

# Surgical Treatment for Carcinoma of the Esophagus Involving the Trachea, Bronchus and Lung in Terms of its Prognosis and Pathological Study

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A total of 10 patients with carcinoma of the esophagus involving the trachea, bronchus and lung were operated upon. Their clinical features and histological patterns of cancer invasion were evaluated.

In 5 patients involving the lung, the preoperative irradiation therapy was histologically effective in encircling the cancer lesions by induced scar formation. It was possible to render the resection to enhance its radicality.

In 5 patients involving the trachea or the bronchus, it has become apparent that the membranous portion is more susceptible to cancer invasion and the structures of the cartilages on the tracheal and bronchial walls have a strong resistance to cancerous spread. The extent of cancer invasion on the trachea or bronchus was considerably limited.

The sharp dissection at the site of occurrence of cancer invasion as an operative procedure of choice is sometimes beneficial in attempt to enhance the operative radicality when cancer invasion reaches to the adventitial layer.

The prognosis, however, was not improved by an extended resection. It seems to be closely related to n-factor. None of them survived exceeding one year after surgery.

## INTRODUCTION

Despite advancing the diagnostic techniques for carcinoma of the esophagus to de-

tect in early stage, we have not infrequently experienced far advanced patients with cancer invasion to the surrounding organs such as the trachea, bronchus and lung.

This study was undertaken to clarify the operability and its validity in 10 cases with carcinoma of the esophagus involving the trachea, bronchus and lung in view of clinical features and pathophysiology.

## MATERIAL AND METHOD

During the period of 10 years from 1969 to 1978, a total of 106 cases with carcinoma of the esophagus were admitted in our clinics. Among of them, only 58 cases (54.7%) underwent surgical resection of the esophagus.

Five patients with carcinoma of the esophagus involving the trachea and bronchus were included, 4 males and 1 female. Table 1 summarized their clinical features. The other 5 patients with carcinoma of the esophagus involving the lung were also subjected, 3 males and 2 females. Table 2 also summarized their clinical features.

The surgical specimens were histologically examined as to the modality and extent of cancer invasion.

## RESULT

The tumor of the esophagus in 5 cases involving the trachea and bronchus were located in the cervical and upper intrathoracic esophagus (Ce+Iu) in one, in the upper intrathoracic esophagus (Iu) in one, in the upper and middle intrathoracic esophagus (Iu+Im) in two and in the middle intrathoracic esophagus in one. They ranged in age from 53 years to 66. The main symptoms consisted of dysphagia and bloody sputum. According to the findings of the esophagogram, the spiral type was seen in 4 and the serrated type in the remaining one. The shadow defect on the esophagogram varied in length from 6.0cm to 10.0cm. On the esophagoscopy examination, one showed the complete stenotic type, three revealed the ill-defined-depressed-stenotic types and the other one was the tumorous type.

Bronchoscopic examination was performed in three cases. In one case, it failed to identify the lesion intensity due to an existence of stenosis. In another case, there was the stenotic lesion in the right middle bronchus. In the other case, the protrusive changes in the membranous portion of both the trachea and the left main bronchus were revealed. Three cases of them underwent preoperative irradiation of 4000 rads of Co<sup>60</sup>. The lymph node involvements were ranged from n<sub>2</sub> to n<sub>4</sub> except for undermind one case from the operative record. The term, A<sub>3</sub>, were based on a presence of cancer invasion to the trachea in three, to the right main bronchus accompanying the involved pleura in one and to the right middle bronchus with involved pleura and pericardium. The additional operative procedures for the involved sites of carcinoma were dissection only in three, combined resection with the lung in two respectively.

**Table 1.** Clinical features and pathological findings in 5 patients with carcinoma of the oesophagus involving the trachea and bronchus.

case	age	sex	tumor location	symptom	esophagogram type defect length		esophagoscopy	bronchoscopy	n
1	66y	M	Ce+Iu	dysphagia bloody sputum	spiral	8cm	stenosis	not visible due to stenosis	
2	61y	M	Iu	dysphagia	spiral	6cm nishe	ulceration circumference		n <sub>4</sub>
3	53y	M	Iu+Im	dysphagia	spiral	7cm nishe	ulceration circumference	protrusive stenosis in membranous portion	n <sub>2</sub>
4	55y	M	Iu+Im	dysphagia	spiral	10cm	ulceration cerumference		n <sub>8</sub>
5	56y	F	Im	cough, bloody sputum, nausea	spiral	7cm nishe	tumorous	obstruction in the right middle bronchus	n <sub>4</sub>

