

Incidental Splenectomy:

A Review of the Literature and the New York Hospital Experience

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981 consecutive splenectomies at The New York Hospital were reviewed. 18.9% were removed incidental to some other procedure, either to facilitate exposure or because of uncontrolled bleeding from capsular tears. The primary operation with which this was most frequently associated was gastric resection for peptic ulcer disease, accounting for 20.5% of the spleens so removed. Conversely, the incidental splenectomy was noted in only 0.91% of all gastrectomies and 1.4% of all left colectomies designated as nonradical procedures. It is therefore seldom a necessary procedure. Incidental splenectomy is more frequent when midline abdominal incisions are employed, less frequent with paramedian or left rectus splitting incisions. 85% of the spleens removed incidentally were grossly and microscopically unremarkable; lacerations most probably result from excessive manipulation rather than pathological changes predisposing to rupture. The postoperative morbidity and mortality is discussed and is felt to be increased significantly by the incidental splenectomy.

THE PROXIMITY of the spleen to organs and tissues in the left upper quadrant may necessitate its removal during procedures in this region, either to facilitate exposure, to extend an operation, or secondary to injury with subsequent inability to control bleeding. In spite of the well known occurrence of incidental removal of the spleen, there remain relatively few studies documenting its frequency or contributing factors. Such information may prove helpful in understanding the morbidity and mortality associated with this procedure, and for this purpose the records of The New York Hospital have been reviewed.

All splenectomies performed at The New York Hospital between 1932 and 1971 were recorded. In-

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cluded in this study as incidentally removed spleens are all spleens removed during an operation where splenectomy was not a part of the standard surgical description, or where extension of disease was not such as to make removal necessary. Each incidental splenectomy was evaluated as to the type and frequency of the primary procedure, gross and microscopic condition of the spleen, type of incision used, and postoperative complications, including any problems subsequent to the primary procedure and not simply those felt to be precipitated by the splenectomy itself.

Results and Discussion

The New York Hospital Experience

A total of 981 splenectomies were performed at The New York Hospital between 1932 and 1971 (Table 1). Of these, 433 (44.1%) were removed for the diagnosis and/or treatment of hematological disorders, 170 (17.3%) as part of a radical cancer procedure, 50 (5.1%) for trauma, and 143 (14.6%) for assorted hepatic and splenic abnormalities. Most importantly, 185 (18.9%) were removed incidental to other abdominal surgery, a figure which is consistent with reported series: Quan and Castleman⁹ reviewed 70 splenectomies, all incidental to gastrectomy, and noted 18.5% to be secondary to operative trauma. In 748 consecutive splenectomies at Ohio State University, Zollinger *et al.*¹³ found 58 removed as an adjunct to procedures for benign lesions and 23 for capsular tears, for a total of 81, or 10.4%. Fabri *et al.*⁵ subsequently reviewed 1,944 splenectomies in the same in-

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stitution, apparently extending the previous series, and found that 18.9% were removed incidental to surgery for benign disease. Finney and Sumner⁷ reported 13 of 116 consecutive splenectomies, or 11%, at Johns Hopkins Hospital to be secondary to iatrogenic tear. Peck and Jackson⁸ reviewed 95 consecutive splenectomies at the University of Pittsburgh and noted 22, or 23%, to be necessitated by surgical trauma. And Rich *et al.*,¹⁰ evaluating 925 splenectomies from California hospitals, found 244 removed for operative trauma (26%) and 46 (5%) to facilitate a benign procedure, for a total of 31%.

Incidental splenectomy in our series was most frequently associated with gastrectomy for peptic ulcer disease, accounting for 20.5% of the spleens so removed (Table 2). An additional 4 splenectomies were performed in association with other benign gastric surgery, including excision of a diverticulum, two gastrojejunostomy revisions, and a gastrostomy. Zollinger *et al.*,¹³ discussing 58 splenectomies performed incidental to procedures for benign disease, noted that the procedures were "usually gastric resection for peptic ulcer." Rich *et al.*¹⁰ found 37% of their incidental splenectomies to be associated with gastric surgery, and Devlin *et al.*,⁴ reviewing 70 incidental splenectomies, noted 58.5% to be in conjunction with gastrectomy, predominantly partial. The removal of the spleen inci-

