



Article

Salivary Polyamines Help Detect High-Risk Patients with Pancreatic Cancer: A Prospective Validation Study

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Abstract: Pancreatic cancer is one of the most malignant cancer types and has a poor prognosis. It is often diagnosed at an advanced stage because of the absence of typical symptoms. Therefore, it is necessary to establish a screening method for the early detection of pancreatic cancer in high-risk individuals. This is a prospective validation study conducted in a cohort of 1033 Japanese individuals (male, $n = 467$, age = 63.3 ± 11.5 years; female, $n = 566$, age = 64.2 ± 10.6 years) to evaluate the use of salivary polyamines for screening pancreatic diseases and cancers. Patients with pancreatic cancer were not included; however, other pancreatic diseases were treated as positive cases for accuracy verification. Of the 135 individuals with elevated salivary polyamine markers, 66 had pancreatic diseases, such as chronic pancreatitis and pancreatic cysts, and 1 had gallbladder cancer. These results suggest that the salivary polyamine panel is a useful noninvasive pancreatic disease screening tool.

Keywords: pancreatic cancer; chronic pancreatitis; saliva; metabolomics; polyamine



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1. Introduction

The annual global incidence of pancreatic cancer has doubled in the last 20 years, from 196,000 in 1990 to 441,000 in 2027 [1]. The 5-year survival rate for pancreatic cancer is 11%, the lowest among all cancers [2]. The poor survival is due to diagnosis in the advanced stages in most cases, with only approximately 20% of patients presenting with surgically resectable stages [3]. The five-year survival rates of patients with pancreatic cancer who undergo surgical resection ranges from 15% to 25% [3], and the survival of patients with stage 1A exceeds 80% in the United States [4]. In Japan, a multiple-center screening test for early stage pancreatic cancer was performed and among 200 patients with pancreatic cancer, only 0.7% and 3% were with stage 0 and I diseases, respectively [5]. These studies indicate that the early detection of this cancer is unfavorable.

Several risk factors of pancreatic cancer have been identified. For example, type 2 diabetes increased the risk of developing pancreatic cancer [6]. Current and past smokers were at higher risks than are non-smokers [7], and alcohol consumption (≥ 30 g per day) increased the risk of developing pancreatic cancer [8]. Particularly, epidemiological studies have reported chronic pancreatitis as a risk factor for pancreatic cancer [9–11]. Chronic pancreatitis is a multifactorial fibroinflammatory syndrome which occurs in the pancreas. Repeated inflammation of the pancreas results in extensive fibrotic tissue replacement, leading to chronic pain and exocrine and endocrine pancreatic insufficiency [12]. Considerable variability in the incidence of this disease ranges from 2 to 14 per 100,000 in the United States [13]. Approximately 5% of these patients will develop pancreatic cancer during their lifetime [14]. Compared with healthy individuals, those with chronic pancreatitis have a 13-fold higher risk of developing pancreatic cancer [14]. Thus, the screening of