The Value of CT Enhancement Degree in Prognosis of Pancreatic Cancer

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Abstract: Objective: To explore the prognostic value of CT enhancement degree of pancreatic cancer in pancreatic cancer. Methods: From January 2019 to January 2022, 50 patients with pancreatic cancer who came to our hospital for pathological confirmation were selected. Prior to surgery, use multiphase CT of the pancreas to complete enhanced scans. After surgery, the patient's survival period, clinical treatment effectiveness, and imaging data are used as research variables. In the scanning diagnosis, it is necessary to collect the patient's age, gender, tumor location and size, differentiation process, CT value, etc. Create a mathematical model based on the collected data and complete the experimental research work. Results: Univariate analysis showed that the prognosis of pancreatic cancer patients with higher enhancement degree in each stage ($P<0.05$ in each stage) was better. Multivariate analysis showed that tumor differentiation ($P=0.0118$), TNM staging ($P=0.004$), and portal vein enhancement ($P<0.001$) can be independent predictors of patient prognosis. Conclusion: The lower the CT enhancement degree of pancreatic cancer, the worse the prognosis.

Keywords: Pancreatic Cancer; Tomography; X-Ray Computer; Prognosis

Introduction

Pancreatic cancer is a high incidence tumor and a malignant tumor with poor prognosis. The survival probability of patients with pancreatic cancer in the next five years is only 9%, which is the lowest among all cancers. Therefore, before treatment, we should fully understand the various factors that affect the prognosis of pancreatic cancer. Through accurate collection of various data, we can ensure the survival time of the prognosis and determine effective treatment plans. The blood supply of pancreatic cancer can be displayed by enhanced CT. Usually, pancreatic cancer has no blood supply, but there is a small part of blood supply. At present, multiple foreign scholars have found through research that analyzing the blood supply of tumors can predict the invasiveness and prognosis of tumors. This article analyzes the clinical and imaging characteristics of pancreatic cancer in order to explore the relationship between CT enhancement degree and prognosis, so as to improve the preoperative diagnosis and prognosis of pancreatic cancer.

1. Materials and Methods

1.1 General Information

50 patients with pancreatic cancer who came to our hospital for pathological confirmation from January 2019 to January 2022 were selected. Among them, there were 28 males (55.7%) and 22 females (44.3%), aged 48-86 years, with an average age of (68.4 ± 8.2) years. Inclusion criteria: (1) Patients with pancreatic cancer confirmed by pathology; (2) Abdominal CT enhanced examination before surgery, and all patients underwent surgical treatment; (3) Failure to undergo biopsy or treatment before CT enhancement examination, such as fine-needle aspiration biopsy, surgical treatment, radiotherapy and chemotherapy, etc; (4) The patient eventually died of pancreatic cancer or its complications. All patients underwent surgical treatment, and postoperative specimens were sent to the pathology department for HE staining and

immunohistochemical examination. The pathological results were used as the final diagnosis.

1.2 Inspection method

Using the AquilionViSIONSi emensSomatom Definition Flash CT scanner of the Canon (Toshiba) 320CT, all cases underwent three phases of enhanced CT scanning (pancreatic parenchymal phase, portal vein phase, and delayed phase) after plain CT scanning (images were collected at 45s, 65s, and 120s after injection), with a scanning range ranging from the level of the top tangent of the diaphragm to the level of the lower edge of both kidneys. Iodopanol, an enhancer, has a concentration of 370mgI/ml, a dosage of 100ml, and an intravenous injection rate of 3ml/s.

1.3 Image Analysis

The CT scan images were retrospectively reviewed and analyzed by two professional abdominal imaging physicians. When the opinions of the two physicians differed, consistent data was obtained through discussion. Selection of Region of Interest (ROI) in CT: ROI selects the solid area of the lesion, and the size of the ROI should not exceed the boundary of the lesion, avoiding cystic necrosis and calcification areas. The observation content is as follows: (1) The location and size of the lesion (pancreatic head, pancreatic neck, pancreatic body, and pancreatic tail) (select the maximum diameter); (2) Enhancement degree: One imaging physician will measure the CT value of ROI at each stage of the lesion, and take the average of three measurements; (3) Other imaging changes: presence or absence of lymph nodes (lymph node metastasis is defined as lymph node short diameter>1.0cm), and metastasis to other organs.

1.4 Statistical Analysis

The survival period of a patient refers to the period from the first imaging examination to the most recent follow-up or patient death. Use SPSS24.0 statistical software for data analysis. Survival variables include age, gender, tumor indicator (CA199) serological level, tumor location, tumor size, degree of differentiation, TNM staging, and CT values at each stage of enhanced CT. The survival curve was plotted using Kaplan Meier method, univariate analysis using log rank test, and multivariate analysis using COX regression model. $P<0.05$ indicates a statistically significant difference.

