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The Surgery of the Spleen.

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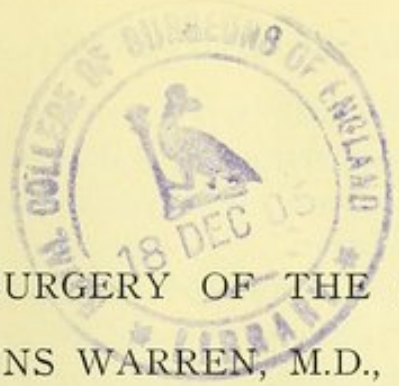

THE SURGERY OF THE SPLEEN.[1]

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Owing probably to the imperfect knowledge of the various affections of the spleen, operations upon that organ have not kept pace with the surgery of the other organs of the abdominal cavity; but the increased attention given to the study of the blood in recent years has aided greatly in unravelling the somewhat tangled classification of diseases of the spleen, has led to a more intelligent study of pathological conditions, and has paved the way for a more rational treatment.

Among the list of affections of this organ,—which is much larger than one might suppose,—there are several which it is generally agreed go beyond the pale of surgery; others have been found to be well adapted to surgical interference, and in some of the more purely medical diseases there are several which hold out hope for encouraging treatment in the future.

It is for this reason that it has seemed to me appropriate in this communication, in presenting a few cases of splenectomy, to call attention to the diseases of this organ, and to consider to what extent, from the present point of view, they are amenable to surgical treatment.

The list, which is by no means a short one, includes, among others, the following:

(1) Malarial Spleen.

(2) Splenic Anæmia.

[1] Read at the ninety-fifth annual meeting of the Medical Society of the State of New York, January 30, 1901.

(3) Splenic Leukæmia.
(4) Chronic Enlargement of the Spleen in Infancy.
(5) Banti's Disease, or Hypertrophy with Cirrhosis of the Liver.
(6) Atrophic Cirrhosis of the Liver leading to enlarged Spleen.
(7) Amyloid Disease.
(8) Echinococcus and other Cysts.
(9) Cavernous Angioma of the Spleen. Fibroma.
(10) Wandering Spleen.
(11) Twisted Pedicle.
(12) Abscess of the Spleen.
(13) Rupture of the Spleen.
(14) Sarcoma of the Spleen.
(15) Tuberculosis of the Spleen.

There are also groups of cases classed as simple hypertrophy. The enlargement of this organ seems at times to be a racial characteristic. Among the Armenian inhabitants of Boston enlargement of the spleen is so common as to be regarded of little diagnostic significance. In Southern Italy large spleens are said to be very common, and there is a tradition there that disease of this organ is cured by eating onions.

Splenectomy is, of course, no new operation. Indeed, it is said to have been done in the most ancient times, and several writers of antiquity state that the spleen was sometimes actually excised from runners to give them greater speed.

Bartholomeus says that the Turks, if their old chroniclers are to be believed, had a special and secret means of removing the spleen of runners.

According to Shattuck, laymen have informed him that splenectomy has been practised on the Indian runners of Texas and on the Syces of Hindostan, and that this operation was performed on the spleen of the runners to spare them the stitch in the side.

The number of operations performed in modern times is by no means small. Hagen, in a recent monograph, has col-

lected three hundred and sixty, with a mortality of 38.3 per cent. This is a decided improvement on the statistics collected by different writers up to 1894, which varied from 51.6 per cent. to 49.6 per cent. After carefully revising his list and eliminating what would be considered incurable cases, and cases in which the diagnosis has not been sufficiently established, Hagen was able to reduce this mortality to 12.2 per cent., which he thinks may fairly be considered the legitimate mortality of the operation as practised at the present time.

(1) *Malarial Spleen.*—The large spleen of chronic malaria is often accompanied by a degree of anæmia so marked as to justify the term cachexia; the history of the recurring attacks and of residence in malarial districts will assist in the diagnosis, and the blood examination will probably show the characteristic pigment and perhaps malarial organisms. Quite a number of malarial spleens have been removed in recent years, and the mortality per cent. of the operation is still diminishing. Hagen has collected eighty-eight cases of malarial hypertrophy of spleen exclusive of wandering spleen. Of these cases, twenty-four previous to the year 1890 gave a mortality of 62.5 per cent., while sixty-four cases operated after the year 1890 gave a mortality of 23.4 per cent. When we consider the very large size that the organ often attains in this disease, and the unfavorable constitutional condition of the patient, such results, if not all that we could hope for, are at least encouraging. Jonnesco regards the spleen of malaria as a habitat of the malarial organisms, but does not advise splenectomy as an early form of treatment.

(2) *Splenic Anæmia,* or *Splenic Pseudoleukæmia,* is a disease of young adult life, and is to be sharply distinguished from the anæmias of infancy, with many of which is associated a moderate enlargement of the spleen. This is a disease which has lately been brought into prominence by the investigations of several writers; and, as it seems one which holds out promise of good results from surgical treatment, I shall take the liberty of making more than a brief allusion to it.

Sippy collected twenty-five cases of splenic anæmia, and

Osler reported fifteen; these being the only cases so far reported which were in any way characteristic.

The clinical course of the disease is about as follows: An insidious onset, with slight pallor and dizziness, is soon followed by the appearance of the splenic enlargement. There is rarely complaint of much pain and tenderness over the tumor, although extreme sensitiveness may draw attention to the tumor before the anæmia has become marked. At this stage, nausea, vomiting, and diarrhœa may occur as well as epistaxis and dyspnœa. As the tumor increases, enlargement of the spleen towards the umbilicus and the right iliac crest occurs, more complaint is made of the dragging sensation in the left side, and the increased anæmia causes marked debility and fatigue, œdema of the feet, and occasionally an evening rise of temperature. As the disease progresses the extreme pallor changes to a yellowish color, and in several of Osler's cases a bronzing of the skin is noted. Ascites may develop in the later stages, and petechiæ, and even extensive hæmorrhages from the stomach and intestine. Finally, protracted diarrhœa follows, and death from extreme exhaustion. There is no enlargement of the lymphatic glands. The study of the blood in splenic anæmia is essential to a positive diagnosis, many of the reported cases being quite worthless on account of the lack of complete blood examination, and the differential count of the white blood-corpuscles is quite as necessary as an estimate of their whole number, as only by this means can cases of leukæmia, pernicious anæmia, and the infantile anæmias be excluded.

The first change in the blood in splenic anæmia is a diminution of hæmoglobin, together with a lesser degree of diminution of red corpuscles,—an anæmia of the chlorotic type. This is soon followed, however, by an extreme drop both in red corpuscles and hæmoglobin, the appearance of large and small and imperfectly formed red corpuscles, and occasionally even nucleated forms and normoblasts. The coagulability of the blood is much diminished, and the type of an extreme anæmia only little short of the pernicious type is presented. The

white corpuscles are, as a rule, actually and relatively diminished, in spite of the large diminution of red corpuscles, and a differential estimate of the white corpuscles shows probably a normal ratio between young and adult forms. Although a slight preponderance of the younger forms (large and small mononuclears) exists in a certain proportion of cases, there should be no myelocytes. This statement of the blood condition shows that there is no one characteristic which serves to distinguish splenic anæmia from secondary anæmia of any kind; but it is by the lack of certain well defined characteristics that we rule out other and more easily recognized diseases, and for this reason the blood examination is essential. The normal histology of the spleen at the present time is so little understood, and the function of the spleen itself is so obscure, that reports of autopsies and of examination of specimens removed at operations are of necessity unsatisfactory and incomplete.

