Elective Splenectomy: *

An Analysis of 220 Operations

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THE INDICATIONS for splenectomy have gradually become broader during the past two decades.[1, 4, 5] As the results of this operation are evaluated, the criteria for surgical intervention are becoming more clearly defined. As emphasized in a previous communication,[3] however, the indications for splenectomy in the presence of associated blood dyscrasias are not definite, and under these circumstances the results frequently are unpredictable. Certainly the surgeon must be guided by the advice of a competent hematologist before recommending surgical treatment.

Two hundred and twenty splenectomies performed at the Lahey Clinic from 1939 to 1957 are reported here, together with a review of the indications for operation and the results obtained. We also wish to emphasize the morbidity and mortality associated with this procedure, and in this way provide a useful guide for the surgeon who does not frequently encounter the surgical problems associated with elective splenectomy.

Indications for Operation and Results

For purposes of anaylsis we have tabulated our cases according to the indications for operation (Table 1). Each of these groups is discussed below.

Liver Disease

This group of 83 patients is the most challenging to the surgeon, since congestive splenomegaly occurring in conjunction with liver disease presents the greatest technical difficulties. Furthermore, the question of benefit is often debatable because of the unpredictable clinical course and subsequent complications attributable to the primary disease.

We have divided this group into three categories in order to analyze the postoperative problems relating to shunt procedures and to ascertain why splenorenal shunts were not performed in some instances when this maneuver would seem advisable.

All 83 patients had some type of liver disease. Cirrhosis, of the Laennec or postnecrotic type, was present in the majority

TABLE 1. *Indications for Splenectomy—220 Patients*

		No. of Patients
Liver disease		83
Splenectomy, 1939–1948	26	
Splenectomy with shunt operation, 1949–1957	29	
Splenectomy without shunt operation, 1949–1957	28	
Idiopathic thrombocytopenic purpura		40
Congenital hemolytic anemia		30
Acquired hemolytic anemia		22
Splenomegaly with hypersplenism (neoplastic)		16
Splenomegaly with hypersplenism (nonneoplastic)		15
Cysts		9
Primary splenic neutropenia and pancytopenia		5
Total		220

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of cases. All of the patients had portal hypertension or hypersplenism, and splenectomy was advised. In several of the patients with portal hypertension, the results of liver function tests and liver biopsies were normal. Splenoportography revealed no evidence of extrahepatic obstruction. We have classified these, as have others,[2] as intrahepatic portal obstruction of undetermined origin. It is interesting that biochemical and microscopic evidence of portal cirrhosis was obtained several years later in two of these patients. We suspect that many cases listed in the literature as splenomegaly of unknown origin are a reflection of incipient liver disease.

Thirteen of the 83 patients had biliary cirrhosis; in 12 of the 13 this was the end stage of recurrent bile duct stricture.

Splenectomy, 1939–1948: The 26 patients in this group with associated liver disease were operated on before the time of the clinical application of shunt procedures. The indications for splenectomy were splenomegaly with evidence of portal hypertension, hypersplenism or both. The spleen was palpable in every instance and hepatomegaly was noted in 17 cases. Sixteen patients had had one or more episodes of upper gastro-intestinal bleeding attributed to esophageal varices. The remaining patients complained of anemia, weakness, fatigue and left upper quadrant distress resulting from splenomegaly, dyspnea or edema. The platelet count was significantly diminished in six patients.

Of the 16 patients with a history of bleeding varices preoperatively, eight bled within one year postoperatively. Of the six patients with abnormal blood findings, the blood reverted to normal in four for varying periods of time. Significant clinical improvement was noted in 16 of the 26 patients after splenectomy. The morbidity rate was 50 per cent, with infection constituting the major problem: atelectasis in association with pneumonitis was present in five cases; subphrenic abscess in four, and one instance each of urinary infection, gastro-intestinal hemorrhage, pleural effusion, wound hematoma, empyema, thrombophlebitis, abscess of the tail of the pancreas, postoperative ascites, and obstruction of the small intestine was noted. Two deaths (7.7%) occurred as the result of streptococcal septicemia and generalized peritonitis.