2. Results

2.1 Patient characteristics

The main characteristics of the patient. The TNM staging is based on the AJCC 8th edition staging standards. The median survival time of the patient is 18 months (1-61 months).

2.2 Univariate and multivariate analysis of prognosis of pancreatic cancer

Single factor and multi factor analysis results for each variable. Univariate analysis showed that age ($P=0.386$), tumor site ($P=0.311$), and CA199 serum level ($P=0.445$) were not related to the prognosis of pancreatic cancer patients. The survival time of female patients was significantly longer than that of male patients (median survival time of 40 months vs. 20 months, $P=0.024$). The survival time of patients with tumors<3.0cm was significantly longer than that of patients with tumors ≥ 3.0cm (median survival time of 34 months vs.15 months, $P=0.012$). The survival time of patients with medium to high degree of tumor differentiation was significantly longer than that of patients with low to low degree of differentiation (median survival time of 31 months vs 13 months, $P=0.015$). The survival time of TNM stage I-II patients was significantly longer than that of TNM stage III-IV patients (median survival time 29 months vs. 6 months, $P=0.001$). Patients were divided into two groups based on the median CT values of each stage after enhancement, and there was a significant difference in survival time between the two groups ($P<0.05$). The survival time of patients with high enhancement was significantly longer than those with low enhancement. In this paper, we found that one case of pancreatic cancer had higher enhancement than the surrounding normal pancreatic parenchyma, and its survival time has exceeded 78 months. The results of multivariate analysis showed that the degree of tumor differentiation ($P=0.017$), TNM stage ($P=0.004$), and portal phase enhancement ($P<0.001$) can be independent predictors of patient prognosis. Patients with low to medium low differentiation,

TNM stage III-IV, and lower portal phase enhancement have poorer prognosis.

3. Discussion

3.1 Enhancement degree, tumor differentiation degree and prognosis of pancreatic cancer

This article focuses on the enhancement degree of pancreatic cancer at various stages. Through the analysis of collected data, the relevant effects of patient prognosis can be understood, among which the degree of enhancement in the portal vein phase can serve as an independent predictor of patient prognosis ($P<0.05$). Previous studies have shown that the richer the blood supply and the higher the degree of enhancement of pancreatic cancer, the better its prognosis. For pancreatic cancer with high CT enhancement, the enhancement degree can be similar to that of normal pancreatic tissue. It is called equal enhancement pancreatic cancer, accounting for 5.4% -14% of pancreatic cancer. It has unique clinical and pathological characteristics, and has a better prognosis after surgical treatment. The mechanism behind it is not yet clear.

Some studies have shown that tumor size, tumor differentiation, cell density, matrix fibrosis, coexisting normal pancreatic tissue, and degree of necrosis may all affect the degree of tumor enhancement. The study found that for small pancreatic cancer below 2cm, its enhancement degree is higher, and it is more likely to have equal enhancement. The smaller the tumor, the better its prognosis. However, small equal enhancement pancreatic cancer is easy to be missed in CT enhancement examination. Therefore, for patients with increased clinical lesions, the pancreatic head is slightly enlarged, the uncinate process is blunt or loses its normal shape in CT scanning. Whether there is expansion of pancreatic bile duct or obvious mass, the possibility of small pancreatic cancer should be highly suspected. CT energy spectrum imaging, enhanced MRI or PET/CT are more sensitive to this type of pancreatic cancer. The degree of tumor differentiation is also an important factor affecting prognosis, and usually the higher the differentiation, the better the prognosis. For well differentiated pancreatic cancer, its characteristic histopathological manifestation is that normal pancreatic acini remain between tumor glands, so well differentiated pancreatic cancer also has a high degree of enhancement. This is also consistent with the results of this article. Some scholars also believe that matrix fibrosis plays an important role in the treatment and prognosis of patients. The more obvious matrix fibrosis, the lower the degree of tumor enhancement, the stronger the invasiveness of the tumor, the more obvious the resistance of the tumor to radiotherapy and chemotherapy, and the poorer the prognosis of patients.

3.2 TNM staging and prognosis of pancreatic cancer

This paper found that TNM staging of pancreatic cancer is also closely related to the prognosis of patients, which is currently recognized as a factor affecting the prognosis of pancreatic cancer. Preoperative TNM staging of pancreatic cancer patients according to relevant standards found that TNM staging can not only guide the choice of treatment plans, but also serve as an independent predictor of the prognosis of pancreatic cancer. To sum up, the lower the degree of CT enhancement of pancreatic cancer, the worse its prognosis. And the degree of tumor differentiation, TNM staging, and portal vein phase enhancement can be independent predictors of patient prognosis.

4. Summary

The study found that the lower the CT enhancement degree of pancreatic cancer, the worse its prognosis. And the degree of tumor differentiation, TNM staging, and portal vein phase enhancement can be independent predictors of patient prognosis.

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