Sippy collected ten cases where the pathological findings were clearly indicated, and these, for the most part, give us no accurate knowledge of the etiology of the disease.

The spleen is always enlarged, generally to five or ten times its usual size (the normal weight of the spleen is 200 grammes), and there is an increase in the consistency of the organ; on section, areas of connective tissue are described replacing the pulp reticulum with firm tissue. Atrophy and sclerosis of the Malpighian bodies were noted by Banti. (A marked point of differentiation from leukæmia, in which the Malpighian bodies are increased.—Cabot.)

Splenic anæmia is regarded by some writers as a splenic form of Hodgkin's disease. In this instance, however, splenic enlargement is uncommon; and when it does occur, the size of the spleen does not attain the proportions of a true splenic anæmia. The anæmia, also, is slow in its development. Moreover, it does not appear that the condition of the spleen is analogous to the condition of the lymphatic glands in Hodgkin's disease.

Boviard has described a form of endothelial splenomegaly

accompanied by an anæmia of later appearance and longer duration, but it has been questioned whether this might not be actual tumor formation. The weight of evidence, however, lies on the side of Boviard.

The cases described by Osler were of longer duration than Sippy's, one of them extending to ten years. The longest case of Sippy lasted three and one-half years.

Sippy regards the disease as fatal unless relieved by surgical interference. Of the seven cases reported by him in which splenectomy was done, five recovered.

Osler, however, considers the disease of less severity, and advises operation only in chronic cases where there are recurring attacks of hæmorrhage.

A recent writer (A. C. J. Kelly) speaks thus on the treatment of splenic anæmia: "It is upon the assumption that the enlargement of the spleen is the essential feature of the disease that the only successful treatment known at present is based. Medicinal treatment is hopelessly inefficient. In but a few cases has temporary improvement followed regulation of the diet and the mode of living, fresh air and sunshine, iron, arsenic, and the like. In appropriate and selected cases, removal of the enlarged spleen should be considered." He advises operation as soon as the physician can become assured of the correctness of the diagnosis.

In Kelly's case there was hæmorrhage from the genitals, on one occasion, of a quart of blood, the catamenia following at the regular time one week later.

One of Osler's cases, operated upon by Cushing, recovered. Four died, one after an operation for stone in the bladder, and the end result of the other cases is not stated.

The case which I report below adds one to the list of successful cases operated upon for this disease.

(3) *Splenic Leukæmia.*—The clinical features of splenic anæmia and of splenic myelogenous leukæmia are identical. It is for this reason that the separation of this disease has only been attained by the differential blood examination. This shows, in splenic leukæmia, an increase in the total num-

ber of white corpuscles with the appearance of the characteristic cell,—the myelocyte. Even in one case reported by Osler, in which, during the remission of the disease, the white count fell as low as 7500, there was still four per cent. of myelocytes. On the white count, then, and the myelocytes is based the diagnosis of splenic myelogenous leukæmia.

Splenectomy in this disease is almost invariably followed by a fatal result. Hagen reports forty-two operations with only four recoveries. Death was almost without exception due to secondary hæmorrhage from the surface of the wound, owing to the condition of the walls of the large vessels.

The case of Richardson's which I give below adds, however, one to the list of recoveries.

(4) *Chronic Enlargement of the Spleen in Infancy* is, as in adults, an almost constant accompaniment of leukæmia, pseudoleukæmia, cirrhosis of the liver, and malaria. Indeed, most of the chronic affections of infancy, especially those associated with cachexias, cause chronic enlargement of the spleen. The splenic enlargement is, as a rule, moderate only, but it sometimes attains considerable size. The tumor, however, readily yields to the treatment appropriate to the disease, and marked diminution in the size, or actual disappearance, is often recorded.

(5) *Banti's Disease,* or *Hypertrophy with Cirrhosis of the Liver.*—The case reported by this writer is somewhat analogous to those already alluded to as splenic anæmia.

In the earlier stages we see an anæmia and a progressive enlargement of the spleen followed later, sometimes, after an interval of years, by an interstitial hepatitis; that is, in this affection there is a tendency to cirrhosis; but the liver is rarely involved to any great extent.

Banti's cases show an increase in the marrow of the long bones, and the return to the red or fœtal condition. Beyond this there is little positive about the pathological appearances. Extreme anæmia, cachexia, and wasting, together with an occasional bronzing of the skin, and sometimes petechial hæmorrhages in the skin. It seems at least an open question

whether these are not closely related to cases of hypertrophy of the spleen following atrophic cirrhosis of the liver, owing to the close relation of the two organs through the medium of the portal system. Several of Osler's cases, which were marked by extreme hæmorrhage and ascites, call to mind cirrhosis of the liver; and it would seem but fair to state that further proof is necessary to make clear the question of a distinction between these two forms of splenic enlargement, and what relation they bear to the simple idiopathic hypertrophies of the spleen reported in literature.

Hagen reports sixteen cases of Banti's disease in which splenectomy was performed, with only three deaths. In many of these cases, in which the subsequent history was obtained, patients were found to have fully regained their health.

Passing now some of the rarer forms of disease of the spleen, such as *Amyloid Disease, Cysts,* and *Cavernous Angioma,* we come to

(10) *Wandering Spleen.*—Enlargement of the spleen is not infrequently accompanied by a displacement of that organ, due to a mechanical elongation of the ligaments by the traction of the organ itself; or it may be due to a congenital laxity of the ligaments themselves. The organ is attached to the diaphragm by the phrenicosplenic or suspensory ligament, and to the fundus of the stomach by a fold of omentum—gastrosplenic ligament—which encloses the splenic vessels as they pass in and out behind the upper border of the pancreas. The organ is less movable at its diaphragmatic attachment, and it is the phrenicosplenic ligament which is the first to feel the traction and become elongated and ruptured. The spleen then falls forward, lies horizontally in the body with the hilus directed upward, and hangs only on the gastrosplenic attachment and vessels, thus drawing the fundus of the stomach outward by the traction of the ligament, and perhaps detaching the pancreas by traction on the vessels. Rotation may then take place and the pancreas be wound round the vessels, which become more or less diminished in calibre, or even obliterated. (Shattuck.) The falling spleen will be a source of danger not only from its displacement (which may cause serious dis-

turbance to the stomach, and even intestinal obstruction), but may give rise, as the result of the twisting of its pedicle, to a fatal peritonitis.

The number of cases operated upon up to the last decade have been comparatively few; but during this decade eleven reported cases, with four deaths, giving a mortality of 36.3 per cent.

