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 anterior-posterior 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%)...
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 mediul disease in 136 cases (76%), fungating disease in 38 cases (21%), and intraluminal disease in six cases (3%).

Telecobalt or 6-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/4wk 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 uncontrollable, 60.5% (n = 109, among whom 21 succumbed to fatal hemorrhage or esophagotracheal 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 1 Reasons for administering radiotherapy to 180 patients with esophageal cancer accepted for surgery

| Reason                                      | No. | %   |
|---------------------------------------------|-----|-----|
| Poor cardiac function                      | 23  | 11.7|
| Poor pulmonary function                    | 36  | 19.9|
| Poor general condition                     | 15  | 8.3 |
| Scurvity (68-81 yr)                        | 32  | 17.7|
| Refused by patient or spouse               | 55  | 30.4|
| Total                                       | 138 | 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
|--------------------|-----------------|------|---------------------------------|
| Surgery            | Li et al[16]    | 1980 | 59/213 (28) from patients who refused operation |
| Radiotherapy       | Present series  | 1994 | 42/180 (23%) from patients who refused operation |

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

| Author             | Year          | Operation year | 5-year survival rate |
|--------------------|---------------|----------------|----------------------|
| Wu et al[10]       | 1962          | 1940-1960      | 18/76 (23.7%)        |
| Gu et al[11]       | 1964          | 1953-1957      | 21/91 (23.1%)        |
| Gu et al[12]       | 1979          | 1957-1973      | 25/140 (17.7%)       |
| Li et al[13]       | 1978          | 1957-1973      | 14/107 (13.0%)       |
| Li et al[14]       | 1980          | 1964-1973      | 59/211 (27.9%)       |
| Zhe et al[15]      | 1980          | 1952-1979      | 103/120 (85.3%)      |
| Gu et al[16]       | 1980          | 1950-1979      | 375/1470 (25.3%)     |
| Shao et al[17]     | 1987          | 1965-1985      | 958/2032 (47.1%)     |
| Jia et al[18]      | 1992          | 1982-1989      | 17/86 (19.8%)        |
| Elias et al[19]    | 1992          | 1982-1990      | 30/128 (23.4%)       |
| Vigneswaran et al[20] | 1993      | 1983-1991      | 27/131 (20.6%)       |
| Zhang et al[21]    | 1994          | 1985-1992      | 942/3099 (30.4%)     |

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

| Treatment          | Author          | Year          | Upper segment Middle segment Lower segment |
|--------------------|-----------------|---------------|--------------------------------------------|
| Surgery            | Wu et al[10]    | 1962          | 0/4 (0) 5/33 (15.2) 17/35 (50.0) 19/39 (53.8) |
| Radiotherapy       | Zhang et al[21] | 1994          | 42/180 (23%)                               |

### 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 their results with our 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 Zhao and associates[23] 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 resectional 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 poorest in the lower segment. It can be concluded from Table 5 that radiotherapy surpasses surgery and radiation therapy are equally effective for esophageal carcinoma.

### 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 a statistically significant effect on the radiotherapy results for operable esophageal cancer. Due to the limited number of patients, it appears that length does not have a statistically significant effect on the radiotherapy results for operable esophageal cancer.
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[23] and Cunha-Melo[6-23] 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 extraseophageal extension, and so on. The 5-year survival rates by surgery as reported in the literature range 20%-30.4%[2,3]. It may have already developed metastases when they received radiotherapy. Therefore, surgery should be indicated with priority for 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 extraseophageal 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 gastroepiploic 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[1,4-6,10,12-16], 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: 381-396 [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: 10.1097/00000658-198007000-00008]

6. Wu YK, Huang GJ. Experiences of surgical treatment of esophageal carcinoma. Zhonghua Zhongliu Zazhi 1979; 1: 241-243

7. Zhang ZX, Feng QF, Gu XZ. Evaluation of preoperative irradiation of esophageal carcinoma: an analysis of 1021 cases. Zhonghua Fangshu Zhongluxue Zazhi 1992; 1: 169-171

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