Splenectomy with Shunt Operation, 1949–1957: With the advent of the shunt procedures, those patients with liver disease and associated portal hypertension were subjected, when possible, to splenectomy with splenorenal or portacaval shunt. Patients with only a portacaval shunt are not included in this study. The indication for the procedure was again portal hypertension, with or without hypersplenism. Hypersplenism alone constituted the indication for surgery in eight patients while varices which had bled at least once (with or without associated hypersplenism) were present in 21 cases. The spleen and liver were palpable in 23 and 25 instances respectively, the two findings generally occurring together. In this group of 29 patients, splenectomy and splenorenal shunt were performed in 28 instances and portacaval shunt combined with splenectomy in one.

The morbidity rate was 76 per cent and four operative deaths occurred (14%). The complications occurring in 22 of these patients included atelectasis and pneumonitis, five cases; wound infection, three; subphrenic inflammation, three; subphrenic abscess, three; gastro-intestinal hemorrhage, three; pleuritis, two; abscess of the tail of the pancreas, two; liver failure, two; hepatitis, one; congestive failure, one; urinary infection, one; wound dehiscence with evisceration, one; cerebrovascular accident, one, and postoperative shock, one.

The four deaths occurred following thoracoabdominal splenorenal shunt. The causes of death were, respectively, irreversible shock beginning 24 hours after

operation and associated with liver failure and possible ammonia intoxication; wound dehiscence with evisceration and massive hemorrhage from the omentum followed by liver failure; severe atrioventricular block occurring during operation and followed by severe pulmonary edema, and liver failure with bronchopneumonia.

Splenectomy without Shunt Procedure, 1949–1957: Of the 28 patients submitted to splenectomy without shunt, the spleen was palpable in all but one. Hepatomegaly was present in 19 instances. This group included 12 patients in whom a shunt procedure was not contemplated. Hypersplenism was present in all but one instance; this latter patient had hepatosplenomegaly and unexplained gastro-intestinal bleeding, the origin of which was not discovered either at operation or necropsy. Sixteen patients demonstrated one of the facets of portal hypertension which might be ameliorated by shunt operation. Seven of these had bled from the gastro-intestinal tract, while hypersplenism without gastro-intestinal bleeding was demonstrable in nine. Of this group, thoracoabdominal splenectomy was performed in seven cases. Splenoportography was not utilized in most of these patients; wider use of this technic subsequently has facilitated our selection of candidates for splenorenal shunt before making a combined incision.

Three factors influenced our decision not to perform a shunt: (1) small caliber or unusual friability of the splenic vein; (2) operative injury to the splenic vein, short splenic vein or inaccessibility of the renal vein; and (3) failure to find varices at operation, together with a relatively normal portal pressure.

The morbidity rate was 29 per cent, with the complications including subphrenic abscess in two instances; subphrenic inflammation, two; abscess of the tail of the pancreas, one; ileus and gastro-intestinal bleeding, one; postoperative coma, one, and postoperative shock, one. The mortality rate was 10.7 per cent; the three deaths were caused by bronchopneumonia with renal failure, intra-abdominal hemorrhage plus pulmonary edema, and liver failure.

Idiopathic Thrombocytopenic Purpura

Idiopathic thrombocytopenic purpura must be carefully distinguished from thrombocytopenia of known cause in order to assure a satisfactory response following splenectomy. It is important that the bone marrow be studied; the megakaryocytes will be essentially normal but show little platelet formation at the periphery. These findings were noted in the 35 marrow specimens examined in this group of 40 patients.

The clinical findings are primarily those resulting from an increased capillary fragility and prolonged bleeding time. Petechiae, ecchymoses or both were noted in all cases. Other symptoms included epistaxis, gingival bleeding, menorrhagia, hematuria, hematemesis and fatigue. Hepatomegaly was noted in one case and splenomegaly was present in four.

Complications occurred in 12 patients: atelectasis and pneumonitis, three; subphrenic abscess, two; wound bleeding, two, and one instance each of electrolyte imbalance, postoperative psychosis, ileus, and urinary retention. One operative death occurred; this patient was a 55 year old man submitted to an emergency operation in the presence of active intracerebral hemorrhage caused by profound depression of the platelet count.

The immediate response to splenectomy was good in 95 per cent of the cases. Subsequent follow-up studies revealed recurrent thrombocytopenia in at least three patients. In one of these an accessory spleen was removed seven years later, with gratifying results.