On the other hand, of forty-three cases of wandering spleen operated upon during the last decade, there were only three deaths. It would seem, therefore, that, as a prophylactic measure, extirpation of the wandering spleen was a justifiable procedure, and that we should certainly be within the limits of propriety in advising an operation where the displacement had reached a degree to produce marked abdominal symptoms.

Splenopexy does not seem to meet with approval, as the result is uncertain, owing principally to the fact that the displaced organ is usually enlarged and its tissue more or less diseased. The result in Case V seems, however, to have been satisfactory.

(12) *Abscess of the Spleen.*—Only certain forms of abscess of the spleen are suitable for splenectomy. Such cases are those in which the spleen itself is surrounded with pus, or cases in which the spleen, containing an abscess, is not too tightly bound down to the abdominal wall by adhesions. Where there is danger of infecting the general peritoneal cavity by an attempt to extirpate the spleen, it would be better to content one's self by the simple opening of the abscess and drainage.

Seven cases of abscess are collected by Hagen, all of which recovered after splenectomy. In two cases of splenotomy in which the operation was performed, Hagen, the abscess was reached after resection of portions of the ninth and tenth ribs. In the majority of the cases reported, however, the abscess was reached by an incision through the abdominal walls. In one case the abscess followed appendicitis. The same author reports three cases of splenectomy for tuberculosis of the spleen, with two recoveries.

(13) *Rupture of the Spleen.*—The spleen has often been

removed for injury from an open abdominal wound, and more than one-half the cases were successful. When the spleen is ruptured without injury to the abdominal wall, the necessity of an early diagnosis becomes a matter of grave importance. The diagnosis of rupture can be made in the history of a blow received in the splenic region, followed by dulness in this region and the usual symptoms of internal hæmorrhage. The rupture of the spleen, or a subsequent breaking out of a serious hæmorrhage of that organ following injury, is associated with sharp pain in the left hypogastrium and the symptoms of collapse.

Pitts reports three successful cases of splenectomy for rupture. The lesion was caused in one case by a blow from a cricket-ball; in the second by the patient being run over by a hansom cab; and in the third case by a fall across an iron girder. His patients were fed during convalescence on splenic extract and bone marrow, which were supposed to have exerted a favorable influence upon the recovery.

Sevor reports a case of rupture of the spleen in a pregnant woman, splenectomy being performed during pregnancy, which was not affected by the operation.

Pitts advises a median incision below the ensiform cartilage for exploratory purposes, and a subsequent incision in the left linea semilunaris. Both suturing and packing the wound have been recommended as substitutes for splenectomy. Ligature of the splenic artery has also been proposed. These methods are not sufficiently reliable substitutes for the more radical operation.

Since 1890, thirty-four cases of splenectomy for rupture of the spleen have been reported, with a mortality of 41.2 per cent. It is probable that, except in cases of more superficial injury to the spleen, splenectomy is the operation which will be resorted to in the future for this lesion.

(14) *Sarcoma of the Spleen.*—Up to the year 1890, five cases of splenectomy for sarcoma were reported by Hagen, of which three were cured and two died. From 1891 to 1900, four cases were reported, of which three were healed and one

died. To these may be added one death in the short list of cases reported in this paper.

As will be seen from the above review of the subject, the operation of splenectomy has a much wider range than might have been supposed. It is only distinctly contraindicated in such grave organic lesions as leukæmia, cirrhosis of the liver, and amyloid disease. In many other affections its merits still remain to be fully tested. The technical details of the operation are much better understood to-day than when splenectomy was first performed, as is clear from the striking statistics furnished by the very thorough and painstaking work of Hagen. The reduction of the mortality of the operation has been obtained, also, by a judicious selection of cases suitable for the operation. The size of the spleen is much less a contraindication for splenectomy than the adhesions it forms with other organs, death being more likely to occur from hæmorrhage from ruptured adhesions than shock from the removal of the organ itself.

For the removal of the spleen, an incision near the border of the left rectus muscle, or the linea semilunaris, is to be recommended, with such lateral incisions towards the flank or towards the median line as the necessities of the individual case may suggest. The incision should be sufficiently large to enable the operator to inspect with facility the exposed surfaces of the organ and the structures to which it is adherent. All accessible adhesions should first be carefully divided with double ligatures, and the pedicle of the spleen should be exposed, if possible, by lifting up the inner border of the organ. If this is accessible, the vessels may now be secured separately by double ligatures, or the splenic omentum may be transfixed, as Pitts suggests, by a double ligature and each half may be tied separately; the whole pedicle being encircled afterwards by a single ligature. In large tumors, the vessels of the hilus are often enormously dilated, and the walls of the veins are in such cases readily torn. In such cases the greatest possible care should be taken, in the introduction of ligatures, to avoid wounding the vessels.

Before attempting the removal of the organ, the hand should be passed between it and the diaphragm, and its surroundings carefully explored. In some cases the spleen can readily be pulled down by the hand thus introduced, in which case it can be turned completely over, and in this way the vessels of the hilus are immediately made superficial and can readily be seized and controlled. Such was the case in both the operations performed by the writer. The spleen was, as it were, "turned turtle,"—the vessels which before were underneath and inaccessible were now on top. In separating the spleen from the stomach, care should be taken not to injure the walls of the stomach; and if the peritoneum has been freely torn on the surface of this organ, it may be advisable to suture the edges of the peritoneum along the greater curvature of the stomach. Considerable oozing may in this way be effectually controlled. If there have been much laceration of the peritoneum, owing to the severing of the adhesions, the operation field should be tamponed temporarily, and a wick should be left in the wound. In both cases operated upon by the writer, the patient complained of pain in the left side, as if from pleurisy. The diagnosis made in one case at least by Dr. Shattuck, after a careful exploration of the edges, was that this symptom should be ascribed to an "aching void." It is a symptom which is to be expected after so severe an operation in this locality, even under the most favorable circumstances.

The After Results of Splenectomy have been the occasion for much investigation, and many varied and quite constant symptoms have been observed in patients who have survived the operation.

On the theory that the spleen was an active agent in the struggle of the body against infections, because of its common enlargement in septic conditions, many experiments on animals have been performed. The conclusions reached by Blumreich and Jacoby by experiments on guinea-pigs show that no difference in resistance to infection of bacteria or of

toxins between guinea-pigs with and without spleens can be determined.

Animals whose spleens have been removed have shown a diminution in the amount of hæmoglobin and in the amount of red corpuscles, and this diminution reaches its height two to three weeks after the operation and disappears after three to four months. (Laudenbach.) These blood changes also occur in man after splenectomy, and repeated observations go to show that the diminution is greater than would be accounted for by the loss of blood at operation. Recuperation after hæmorrhage was observed by Czerny and Maydl to be slower in pigeons after splenectomy.

An increase in the total number of white corpuscles is a practically constant result of removal of the spleen in animals or in man, although in one case reported by Vaquez the white count did not go above 7200. The increase is apparently due both to polynuclear forms and lymphocytes, but data upon this point are unsatisfactory. Tschistowitsch noted an increase in eosinophiles. The white count generally reaches 20,000, but varies within wide limits.

