Effect of Splenectomy on Histopathology and Functions of the Liver in Banti's Syndrome*

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In most of 64 patients of Banti's syndrome who survived splenectomy for six months or more, there were marked improvements of liver functions in terms of the icteric index, B.S.P. test and serum colloidal reactions. Of 35 cases subjected to liver biopsy at various postoperative stages, on the other hand, the histopathology of the liver exhibited a considerable improvement in 15 cases, little change in 18 cases and an aggravation in only two cases, as compared with the findings at the time of splenectomy. These results indicate a favorable effect of splenectomy upon pathologic as well as functional aspects of the liver and may suggest the significance of the spleen in pathogenesis of this condition.

In the preceding paper,1) the mortality and survival of Banti's syndrome following splenectomy were reviewed with respect to pre-operative data on the histopathology and functions of the liver. The present communication is concerned with morphologic as well as functional aspects of the liver of the survivors of splenectomy.

MATERIALS AND METHODS

A total of 74 cases of Banti's syndrome underwent splenectomy in the authors' clinic of which 66 survived the operation. Of 64 survivors, excluding two patients for whom post-operative information was unavailable, there were 45 patients who, at the time of the present investigation, were alive and had survived splenectomy for six months or longer: 16 cases had survived for one half to 2 years after operation, nine for 2 to 5 years, 12 for 5 to 8 years, and eight for 8 years or longer. Some of these long-term survivors were subjected to function tests and needle biopsy of the liver.

Methods as well as criteria of judgement for the icteric index, B.S.P. test and serum colloidal reactions are the same as presented previously1). Biopsy of the liver was performed with a Silverman needle, and the specimens obtained were

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xed in formalin and then processed to histological slides stained with hematoxylin and eosin and by Van Gieson and Goldner methods. The specimens were taken from several different sites of the liver, but only those with an adequate amount of both the parenchyma and stroma were used.

RESULTS

I. Functions of the Liver

1. Icteric index

Fig. 1 illustrates the distribution of the icteric indexes for 41 cases, and the corresponding pre-operative indexes are also given. In the group of 14 cases which had been operated on 1/2 to 2 years pre-operatively, jaundice (with an icteric index of more than 10) had been observed in four cases pre-operatively but in none after splenectomy. For the eight cases tested in the post-operative course of 2–5 years, jaundice had disappeared following splenectomy in two of three cases which had shown it pre-operatively, while one case with moderate jaundice (index 12.5) appeared among the five cases which had not shown jaundice pre-operatively. Two of the 12 patients in the 5–8 year group had had jaundice before the operation, the index being as high as 23 in one of them, but on late examination these cases were found to be free of jaundice. However, moderate jaundice (index 15) developed following splenectomy in one of the remaining 10 cases which had not shown it pre-operatively. None of the seven cases in the group operated on 8 or more years previously were found to be jaundiced, although one of them had shown jaundice pre-operatively.

Fig. 1. Post-operative change of the icteric index. Double circles indicate aggravated cases.
It was therefore proved that splenectomy for Banti's syndrome was generally followed by the disappearance of jaundice, although there were a few exceptional cases in which jaundice developed after operation.

2. B.S.P. test

The post-splenectomy change in B.S.P. excretion is shown in Fig. 2 for each post-operative group. All but one of 14 cases of the 1/2–2 year group showed a B.S.P. value within the normal range (30 minute level 5% or lower) after splenectomy, although eight of them had shown an impaired excretion pre-operatively and two of them a marked impairment (a level of 16 or higher). Even for the exceptional case, the pre-operative B.S.P. value of 32% had dropped to 26% on late examination. Among the eight cases of the 2–5 year group, two showed a moderate delay in B.S.P. excretion (a level of 6–15%) pre-operatively; one of these showed an improvement after splenectomy. However, an aggravation of the function was noted in one case of this group: The pre-operative value of 1% was increased to 7% after splenectomy. Five of 12 cases of the 5–8 year group had had an impaired B.S.P. excretion pre-operatively, the grade being marked in one of them, but on late examination the function was found to be normal in all cases. All six cases of the group operated on 8 or more years previously were shown to have a normal function of B.S.P. excretion on late examination, including a patient who had shown a delayed function pre-operatively.