case	histology differentiation	A <sub>3</sub> involved organ	operation for involved organ	reconstruction for resected esophagus	recurrence	survival time (cause of death)
1	Sq moderately	trachea	trachal resection	non	unknown	13days (cardiac failure)
2	Sq poorly	trachea	dissection	non	neck mediastinum esophagus	3M (gastric bleeding)
3	Sq poorly	trachea aorta	dissection	retrosternal gastric tube	lung bone abdomen	3M (cachexia)
4	Sq poorly	r-main bronchus pleura	partial resection	antesternal gastric tube	remained esoph neck	3M (pneumonia)
5	Sq poorly	r-middle bronchus pericardium pleura	lung resection (middle lower lobectomy)	retrosternal gastric tube	lung diaphragm	4M (pneumonia pyothorax)

Histological examination from the surgical specimens showed squamous cell carcinoma in all 5 cases. One was moderately differentiated type, and the other four were poorly differentiated.

According to INF classification,  $\alpha$  was seen in one,  $\beta$  in two and  $\gamma$  in two. All specimens showed a presence of the lymph node involvement.

The modes of cancer invasion at the site of  $A_3$  were histologically examined. Except for one without preoperative irradiation therapy, two of five cases showed  $R-a_2$  and the remaining two revealed  $R-a_3$ . Three of them had the cancer lesions in the scar tissues probably produced by irradiation. In one of them, the fistula between the esophagus and the trachea was formed by advanced cancer. The invasion patterns of carcinoma were histologically evaluated in all five cases. The fistulous communication between the esophagus and the trachea was seen in one as shown Fig. 1. It was accompanying the cancer invasion into both the mucosal membranes and it was nearly situated in their centers, reflecting the resultant necrosis in the central portion of cancer involvement. The affected site of the involved bronchus was the membranous portion of the right middle bronchus.

Fig. 2. indicated that involved bronchus had become occluded with the development of an excess of the tumor mass.

According to histological examination, the fistulous communication caused by cancer accompanied the extensively growing cancer cells around it (Fig. 3). The other specimen involving the trachea indicated that the invaded cancer to the trachea extended throughout the tracheal wall and it avoided reaching the cartilages itself (Fig. 4). When cancer inva-

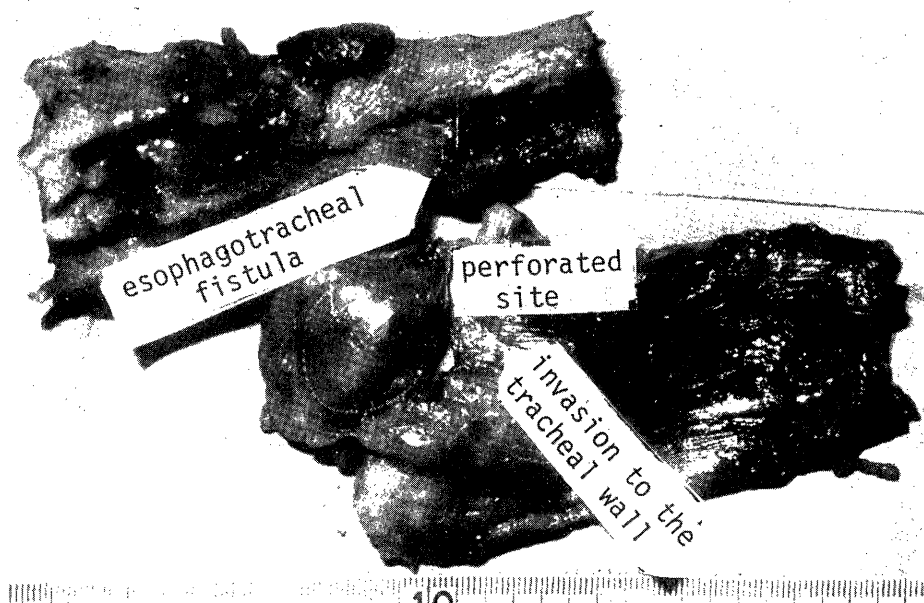


Fig. 1. Gross specimen with fistulous communication between the oesophagus and trachea, showing perforated site from carcinoma of the oesophagus and involved trachea.