Pyrexia has been observed in several cases (Lacretti, Tschernjackowski), but whether due to absence of spleen or to septic absorption could not be determined. Mental disturbance has also been noted (Bovee), and a change of disposition from a gentle nature to one that was morose and irritable (Deeble), but these results are extremely rare.

A diminution in the biliary coloring matters, and pale color of the fæces, have been noted by Pugliese, and are attributed to the lack of hæmoglobin derivatives which are normally supplied to the liver from the spleen.

Accessory spleens are known to be present in a large number of autopsies (1 to 400 up to 1 to 16 (Hartley)), but they are far from constant, and many observations have been made to determine what tissues or organs vicariously assumed the function of the spleen. Enlargement of the lymph glands has been frequently noticed (Bolton, Warbasse), and the thyroid has three times been found to increase in size after splenec-

tomy. In a few cases, pain in the bones after operation has suggested medullary proliferation (Lacretti), and in animals a reddened and denser condition of the marrow is observed as a frequent result of removal of the spleen.

In general, then, the results of splenectomy are not constant, except for a reduction of hæmoglobin and red corpuscles and an increase of white corpuscles; and these conditions are of only temporary duration, and in no way debar the patient from a complete restoration to health after splenectomy.

The following five cases, hitherto unreported, serve to illustrate fairly well the different phases of surgery of this organ.

CASE I.—*Splenic Anæmia. Splenectomy. Recovery.* Operator, J. Collins Warren. J. M., twenty-six years of age, born in Scotland. He was first seen by me in consultation with Dr. S. W. Torrey, of Beverly, Massachusetts, in September, 1899. The case then presented the following history:

Father had died of tumor of the stomach, and one brother had died of phthisis. He himself had had pleurisy five years before. He had no venereal disease or malaria. His habits had always been good.

About one year before he began to have diarrhœa, the movements taking place from three to five times a day, with tenesmus. He also suffered from distress after eating, which at times obliged him to vomit. Sometimes improved under treatment, but symptoms returned every two or three months since. At times has had regular chills with vomiting. He was never exposed to malaria.

In the previous August he first noticed a lump the size of a grape fruit in the splenic region of the abdomen, that had increased somewhat in size at the time of my consultation. He had lost some flesh, and had for several months been unable to attend to his work. He was not seen by me after this for a year, when I again saw him in consultation with Dr. Torrey. The tumor had increased in size, and now extended across the median line and down to the umbilicus. His other symptoms had not changed except that he had lost considerable flesh, and lately had suffered from dyspnœa on exertion. His general health, however, con-

tinued fairly good. He had been taking arsenic during most of the past year, without any improvement.

The question of operation having been decided, he entered the Massachusetts General Hospital on October 6, 1900. The examination of the patient at that time showed that there were no symptoms of disease in the chest. The abdomen was soft and not distended or tender. A large mass was observed in the splenic region extending from the level of the sixth rib in the axillary line of the umbilicus and inward as far as the median line. It was easily felt by manual palpation, one hand resting on the lumbar region. The tumor was not tender, and moved with respiration. On inflating the colon with air, there was no change in the area of dulness.

Blood Examination.—Whites, 2200; reds, 5,200,000; hæmoglobin, 65 per cent.; polymorphonuclear-neutrophiles, 70 per cent.; lymphocytes, 22 per cent.; eosinophiles, 3 per cent.; megaloblasts, .07; normoblasts, .01.

Nothing remarkable about red corpuscles. (F. T. Lord.)

Three days after entrance, the patient, having been comfortable and up and about the ward, was taken at 7 P.M. with a chill. Temperature 101° F., but an examination of the blood showed no plasmodia or pigment.

The operation was performed on October 16. Patient was placed in the reversed Trendelenburg position. Incision was made along the outer border of the left rectus muscle from the costal margin to the left of the umbilicus. On opening the abdomen the spleen was found presenting at the wound. The opening was now enlarged by an incision from midpoint of the first incision to the median line, dividing the rectus muscle; and the hand introduced between the spleen and the abdominal wall was found to follow the dome of the diaphragm on the left, extending to about the level of the sixth rib. Many adhesions were found along the anterior border of the spleen containing large vessels. These adhesions were principally connected with the omentum. Many notches were observed on the anterior border of the spleen, the organ appeared greatly enlarged, and its walls greatly stretched by the vascular condition. The adhesions in sight having been clamped, tied, and cut, the anterior edge of the organ was lifted up, and the vessels of the pedicle were observed greatly enlarged and closely packed together and not easily acces-

sible. An attempt to secure them from this direction having been followed by a brisk hæmorrhage, the vessels were compressed by gauze packing, and the hand being introduced between the spleen and the abdominal wall up to the dome of the diaphragm, the organ was seized and pulled down and drawn out through the wound, the organ being rotated on the hilus as an axis, so that the posterior surface was uppermost. This brought the hilus and large vessels of the pedicle in plain sight. They were easily seized with the left hand, clamped, and tied with silk. The few remaining adhesions being clamped and tied, the spleen was removed.

On inspecting the bed of the tumor, it was found that a considerable amount of the larger curvature of the stomach had been stripped of the peritoneum. This rent in the peritoneum was closed by intestinal sutures. The general oozing from adhesions was controlled by temporary pressure, the abdominal wall was closed by through-and-through silkworm-gut sutures, and a wick was left in for drainage extending to the deeper portions of the wound.

The patient was found to be in good condition at the close of the operation,—pulse 80, and of good quality. In the afternoon and evening he complained of much pain, and was very restless, requiring large doses of morphia. The patient suffered for the first few days from shock; but his condition gradually improved, and the temperature (which did not at any time exceed 101°) gradually fell during the following week to the normal line.

On the 18th, examination of the blood showed: Whites, 24,000; reds, 5,000,000; hæmoglobin, 65 per cent.; polymorphonuclear-neutrophiles, 93 per cent.; large lymphocytes, 3.2 per cent.; small lymphocytes, 3.6 per cent.; eosinophiles, .2 per cent.

On the 19th the whites were 21,400. The wound healed well, although there was some slight redness around a few of the stitch-holes near the point of drainage.