TABLE 2. Procedures with which Incidental Splenectomy was Associated

Gastrectomy for peptic ulcer disease	38	20.5%
Repair hiatus hernia	18	9.7%
Left colectomy	18	9.7%
Bilateral nephrectomy	13	7.0%
Pancreatic surgery	12	6.5%
Vagotomy and drainage	11	5.9%
Exploration left upper quadrant	11	5.9%
Splenic flexure resection	11	5.9%
Left nephrectomy	10	5.4%
Transverse colectomy	6	3.2%
Left adrenalectomy or exploration	6	3.2%
Sigmoid resection	5	2.7%
Esophagectomy or esophageal surgery	4	2.2%
Resection abdominal aortic aneurysm	4	2.2%
Other colon surgery	3	1.6%
Exploration or biopsy left kidney	2	—
Right hemicolectomy	2	—
Revision gastrojejunostomy	2	—
Other gastric surgery	2	—
Total colectomy	1	—
Repair diaphragmatic hernia	1	—
Repair omphalocele	1	—
Measure portal pressure	1	—
Aortofemoral bypass	1	—
Splenic artery ligation	1	—
Cholecystectomy	1	—
Total	185	100.0%

TABLE 1. All Splenectomies at The New York Hospital, 1932–1971

Incidental Splenectomy	185	18.9%
Primary Splenectomy	796	81.0%
Hematological Disorders	433	44.1%
ITP	157	—
Congenital Hemolytic Anemia	148	—
Acquired Hemolytic Anemia	56	—
Hodgkins Disease	37	—
Miscellaneous	35	—
Radical Cancer Surgery	170	17.3%
Stomach	137	—
Esophagus	13	—
Pancreas	10	—
Colon	6	—
Miscellaneous	4	—
Abdominal Trauma Rupture)	50	5.1%
Traumatic	38	—
Blunt	31	—
Penetrating	7	—
Spontaneous	12	—
Splenomegaly	33	3.4%
Splenorenal Shunt	20	2.0%
Banti's Syndrome	17	1.7%
After Splenoportogram	14	1.4%
Splenic Cysts	9	0.9%
Accessory Spleens	8	0.8%
Gaucher's Disease	8	0.8%
Splenic Artery Aneurysm	6	—
Liver Disease	5	—
Splenorenal Arterial Anastomosis	5	—
Hemangiosarcoma	2	—
Perisplenitis	2	—
Splenic Abscess	2	—
Miscellaneous	12	1.2%
Total	981	100.0%

dental to surgery on the stomach is thus well documented, whether it be as a consequence of mobilization for hemigastrectomy and Billroth I procedures as described by Zollinger,¹² or as a result of traction on the lienogastric ligament with disruption of the short gastric vessels and the splenic capsule in the hilar area, as proposed by Peck and Jackson.⁸

The above incidence of 20.5% is not to suggest that incidental splenectomy frequently accompanies gastric surgery. Between 1932 and 1971, 4,411 gastric resections were performed at The New York Hospital,* or which 175 had associated splenectomies—137 planned as part of a radical procedure (Table 1) and 38 removed incidentally (Table 2). Thus 4,274 gastrectomies were considered "nonradical" (4411–137), representing an incidence of incidental splenectomy with gastric resection of 38/4274 or 0.91%. This does not include all other gastric procedures (gastrostomy, etc.) with which there were only 4 incidental splenectomies. This suggests that there is probably no anatomical reason necessitating removal of the spleen during gastric surgery, and with careful handling this added procedure can usually be avoided.

Procedures on the left kidney accounted for 25 of the incidental splenectomies, or 13.5%, and included 13 bilateral and 10 left nephrectomies, one biopsy, and one left renal exploration (Table 2). Three of the left nephrectomies were performed for malignant neoplasms,

* No figures available for war years, 1941–1946.

TABLE 3. *Type of Incision Used*

Midline, upper or long	95
Left rectus	30
Left paramedian	17
Upper transverse	9
Left subcostal	9
Right subcostal	8
Thoracoabdominal	6
Right rectus	4
Left flank	5
Left thoracotomy	1
Left transverse	1
Total	185

all others being done for benign disease including hydronephrosis, renal calculi, or end-stage renal disease. All bilateral nephrectomies were done through midline incisions, while of the three radical nephrectomies, two used a thoracoabdominal and one a paramedian approach. Rich *et al.*¹⁰ reported that 5% of all iatrogenic injuries to the spleen were associated with left nephrectomies, and Bozzell and Powell,¹ reviewing 63 operations on the left kidney, noted three splenectomies all associated with nephrectomies. We have included spleens removed for exposure as well as lacerations and, as noted, 16 of our nephrectomies used midline or thoracoabdominal incisions, which may have decreased exposure as compared to flank incisions. The four radical nephrectomies were accompanied by node dissections. Although comparative information for other series is not available, these factors may explain our higher incidence.