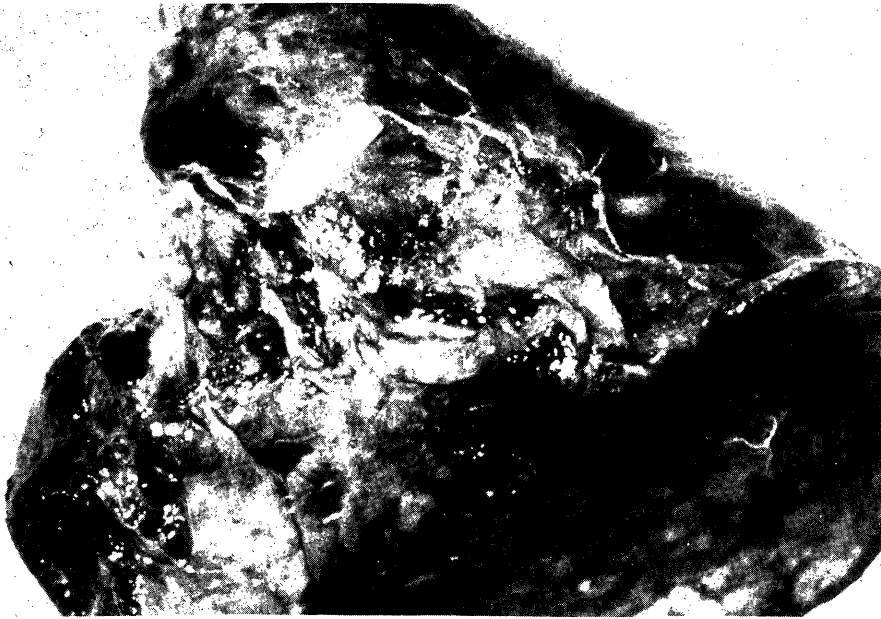


Fig. 2. Gross specimen showing complete occlusion with growing tumor mass in the right upper bronchus.

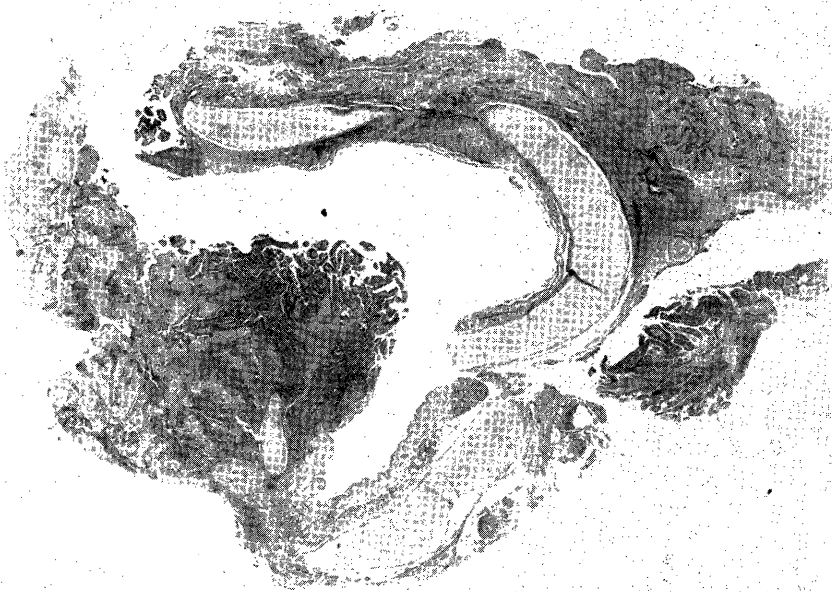


Fig. 3. Histological findings, showing the growth of cancer mass into the mucosal face accompanying fistulous communication.