The late examination thus revealed a marked improvement of the B.S.P. excretion function of the liver after splenectomy. A few exceptional cases were found in patients who had survived the operation for less than 5 years but not in
long-term survivors of 5 years or longer.

3. Serum colloidal reactions

Fig. 3 compares the results of serum colloidal reactions in 40 splenectomized survivors with corresponding results before operation. In the 13 cases of the 1/2–2 year group, the number of cases with moderately disturbed (+) reactions decreased from six to three and that of a marked disturbance (++) from three to none. A post-operative aggravation of the reaction was not observed in this group. In the eight cases of the 2–5 year group, there had been three cases of a moderate disturbance and two of a marked disturbance, pre-operatively; all except two of these cases showed normal reactions on late examination. Although five of the 12 cases in the 5–8 year group had shown an impairment of colloidal reactions pre-operatively (the grade being marked in all but one), only three cases were found to show impaired reactions on late examination. Furthermore, all seven cases of the group which survived the operation for 8 years or longer, were normal in colloidal reactions after splenectomy, although five of them had shown positive reactions pre-operatively.

Thus the incidence of impaired colloidal reactions was lowered strikingly after operation and none of the cases showed a markedly positive result on late examination.

II. Histopathology of the Liver

Biopsy of the liver was performed in 35 survivors and the histology was compared with the corresponding histology at the time of splenectomy. In examination careful consideration was paid to chronic inflammation and fibrosis
of the Glisson capsules, since these were predominant features of Banti's syndrome as revealed by the previous study. The results are presented below for various lapse of time since operation.

1) The 1/2-2 year group

There were 13 cases in this group. The results of the comparison of the pre- and post-operative histology have been summarized in Table I. The histological types shown in the table are the same as in the previous paper.

<table>
<thead>
<tr>
<th>Case</th>
<th>Time after operation</th>
<th>Type</th>
<th>Before operation</th>
<th>On late examination</th>
<th>Judgment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Inflamm.</td>
<td>Fibrosis</td>
<td>Inflamm.</td>
</tr>
<tr>
<td>1</td>
<td>1y. 10m.</td>
<td>I</td>
<td>(+)</td>
<td>(-)</td>
<td>(+)</td>
</tr>
<tr>
<td>2</td>
<td>8m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
</tr>
<tr>
<td>3</td>
<td>8m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
</tr>
<tr>
<td>4</td>
<td>11m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
</tr>
<tr>
<td>5</td>
<td>11m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
</tr>
<tr>
<td>6</td>
<td>11m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
</tr>
<tr>
<td>7</td>
<td>11m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
</tr>
<tr>
<td>8</td>
<td>1y. 0m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
</tr>
<tr>
<td>9</td>
<td>1y. 2m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
</tr>
<tr>
<td>10</td>
<td>1y. 2m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
</tr>
<tr>
<td>11</td>
<td>1y. 11m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
</tr>
<tr>
<td>12</td>
<td>2y. 0m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
</tr>
<tr>
<td>13</td>
<td>1y. 1m.</td>
<td>III</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
</tr>
</tbody>
</table>

In Case 1, the only case of Type I histology, the finding 1 year 10 months after splenectomy resembled that at the time of operation and no evidence of chronic inflammation or of fibrosis was noted.

In eight of 11 cases of Type II histology, the grade of chronic inflammation remained practically unchanged after splenectomy. Fig 4 illustrates pre- and post-operative findings in Case 7. At the time of operation there was a fibrous thickening of the Glisson capsules associated with marked cellular infiltrations, and fibrosis was so extensive to partly involve the lobules (Fig. 4, A). After 11 months a slight decrease in grade of the cellular infiltration was revealed, and fibrosis was similar in extent to that seen at the time of operation (Fig. 4, B). In Case 8, proliferation of the stroma associated with fibrosis of the peri-glissonian areas, which had been remarkable at the time of operation (Fig. 5, A), remained little changed after 1 year (Fig. 5, B).

In the other three cases of Type II histology, some improvement was noted in fibrosis of the liver. In Case 9, for example, there was a considerable decrease in quantity of stromal cell infiltration and fibrosis when compared with the finding at the time of operation (Fig. 6). Fig. 7 also demonstrates a remarkable improvement of fibrosis seen in Case 11.
No significant change was observed, after 1 year 1 month, in the histology of Case 13, the only case of Type III histology of this group.

