the past two decades or so, surgery has indeed yielded better results than radiation therapy. However, it cannot be refuted that surgeons treat far earlier lesions than radiotherapists do. As early as 1980, Earlam *et al.*^[2] and Cunha-Melo *et al.*^[2,3] had expressed their doubts about the superiority of surgery, for which the better survival rates could have been due to the earlier disease. If surgeons and radiotherapists were on equal footing, what kind of result may they yield? The present series of 180 patients had originally been accepted by the surgeons for surgery after clinical work-up. However, for various reasons (Table 1), radical irradiation was administered instead. Even though this was not a randomized study, this still presented a relatively comparable basis, *e.g.*, length of lesion, absence of extraesophageal extension, and so on. The 5-year survival rates by surgery as reported in the literature range 20%-30.4%^[1,4-12,14-17]. Only that by Su *et al.*^[13] should be considered separately, as some of their patients had very early pathological lesions, *e.g.*, carcinoma *in situ* and early submucosal infiltrating carcinoma. Hence, a 5-year survival rate of 47.1% was reported (Table 4). The 5-year survival rate of the present series is, in fact, equivalent to the exploratory 5-year survival rate by surgery, which the surgeons would use when presenting their results. Typically, the resection rate of esophageal cancer ranges 78-85%, hence the 5-year survival rate by surgery (15-22%) is too high. Considering all factors, the radiation therapy result of the present series is comparable with any results obtained (Tables 3, 4). In the 82 patients who refused surgery, the 5-year survival rate following radiotherapy was 32% (Table 7), which is similar to the overall 5-year survival rate of 30.4% following surgery (Table 4). It should be noted that the former is the exploratory survival rate and the latter the resectional survival rate (15%-22%),

Table 7 Influence of reasons for rejecting surgery on result of radiotherapy in operable esophageal carcinoma

Causes of rejecting surgery	5-year survival rate	
	n	%
Poor cardiac function	4/21	19
Poor pulmonary function	5/36	14
Poor general condition	0/9	0
Senility	7/32	22
Patient refusal	26/82	32
Total	42/180	23

which is too high. For genuine comparison, a prospective randomized trial carried out by both surgeons and radiotherapists is warranted and a truly objective conclusion may thus be obtained.

Treatment options for esophageal carcinoma in different esophageal segments

Due to the difficulty in resecting upper segment lesions, radiotherapy used to be the preferred treatment for esophageal carcinoma. In the present series, a 44% 5-year survival rate was obtained for 27 patients with upper segment cancer. By improving the operative procedures in this segment, surgery has achieved better results in recent years, ranging 0%-26.3%^[1,4-6,8-10,13-16]. In 1982, Shao *et al.*^[11] reported 50% survival for upper segment esophageal cancer. According to their report, 13.4% (142/1061) was stage 0-I early pathologic lesions. In contrast, the staging of the present series showed only 4% (7/180) early lesions, designated as 3 cm in length by the barium meal esophagograms. Some of these patients may have had tumors far more advanced than what was shown on the X-ray films. The high survival in the report of Shao and colleagues may have been due to the abundance of actual early lesions in their patients. Even so, the results of upper segment lesions in the present series and that of Shao and colleagues are still comparable (44% vs 50%). For upper segment esophageal cancer, there have been only a few reports on combined treatment, reporting 5-year survival rates of 23.1%-47.6%^[7,17] which are not superior to that following radiotherapy alone. Generally, it is believed that radiotherapy is slightly superior to surgery and is similar to preoperative radiation plus surgery. Hence, radiotherapy is suitable for upper segment esophageal carcinoma, especially for patients who have very short lesions, without obvious stenosis, or extraesophageal invasion, or very superficial, intraluminal, or fungating disease. Aside from the satisfactory results, radiation therapy raises very little risk of radiation injury and costs less, so it is readily acceptable to the patient. The 5-year survival rate of operable esophageal carcinoma was 44% for the upper segment, which is better than the 21% and 14% for the middle and lower segments, respectively ($P < 0.05$).

The reasons for the poor 5-year survival rate of 14% for the lower segment lesions may be that the lower carcinoma locations are apt to develop lymphatic metastasis along the left gastric and epigastric vessels, which are difficult to discover clinically. Some of the patients may have already developed metastases when they received radiotherapy. Consequently, recurrence would naturally lead to failure as these involvements are easily missed by the conventional portals. The lower segment cancers usually have a 5-year survival rate of 30% following surgery^[1,4-6,8-10,12-16], which is superior to that following radiation therapy. Therefore, surgery should be indicated with priority for lower segment esophageal carcinoma. The same is true for middle segment lesions, for which surgery is also preferred. The conclusions drawn from this study are as follows:

1. When treated by radiation therapy alone, operable esophageal carcinoma yields comparable results to that treated by surgery.
2. Radiation therapy, surpassing surgery for upper segment esophageal carcinoma, is preferred for this kind of lesion.
3. Surgery, surpassing radiation therapy for lower segment esophageal carcinoma, is preferred for this kind of lesion.
4. Comparison of surgery with radiation therapy for middle segment lesions shows that the latter is less effective. Surgery is generally preferred although radiation therapy is acceptable for certain types of the disease.