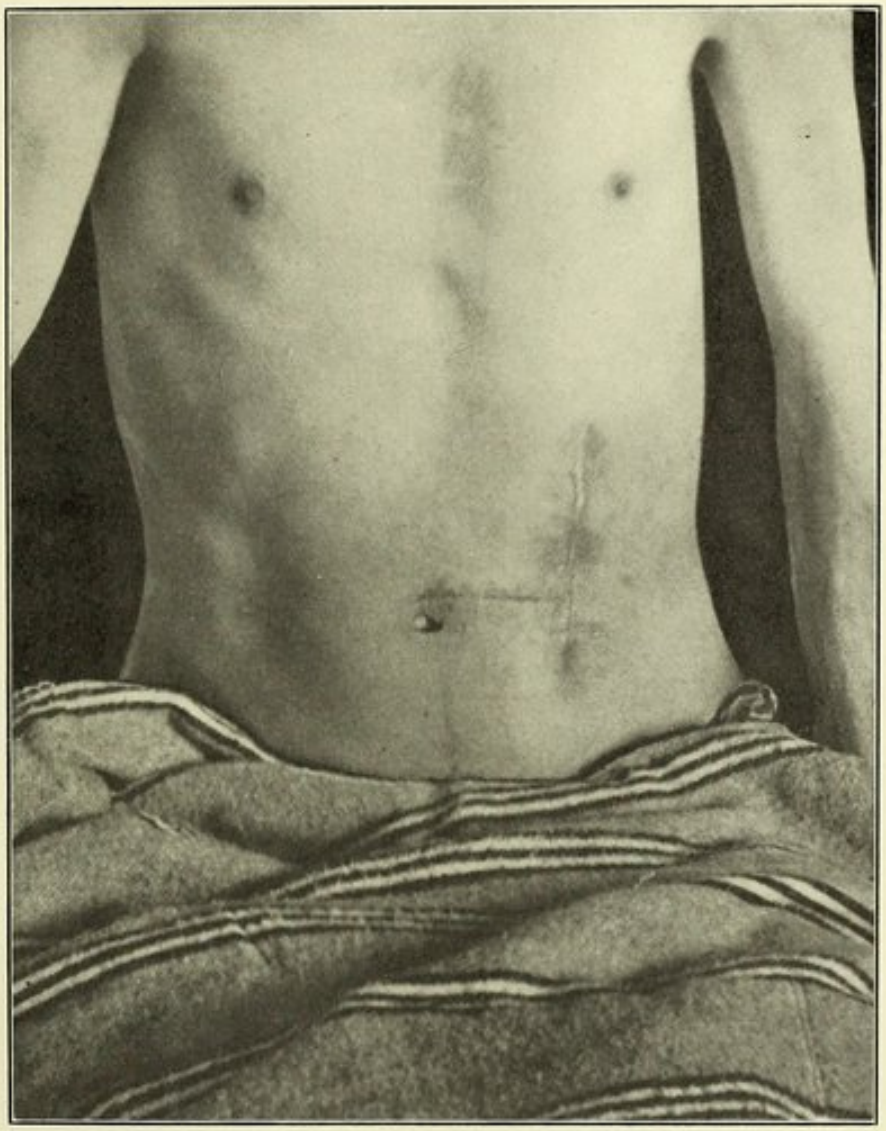
The wick was removed on the third day. The wound healed by first intention.

On October 20, whites, 23,800.

On October 21, whites, 18,000.

On October 24, whites, 18,000.

Stitches were removed on the 25th. Temperature at this time had risen to 100.8° F. The patient complained of pain in the left



Cicatrix of incision in Case I.

side on taking a long breath. Nothing, however, was found on careful examination. This symptom of pain was present, resembling pleurisy, in both of my operations of splenectomy.

On the 27th, whites, 24,000; reds, 3,256,000; hæmoglobin, 45 per cent.; polymorphonuclear-neutrophiles, 81 per cent.; large lymphocytes, 8.5 per cent.; small lymphocytes, 7.9 per cent.; eosinophiles, 2.6 per cent.; two myelocytes; no megaloblasts; ten mastzellen; no normoblasts.

November 1, whites, 16,400.

November 5, whites, 17,000; reds, 4,496,000; hæmoglobin, 45 per cent.; polymorphonuclear-neutrophiles, 76.8 per cent.; large lymphocytes, 9 per cent.; small lymphocytes, 7.8 per cent.; eosinophiles, 6.2 per cent.; myelocytes, .2 per cent.

There was an evening rise of temperature during the rest of his stay at the hospital, which terminated November 21.

On November 11, whites, 20,000; reds, 3,984,000; hæmoglobin, 40 per cent.; polymorphonuclear-neutrophiles, 82.2 per cent.; large lymphocytes, 7.4 per cent.; small lymphocytes, 9 per cent.; eosinophiles, 1.4 per cent.; no normoblasts or megaloblasts.

On November 18 there was a slight pain in the left ankle, foot was œdematous, and marked tenderness in the calf of the leg over the saphenous vein. Kept in bed and leg tied up on pillow splints. This tenderness and swelling eventually disappeared.

On the 21st, the day of his return home, the blood examination was as follows: Whites, 15,000; reds, 4,000,000; hæmoglobin, 40 per cent.; polymorphonuclear-neutrophiles, 82.8 per cent.; large lymphocytes, 7.4 per cent.; small lymphocytes, 5.8 per cent.; eosinophiles, 4 per cent.; red shows a slight poikilocytosis.

For a week or two previous to his departure from the hospital the patient was moved in a chair into the open air air, but, owing to the continued pyrexia, failed to regain his strength. This pyrexia continued for a week or two after his return home. Under careful nursing and plenty of fresh air, it presently disappeared, since which time the patient has fully regained his health and strength and weight, and now (March 18) feels as well as he ever did in his life.

Examination of the blood, December 10. Whites, 21,600; reds, 4,672,000; hæmoglobin, $52^1/_2$ per cent.; polymorpho-

nuclear-neutrophiles, $73^{2}/_{5}$ per cent.; large lymphocytes, $8^{4}/_{5}$ per cent.; small lymphocytes, $15^{4}/_{5}$ per cent.; eosinophiles, 2 per cent.; two myelocytes; no nucleated reds; reds not remarkable.

Examination of the blood, January 23, 1901. White corpuscles, 16,000; differential count, 500 cells; polynuclears, $79^{4}/_{5}$ per cent.; large lymphocytes, $10^{1}/_{5}$ per cent.; small lymphocytes, $5^{3}/_{5}$ per cent.; eosinophiles, 3.5 per cent.

Nothing abnormal noted in size or character of the reds.—(L. G. Mead.)

The following pathological report is made by Dr. W. F. Whitney:

The spleen removed by Dr. Warren, October 16, 1900, was greatly enlarged, weighing 1155 grammes and measuring twenty-one by sixteen by eight centimetres. The outline was normal, with the exception of deep indentations along the anterior edge, giving it, at first sight, a somewhat lobulated aspect. The capsule was smooth, and from the outside presented the normal color. The vessels at the hilus presented nothing remarkable. The section surface was of a uniform red color, the follicles were indistinct, and the trabeculæ prominent.

Microscopic Examination.—Portions of the spleen were hardened immediately upon removal in Zenker's fluid, and stained in various ways. On section the vascular openings were well marked, follicles small and infrequent and rather irregular in outline. The embryonic centres were marked by large cells, with an occasional one showing nuclear figures. The spleen pulp was characterized by the thickness of the reticulum, the smallness of its mesh-work, and by the relatively small number of cells in the spaces. Nowhere were there any phagocytic cells to be seen. The spaces contained a moderate number of red corpuscles. Occasional eosinophiles were found, but were very moderate in number.

The enlargement of the spleen seems to be entirely in the growth of the pulp, with hypertrophy of the reticulum.