In summary, the hepatic histology of the 1/2-2 year group remained unchanged in most of the cases and a little improved in some.

2) The 2-5 year group

All seven cases of this group showed hepatic histology of Type II. Table II summarizes the comparison of the pre- and post-operative findings.

**Table II. Histopathology of the Liver of Banti’s Syndrome**

<table>
<thead>
<tr>
<th>Case</th>
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<th>Type</th>
<th>Before operation</th>
<th>On late examination</th>
<th>Judgment</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>2y. 2m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>unchanged</td>
</tr>
<tr>
<td>15</td>
<td>2y. 2m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>improved</td>
</tr>
<tr>
<td>16</td>
<td>2y. 8m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>unchanged</td>
</tr>
<tr>
<td>17</td>
<td>3y. 1m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>unchanged</td>
</tr>
<tr>
<td>18</td>
<td>3y. 6m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>unchanged</td>
</tr>
<tr>
<td>19</td>
<td>3y. 10m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>unchanged</td>
</tr>
<tr>
<td>20</td>
<td>4y. 9m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>improved</td>
</tr>
</tbody>
</table>

The histology was practically unchanged in five of the seven cases. None of the cases revealed a change suggestive of an aggravation. In Case 18, for instance, intrastromal cell infiltration as well as fibrosis after 3 years 6 months (Fig. 8, B) were approximately comparable in grade to those at the time of operation (Fig. 8, A).

On the other hand, an unquestionable post-operative improvement of the hepatic histology was demonstrated in the other two cases of this group. The fibrous thickening of the Glisson capsules and intralobular invasion of fibrosis observed at the time of operation in Case 15 (Fig. 9, A) were found to have disappeared after 2 years 2 months (Fig. 9, B). A similar improvement was also noted.
Banti’s Syndrome

in the other case, Case 20, after 4 years 9 months, as shown in Fig. 10.

The hepatic histology of this group was thus revealed to be similar to the finding at the time of operation in the majority and to have definitely improved in a few of the cases. An aggravation took place in none of this group.

3) The 5–8 year group

Table III shows the summarized results of the nine cases of this group. Preoperatively all except one of the cases had hepatic histology of Type II, the exceptional one being a Type III case.

Two of these cases, Cases 22 and 26, showed a more progressed fibrosis of the liver than seen at the time of operation. At the time of operation, Case 22 showed a picture of so-called pseudocirrhosis, with a marked fibrosis of the Glisson capsules and invasions of the fibrous elements into lobules dividing them. This case was subjected to laparotomy 5 years 2 months after splenectomy for a condition unrelated to Banti’s syndrome and a tissue piece of the liver was then available for microscopy. This material evidenced an aggravation of fibrosis, the proliferated fibrous tissues entering into the hepatic lobules and showing characteristics of cirrhosis of the liver (Fig. 11). However, in this case clinical examinations revealed a significant improvement of physical condition, including disappearance of esophageal varices which had been extensive pre-operatively. Fig. 12 shows the histology of Case 26, the other one of post-operative aggravation. At the time of splenectomy, a moderate cell infiltration into the stroma was the only significant finding; fibrosis was not demonstrable (Fig. 12, A). After 7 years 5 months, however, there was apparent fibrosis with thickening of the Glisson capsules besides an increased extent of cell infiltration; the boundary between the parenchyma and stroma was obscure (Fig. 12, B).

Little post-operative change was noted in the other three cases of this group. As an example, the histology on late examination of Case 25 is shown in Fig. 13. This case was pre-operatively diagnosed as pseudocirrhosis of the liver. After 6 years 7 months, a specimen suggested an improvement of the fibrosis (Fig. 13, A). but another one taken from a different site evidenced still remarkable stromal fibrosis, which, in part, invaded lobules with wedge-shaped processes showing a tendency toward disintegration of the lobules (Fig. 13, B).

