

THE CLINICAL CONDITION AND TREATMENT RELATED TO THE PROGNOSIS IN THE PATIENTS WITH CANCER

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ABSTRACT. *The relation of the prognoses to the clinical condition and treatment was investigated in patients with cancer of five organs, namely, stomach, colon/rectum (colorectal), liver, lung and breast, by using the methods of survival curve of Kaplan Meier and decision tree analysis. The data of the hospital-based cancer registry for 4 years from April 1, 2011 to March 2, 2015 and corresponding DPC survey were adopted. As a result, the presence of distant metastasis increases the rate of death. In cases with lung and liver cancer, the treatment methods of a thoracoscopic operation or a surgery affected the prognosis. In cases with breast cancer, the ability of walking at admission is related to the prognosis. The clinical condition and treatment methods related to the prognosis could be investigated using a decision tree analysis without a prior information.*

Keywords: Kaplan-Meier survival curve, Decision tree analysis, Hospital-based cancer registry

1. Introduction. Two kinds of data by which the form was unified exist. One is DPC (Diagnosis Procedure Combination) survey data, which contains information on diagnosis, treatment and prognosis for cancer patients, and the other is the hospital-based cancer registry data [1], which contains the primary tumor, pathology, property of neoplasms, histological grade and differentiation, and the date of definitive diagnosis. By using these data and survey data of fatal outcome in patients with cancer, the related factors to the survival, such as the degrees of cancer progress, the treatment methods (chemotherapy or surgical therapy), and activity of daily living (ADL) in hospitalization, can be investigated.

Cancer diseases are most diseases by the dead cause in Japan. It is different in the degree of cancer progress, a treatment and the prognosis depending on various cancer diseases and also different in the survival rate. In the most cases, the survival rate and the prognosis are investigated for each cancer, independently. However, there are few studies about the common factors to relate the prognosis and survival rate for the various kinds of cancer diseases.

An analyzing method of decision tree has been used for a great deal of data without foresight information [2-7]. In clinical studies, many conditions and factors have been related to the outcome in patients. The decision tree method can help predict the factors affecting the outcome of the patients with cancer.

The purposes of this study are to obtain useful information such as a clinical condition, progress of disease and treatment method related to the fatal outcome in the patients with cancer.

2. Methods.

Subjects: We focused on patients with five cancers selected from 1,028 cases in the hospital cancer registry with a date of diagnoses between April 1, 2010 and March 31, 2011. Cancer sites and diagnosis ICD-O-3 codes [8] of the five cancers were as follows: stomach (C16), colorectal (C18, C19, C20), liver (C22), lung (C33, C34) and breast (C50).

Analysis:

(1) The survival curve generation with Kaplan-Meier method [9,10]

The survival period was defined as the number of days from date of diagnosis until the date at which ‘alive’ or ‘death’ was verified. The date of diagnosis was the date on which cancer was first diagnosed, either by our hospital or by another hospital before referral to our hospital. The survival period (days) was converted into years.

(2) Decision tree analysis

Each cancer was analyzed using a decision tree with Chaid Method. The outcome of ‘Alive’/‘Dead’ was used as the dependent variable. The independent variables were as follows: age, sex, degree of cancer progress before treatment, ADL of walking, sitting, lifting and meal at admission, chemotherapy, thoracoscopic operation, surgery, immunotherapy, BRM (Biological Response Modifier), endocrine treatment, endoscopic operation, radiation, ablation by laser, thermotherapy, other therapy, severity and pathology.

The number of parent node data items was set to be 10 and the number of child node data items was set to be 5. Three layers were adopted in decision tree analysis.

3. Results. The ratio of the patients with cancer of five anatomical sites (stomach, colorectal, liver, lung and breast) was 41% of overall patients with cancers.

The 4-year survival rate was highest in breast cancer which was 96.0% and lowest in lung cancer which was 53.0%.

In the result of decision tree analysis for stomach cancer, ‘the degree of cancer progress before treatment’ was found to be the first branch dividing ‘alive’ and ‘dead’ as shown in Figure 1. ‘The degrees of cancer progress before treatment’ was branched into two nodes of distant metastasis which is shown as ‘4’ and the others which is shown as ‘1, 3, 2, 9, Null’ in Figure 1. Patients with distant metastasis accounted for 20% of patients and had a death rate of 59%, which was about 7 times greater than that of patients without distant

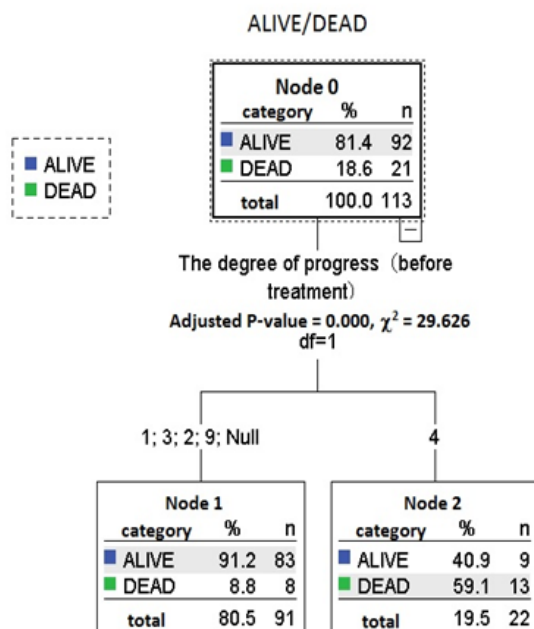


FIGURE 1. Decision tree analysis for stomach cancer

metastasis. Although over twenty of independent variables were set, only one variable of “the degree of cancer progress” was selected by this analysis.