CASE II.—*Sarcoma of the Spleen. Splenectomy. Death.* Operator, J. Collins Warren. C. M. P., thirty-six years of age, entered the Massachusetts General Hospital on December 21, 1899, service of Dr. Shattuck.

He had had the ordinary diseases of childhood, and had suffered ten years before from severe malaria while in India as an English soldier. His health since, however, has been good. For two months past has noticed an increasing lump in the left side, at times painful. Has lost fifteen pounds the last four months. Has had no other symptoms.

Physical examination shows a well developed man of rather pale complexion. There is an irregular prominence in the left hypogastrium extending a little to the right of the median line, firm, not tender, moving a little with respiration, somewhat movable on palpation. Dulness encroaches on the left pulmonary space to the eighth rib on the axillary line.

Blood count shows: White corpuscles, 5000; hæmoglobin, 60 per cent.

There was the slightest possible trace of albumen in the urine, and a few hyaline casts. As the growth of the tumor appeared to progress, it was decided to attempt its removal by an operation. This was done on January 11, 1900.

An oblique incision was made parallel to the axillary border. A smooth, dark purplish tumor presented, very adherent on all sides. An exploratory incision into the tumor showed it to be a sarcoma covered with a thin capsule of spleen tissue. The incision in the abdominal wall was now enlarged downward along the outer border of the left rectus muscle. The tumor was seized, as in the former case, in the right hand, passed behind the spleen and the diaphragmatic wall, and pulled downward. The extensive adhesions were divided by the actual cautery; some of the tissue of the pancreas being removed with the tumor. A portion of the spleen, not affected by the growth, was allowed to remain attached to the cardiac end of the stomach; the free hæmorrhage from the adhesions not permitting a prolonged dissection. This hæmorrhage necessitated an extensive packing with gauze which protruded from the upper portion of the wound, which was brought together by through-and-through stitches. The gauze was removed on the third day; and it was found on the fifth day that there was an extensive bloody, serous oozing from the wound, an examination of which showed an infection with streptococci. The patient rapidly failed and died on the following day. Autopsy by Dr. Wright showed an acute general peritonitis, pleuritis, and streptococcus septicæmia.

A portion of the spleen was found measuring twelve by twelve by three centimetres, apparently normal on section. No sarcomatous tissue found.

The Pathological Report of Dr. W. F. Whitney.—Two specimens of the tumor were submitted.

(1) Small, round-celled sarcoma, size of two fists, partially covered with tissue resembling the spleen.

(2) Sarcomatous mass, size of palm of hand, with some pancreatic tissue, and a small supernumerary spleen, size of a walnut.

CASE III.—*Splenic Leukæmia. Splenectomy. Recovery.* Operator, M. H. Richardson. Mrs. E. M. D., of Haverhill, a woman of thirty-four, with five children, good family history, had her last menstruation in August, 1900. For two months there had been no flow. She thought herself pregnant. She came of a strong and healthy family. There had been no abnormalities of menstruation up to August. Her husband noticed in February, 1900, a bunch in the left side of the abdomen. She had had a backache. Since May, 1900, she had complained of spells of weakness and of a pain in the left lower extremity. Her family said that she looked very weak. Her friends had remarked on her bad looks. There had been no malaise and no localizing symptoms. Her appetite had been poor. Her father and mother living and well. In the family there was no tumor, consumption, or cancer. I found the woman lying in bed. She was nervous, frightened, and crying. I did not notice anything wrong in her general appearance. She seemed to be in good general condition; good color to her lips. I found a hard, doughy tumor filling the left side of the abdomen, extending from the ribs on the left side to the pelvis. The right border of this tumor had a sharp edge and had a distinct hilus in it. The line of the tumor extended diagonally, downward, forward, and to the right, from the rib margin near the epigastrium on the left. The diagnosis was "enlarged spleen."

I decided to examine her under ether, to be sure. Under ether, the tumor was found to be very movable, and unmistakably the spleen. It could be tilted up so that the right edge looked forward.

The patient was so nervous and frightened that I decided that it was best to go ahead rather than let her come out for

renewed study. The operation promised to be easy and seemed to be the only chance of permanent success. It was therefore decided to operate.

A long median cut was made from the edge of the epigastrium to below the navel, large enough to deliver the tumor, if necessary. The intestines were all packed to the patient's right and the splenic vessels put on stretch. I began at the lower part and tied each vessel with two ligatures about an inch apart, and the vessels were then cut between the ligatures. Excessive care was taken in applying the ligatures not to tear the veins. The tumor was, as we had supposed, the spleen. It was dark-colored and soft. It was extremely movable, and it was clearly one of the easiest of operations to remove it. The vessels, in spite of great care, were easily torn in the manipulations; but there was practically no hæmorrhage; probably in the whole operation not a teaspoonful of blood was lost. The tail of the pancreas was intimately connected with the splenic vessels and required several ligatures; also the attachments of the stomach. We went ahead leisurely and thoroughly and got out the spleen finally without shock. The time was about forty-five minutes. Silk ligatures were used; silkworm-gut sutures through the abdominal wound. There were no buried sutures enclosed in the abdominal wound. At the close of the operation the pulse was 92. The spleen was filled with a reddish-brown muddy substance, and was evidently changed blood. One small gland was removed from the pedicle of the spleen.

The patient did very well after the operation, except that the pulse went up. There was some pain in the lung, which was supposed to be a localized patch of pneumonia. She made an excellent recovery; at the end of three weeks she was able to be up and about. There has been a considerable improvement in the character of the blood.

Report of Pathological Examination by Dr. W. F. Whitney.—The spleen removed by Dr. M. H. Richardson, December 12, 1900, was received within three hours of the time of its removal and while yet warm. It was very much enlarged, weighing 2275 grammes, and measured twenty-five centimetres in length by sixteen in width and nine in thickness. Its shape and form were, in general, regular, but on one part of the surface there was a slight depressed area measuring four centimetres in greatest extent,

and of a deep yellow color. This was evidently the result of an anæmic necrosis. Otherwise, the spleen presented no remarkable appearance externally. The capsule was smooth and of normal color. It was of moderate firmness.

On section, it was uniform in texture and of a pale grayish-red color. The openings of the vessels were visible, the follicles not to be made out with the eye, and the trabeculæ only here and there to be seen. At the hilus was a large vein filled with a loose grayish-red thrombus. The blood which came from the vessels was of a pinkish-red color and formed rather loose coagula. Lying at the hilus, attached to the spleen, was a small lymph node the size of a bean, and another a little larger had been removed separately.

Microscopic Examination.—The spleen was hardened in Zenker's fluid and stained in various ways. With a low power the follicles were seen as occasionally widely separated accumulations of lymphoid cells which stained deeply. Between them the spleen pulp was very much increased, the openings of the veins were prominent and could be readily detected. On examination with a high power numbers of large mononucleated cells were found lying in the meshes of the reticulum associated with eosinophiles in large numbers. The reticulum was not increased in thickness, but the spaces seemed to be dilated, and in this way the increase in bulk was brought about.