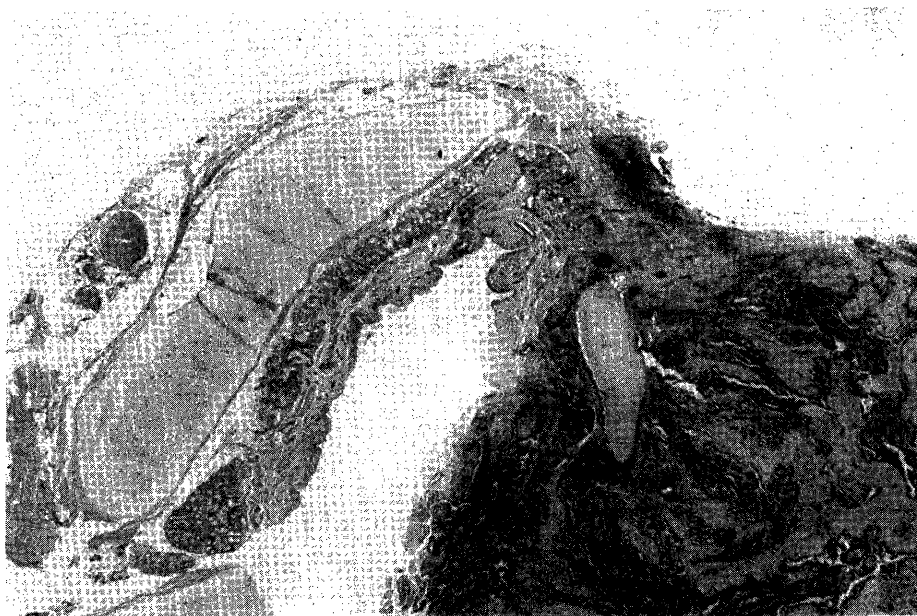


Fig. 4. Histological findings, showing the resistance of the cartilage to cancer invasion.



Fig. 5. Histological finding of scattered cancer invasion into the scar caused by irradiation.

sion extended to the mucosal membrane, it gradually entailed the ensuing tracheal stenosis.

The intramusocal cancer extension and the dysplastic changes were histologically demonstrated in the mucosal membrane surrounding cancer invasion. These findings were consistent with those of metastatic cancer, distinguishing from those of primary cancer.

The ages of 5 cases involving the lung ranged from 56 years to 71, 3 males and 2 females, as shown in Table 2. The tumors were located in Im + Iu in 2, Im in 1, Im + Ei in 1 and Ei in 1. The symptoms composed dysphagia and chest pain in all of them. The findings on the esophagogram were the spiral type in all but one who was impossible to determine from the record and the lesions on the esophagoscopy showed infiltrative ulceration situated circumferentially. A total of 4000 rads of preoperative irradiation therapy were carried out in 4 cases. The sites of the involved lung were the right S<sup>6</sup> in 3, the right S<sup>7</sup> in 1 and the left S<sup>8</sup> in 1.

The segment resection of the lung was performed in the right S<sup>6</sup> in 3 and the left S<sup>8</sup> in 1. The remaining one underwent dissection only. The lymph node involvements were N<sub>1</sub> in one, N<sub>2</sub> in two and N<sub>4</sub> in two. None of them had the pleural involvement. The type of histology was squamous cell carcinoma in all. One was well differentiated, two moderately, and the remaining two poorly. According to INF classification,  $\alpha$  was seen in one,  $\beta$  in two and  $\gamma$  in two. The cancer invasion to the surrounding organs was histologically examined in all of five. There were the fistulous communication with the lung in one, and the concomitant involvement of the pericardium in one and the remaining three had cancer invasions into the surrounding scar tissues (Fig. 5).

The prognosis of A<sub>3</sub> directly involving the trachea, bronchus and lung was very poor. All of them died within 1 year following surgery. In 5 cases involving the trachea and the bronchus, the operative death was encountered in one, and deaths within 6

**Table 2.** Clinical features and pathological findings in 5 patients with carcinoma of the oesophagus involving the lung.

age	sex	symptom	esophagogram defect length	esophagoscopy	involved organ	n	histology differentiation	survival time cause of death
71	M	dysphagia back pain	spiral 11cm	ulceration circumference	$\gamma$ -S <sup>6</sup> lung pleura	n <sub>2</sub>	Sq moderately	6M lung meta.
72	M	dysphagia chest pain	spiral 8cm	ulceration circumference	$\gamma$ -S <sup>6</sup> lung aorta, pleura	n <sub>4</sub>	Sq moderately	4M bone meta. pleurisy
65	F	dysphagia	spiral 7.5cm	ulceration circumference	$\gamma$ -S <sup>6</sup> lung pericardium pleura	n <sub>2</sub>	Sq well	op. death (bleeding)
58	F	dysphagia chest pain	spiral 6cm	ulceration circumference	l-S <sup>8</sup> lung pericardium aorta	n <sub>1</sub>	Sq poorly	op. death (circulat. collapse)
56	M	dysphagia chest pain			$\gamma$ -S <sup>7</sup> lung aorta	n <sub>4</sub>	Sq poorly	4M lung meta pleurisy

months after surgery in three and the remaining one lived a maximum of 7 month duration. In 5 cases involving the lung, two were the operative deaths due to bleeding diathesis and circulatory collapse with high fever and the remaining three survived 4 months in two and 6 months in 1 respectively.

## DISCUSSION

It is well known that the prognosis of carcinoma of the esophagus is associated with either the degree of the advancing cancer indicated by A and N number or the host resistance demonstrated as an immunocompetence.