‘The degrees of cancer progress before treatment’ was also the first factor dividing ‘alive’ and ‘dead’ for colorectal cancer as shown in Figure 2. Patients with distant metastasis accounted for 15% of patients and had a death rate of 65%, which was about 10 times greater than that of patients without distant metastasis.

Otherwise, in the case of liver cancer, the first branch was found to be ‘undergo or not surgery’ as shown in Figure 3. Patients without surgery accounted for 42% of patients and had a death rate of 37%, which was 5 times higher than those of patients with surgery.

In the patients with lung cancer, ‘operation with thoracoscopy or not’ was found to be the first branch as shown in Figure 4. Patients without thoracoscopic operation accounted

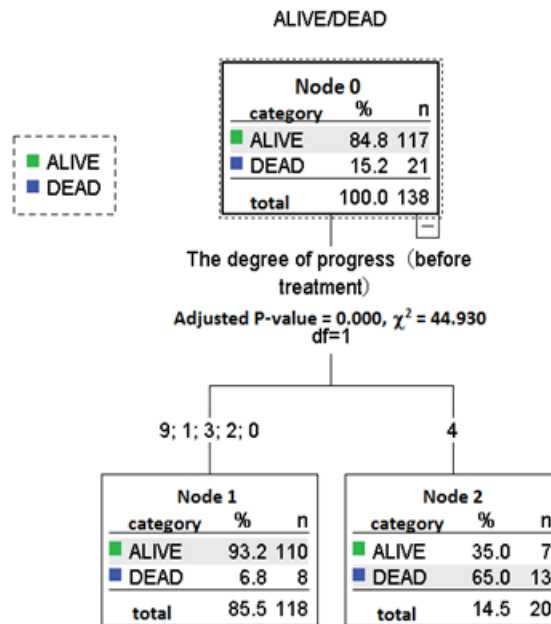


FIGURE 2. Decision tree analysis for colorectal cancer

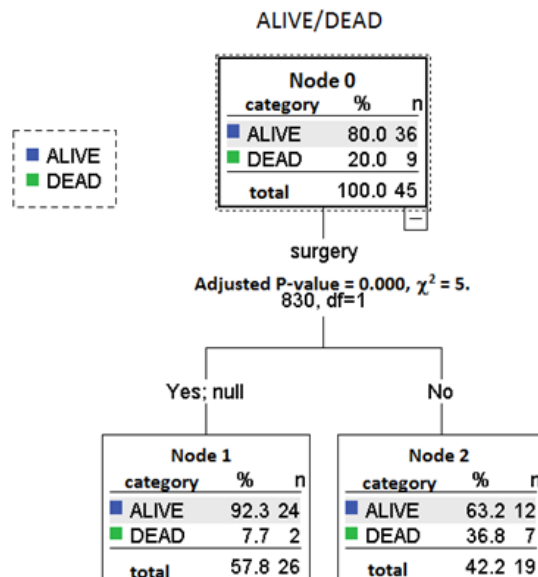


FIGURE 3. Decision tree analysis for liver cancer

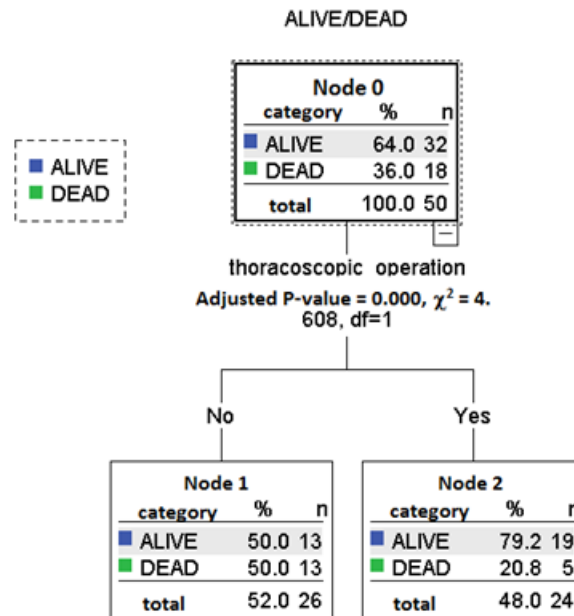


FIGURE 4. Decision tree analysis for lung cancer

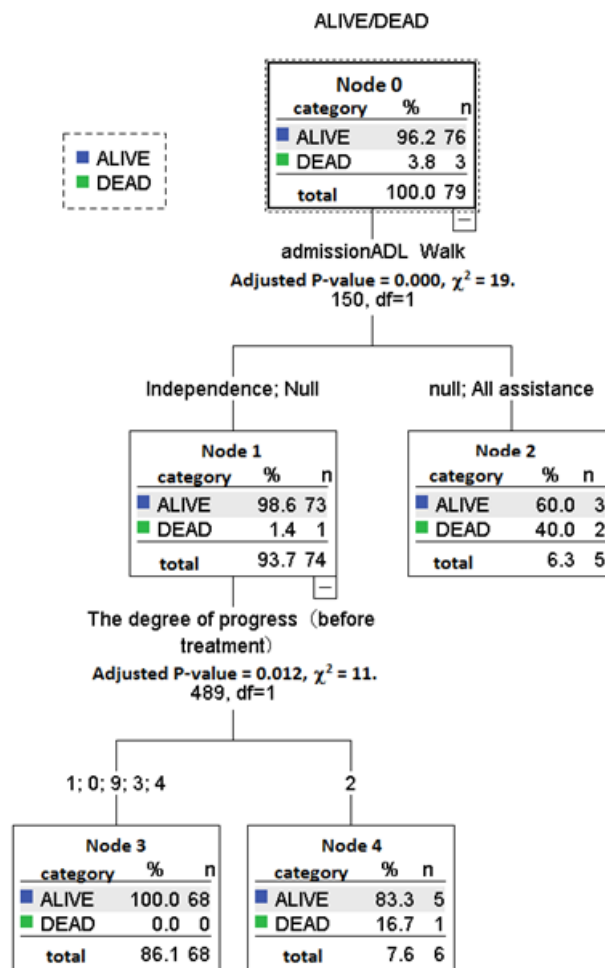


FIGURE 5. Decision tree analysis for breast cancer

for 52% of patients and had a death rate of 50%, which was 2.5 times higher than those of patients with thorascopic operation.

The result of decision tree analysis in the patients with the breast cancer was shown in Figure 5. The first branch of the breast cancer was the admission ADL of walking ability. Patient to be able to walk by himself accounted for 94% of patients and had a death rate of 1.4%, which was 1/29th those of the patients to need assistance. Among patients be able to walk by themselves, patients with lymph node metastasis shown as ‘2’ in the second branch of Figure 5 accounted for 7.6% and had a death rate of 16.7%, whereas those without lymph node metastasis or whose metastasis status was unknown had a death rate of 0%.

4. Discussion. In the cancer of the stomach and colorectal with higher survival rate, ‘alive’ or ‘dead’ were firstly branched by ‘the degrees of cancer progress before treatment’. Otherwise, in the liver and lung cancer with lower survival rate, the treatment method firstly appeared as the branch. The treatment method is determined according to ‘the degrees of cancer progress before treatment’ and the patients with distant metastasis are not operated surgically in cases with liver and lung cancer as shown in the left side of Table 1.

TABLE 1. The number of the patient with/without surgical operation in the distant metastasis patient

	operation method	No. of patient with distant metastasis		operation method	No. of patient with distant metastasis