The examination of the lymph nodes showed the lymph channels filled with large mononuclear cells, among which were occasional eosinophiles. The medullary strings were replaced by similar tissue, but less compact, and in which were very numerous eosinophiles and large multinucleated protoplasmic masses (giant cells). There was only a narrow zone of lymphoid tissue to be found in the periphery. The infiltration in the gland had apparently taken place from the hilus outward.

Microscopic Examination of the blood, taken at the time of the operation, showed the characteristics of an advanced leukæmia, viz., myelocytes, largely increased number of the eosinophiles, and the presence of macrocytes and microcytes, together with numerous megaloblasts and normoblasts. The absence of lymphoid cells was noticeable. Examinations of the blood, made at short intervals until a month after the removal, showed essentially the same features without any material change, except in

the last examination, January 10, there appeared to be fewer myelocytes in proportion to the polynuclear leucocytes. There was no increase in the lymph elements.

From a histological stand-point, the two spleens, one from the case of anæmia and the other from leukæmia, are extremely interesting. In both the follicles are reduced in size. On the other hand, in the spleen of anæmia the reticulum seems to be increased and the size of the meshes decreased. In the spleen from leukæmia, the increase appears to be due chiefly to distention of the meshes of the reticulum, which is of normal thicknesss.

In regard to the lymph nodes in Dr. Richardson's case, the lymphoid elements are entirely replaced by those of the bone marrow. If this is an index of what has taken place in other parts of the body, it is not surprising that the lymphoid elements should be absent from the blood, and that there should be no increase of them after the removal of the spleen.

In Dr. Warren's case, we have no definite information in regard to whether any change has taken place in the structure of the lymph nodes. It is extremely interesting that, although the blood shows a marked leucocytosis after the removal of the spleen, it is not due to an increase of lymphoid cells, as has been found to have taken place usually in cases of normal splenectomy.

It is a question whether the removal of the spleen in these two cases will have any effect upon the progress of the disease, as the consensus of opinion is that the spleen has really nothing to do with the formation of the blood after birth, its function being chiefly to remove the worn-out and used-up corpuscles and their detritus. In Dr. Warren's case, it is possible that this function of the spleen may have been too active, although no evidence of any such phagocytic action was detected in its cells. In Dr. Richardson's case, the overloaded spleen may be looked on as an overcharged filter which simply was pouring out cells, which it could no longer retain, into the circulation. As regards its phagocytic action, there was no evidence of it, if it still possessed it. Therefore, on purely theoretical grounds, the removal of the spleen would do no harm in either case, and may tend to lengthen life by the removal of a heavy burden from the abdominal cavity.

CASE IV.—*Rupture of an Infarcted Spleen. Splenectomy. Death. Autopsy.* Operator, F. B. Lund. P. R., male, aged twenty-six years, single, was brought to the Boston City Hospital, on July

12, suffering from severe pain in the epigastrium and left side of the abdomen. He had suffered for several months from pain in the abdomen, less severe, however, than the present attack. The pain had suddenly become very severe on the day of his entrance to the hospital, while he was lifting a moderately heavy basket. He was admitted in the evening, and was in such great pain that it was not possible to obtain from him more than the most unsatisfactory history of his illness. He required frequent doses of morphia to quiet him during the night, and in the morning was seen by Dr. Lund in consultation with Dr. J. W. Bartol, to whose service he had been admitted.

Examination showed a rather thin young man, with anxious expression, blanched lips, skin pale and moist. He was restless, constantly groaning, and complaining of thirst. The tongue was dry and slightly coated. On both legs were old ulcers, surrounded by pigmented areas of skin. The saphenous veins of both legs were enlarged, and along the whole length of the outer border of the right rectus abdominis muscle extended an enlarged superficial vein. The abdomen was moderately distended. There was acute tenderness in the epigastrium, especially a little to the left of the median line, shading off towards the lower portion of the abdomen, and spasm of the abdominal muscles on pressure, most marked in the epigastrium. The presence of free fluid in the abdomen was evidenced by dulness in both flanks in the recumbent position, changing to tympany when the patient lay on the opposite side. Percussion showed increased area of splenic dulness, though the exact outlines were not marked out. The temperature was 101° F. and the pulse 124, weak and compressible. The patient had vomited greenish fluid several times during the night. A diagnosis was made of acute peritonitis originating in the epigastrium, probably perforating gastric ulcer. The patient was etherized, and on making an incision above the umbilicus in the median line, several dilated subperitoneal veins were noted. On opening the abdomen, there was an immediate escape, not of the expected pus or turbid serum, but of a large quantity of dark fluid blood. After rapidly sponging and washing out a great deal of blood, estimated at least at two quarts, from the abdomen, and enlarging the wound upward and downward, the wound was forcibly retracted to the left, the side from which the most blood seemed to come, and a longitudinal rent about three inches long

was found in the capsule of the greatly enlarged spleen, with a smaller rent above it on the external surface. It was thought that attempts to suture the torn capsule, through which pulpy splenic tissue was protruding, would prove futile; and the spleen, which was adherent to the diaphragm by fresh fibrinous adhesions, was brought outside the abdomen and removed, after ligature of the pedicle, consisting of the splenic artery and vein, with a transfixion interlocking double ligature of coarse silk. On section of the vein it was found to be filled with a thrombus, and the hard clot could be felt extending along the vein above the ligature for some distance. The fatty and connective tissue through which this ligature was applied was somewhat frail, so that the first ligature cut through, and a second had to be applied above it. Thorough irrigation of the abdomen resulted in the washing out of much blood from the pelvis and both flanks. The abdomen was left full of salt solution, and sutured with through-and-through sutures of silkworm gut. The patient bore the operation well, and the after-treatment consisted of the liberal administration of salt solution and stimulants under the skin and by the rectum. The patient had a fairly good night, though rather restless, and on the following day became more restless and began to vomit. The blood count showed 25,400 white corpuscles. The third day the vomiting had ceased, and he was taking considerable fluid by mouth, and the bowels moved freely. The pulse through this day was 130, weak and irregular. During the evening the pulse failed, and death occurred at 3.45 P.M. on the fourth day.

The autopsy by Dr. F. B. Mallory showed a slight roughing of the surface of the coils of jejunum immediately under the wound, no more than would normally result from the manipulations of the operation and suture. There was no blood or other fluid in the general peritoneal cavity, more than the normal amount of serum. The portal vein contained a thrombus which almost completely filled it, and extended along the splenic vein to the front, where it was ligatured. A small vein on the greater curvature of the stomach was also thrombosed. The cavity left by the removal of the spleen was walled off by light adhesions, and contained a little serum and blood at the bottom. Other organs normal. Anatomical diagnosis; traumatic peritonitis; thrombus of portal, splenic, and gastric veins; splenectomy.

The pathological report of the spleen, signed by Dr. F. B.

Mallory, stated that the specimen was an infarcted spleen, with rupture of the capsule, and that microscopic examination showed no evidence of malaria, tuberculosis, or other disease.