Eighteen incidental splenectomies were associated with hiatus hernia repair, for an incidence of 9.7% (Table 2). This is to be compared with 7% reported by Rich *et al.*,¹⁰ 11% in Devlin's series,⁴ and 28% in the study by Brown *et al.*² Of note is the fact that 5.9% of our incidental splenectomies accompanied vagotomy. While surgical manipulation in and around the esophagus for vagotomy is necessarily less than that for repair of a hiatus hernia, many of the maneuvers are similar, and attention to Weinberg's observation¹¹ regarding transabdominal vagotomies, that splenectomies "can be avoided if gauze packing is not used within the abdomen during the operation, and if the liver retractor is held properly so that it does not move to the left toward the spleen and its pedicle during exposure of the esophageal hiatus," may do much to reduce inadvertent splenic lacerations during hiatus hernia repair.

Left or transverse colon resections accounted for an additional 40 splenectomies, or 21.6% of those removed incidentally (Table 2). It is of interest that between 1932 and 1971, 274 "large bowel resections" (site not specified), 2,260 left, and 279 transverse colon resections

were performed.* If the 6 radical colon procedures involving elective splenectomies (Table 1) are excluded, the remaining 2,807 colectomies comprise the total experience from which the above 40 incidental splenectomies were recorded, giving an approximate incidence of 1.4%. Thus, as in the case of gastric resection, if proper respect is paid to the left upper quadrant during procedures involving the left colon, splenectomy is seldom necessary.

The majority of incidental splenectomies in our series is thus found in association with gastrectomy for peptic ulcer disease, left or transverse colon resections, nephrectomies, and hiatus hernia repair. The remainder are associated with 15 different operations, including exploratory laparotomy, adrenalectomy, pancreatic and esophageal surgery, abdominal aortic aneurysm resection, and one cholecystectomy. The latter emphasize the respect one must give the spleen even in procedures not involving the left upper quadrant.

The most frequently employed incision was the midline, either upper or long, used in 52.4% of the cases (Table 3); only half this number was noted for left rectus and left paramedian incisions. If this is not coincidental, then better access to the left upper quadrant is obtained through these latter incisions, reducing the need for splenectomy to facilitate exposure, and at the same time giving more control over the factors likely to cause lacerations of the capsule—traction on the lienophrenic ligament, traction on the lienogastric ligament, traction on the splenic flexure of the colon with avulsion of the lienocolic ligament, or splenic puncture—described by Peck and Jackson.⁸ Our findings, therefore, are not surprising, but point out the need for greater care in the exploration of the left upper quadrant through midline incisions.

Approximately 85% of the spleens removed incidentally were grossly and microscopically unremarkable (Table 4). Of the remainder the most frequent abnormality was hemosiderosis, noted in 10 cases. Incidental splenectomies, if not done for exposure, there-

* No figures available for war years, 1941–1946.

TABLE 4. *Pathological Diagnosis of Spleens Removed Incidentally*

Unremarkable	157
Hemosiderosis	10
Passive congestion	6
Extramedullary hemopoiesis	2
Lipid granulomata	2
Perisplenitis	2
Splenomegaly	2
Fibrosis and congestion	2
Nephroblastoma involving pancreatico-splenic ligament	1
Splenic artery aneurysm	1
Total	185

fore probably result from excessive manipulation of normal spleens rather than from an abnormal condition which makes them more friable or prone to laceration. Peck and Jackson⁸ similarly could find no morphological change of the spleen predisposing to rupture.

Postoperative deaths and complications are listed in Tables 5 and 6. There were 28 deaths among 185 incidental splenectomies, for a mortality of 15.1%. This is significantly higher than the operative mortality for these cases in the absence of splenectomy, for with few exceptions (total colectomy for toxic megacolon, repair of omphalocele, reduction of diaphragmatic hernia), all should be less than 10%. These 28 splenectomies included 19 removed for lacerations, nine which were felt to require drainage, 5 which resulted in accompanying injury to the distal pancreas, 4 which necessitated either a separate incision or extension of the initial incision, and 2 required reoperation for unrecognized bleeding. All, of course, prolonged the operating time.

In each of the 28 cases the exact contribution of the splenectomy to the operative death is difficult to assess. Reoperation is clearly a significant factor and, while prolonged ileus from the initial bleeding, persistent pancreatic drainage or left subphrenic abscess by itself was not established as a cause of death, in a case perhaps already complicated by other factors, the addition of any one of these problems may easily tip the balance.

