STUDIES ON THE RETROGRADE PANCREATOGRAHY
IN AUTOPSY SPECIMENS

BY

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ABSTRACT

In order to study the normal and aged anatomical structure of the duct system of human pancreas, retrograde pancreatography was performed. Pancreas from 33 cadavers of non-pancreatic disease, aged from 0 to 81 years, was examined. Silicone rubber was injected through the canal of Wirsung, radiographs were taken, and microstereoscopic observation was done after clearing in methyl salicylate. The main duct tapered gradually toward the tail, branching off about 56 second term ducts at a regular interval. The eighth term branch became the centroacinar ducules in the peripheral region, and the fourth and fifth term branch did it in the proximal region. In aged cases, prominently over 60 years, the main duct became large in caliber and showed irregular dilatation and narrowing like beads. The second term ducts were visualized as irregular patterns. The figure of distortions like a corkscrew was also seen in smaller ducules of the aged cases over 50 years. The histological findings of these sites were not the pancreatic lesions but only the increase of fibrous tissues and decrease of a cellular component in the ductal wall itself.

INTRODUCTION

Endoscopic pancreatography has been proved to be an effective procedure for the diagnosis of pancreatic disease. To aid in the interpretation of the pancreatogram, much knowledge about the anatomic and pathological appearance of the pancreatic lesion has been obtained, and this has made it possible to diagnose a pancreatic cancer or chronic pancreatitis.

However, as Birnsting1) and Ikeda2) stated, smaller lesions which belonged to the second term branch of the pancreatic duct could not be detected by the present procedure. It is expected to become possible to catch a smaller lesion in the near future.

Little investigation has been done about the finer details of the pancreatic ducts. The purpose of this paper is to show the finer and normal structure of the pancreatic duct by means of retrograde pancreatography in the autopsy specimens.

MATERIALS AND METHODS

The examinations were made on 33 autopsy cases who had died at Saku Central Hospital, Nagano Prefecture, Japan, between 1974 and 1976. The age of the patients ranged from 0 to 81 years. None of the patients had suffered from pancreatic diseases.

Retrograde pancreatograms were made after en bloc removal of the stomach, duodenum, and pancreas. The contrast medium (MV-117 orange, Canton Biomedical Inc.) was hand-injected, 7-8 ml in amount, into the canal of Wirsung in all the patients.

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Received for publication, November 10, 1976.
within 2 hr after death.

After the specimens were vulcanized for 2 hr at room temperature, roentgenographs were taken. Then the specimens were hardened and dehydrated in graded ethanol and cleared in methyl salicylate. The injection cast was observed under the microstereoscope, and photographed with Multi-photo (Nikon). For histological examination, three blocks were taken from the head, body, and tail of the pancreas, and stained with Hematoxylin-Eosin and Elastica van Gieson.

Results

Pancreatograms were obtained in 33 of 38 cases. The injection failed in five cases, in which were primary and secondary carcinomas of the head or acute pancreatitis.

The main pancreatic duct tapers gradually toward the tail, but commonly there are very slight undulations and smooth irregularities (Fig. 2). In child cases, it runs in a pliable fashion (Figs. 3 and 7), but there is a high frequency in the appearance of irregular dilatation and narrowing like beads, and some rigidity in aged cases (Fig. 4). It appears commonly in the head and body part of the main duct, and its frequency is 12 of 18 cases (2/3) over 60 years. No case under 50 years shows such an abnormal pattern.

The accessory pancreatic duct was visualized in 15 of 33 cases (45.5%). Their major courses were classified according to Dawson and Langman; 10 of 15 cases (2/3) show the patent accessory duct type and 5 of 15 cases (1/3), the ansa pancreatica type.

The mean value of the maximum diameter of the main duct in adult cases is 3.18 mm, and ranges from 2.0 to 4.8 mm. The value increases with age of the individual and it becomes prominent when the age is over 60 years (Fig. 1). There is no significant difference between sexes.

![Graph](image)

Fig. 1. Maximum diameter of the main duct and the age
The main pancreatic duct is most often the widest just beyond the point of junction with the accessory pancreatic duct, in the head part of the main duct.

