The assessing the left bronchial invasion of esophageal cancer in computed tomography

Hiroshi Makino 1*, Hiroshi Yoshida 1, Hiroshi Maruyama 1, Tadashi Yokoyama 1, Atsushi Hirakata 1, Jyunji Ueda 1, Yuta Kikuchi 1, Eriko Shinozuka 1, Tsutomu Nomura 2 and Eiji Uchida 2

1 Department of Surgery, Nippon Medical School, Tama-Nagayama Hospital, Tokyo, Japan
2 Department of Surgery, Nippon Medical School, Chiba-Hokusoh Hospital, Tokyo, Japan
3 Department of Surgery, Nippon Medical School, Chiba-Hokusoh Hospital, Tokyo, Japan

Abstract

Background and aims: The prognosis of esophageal squamous cell carcinoma varies according to the degree of invasion of the tumor in the organ wall. When the trachea and the main bronchus are involved in esophageal carcinoma, the disease is classified as incurable and the mortality is lower than that for patients who can be treated with curative surgery.

To evaluate the carcinoma invading the trachea and main bronchus, retrospectively, we investigated computed tomography (CT) findings.

Methods: Of 74 patients with or without proven tracheobronchial involvement who underwent thoracotomy for esophagectomy and Surgery disclosed tumor invasion in pericardium, aorta, pleura, trachea, left main bronchus and parenchyma. Ten patients were not operated upon but exhibited invasion to respiratory tract by broncho-fiber scope.

Results: Lt. main bronchus (NMS angle) were statistically significant in patients with and without invasion. (P<0.05)

Conclusion: It is our conclusion that preoperative evaluation by CT plays an important role whether the tumor is resectable or not.

Correspondence to: Hiroshi Makino, MD, Department of Surgery, Nippon Medical School, Tama Nagayama Hospital, Tokyo, Japan. 1-7-1, Nagayama, Tama-city, Tokyo, Japan; Tel: +81-42-371-2111; Fax: +81-42-372-7384; E-mail: himiyumo@nms.ac.jp

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lumen to aorta (2), that from the left main bronchus or trachea (3 or 3'),
diameter (4), angles between tumor and aorta (Picus angle) (5), lt. main
bronchus or trachea (6 or 6') in CT shown in Figure 1a-1c.

We analyzed the frequencies of tumors in the 6 matters via CT
(Figure 2-5). The patients were divided into 2 groups; involvement of
other organs (t(4) and non-involvement (t3), and also separated into the
2 groups; involvement to other organs (t(4) and non-involvement (t3)
based on the pathological findings after surgery.

We compared the frequencies of tumors in the 6 matters of both
groups (t(4) and t3). In the sectional area of the tumor (1) (Figure 2),
diameter (4) (Figure 3), Picus angle (5) (Figure 4), angles of lt. main
bronchus (NMS angle 6) (Figure 5), the frequencies in group t(4) tended
to be higher than that of t3.

We compared CT findings (t(4) and t3) and surgical-pathological
findings (t(4) and t3). There were significant differences of Picus angle
and angles of lt. main bronchus (NMS angle) between the 2 groups
by statistical analysis. (P<0.05) There were no significant differences in
other matters.

The criteria is as follows: (1) aortic infiltration diagnosed the
existence of an angle greater than 90 degrees between tumor and aorta
(2) its main bronchus infiltration was diagnosed when the tumor
developed an intimate contact with the lt. main bronchus that was
greater than 135 degrees. Sensitivity, specificity and accuracy of (1)
were 71%, 77% and 67%, respectively and those of (2) were 100%, 85 %
and 75%, respectively (Table 2).

![Figure 1](image1.png)
Figure 1. The distance from the internal lumen of esophagus to aorta (2), left main bronchus
or trachea (3 or 3'), diameter (4), Picus angle (5), angles between tumor and lt. main
bronchus (6) were showed in CT. (1a) The sectional area of tumor (1) (1b) and angles between tumor
and trachea (6') were showed in CT (1c).

![Figure 2](image2.png)
Figure 2. The frequency of tumor involvement to other organs (t4) in the sectional area of
tumor tended to be higher than non-involvement (t3).

![Figure 3](image3.png)
Figure 3. The frequency of group t4 in diameter tended to be higher than that of t3.

![Figure 4](image4.png)
Figure 4. The frequency of group t4 in Picus angle tended to be higher than that of t3.

![Figure 5](image5.png)
Figure 5. The frequency of group t4 in angles of lt. main bronchus tended to be higher than
that of t3.

Table 1. Clinicopathological findings of patients with esophageal cancers.
(n = 85) analyzed.

|                  | Male | Female |
|------------------|------|--------|
| Sex              | 68   | 17     |
| Age              | 60.8 ± 9.3 |
| Clinical depth   | T4   ~ T3 |
| Pathological depth | t4   ~ t3 |
| Ope              | +    ~ -  |
| No. of patients  | 74   | 11     |

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transmediastinal esophageal dissection technique is not available in obtained [16-18].

greater the diagnostic capacity of CT, justifying the accuracy of 85.1% were unhelpful in evaluating invasion [15]. The larger the tumor the one-third of the cases had trans-mediastinal esophageal resection, that

et al. bronchus [1]. Lehr et al. described no statistically significant difference between CT and broncho-fiber scope because an accuracy of 85.1% was obtained with CT in the evaluation of esophageal carcinoma 

invasion itself, and is essential for the evaluation of the respiratory tree [6]. Broncho-fiber scope allows the direct visualization of changes, growth, endoscopic ultrasonography was significantly more accurate in esophageal carcinoma. But Halvorsen et al. reported scanning the patient in the prone position potentially improved the capacity for assessing the contact between tumor and the aorta or left main bronchus. Wayman mentioned 3 cases where aortic invasion was downstaged by performing the scan in supine position [13].

On the other hand, other studies have obtained very poor results with CT in the evaluation of esophageal carcinoma [14].

Many investigators reported that in staging the depth of tumor growth, endoscopic ultrasonography was significantly more accurate [6]. Broncho-fiber scope allows the direct visualization of changes, such as hyperemia of the mucosa, compression of the airway, and invasion itself, and is essential for the evaluation of the respiratory tree in esophageal cancer carcinoma. But Halvorsen et al. [10] summarized a statistically significant advantage for spiral CT over bronchoscopy in advanced esophageal masses with a sensitivity of 88.3%.

Takashima et al. concluded that MR and CT have nearly the same accuracy in predicting resectability of tumors in patients with esophageal carcinoma [7].

Endoscopic ultrasonography was an excellent method for evaluating T3 or T4, but sometimes the endoscopy cannot pass the tumor because of stenosis caused by esophageal tumor especially in the case of the tumor extending beyond adventitia. CT was applied to all the patients even when the esophageal lumen was stenotic. Schimer et al. described no statistically significant difference between CT and broncho-fiber scope because an accuracy of 85.1% was obtained with regard to impingement, displacement and invasion of trachea and bronchus [1]. Lehr et al. also mentioned poor results with CT in the evaluation of esophageal carcinoma due to small sample size and that one-third of the cases had trans mediastinal esophageal resection, that were unhelpful in evaluating invasion [15]. The larger the tumor the greater the diagnostic capacity of CT, justifying the accuracy of 85.1% obtained [16-18].

Another problem is evaluation by surgical technique. A transmediastinal esophageal dissection technique is not available in evaluating tumors because dissection at the superior mediastinum is performed without direct vision [1,18].

It is our conclusion that esophagectomy is preferable when the tracheo-bronchial involvement is assessed as technically, resectable and preoperative assessment by CT plays an important role whether the tumor is resectable or not.

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