A comparison of the operative mortalities of different series of incidental splenectomies shows our figure of 15.1% to be similar to others (Rich *et al.*,¹⁰ 10%; Zollinger *et al.*,¹³ 12.9%; Fabri *et al.*,⁵ 14.0%; Peck and Jackson,⁸ 18%). What increase is noted cannot be ascribed to an inherently higher mortality of the primary procedure, for the spectrum of operations in each series is similar. Nor can it be explained on the basis of operating conditions, patient population, or availability of diagnostic procedures, for all series were from large American university hospitals where these factors are rather uniform. The technical aspects of our 28 cases have been reviewed (Table 6), and indeed may explain what differences are observed. While this information is not available for other series, an increased frequency of drainage, more persistent attempts to repair lacerations, higher incidence of reoperation, or injury to contiguous organs may account for the 5.1% higher mortality over that reported by Rich *et al.*¹⁰

In addition to the 28 operative deaths, 64 complications were noted among 44 patients, including 6 cases of left subphrenic or subhepatic abscess and 7 thoracic complications (left pleural effusion, pneumonia, atelectasis). The latter most directly implicate the splenectomy, but many of the remainder including ileus, myocardial dysfunction, pulmonary embolus, and wound infection,

TABLE 5. *Complications Among Cases Involving Incidental Splenectomy*

Postoperative deaths	28	15.1%
Wound infection	15	8.1%
Left subphrenic/subhepatic abscess	6	3.2%
Ileus	4	2.2%
Left pleural effusion	4	2.2%
Congestive heart failure	3	—
Pulmonary embolus	2	—
RLL pneumonia	2	—
LLL pneumonia	2	—
Abdominal abscess (multiple)	2	—
Urinary tract infection	2	—
Dumping syndrome	2	—
Urinary retention	2	—
UGI bleeding	2	—
RUL atelectasis	1	—
Diabetes mellitus (difficulty in control)	1	—
Arterial occlusion rt. lower extremity	1	—
Myocardial infarction	1	—
Pancreatitis	1	—
Psychosis (steroid)	1	—
Atrial arrhythmias	1	—
Wound dehiscence	1	—
Aspiration pneumonia	1	—
LLL atelectasis	1	—
Esophagitis	1	—
Thrombophlebitis	1	—
Fecal fistula	1	—
RLL atelectasis	1	—
Pancreatic fistula	1	—
Hypercalcemia	1	—
Total		100.0%

while at sites distant from the left upper quadrant, nevertheless might be influenced by intra-abdominal bleeding, thrombocytosis, and the like accompanying splenectomy.

Thus, an overview of the postoperative course reveals it to be remarkable in 72 of 185 patients (44 patients with complications and 28 deaths) suggesting a rather significant contribution of the incidental splenectomy to the morbidity and mortality of these operations. This position is supported by others: Devlin *et al.*⁴ feels that removing the spleen because of accidental damage during surgical operations "adds considerably to the operative morbidity as estimated by postoperative sepsis, chest infection rates, and length of inpatient stay." Quan and Castleman,⁹ reviewing operative mortality among transthoracic gastrectomies with incidental splenectomies, noted "most (of the 18 mortalities) showed local thrombosis of the splenic vein from the site of ligation," and 5 cases demonstrated "more extensive involvement of the portal system." In 4, thrombosis had extended to intrahepatic branches to produce infarcts of the liver; . . . "in only one was death attributable to initial splenic vein thrombosis; the other 4 had multiple incomplete infarcts of the liver which, had death not occurred, might have produced symptoms of liver