The peripheral running pattern of the main pancreatic duct in the tail is sometimes separated into two. These eaparating type was seen in 7 of 33 cases (21.2%). Another ore is the gradually diminishing type in the tail part. These findings are not related to age.

The second term ducts branches off at right angles to the main duct (Fig. 5). The branch which runs in the head part is the largest one, and its caliber ranges from 1 to 2 mm. Smaller branches are repeated to separate into two. The third to fourth term branches can still be recognized on the radiographs. With a microstereoscope, the eighth term branches are detected, reaching up to the centroacinar ductules (Fig. 6). However, every branch does not always have the same term, and a small number of them ends in fourth to fifth term, particularly in the region near the main duct, and a large number of them have eighth term in the peripheral region.

The number of the second term branches varies from case to case, and ranges from 52 to 66, with a mean of 56. This number does not depend on age and sex. While they branch off at almost regular intervals in infants and adults (Figs. 2 and 3), they do so at irregular intervals in aged cases (Fig. 4). They show much narrowing, tortuosity, and distortion like a corkscrew in aged cases. These abnormal patterns are also seen in smaller branches (Fig. 8), and it appears to increase with age, especially over 50 years.

Histological findings show few remarkable changes (Figs. 9 and 11). There are no particular pathological figures (Fig. 10), such as chronic pancreatitis, in all the cases. The histological changes of the sites, where the retrograde pancreatogram shows tortuosity and distortions, are only the increase of fibrous tissues and decrease of a cellular component in the wall of the duct (Fig. 12). There are a few cases which show squamous and goblet cell metaplasia, but it has little direct relation to the abnormal figures on the radiographs. The histological changes of the abnormal pattern in smaller branches are also related to the increased fibrous tissues.

Discussion

Anatomical studies on the pancreatic duct have been made recently by using various contrast media, such as vinyl plastic⁴, barium sulfate¹,⁴,⁶ Jodipin⁷, Hypaque⁸ and Urografin²,⁹. Most of them were investigated only by means of radiography. In spite of using the high-resolution X-ray films, it was impossible to get finer details of ductules. Silicone rubber, which was used for studying the microvasculature¹⁰,¹¹ proved to be a better medium to meet such a demand. It made possible the uniform injection up to the centroacinar ductules.

In the pancreatic duct system, it was revealed that a large number of centroacinar ductules were made of the eighth term branches from the main duct, and that a small number of them near the main duct was fourth term branches.

The mean value of the maximum diameters of the main duct was measured by many investigators; Newman¹² gave it as 3.5 mm, Millbourn¹³ 4.1 mm, Kato⁶ 4 mm, Nakajima¹⁴ 3.3 mm, and Komatsu¹⁵ 3.68 mm. Our measurement, 3.18 mm, was consistent with these values. It was established that it increased with age, as was mentioned by Millbourn¹³, Komatsu¹⁵, Ikeda², and MacCarty¹⁶.

The appearance of irregular dilatation and narrowing like beads of the main duct had been only referred to in chronic pancreatitis.
Kasugai’s report on the criteria for endoscopic pancreatographic diagnosis classified it into three groups: minimal, moderate, and advanced pancreatitis. Slight rigidity and tortuosity were seen in the minimal pancreatitis according to his report, but our studies revealed that the aged cases without any pancreatic changes showed the same kind of abnormal figure in two-thirds, over 60 years. The same abnormal figure was seen in small ductules of the aged cases of over 50 years.

The true etiology of these figures is left open to question. Chronic pancreatitis could be a cause, but the aging process might be the principal cause. These lesions are assumed to be associated with atrophy or degeneration of the fibrous tissues themselves in the ductal wall.

Acknowledgement

The authors are most grateful to Mr. R. Yamasibita, Mr. H. Ide, Mr. M. Haketa, and Mr. K. Shimazaki of the Branch of Pathology, Saku Central Hospital, for their kind assistance. Thanks are also expressed to Mr. M. Takata and Mr. S. Ono of the Photo Center of our University for their kind advice for taking photographs.

References

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