Lung Cancer	surgery	0	Stomach Cancer	surgery	4
	No surgery	15		No surgery	18
Liver Cancer	thoracoscopic operation	0	Colorectal Cancer	surgery	9
	No operation	1		No surgery	11

The surgical operation was performed only in the cases without distant metastasis in both cases with lung and liver cancer. On the other hand, in the cases with stomach and colorectal cancer, the patients with distant metastasis are operated surgically.

On the other hand, in the cases with stomach and colorectal cancer, the patients with distant metastasis are also operated surgically as shown in the right side of Table 1. This was considered to be the reason why treatment method appeared in the first branch in cases with lung and liver cancer.

The surgical operation was performed only in the cases without distant metastasis in both cases with lung and liver cancer. This seems to be because the survival rate was higher in the patients with surgery than in the patients without surgery.

In the cases with breast cancer in which the survival rate was the highest, the number of patients with distant metastasis was small and activity of daily living at admission greatly influenced the outcome of the patient. These results of decision tree analysis show that ‘the degrees of cancer progress before treatment’, especially the presence of distant metastasis, affects the prognosis in the patient with cancer. In patients without distant metastasis, their daily activities at admission affect the prognosis.

To find cancer early and to do surgery treatment could raise the survival rate.

There are several factors which were thought to affect the fatal outcomes of the patients with cancer. In these cases, a decision tree analysis method was shown to be able to pick up much more influenced factors from them, for example, ADL of walking activity at admission in cases with breast cancer. Although over twenty of independent variables were set, one or two variables were selected in this study of three layers of decision tree.

5. **Conclusions.** In cases with cancer some factors that affected the fatal outcome were investigated by using decision tree analysis. In results, the presence of distant metastasis increases the rate of death. In cases with lung and liver cancer, the treatment methods affect the prognosis. In cases with breast cancer, the ability of walking at admission is related to the prognosis.

In conclusion, to find the cancer at an early stage leads to a decline of the mortality rate.

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