It would seem as if the capsule of a spleen, swollen by infarction resulting from thrombosis of the splenic vein, had been ruptured by the slight violence caused by the exertion of lifting a basket. A plausible explanation of the thrombosis and infarction might be found in a twist of the pedicle of a movable spleen. At the operation, however, no twist was found, and the spleen was lightly adherent to the diaphragm in its normal position.

The so-called spontaneous rupture of the spleen is rare, but not infrequent in tropical climates, where the greatly hypertrophied spleens met with in malarial regions are not infrequently ruptured by even slight blows upon the chest, resulting in fatal hæmorrhage.

In general, rupture of the spleen is due to very violent accidents, such as falls from heights, railroad crushes, etc.

In the case in question, it would seem highly probable that distention of the capsule nearly to the bursting point by the cutting off of the egress of the blood by thrombosis of the splenic vein had prepared the way for rupture of the capsule by slight violence. The great enlargement and total infarction of the organ, together with the presence of the rupture and absence of other disease, render this conclusion almost inevitable.

The operation of splenectomy, which in this case was a rapid and easy procedure, arrested the hæmorrhage, but did not remove the cause both of the rupture of the spleen and the death of the patient, namely, thrombosis of the portal vein.

CASE V.—*Splenopexy.* Operator, F. G. Balch, M.D. Mrs. L. E. D., forty-six years old, married. Mrs. D. entered my service at the Carney Hospital, November 21, 1901. Her family history is negative, as far as can be determined, in regard to her present illness. She says her mother died of a "tumor of the bowels" and her father of a fever. As a child she had scarlet fever, and has been very deaf ever since. Her doctor, Dr. Wallace E. Webber, of Lewiston, Maine, sent in a full history of the case, which is followed closely in this record. She is a well-nourished woman and has had two children. Twenty-eight years ago she was crossing the street, when she fell, striking her left side violently against the edge of a stone. For two years after that she

was a great sufferer with pain in that side, a sinking sensation "in the stomach," and dizziness. She gradually recovered, although never regaining her health completely. Seven years ago she was caught on the front of a car and received a severe shaking. She was taken to the hospital in Chelsea, and a tumor was then discovered in the left side. This the doctors told her could be easily removed. She had a badly lacerated perineum, and chose that time to have it repaired, but, as the tumor then gave her very little inconvenience, she refused to have it operated upon. Dr. Webber had been the family physician for two years previous to August, 1900, and, although he knew that she was not well, he had never been called to attend her. August 1 she went to Boston for a visit, and the first day there she was seized with severe pain in the right side and vomited. She was constipated, and said she had had a good deal of pain in the bowels all summer. The diagnosis made was appendicitis, but, as she improved rapidly, she was sent home in about ten days without operation. She had been up only a few days, and as soon as she got home she went to bed and sent for her doctor. He found her suffering severely with a great deal of pain in the right side of the abdomen. She had no fever and a good pulse. She was constipated. There was a decided tumor, more marked upon the left side than on the right. Upon vaginal examination this mass appeared to be connected with the ovary, though it might have been a pedunculated fibroid. There was marked tenderness over the appendix. The pain was intense, and nothing but morphine gave her any relief. As the symptoms were not urgent, she was kept on a light diet with salts and counter-irritation for a week. As she was no better at the end of that time, a consultation was held and operation urged. She went to the hospital about the middle of August and was operated upon. An incision was made in the median line and the tumor exposed. It proved to be the spleen, somewhat enlarged, resting upon the pelvic brim and firmly fixed in its new position by adhesions. Its removal was considered too dangerous to undertake without the consent of the patient's relatives. The appendix was found to be diseased and was removed. She made an uneventful recovery from the operation, but continued to have the same pain. She had had a prolapse of the uterus for some years, and had to wear a cotton plug in the vagina to hold it in place. Examination, November 22, showed the uterus tipped

back with a good-sized tumor in front of it, but apparently not connected with it. The tumor was somewhat movable though slightly adherent to the scar. The kidneys could not be palpated. There was no splenic dulness. The heart and lungs were negative and the urine normal. Examination of the blood showed that to be normal. I operated November 30. The abdomen was opened in the median line just to the left of the old scar. There was some encysted fluid in the peritoneal cavity just below the incision. The spleen came into view at once. It was adherent in one place for about two inches by firm adhesions along the line of the old scar. The splenic vessels were found coming off from the under surface in their normal position and seemed to be of normal size. On the lower anterior edge were several large vessels in old and very firm adhesions. The connection below was to the anterior abdominal wall just above the bladder. These adhesions were divided part at a time until the spleen was entirely free except for its normal vessels and could be lifted outside the abdomen. There was some troublesome hæmorrhage from the splenic end of the adhesions, where some large veins were torn during the separation. Stitches put through the spleen to control the hæmorrhage only increased the bleeding, and the actual cautery had to be freely used to stop it. The size of the spleen was noticeably increased while it was outside the abdomen, but when it was replaced as nearly as possible in its normal position the congestion was relieved and it became nearly normal in size. As the organ was not diseased, unless a moderate amount of hyperplasia could be called disease, it was decided not to remove it, but to put it as nearly as possible in normal position and try to keep it there. As the separation of so many adhesions had given a large torn surface on the spleen, and as every attempt at stitching gave troublesome hæmorrhage, no attempt was made to suture it into position, but it was packed in place with gauze. It was expected that the gauze would cause further adhesions along the lower edge, and these would aid in holding it in position. The incision was closed except where this gauze came out. In applying the dressing, a pad was so placed as to further push the spleen up and keep the abdominal wall firmly against it. It was found impossible to get the spleen as high as its normal position, but it was put in as nearly normal position as possible. There was a great deal of shock during the operation, especially while the spleen was being

handled. The pulse went to 140 early in the operation, and at one time was 180. Three one-twenty-fifth grain injections of strychnia were given besides a stimulating enema. At the end of the operation the patient was in fair condition, and next day the pulse had dropped to 80; the temperature next day was 99. When the patient was put to bed, the foot of the bed had been elevated eighteen inches. At the end of three days it was lowered six inches, and kept at that height until the twentieth day, when it was lowered to its normal position. This was done, not on account of the shock, but to take all drag off from the newly forming adhesions. There was some discomfort during the first few days from distention, but enemata relieved that. On the third day the gauze packing was removed and a provisional suture tied. Dull pain in the pelvis, where adhesions were torn and high up in the new position of the spleen, though marked at first, gradually disappeared, and by the end of ten days there was no pain at all. The patient was in bed flat on her back three weeks. A supporter was then adjusted, giving firm pressure over the lower abdomen, and having a pad to give extra support to the lower border of the spleen. She gradually gained strength and went home, January 1.

January 28, 1901. Mrs. D. came to my office to-day, riding about four miles on electric cars and walking about half a mile. She says that when she gets very tired she has a slight dragging sensation in the splenic region, but none of her old pain. The spleen is plainly felt in about the same position as when she left the hospital. The lower border is on a line drawn from the anterior superior spine of the ileum to the umbilicus. The upper edge is two inches below the rib margin. The outer edge is lost in the kidney dulness.

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