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Case Report

The Pancreatic Islets in Systemic Amyloidosis*

The Occurrence of Two Different Types of Amyloid

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Summary. Pancreases from nine patients with systemic amyloidosis were studied. Eight patients with secondary amyloidosis had amyloid deposits in arteries and veins, while the single patient with amyloidosis due to myelomatosis had no vascular amyloidosis but showed small deposits around fat cells peripancreatically. In four of the patients there was slight vascular amyloidosis in a few islets. In two other patients more extensive deposits were found and, in contrast to all other deposits, this amyloid was negative when stained for tryptophane. It is concluded that systemic amyloidosis has no facilitating effect upon the formation of islet amyloid and that when patients with systemic amyloidosis show extensive islet amyloid deposits, these are not part of the systemic disease.

Introduction

Amyloidosis of the islets of Langerhans, previously often named hyalinosis (Warren *et al.*, 1966), is a very commonly found alteration in elderly persons, especially diabetics. The amyloid exhibits the typical staining properties of all amyloids with Congo red (Ehrlich and Ratner, 1961), and their characteristic ultrastructure (Lacy, 1964; Westermark, 1973). It is almost entirely limited to the islets and only very seldom does it extend a little into the surrounding exocrine tissue. In typical islet amyloidosis there is no involvement of vessels outside the islets. Conversely, in systemic amyloidosis amyloid is very often deposited in the small pancreatic arteries and veins (Dahlin, 1949). Only very occasionally are amyloid deposits found in the connective tissue outside the vessels (Pocock and Dickens, 1953; Gerber, 1934), and in these rare cases they can extend into the islets (Pocock and Dickens, 1953).

The present paper reports the pancreatic findings in systemic amyloidosis and the occasional apparently unconnected occurrence of islet amyloid deposits in this disease.

Material and Methods

Pancreatic tissue was obtained at autopsy from 8 patients with secondary systemic amyloidosis and from 1 patient with amyloidosis due to myelomatosis (see Table 1). One of the patients with secondary amyloidosis also suffered from maturity onset diabetes mellitus. All the patients were known to have amyloid deposits in the kidneys and the rectal vessels. Small pieces from the pancreatic tail which had been fixed in 10% buffered formalin were available as paraffin blocks, usually several from each patient. From each block sections were stained with van Gieson's stain and with alkaline Congo red and were studied in a polarization microscope. From cases 2 and 9 two consecutive sections were stained with alkaline Congo red and with the post-coupled benzylidene technique (Glenner and Lillie, 1957) for demonstration of tryptophane in amyloid.

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Table 1

Case	Age Years	Sex	Major disease	Pancreatic vascular amyloidosis	Pattern of islet amyloidosis
1	58	♀	Rheumatoid arthritis	Severe	—
2	77	♂	,, Diabetes mellitus	Severe	B
3	64	♀	Rheumatoid arthritis	Severe	—
4	67	♀	,,	Severe	A
5	65	♀	,,	Moderate	A
6	72	♀	,,	Moderate	A
7	58	♀	,,	Moderate	—
8	80	♀	,,	Slight	—
9	54	♂	Myelomatosis	—	B

Results

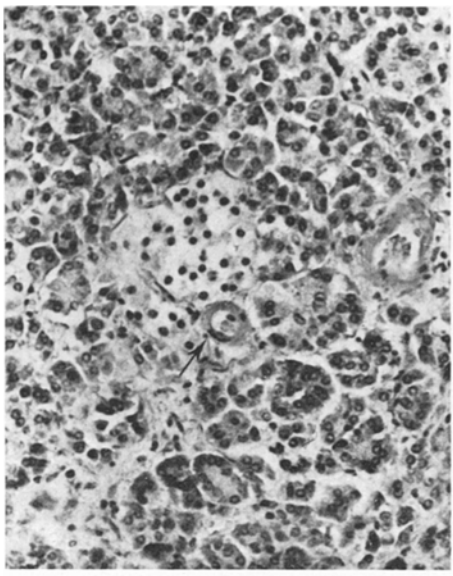
The exocrine pancreatic tissue from the 8 patients with secondary systemic amyloidosis showed amyloid deposits in the media of arteries and veins of varying caliber. In four of the cases the amyloid deposits were heavy and seemed almost to convert the vessels into tubes of amyloid; a few very small vessels, probably arterioles and capillaries, showed amyloid in their walls. These deposits were very faint and could often only be demonstrated in the Congo red stained sections between crossed polars. In the patient with amyloidosis due to myelomatosis there were no vascular deposits of amyloid in the pancreas but deposits were seen around cells in the peripancreatic fat. There was no correlation between the degree of amyloidosis in the pancreatic vessels and in other organs, e.g. the kidneys.

The amyloid deposits in the islets of Langerhans showed two patterns. In three of the patients with secondary amyloidosis very faint deposition of amyloid in small vessels was seen (pattern A, Fig. 1). This pattern was similar to the finding in small vessels of the exocrine tissue. No extravascular amyloid was found. In contrast, some islets of the pancreas from the patient with diabetes mellitus and amyloidosis and from that of the patient with amyloidosis due to myelomatosis showed amyloid deposits which were more extensive and seemed to be located between the vessels and the epithelial islet cells (pattern B, Fig. 2). The vessels in the neighbourhood of these islets contained no amyloid.