The remaining four cases of this group, revealed an unquestionable improvement of fibrosis. Case 23, whose hepatic histology had been that of pseudocirrhosis at the time of operation (Fig. 14, A), evidenced on examination performed 5 years 3 months later a much improved cell infiltration to the Glisson capsules and a disappearance of stromal fibrosis (Fig. 14, B). In Case 27, cellular infiltration as well as fibrosis of the stroma were also found to be much improved 7 years 8 months after splenectomy (Fig. 15, B) as compared with the histology at the time of operation (Fig. 15, A). Fig. 16, A and B, demonstrates definite cirrhosis found at two different sites of the liver of Case 29 at the time of
splenectomy. After 5 years 11 months, biopsy material showed a much improved yet still remaining lesion of pseudolobules (Fig. 16, C); but another one from a different site showed no evidence of cirrhosis (Fig. 16, D), indicating a striking improvement as a whole. This case, the mother of a child born after operation, was good in clinical aspect; esophageal varices completely disappeared.

In summary, a markedly improved or little changed histology predominated in this group, although a few cases showed worsened findings.

4) The 8 or more year group

This group included six patients, the longest post-operative time being 13 years 2 months. Table IV summarizes the results.

In Case 30, who had shown remarkable fibrosis of the stroma at the time of operation, an examination after 9 years 6 months revealed a considerable decrease in fibrosis at a site of the liver (Fig. 17, A), but fibrosis of the Glisson capsules with a tendency toward formation of pseudolobules was seen at another site (Fig. 17, B). Therefore, the histology of this case on late examination was judged to be approximately comparable, as a whole, with the pre-operative one.

All of remaining five cases revealed an apparent improvement of the histology, with a decrease in extent of both cellular infiltration and fibrosis in the stroma. Figs. 18A, and B are histological pictures of the liver obtained in Case 32, 10 years after splenectomy. The histology at the time of operation was that of chronic hepatitis. Although there was a small amount of cellular infiltration at areas adjacent to the Glisson capsules, intralobular granulation tissue was found to have disappeared completely. A similar improvement was noted in Case 33, also showing a typical histopathology of chronic hepatitis at the time of operation, 10 years 2 months after splenectomy (Fig. 19). Case 34 had shown at the time of operation a characteristic feature of pseudocirrhosis of the liver, but biopsy after 10 years 6 months revealed only a slight degree of fibrosis of the stroma and no evidence of cellular infiltration (Fig. 20). This patient, pre-operatively associated with marked esophageal varices and greatly impaired hepatic functions, was found on late examination to be good in general condition with the varices almost completely

<table>
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<th>Judgment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Inflam.</td>
<td>Fibrosis</td>
<td>Inflam.</td>
</tr>
<tr>
<td>30</td>
<td>9y. 6m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
</tr>
<tr>
<td>31</td>
<td>9y. 10m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
</tr>
<tr>
<td>32</td>
<td>10y. 0m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
</tr>
<tr>
<td>33</td>
<td>10y. 2m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
</tr>
<tr>
<td>34</td>
<td>10y. 6m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
</tr>
<tr>
<td>35</td>
<td>13y. 2m.</td>
<td>II</td>
<td>(+)</td>
<td>(+)</td>
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</tr>
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</table>
disappearing and with normal liver functions. Case 35, a patient of evident chronic hepatitis, also revealed a considerable improvement in the histology of the liver after 13 years 2 months, as shown in Fig. 21.

All except one of this group thus showed a strikingly improved hepatic histology; an aggravation of fibrosis was not noted in any of the cases.

DISCUSSION

The present study has revealed a significant improvement of liver functions in Banti's syndrome following splenectomy. Of 41 cases subjected to late examination, jaundice was observed in three cases, a delay in B.S.P. excretion in three and an impairment of serum colloidal reactions in eight; the incidence as well as grade of each malfunction were far lower than had been seen in the comparable pre-operative data. Post-operative development of impaired hepatic functions in patients who had not shown it pre-operatively was very exceptional.

A number of previous reports have indicated either a complete recovery, an improvement, or little change of liver functions of Banti's syndrome after splenectomy2-8). Tomoda9), for instance, observed normalized liver functions in all but one of 13 splenectomized patients on a long-term examination. Masuda10) also reported that the effect of splenectomy on liver functions was an improvement in 11 of 15 cases (73.3 per cent), an insignificant change in three (20.0 per cent) and an aggravation in only one (6.6 per cent).