Congenital Hemolytic Anemia

We have operated on 30 patients who had congenital hemolytic anemia, without a fatality. Complications occurred in two

cases: postoperative cholecystitis in one and subphrenic abscess in the other. Splenomegaly was present in all but two patients.

Splenectomy is effective in preventing the greater part of this type of blood destruction, although it does not change the abnormality leading to spherocytosis. If care is taken to remove accessory spleens, the recurrence of anemia or jaundice is rare. It is in this condition that splenectomy is most uniformly followed by favorable hematologic results.

It is interesting to note that half of these patients were 20 years or older; several had a history of recurrent bouts of jaundice since infancy. A high percentage subsequently required biliary tract surgery, and laboratory and microscopic evidence of liver damage was not infrequently noted at the time of splenectomy. This re-emphasizes the need for operation once the diagnosis has been established.

Acquired Hemolytic Anemia

Splenectomy was performed in 22 selected cases of acquired hemolytic anemia, including three patients with Mediterranean anemia. The etiologic agent was frequently very difficult to ascertain. Splenomegaly was noted in 16 cases and hepatomegaly in eight. The bone marrow was studied in all but one instance. The most consistent signs and symptoms were anemia, fatigue and jaundice. Dyspnea, palpitation and hematuria were noted by several patients. Concomitant disease existed in many instances, further complicating the diagnostic problems.

Postoperative complications occurred in six patients: atelectasis, pneumonitis, or pleuritis in four; progressive hemolysis with liver failure in one, and uremia in one. Three deaths occurred, and these were attributable, respectively, to renal failure, liver failure and atelectasis with bronchopneumonia.

The clinical and hematologic result was rather unpredictable in this group. Poor results included the three operative deaths; late cerebral thrombosis and no relief of hemolysis by splenectomy, three instances, and continued hemolysis, four. A satisfactory result was obtained in 12 cases, including two patients with Mediterranean anemia.

Splenomegaly with Hypersplenism (Neoplastic)

The indication for splenectomy in this type of hypersplenism is largely dependent on the severity of the cytopenia; hemolytic anemia is frequently an associated condition. The results will never be as rewarding as in instances of primary hypersplenism but it must be realized that severe anemia, thrombocytopenia, neutropenia or pancytopenia can, in themselves, inflict severe disability. In the rare case of lymphomatous splenomegaly with no other areas of involvement, splenectomy affords an excellent means of palliation.

In this group we have operated on 11 patients with lymphoma, four patients with chronic leukemia, and one patient with liver metastases five years after radical mastectomy. Splenomegaly was present in all but one case.

Complications occurred in 56 per cent of this group: subphrenic inflammation, two cases; atelectasis and pneumonitis, two; wound bleeding, two; subphrenic abscess, one, and one instance of severe herpes zoster and a urinary infection. One operative death occurred as the result of disseminated Hodgkin's disease.

Five patients were lost to follow up before one year had elapsed. Of the remainder, 73 per cent were dead in less than one year, most of them having suffered from the manifestations of hypersplenism for considerable periods of time. It is in this group that we should re-evaluate our therapeutic approach and perhaps consider early splenectomy once splenomegaly has become manifest clinically.

Splenomegaly with Hypersplenism (Nonneoplastic)

This group of 15 patients exhibited varying degrees of thrombocytopenia, leukopenia and anemia associated with splenomegaly; the spleen was not palpable in two cases. The hypersplenism was associated with sarcoid in five instances; Felty's syndrome, two; Wilson's disease, two; Gaucher's disease, two; and one case each of pernicious anemia, splenic hemangioma, chronic benzol poisoning, and ulcerative colitis was included in the group.

The decision to perform splenectomy was governed by the nature of the primary condition underlying the hypersplenism, the severity of the hematologic abnormality and the probable duration of life if the primary disease were allowed to run its course. Complications occurred in two patients: an exacerbation of posterolateral cord symptoms in one, and an episode of cystitis in the other. No deaths occurred in this group.

The immediate clinical response to splenectomy was satisfactory in all patients, but hematologic improvement was less predictable. Late follow-up studies revealed recurrent neutropenia in several patients and recurrence of hematemesis in a patient with sarcoid of the liver and spleen.

Cysts of the Spleen

We have encountered nine cysts of the spleen. Two were definitely related to subcapsular hemorrhage associated with the splenomegaly of infectious mononucleosis. Two calcified splenic cysts were found in patients with liver disease but with no evidence of hypersplenism or varices. One Echinococcus cyst and four epithelium-lined cysts were removed.