TABLE 6. Postoperative Deaths for Procedures Involving Incidental Splenectomy

Primary Procedure	Drain LUQ	Reason for Splenectomy	Reoperation Required	Extension of Incision Necessary	Attempt to Repair Laceration	Injury to Other Organs	Time and Cause of Death
Total colectomy, Toxic Megacolon	Yes	Lac	No	No	No	Distal Pancreas	6 dys postop, coagulopathy
Renal Transplant	No	Exp	No	Yes**	No	No	4 dys postop, disseminated aspergillosis
Hiatus Hernia Repair	No	Lac	No	No	No	No	28 dys postop, perforated diverticula, bronchopneumonia
Subtotal Gastrectomy, Ca Antrum	Yes	Lac	No	No	No	Distal Pancreas	22 dys postop, myocardial infarction
Subtotal Gastrectomy, Bleeding Gastritis	Yes	Lac	No	No	No	No	1 dy postop, persistent UGI bleeding
Explor. Laparotomy for hemorrhagic pancreatitis	Yes	Lac	No	No	No	No	14 dys postop, hemorrhagic pancreatitis
Sigmoid Resection, Cecopexy, Sigmoid & Cecal Volvulus	Yes	Lac	No	No	No	Distal Pancreas	8 dys postop, RLL pneumonia
Bilateral Nephrect., Renal Transplant	Yes	Lac	Yes	No	No	Distal Pancreas	7 wks postop, subhepatic, subdia. abscess
Repair Gluteal Artery Aneurysm	Yes	Lac	Yes	No	No	No	11 dys postop, cardiopulmonary arrest
Repair Diaphragmatic Hernia	No	Exp	No	No	No	No	1 dy postop, UGI bleeding
Left Colectomy, Ca desc. Colon	No	Lac	No	No	Yes	Distal Pancreas	1 dy postop, gas bacillus infection
Resection Abdom. Aortic Aneurysm	No	Lac	No	No	No	No	7 dys postop, acute renal failure, pulmonary edema
Exploratory Lap., Ca Colon	No	Lac	No	Yes	Yes	No	9 dys postop, renal failure, metastatic ca
Hiatus Hernia Repair	No	Lac	No	No	No	No	1 dy postop, congestive heart failure
Aortofemoral Bypass	No	Lac	No	No	No	No	1 dy postop, thrombosed graft, shock
Vagotomy, Pyloroplasty	No	Exp	No	No	No	No	40 dys postop, broncho-pneumonia, left CVA
Bilateral Nephrectomy, Renal Transplant	No	Exp	No	No	No	No	16 dys postop, chronic renal failure
Subtotal Gastrectomy, Bleeding Gastritis	No	Lac	No	Yes	No	No	14 dys postop, persistent UGI bleeding, hepatic coma
Hiatus Hernia Repair	No	Lac	No	No	No	No	13 wks postop, congestive heart failure, inadequate small bowel function
Left Colectomy, Ca desc. Colon	Yes	Exp	No	No	No	No	1 dy postop, pulmonary embolus
Bilateral Nephrectomy, Renal Transplant	No	Exp	No	No	No	No	7 dys postop, chronic renal failure

* Lac: Laceration Exp: Exposure

** Second incision, left subcostal

TABLE 6. (Continued)

Primary Procedure	Drain LUQ	Reason for Splenectomy	Reoperation Required	Extension of Incision Necessary	Attempt to Repair Laceration	Injury to Other Organs	Time and Cause of Death
Vagotomy, gastroenterostomy, Bleeding Gastritis	No	Lac	No	No	No	No	6 dys postop, persistent UGI bleeding
Completion Total Gastrectomy, UGI Bleeding	Yes	Lac	No	No	No	No	3 dys postop, LLL pneumonia
Subtotal Gastrectomy	No	Lac	No	No	No	No	8 dys postop, septicemia
Repair Omphaloceol, Partial Hepatectomy	No	Exp	No	No	No	No	1 dy postop, cardiopulmonary arrest
Bilateral Nephrectomy, Renal Transplant	No	Exp	No	Yes**	No	No	42 dys postop, bacterial endocarditis, septic emboli
Completion Total Gastrectomy	No	Exp	No	No	No	No	1 dy postop, persistent UGI bleeding
Resection Abd. Aortic Aneurysm	No	Lac	No	No	No	No	9 dys postop, cardiopulmonary arrest

* Lac: Laceration Exp: Exposure

** Second incision, left subcostal

failure.” Zollinger *et al.*¹³ remarking on the initial series of incidental splenectomies at Ohio State University, concluded that despite a 12.9% mortality, “when similar major surgical procedures without splenectomy are compared with those in which splenectomy was done, there is no evidence that removal of the spleen increases the surgical mortality.” Fabri *et al.*⁵ with a subsequent review of 1,944 consecutive splenectomies from the same institution, extending Zollinger’s series, noted a 14% mortality and 44% morbidity for incidental splenectomy. They concluded that the addition of splenectomy to major surgical procedures plays a role in the morbidity and mortality beyond the anticipated risk for benign or malignant disease. Peck and Jackson⁸ similarly feel that “the addition of splenectomy increases the operative risk, protracts convalescence, and may contribute to postoperative mortality.” Others, however, have not had this experience. Ferguson *et al.*⁶ in their series of 100 cases of 50% gastrectomy with vagotomy, with three splenectomies, noted that “this additional procedure (splenectomy) did not seem to produce any untoward results . . .” and Calamel *et al.*³ discussing 3 deaths following surgery for UGI hemorrhage which involved iatrogenic laceration of the spleen, noted that none of these deaths, although the result of persistent postoperative bleeding, “were directly related to the splenic tear except for the general influence of mild to moderate hemorrhage and extension and prolongation of surgical operations.” Analysis of our series of patients supports the conclusion that the

incidental splenectomy does contribute significantly to the morbidity and mortality of the primary operation, and that without good reason this added procedure should not be lightly undertaken.

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