Morphology of Pancreatic Tissue-containing Accessory Spleen in an APA Hamster

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Accessory spleen (AS) was observed in 19 out of 71 (27%) golden hamsters of APA strain autopsied in the Institute of Physical and Chemical Research. When these AS were examined histologically, clusters of pancreatic tissues, such as islets and acini, were detected in the parenchyma of one AS located in the tail of pancreas of a 15-week-old male animal. This heterotopic pancreatic tissue was considered to penetrate deep into the AS from the pancreas through the adhesion site without any connective tissue border during the ontogenesis.

There have been many reports on the incidence and histology of accessory spleen (AS) in the human being [2, 4-6], ape [8], rabbit [3, 9], and mouse [7], but none in hamster to our knowledge. Recently, we have examined 71 golden hamsters of APA strain, and found AS in 19 animals (27%) (Table 1). On the histological examinations, clusters of pancreatic tissues, such as islets and acini, were detected in the parenchyma.

Table 1. Incidence of accessory spleen in APA hamsters

<table>
<thead>
<tr>
<th>Sex</th>
<th>Age (weeks)</th>
<th>5-10</th>
<th>15-20</th>
<th>50</th>
<th>Total incidence by sex (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>0/11</td>
<td>3/10</td>
<td>7/16</td>
<td>4</td>
<td>10/37 (27)</td>
</tr>
<tr>
<td></td>
<td>(0)</td>
<td>(30)</td>
<td>(44)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>0/6</td>
<td>3/16</td>
<td>6/12</td>
<td>0</td>
<td>9/34 (27)</td>
</tr>
<tr>
<td></td>
<td>(0)</td>
<td>(19)</td>
<td>(50)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>0/17</td>
<td>6/26</td>
<td>13/28</td>
<td>0</td>
<td>19/71 (27)</td>
</tr>
<tr>
<td></td>
<td>(0)</td>
<td>(23)</td>
<td>(46)</td>
<td></td>
<td></td>
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</tbody>
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Site of accessory spleen: splenic hilus (11/19), tail of pancreas (7/19), and omentum (1/19).
Fig. 1. Schema of microscopical anatomy of the accessory spleen in APA hamster.

of AS of one 15-week-old male animal. The morphological features of AS containing the pancreatic tissues are described here.

At autopsy, the AS in question had no connection with the main spleen and was seen as a dark red oval nodule (0.7mm × 1.5mm), about one half of which was embedded in the tail of pancreas (Fig. 1). The whole AS, together with surrounding pancreatic tissue, was fixed in 10% buffered formol solution and embedded in paraffine. Serial sections were then cut into 4μm thick each vertically to the long axis of AS (Fig. 1) and stained chiefly with hematoxylin and eosin. The outline of anatomical and histological architectures of AS is schematically shown in Fig. 1; the letters A to E in the following paragraphs indicate the sectioning points given in Fig. 1.

The AS was observed as a small cluster of pancreatic acini and lymphocytes, and was finely demarcated from the surrounding adipose tissue in the section outside A (Fig. 2). In the section A, the AS exhibited an irregular outline with no apparent capsule and was partly attached to the pancreas. There were several groups of pancreatic acini in the red pulp of AS (Fig. 3). In the sections at and around B, as shown in Fig. 4, about one third of the circumference of AS was firmly adherent to the adjacent pancreatic tissue without any connective tissue border. In the section C, small foci of pancreatic islets and acini were found in the red pulp in the proximity of the fine collagenous septum which was the line of demarcation between the AS and the pancreas. In this section, the upper half of AS was encapsulated and contained lymphoid follicles (Fig. 5).

In the section D, in addition to the pancreatic islets and acini, collagenous trabeculae, lymphoid follicles, arteries, and venous sinuses were readily identified in the AS which was completely encapsulated and clearly demarcated from the pancreas (Fig. 6,7 and 8). The AS in this section was thus found to resemble the normal spleen except for the presence of pancreatic tissues in its red pulp. Pancreatic ductules were detected in the septum between the AS and the pancreas (Fig. 8) and also in the vicinity of pancreatic islets and acini situated in the red pulp (Fig. 9). In the sections stained with aldehyde-fuchsin stain, the islet cells in the red pulp of AS showed almost the same stainability as that of ones in the pancreas (Fig. 9).

In the sections at and outside E, the AS consisted mainly of the elements of red pulp accompanied with a few pancreatic acini.

Judging from the above-mentioned light microscopic findings of serial sections, the heterotopic pancreatic tissue was thought to have penetrated deep into the AS from the pancreas through the adhesion site lacking in the connective tissue border which was recognized in the sections in front and rear of B. Thus it seems reasonable to consider that this pancreatic tissue-containing AS probably represents a sort of developmental failure [1]. Moreover, such histological findings of AS as those in the present case have been rarely reported. To our knowledge only two cases, in which pancreatic tissue rested directly on the adjacent red pulp [9] or was embedded in the trabeculae of AS [5],
have been described. Therefore, it appears meaningful to describe the morphologic details of such AS containing pancreatic tissues in its parenchyma as noted in the present study.

With regard to the incidence of AS, it is said that approximately 10% of humans have AS irrespective of the age and race [2-4,6]. Strain differences in frequency have been observed in inbred mice [7] and rabbits [3,9]. In the latter case, chemical and genetical factors were discussed in relation to such differences among strains. In addition, it is worthy to note that the incidence of AS appeared to progress with increasing age in golden hamsters of APA strain (Table 1). However, further studies are needed to clarify the factors influencing the age- or strain-related difference in the incidence of AS in hamsters.

Acknowledgment

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References

Explanation of Figures

Figs. 2 to 9 show transverse sections of accessory spleen (AS) in an APA hamster; the letters A to E are the sectioning points given in Fig. 1.

Fig. 2. Section outside A. The AS is seen as a small cluster of pancreatic acini and lymphocytes. Hematoxylin and eosin stain (HE), × 90.

Fig. 3. Section A. The AS is partly attached to the pancreas. HE, × 90.

Fig. 4. Section between A and B. There is no connective tissue border between the AS and the pancreas. HE, × 90.

Fig. 5. Section C. Pancreatic islets and acini are seen in the red pulp in the vicinity of the fine collagenous septum (arrow). HE, × 90.

Fig. 6. Section D. The AS is completely encapsulated and shows similarity to the normal spleen. HE, × 60.

Fig. 7. Higher magnification of the upper part of Fig. 6. Lymphoid follicle and trabeculae are well developed. HE, × 175.

Fig. 8. Higher magnification of the lower part of Fig. 6. The AS is clearly demarcated from the pancreas by the connective tissue capsule which contains pancreatic ductule (arrow). HE, × 175.

Fig. 9. Pancreatic islet in the AS. Granules of islet cells are well stained with aldehyde-fuchsin stain. Pancreatic ductules (arrow) are visible between islet and acini. Aldehyde-fuchsin stain. × 500.