Abdominal pain or discomfort associated with a feeling of fullness was noted in eight patients. Operation was performed for relief of symptoms in most instances, and to differentiate the lesion from retroperitoneal and pancreatic tumor in two cases.

The results were poor in both patients with cirrhosis caused by progression of the primary disease. Another patient experienced postoperative bleeding from a duodenal ulcer. No operative deaths occurred in this group.

Primary Splenic Neutropenia and Pancytopenia

Five patients were operated on for splenic neutropenia and pancytopenia. The diagnosis was established by the presence of cytopenia and splenomegaly with an abundantly cellular marrow. The spleen could not be palpated in one case, but was found to be definitely enlarged at operation. A circulating leukotoxin was demonstrated in this patient.

The results were good in two cases, fair in two, and no effect was seen in one. No complications or deaths occurred.

Comment

The decision for splenectomy in any given case is not to be regarded lightly. The operation may be technically difficult and the postoperative path strewn with obstacles. Careful selection of cases is essential. Complete medical and hematologic study will help in this selection. A mistaken diagnosis may cause the patient to undergo a serious operation without benefit, or an error in judgment may cost his life.[3] The hazards associated with splenectomy and the variation in these problems with different disease states are indicated in Table 2.

Summary

We have presented an analysis of the problems associated with 220 splenectomies performed between 1939 and 1957. The mortality rate in the entire series was 7 per cent and the morbidity rate 34 per cent.

Patients who have bleeding esophageal varices with or without hypersplenism constitute a special problem. We are convinced that portal decompression by splenorenal

TABLE 2. *Risk of Splenectomy*

	No. of Cases	Operative Mortality, per cent	Morbidity, per cent	Clinical Splenomegaly, per cent
Liver disease				
No shunt, 1939–1948	26	8	50	100
Shunt, 1949–1957	29	14	76	76
No shunt, 1949–1957	28	11	29	96
Idiopathic thrombocytopenic purpura	40	2.5	30	10
Congenital hemolytic anemia	30	0	7	93
Acquired hemolytic anemia	22	14	27	73
Splenomegaly with hypersplenism (neoplastic)	16	6	56	94
Splenomegaly with hypersplenism (nonneoplastic)	15	0	13	87
Cysts	9	0	11	100
Primary splenic neutropenia and pancytopenia	5	0	0	80
Total and average	220	6.4	34	75

or portacaval shunt is indicated in the majority of these cases. The choice of operation is as yet unsettled. The wider use of splenoportography makes us wonder whether a two-stage operative approach (splenectomy with subsequent portacaval shunt) might not be safer for selected patients with severe hypersplenism but no active variceal bleeding, especially if the spleen is not palpable and the liver function moderately deranged (indicating active liver disease) despite prolonged treatment. The degree of splenomegaly is a useful guide to the size of the splenic vein, and this is an important preoperative consideration.

The conditions which respond most favorably to splenectomy are fortunately associated with the lowest mortality and morbidity rates. When the diagnosis of chronic idiopathic thrombocytopenic purpura or congenital hemolytic anemia has been firmly established, the surgeon should feel no hesitancy about performing splenectomy.

Bibliography

1. Cole, W. H., J. D. Majarakis and L. R. Limarzi: Surgical Aspects of Splenic Disease. A. M. A. Arch. Surg., 71:33, 1955.
2. Hallenbeck, G. A. and E. Shocket: An Evaluation of Portacaval Shunts for Portal Hypertension. Surg., Gynec. & Obst., **105**:49, 1957.
3. Lahey, F. H. and J. W. Norcross: Splenectomy: When Is It Indicated? In: Surgical Practice of the Lahey Clinic, Philadelphia, W. B. Saunders Company, 1951, pp. 533–545.
4. Wilson, H. E.: Symposium on Gastrointestinal Surgery; Changing Indications for Splenectomy. S. Clin. North America, **34**:123, 1954.
5. Wiseman, B. K. and C. A. Doan: Primary Splenic Neutropenia; a Newly Recognized Syndrome, Closely Related to Congenital Hemolytic Icterus and Essential Thrombocytopenic Purpura. Ann. Int. Med., **16**:1097, 1942.