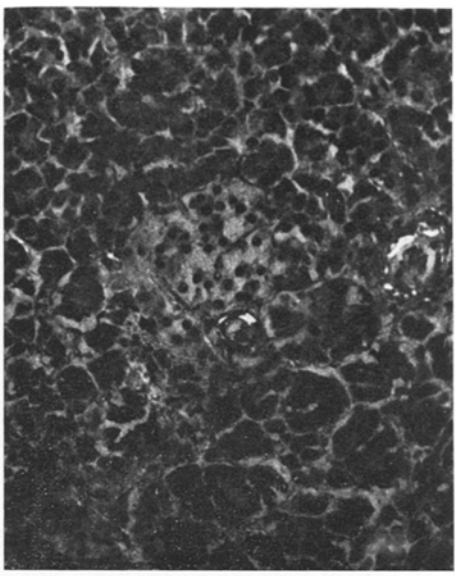
All amyloid deposits exhibited the same staining properties with van Gieson's stain and Congo red and showed a characteristic green birefringence when studied in a polarization microscope. When stained for tryptophane, however, the amyloid in pattern B was negative (Fig. 3). The intravascular amyloid was always as positive as amyloid usually is (Cooper, 1969).

Discussion

The involvement of pancreatic vessels in systemic amyloidosis is well known (Dahlin, 1949; Symmers, 1965). Dahlin found intravascular deposits of amyloid in the pancreas in 19 of his series of 30 patients with secondary amyloidosis. Most of these were observed in small arteries and veins, but in 10 patients amyloid was also seen in interacinar capillaries. He also found capillary amyloidosis of the islets



1a



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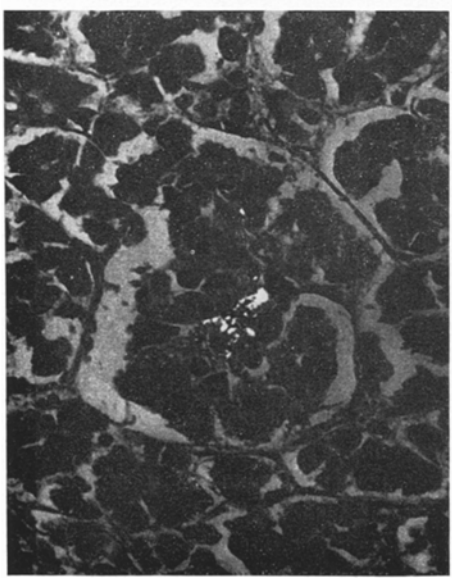

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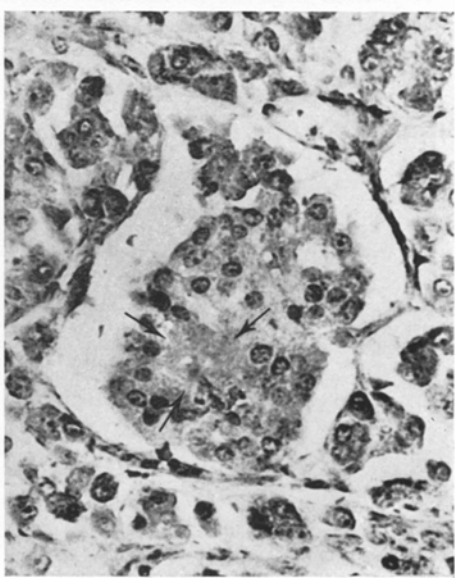

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Fig. 1a and b. Pattern A. A small islet with a vessel, probably an arteriole (arrow), containing amyloid deposits. There is no extravascular amyloid in the islet. Note the artery containing amyloid deposits in the exocrine parenchyma. Congo red, × 450. a Ordinary light, b crossed polars

Fig. 2. Pattern B. The amyloid in this islet is not limited to the vessels but seems to be situated between these and the islet cells. Congo red, × 400. Crossed polars

Fig. 3. The same islet as in Fig. 2 but in an adjacent section, stained for demonstration of tryptophane. The amyloid (arrows) is negative. Post-coupled p-dimethylaminobenzylidene reaction, × 400

in three cases. These findings correspond well with those in the present series, where all patients with secondary amyloidosis had amyloid deposits in pancreatic arteries and veins and four of them also in interacinar and islet capillaries. The only patient with amyloidosis due to myelomatosis had no vascular amyloid deposits in the pancreas but showed characteristic amyloid rings around fat cells peripancreatically.

In the patient with diabetes and in the one with myelomatosis the islet amyloid deposits were not limited to the vessels but had the typical appearance of isolated islet amyloid as is often seen in elderly patients (Warren *et al.*, 1966). The staining reaction to tryptophane was negative in the amyloid of the islets in these two patients. This is not surprising, since it has been shown previously that in isolated islet amyloid no tryptophane can be demonstrated histochemically (Westermark, 1974) and that it differs from most other amyloids in this respect (Cooper, 1969). The finding is noteworthy, however, since as far as I know this is the first time that two different amyloids have been found in the same organ of the same patient.

Islet amyloidosis is extremely common and often extensive in patients with maturity onset diabetes mellitus (Warren *et al.*, 1966; Ehrlich and Ratner, 1961; Bell, 1959). In this study the patient with both diabetes and systemic amyloidosis only showed very slight islet amyloidosis. It is obvious that the systemic amyloidosis had no facilitating effect upon the formation of amyloid in the islets. This is quite in accordance with the hypothesis that the origin of the islet amyloid differs from that of other amyloids (Westermark, 1973).

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