On the other hand, a variety of results have been reported as to the change in liver functions following shunt operations. Although some believe that the functions are temporarily impaired shortly after operation and then recover to the pre-operative condition, Blakemore11), Ellis et al.12) Linton13), and Sedgwick and Hume14) observed a post-operative aggravation of the B.S.P. test in approximately 50 per cent of their cases, an aggravation of C.C.F. in approximately 20 per cent, an aggravation of the serum albumin level in approximately 20 per cent. In Japan, Suzuki15) noted a remarkable impairment, but Kotani16) failed to obtain a definite post-operative tendency of liver functions. According to Imanaga17), cases of cirrhosis of the liver suffered from considerable malfunctions of the liver after shunt operation, while those with so-called Banti's syndrome did not. Hallenbeck et al.18), compared post-operative changes of the functions between cases of splenectomy and those of shunt operations and failed to detect any significant difference, so far as the B.S.P. test and the serum bilirubin level were concerned.

Thus the literature suggests, in general, a more favorable effect of splenectomy on liver functions of Banti's syndrome than shunt operations. As cited above, the improvement of the functions following splenectomy seems to be particularly remarkable in the Japanese. The present results have shown satisfactory effects of splenectomy with a larger number of cases and after a longer post-operative period than those reported by previous investigators.
It may be of little value to discuss end-results of Banti's syndrome without evaluating histopathologic aspects of the liver. However, few of the previous reports have dealt with the subject possibly because of the difficulty in obtaining materials. In the present series histological studies were performed by needle biopsy in 35 cases, after a post-operative period ranging from 8 months to as long as 13 years and 2 months.

The recent progress of hepatic biopsy as a diagnostic tool is largely owing to the extensive work of Iverson and Roholm\textsuperscript{19}). The technique is being used also in Japan by an increasing number of students. However, this method has been known to have a definite limitation. According to Ichida \textit{et al.}\textsuperscript{20}) there is a considerable site difference in histopathology of the liver not only in localized diseases but also in a diffusive ones, limiting the significance of needle biopsy. It has also been pointed out that diagnosis by needle biopsy is particularly difficult when the finding is of a non-specific nature. A correct diagnosis, controlled by autopsy, surgery or laparoscopy, was obtained in 71 per cent (24 of 34) of Ichida \textit{et al.}'s series; the ratio being 91 per cent (20 of 24) for all diffusive disease and 100 per cent (9 cases) for Banti's syndrome. The incidence of failure in diagnosis by needle biopsy was reported to be 16 per cent (4 of 25) for various conditions by Kumpe \textit{et al.}\textsuperscript{21}), 3.2 per cent (1 of 31) for cases of cirrhosis of the liver by Hoffman and Rosenthal\textsuperscript{22}) and 5.6 per cent (1 of 18) for cases of biliary cirrhosis by Wagoner \textit{et al.}\textsuperscript{23}). Furthermore, Waldstein and Szanto\textsuperscript{24}) performed 10 needle punctures in each of 15 livers of cadavers and estimated the extent of variation, by site, of the lobular architecture, granulation tissue and inflammatory reaction to be approximately 10 per cent.

Nevertheless, needle biopsy is a very useful and valuable technique clinically, being the only method to allow serial observations on the same patients with a minor invasion. The above limitations may be partly controlled by adequate care. In this study specimens were obtained from several different portions and only those with a sufficient amount of both the parenchymal and stromal tissue were used.

In 13 cases in a post-operative period ranging from 6 months to 2 years and seven of the 2-5 year group, the majority showed a hepatic histology approximately comparable to the pre-operative condition, but an apparent improvement in fibrosis could be demonstrable in six cases. Of nine patients of the 5-8 year group, two cases showed an aggravation (progressed fibrosis with a tendency toward reorganization of lobules), three little change and four a marked improvement in fibrosis; the last cases included a patient in whom an unquestionable cirrhosis at the time of operation had almost completely disappeared after 5 years 11 months. Moreover, a remarkable improvement of the histopathology of the liver was observed in all but one of six patients 8 or more years after splenectomy. Thus, the majority of cases in this series showed a much improved hepatic
histology after splenectomy; aggravation was very exceptional.

As mentioned before, very few studies have been concerned with the hepatic histology of Banti’s syndrome after operation and for those that have the period of observation much shorter than in the present series. Sugiura6) performed such a study in three cases, 14, 26 and 33 days, respectively, after splenectomy and found an unchanged histology in two cases and a proliferation of Kupffer’s cells and an increased stromal cellular infiltration in one. Miyake et al.25) studied seven autopsy cases, having died after a period from 14 days to 5 years following splenectomy or shunt operation, and concluded that fibrosis of the Glisson capsules sometimes progressed after operation but never became cirrhosis of the liver.