REFERENCES

- 1 **Akiyama H.** Surgery for carcinoma of the esophagus. *Curr Probl Surg* 1980; **17**: 53-120 [PMID: 6987040 DOI: 10.1016/S0011-3840(80)80025-6]
- 2 **Earlam R, Cunha-Melo JR.** Oesophageal squamous cell carcinoma: I. A critical review of surgery. *Br J Surg* 1980; **67**: 381-390 [PMID: 6155968 DOI: 10.1002/bjs.1800670602]
- 3 **Earlam R, Cunha-Melo JR.** Oesophageal squamous cell carcinomas: II. A critical view of radiotherapy. *Br J Surg* 1980; **67**: 457-461 [PMID: 6158354 DOI: 10.1002/bjs.1800670702]
- 4 **Elias D, Lasser P, Mankarios H, Cabanes PA, Escudier B, Kac J, Rougier P.** Esophageal squamous cell carcinoma: the specific limited place of surgery defined by a prospective multivariate study of prognostic factors after surgical approach. *Eur J Surg Oncol* 1992; **18**: 563-571 [PMID: 1478288]
- 5 **Giuli R, Gignoux M.** Treatment of carcinoma of the esophagus. Retrospective study of 2, 400 patients. *Ann Surg* 1980; **192**: 44-52 [PMID: 7406563 DOI: 10.1097/0000658-198007000-00008]
- 6 **Gu YZ, Wang ZH, Zhang JQ.** Long term results of surgical treatment and radiotherapy for carcinomas of esophagus and cardia. *Zhonghua Waike Zazhi* 1964; **12**: 115-120
- 7 **Huang GJ, Gu XZ, Zhang RG, Zhang LJ, Zhang DW, Miao YJ, Wang LJ, Lin H, Wang GQ, Xiao QL.** Combined preoperative irradiation and surgery in esophageal carcinoma. Report of 408 cases. *Chinese Medical Journal (English Edition)* 1981; **94**: 73-76 [PMID: 6786841]
- 8 **Li CL.** Analysis of the results of surgical treatment for 327 cases of carcinomas of esophagus and gastric cardia. *Zhonghua Zhongliu Zazhi* 1980; **2**: 116-117
- 9 **Lin XS, Chen BT, Fang KB.** Long term effects of surgical treatment on esophageal carcinoma. *Zhonghua Zhongliu Zazhi* 1983; **5**: 303-304
- 10 **No.4 Hospital, Hebei Medical University.** Surgical treatment in 2483 patients with carcinoma of esophagus and gastric cardia. *Cancer Prev Treat* 1993; **3**: 1-7
- 11 **Shao LF, Li ZC, Liu SX.** [Results of surgical treatment of 3, 155 cases of esophageal and cardiac carcinoma]. *Zhonghua Waike Zazhi* 1982; **20**: 19-22 [PMID: 7075375]
- 12 **Shao LF, Li ZC, Wang MF.** [Results of surgical treatment in 6123 cases of carcinoma of the esophagus and gastric cardia]. *Zhonghua Waike Zazhi* 1987; **25**: 452-45, 500 [PMID: 3691248]
- 13 **Su YH, Weng PG, Liu JQ.** Long term results of carcinoma of esophagus and gastric cardia after treated with resection. *Zhonghua Waike Zazhi* 1965; **13**: 232-234
- 14 **Vigneswaran WT, Trastek VF, Pairolero PC, Deschamps C, Daly RC, Allen MS.** Extended esophagectomy in the management of carcinoma of the upper thoracic esophagus. *J Thorac Cardiovasc Surg* 1994; **107**: 901-906; discussion 901-96; [PMID: 8127121]
- 15 **Wu YK, Huang GJ, Zhang W.** Long term results of squamous epithelioma treated with resection. A corpus of cancer research papers. Shanghai: Shanghai Science Technology Publishing House 1962: 155-157
- 16 **Wu YK, Huang GJ.** Experiences of surgical treatment of esophageal carcinoma. *Zhonghua Zhongliu Zazhi* 1979; **1**: 241-243
- 17 **Zhang ZX, Feng QF, Gu XZ.** Evaluation of preoperative irradiation of esophageal carcinoma: an analysis of 1021 cases. *Zhonghua Fangshe Zhongliuxue Zazhi* 1992; **1**: 169-171

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