According to advances in diagnostic procedures, carcinoma of the esophagus has come to be detected in early stage as in other cancers. Most of patients undergoing operation for carcinoma of the esophagus were still the advanced cases. The  $A_3$  patients occupy as many as 13 to 34% of the cases operated upon<sup>1)2)</sup>.

It is impossible to determine as to  $A_3$  prior to surgery<sup>1)3)</sup>. We have experienced on occasion that the a-number determined by histological examination is not in concord with the A-one determined by gross appearance if preoperative irradiation is indicated. Then the surgical treatment for carcinoma of the esophagus must not be abandoned on the basis of preoperative evaluation. The ultimate goal of this study is to assess as to whether or not the surgical excision is beneficial in enhancing the cure rate. From our experiences of surgical treatments with 5 cases involving the trachea and bronchus, and 5 cases involving the lung, the resultant prognosis was not satisfactory<sup>4)</sup>. These factors were clinically analyzed.

The modes of cancer extension including n-factor and histological cell differentiation are not so different in cases of carcinoma of the esophagus involving the trachea or bronchus, and the lung. In the cases with the involved lung, preoperative irradiation was effective in preventing a prevalence of cancer extension. It was well established by histological examination that scar formation caused by irradiation benefited from the extension of cancer to the surrounding tissues. In the cases with the involved trachea and bronchus, it was shown that the membranous portions of the trachea and the bronchus was very susceptible to cancer invasion and it affected throughout the tracheal and bronchial walls. When cancer invasion reaches into the lumen through the tracheal wall, it causes some degree of stenosis accompanying the cancer spread into the lumen through the tracheal wall, some degree of stenosis accompanying the cancer spread into the mucosal membrane and the changes of dysplasia in the mucosa adjacent to carcinoma. The cartilages, however, are strongly resistant to cancer invasion. Based on the results of histological examination, it is clear that moderate and poor cell differentiations are the contributing factor causing  $A_3$  with involvement of the trachea and bronchus.

In advancing stage of  $A_3$  with involvement of the trachea, bronchus and lung, the presence of lymph node metastases among 9 cases were  $n_4$  in four (50%),  $n_3$  in one (12.5%)  $n_2$  in three (37.5%),  $n_1$  in one (12.5%). Most of these patients already had a



presence of lymph node metastases exceeding  $n_2^{5)6)}$ .

Reliability of surgical resection for esophageal cancer involving the trachea, bronchus and lung was documented either due to the development of scar formation encircling cancer lesion by means of preoperative irradiation therapy or due to the evidence of histologically limited cancer invasion on the tracheal and bronchial walls. It is considered advisable to remove extensively for increased survival even though Nnumber is increasing as seen in the advanced cancer<sup>1)7)</sup>. The outcome of an aggressive resection for  $A_3$ -patients is poor and our results are not necessarily encouraging. It, however, is concluded that an extended resection is mandatory for a longterm survival even in less frequency<sup>8)</sup>. It is worthwhile to note that an extended resection is contemplated to achieve the prolonged survival whenever feasible. The chief evidence in supporting of this veiv is based on the histologically limited involvement of the trachea, bronchus and lung.

#### REFERENCE

- 1) IIZUKA, N: Resection in carcinoma of the esophagus involving other organs. *J.J.A. T.S.* 28: 607-610, 1980 (in Japanese).
- 2) KINOSHITA, Y: Surgical treatment for carcinoma of the esophagus invading into the other organs. *J.J.A.T.S.* 28: 610-612, 1980 (in Japanese).
- 3) ISONO, K: Surgical treatment in advanced cases with carcinoma of the esophagus. *J.J.A.T.S.* 28: 612-615, 1980 (in Japanese).
- 4) SAKAKIBARA, T: Esophagotracheal fistula in patients with carcinoma of the esophagus, *Surg. Diag. Treatment* 12: 1409-1414, 1970 (in Japanese).
- 5) AKIYAMA, H: Surgery for carcinoma of the esophagus involving other organs. *J.J. A.T.S.* 28: 605-607, 1980 (in Japanese).
- 6) KAKEGAWA, H: Surgical treatment for carcinoma of the cervical esophagus with involvement of other organs. *J.J.A.T.S.* 28: 603-605, 1980 (in Japanese).
- 7) WATANABE, H: Experiences with surgical treatment of carcinoma of the esophagus beyond indication for resection-management of cases with fistula or stricture developed by irradiation. *J.J.A.T.S.* 20: 925-934, 1972 (in Japanese).
- 8) THOMPSON, D. T.: Lower tracheal and carinal resection associated with subtotal oesophagectomy for carcinoma of oesophagus involving trachea, *Thorax.* 28: 257-260, 1973.