There have been many discussions as to whether splenectomy can control further progress of the hepatic involvement in Banti’s syndrome. In the discussion, it should be taken into consideration that the progress is generally very slow and there is a marked individual variation. A favorable effect of splenectomy may be expected if the hypothesis of Banti, that the syndrome is caused by toxic factors liberated from the spleen, is granted. There are many clinical observations which seem to suggest an improvement of the hepatic pathology after splenectomy. A marked improvement of cirrhosis of the liver with the disappearance of ascites and edema was observed after splenectomy by Mayo26) and by Moinyhan27). Durham3) reported that hepatic cirrhosis never took place after splenectomy in patients pre-operatively not having cirrhosis and that splenectomy did not worsen pre-existing cirrhosis. Tomoda and Ichiyoshi28) obtained a long-term survival of 5 years of longer following splenectomy in two of nine cases of progressed (Stage III) Banti’s syndrome and believed that this was due to an improvement of the hepatic pathology. On the other hand, there are some students who think the progress of hepatic involvement is effected by splenectomy either little or not at all29–32).

From the results of the present study, it may be positively concluded that splenectomy suppresses the progress of hepatic involvement in Banti’s syndrome. The authors have previously shown that splenectomy is also followed by a long-term survival of patients33) by greatly improved hematology34), and by considerable restoration of esophageal varices and associating hematemesis35). All these facts strongly suggest that a splenic factor plays an important role in the pathogenesis of Banti’s syndrome, contrary to the hypothesis of the Presbyterian school that an occlusion of the portal system is the prime cause.
References

8) Kawakita, Y. *et al.*, *Rinsho Shokakibyogaku* (Jap.), 1960, 8, 571.
Fig. 4. Hepatic histology of Case 7. A, at the time of operation; B, after 11 months (needle-biopsied).
Fig. 5. Hepatic histology of Case 8. A, at the time of operation; B, after 1 year (needle-biopsied).
Fig. 6. Hepatic histology of Case 9. A, at the time of operation; B, after 1 year 2 months (needle-biopsied).
Fig. 7. Hepatic histology of Case 11. A, at the time of operation; B, after 1 year 11 months (needle-biopsied).
Fig. 8. Hepatic histology of Case 18. A, at the time of operation; B, after 3 years 6 months (needle-biopsied).
Fig. 9. Hepatic histology of Case 15. A, at the time of operation; B, after 2 years 2 months (needle-biopsied).
Fig. 10. Hepatic histology of Case 20. A, at the time of operation; B, after 4 years 9 months (needle-biopsied).
Fig. 11. Hepatic histology of Case 22, 5 years 2 months after splenectomy. The specimen was obtained by laparotomy.

A

Fig. 12. Hepatic histology of Case 26. A, at the time of operation; B, after 7 years 5 months (needle-biopsied).
Fig. 13. Hepatic histology of Case 25, 6 years 7 months after splenectomy (needle-biopsied). A and B show different sites.
Fig. 14. Hepatic histology of Case 23. A, at the time of operation; B, after 5 years 3 months (needle-biopsied).
Fig. 15. Hepatic histology of Case 27. A, at the time of operation; B, after 7 years 8 months (needle-biopsied).
Fig. 16. Hepatic histology of Case 29. A and B, at the time of operation, showing different sites.
Fig. 16. (Contd.). C and D, after 5 years 11 months, showing different sites.
Fig. 17. Hepatic histology of Case 30, 9 years 6 months after splenectomy (needle-biopsied). A and B show different sites.
Fig. 18. Hepatic histology of Case 32, 10 years after splenectomy (needle-biopsied). A and B show different magnifications.
Fig. 19. Hepatic histology of Case 33, 10 years 2 months after splenectomy (needle-biopsied). A and B show different magnifications.
Fig. 20. Hepatic histology of Case 34, 10 years 6 months after splenectomy (needle-biopsied). A and B show different magnifications.

Fig. 21. Hepatic histology of Case 35, 13 years 2 months after splenectomy (needle-biopsied).