SCIENTIFIC PAPER

# Laparoscopic Splenectomy Coupled with Laparoscopic Cholecystectomy

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## ABSTRACT

**Background and Objectives:** The aim of this study was to evaluate the results of laparoscopic surgery performed for coexisting spleen and gallbladder surgical diseases.

**Methods:** Between May 2004 and October 2012, 12 patients underwent concomitant laparoscopic splenectomy and cholecystectomy. Indications for surgery included idiopathic thrombocytopenic purpura in 5 patients, hereditary spherocytosis in 4 patients, and thalassemia intermedia in 3 patients.

**Results:** The mean operative time was 100 minutes (range, 80–160 minutes), and the blood loss ranged from 0 to 150 mL (mean, 50 mL). The mean longitudinal diameter of the spleen was 14 cm. One patient required conversion to open procedure. An accessory spleen was detected and removed in one case. The mean length of hospital stay was 5 days. No deaths or other major intraoperative and/or postoperative complications occurred.

**Conclusion:** Provided that the technique is performed by an experienced surgical team, concomitant laparoscopic splenectomy and cholecystectomy is a safe and feasible procedure and may be considered for coexisting spleen and gallbladder diseases.

**Key Words:** Laparoscopic surgery, Laparoscopic splenectomy, Laparoscopic cholecystectomy.

## INTRODUCTION

After its introduction in 1991 by Delaitre and Maignien,[1] laparoscopic splenectomy has been widely performed for surgical removal of the spleen, especially in hematologic patients. Cholelithiasis is often associated with splenic hematologic disorders requiring splenectomy, and therefore concomitant laparoscopic cholecystectomy and splenectomy are sometimes indicated.

With the traditional open approach, splenectomy and cholecystectomy may be performed during the same operation, but a large abdominal incision may be necessary.

With improving experience in laparoscopic surgery, concomitant cholecystectomy and splenectomy have been proposed by the mini-invasive approach, but at this time, only a few reports have been published in the literature.[2–10]

In this study we evaluate the feasibility and the results of concomitant laparoscopic removal of the spleen and gallbladder in a series of 12 consecutive patients and report their results.

## MATERIALS AND METHODS

The charts of patients operated on with concomitant splenectomy and cholecystectomy between May 2004 and October 2012 were retrospectively reviewed. For the 38 patients operated on with concomitant splenectomy and cholecystectomy, we reviewed, when available, the following data: type of procedures (laparoscopic or open), indications, operative time, intraoperative blood loss, diameter of the spleen, conversion to open surgery for laparoscopic procedures, postoperative complications, and length of hospital stay. All of the previously mentioned data were available for this study in only 12 patients operated on with laparoscopic surgery.

The patients' data are shown in **Table 1**. There were 4 men and 8 women with a mean age of 29 years (range, 20–44 years). The indications for splenectomy were idiopathic thrombocytopenic purpura (5 cases), hereditary spherocytosis (4 cases), and thalassemia intermedia (3 cases). All patients showed associated symptomatic (5 cases) and asymptomatic (7 cases) noncomplicated gall-

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**Table 1.**
Preoperative Clinical Data

| | Data |
|---|---|
| Period of study | May 2004 to October 2012 |
| No. of patients operated on with concomitant laparoscopic splenectomy and cholecystectomy | 12 |
| Male/female ratio | 0.5 |
| Age (range) (y) | 29 (20–44) |
| Spleen longitudinal diameter (range) (cm) | 14 (10–20) |
| Indications | |
| Idiopathic thrombocytopenic purpura | 5 (41.6%) |
| Hereditary spherocytosis | 4 (33.3%) |
| $\beta$-Thalassemia | 3 (25%) |

bladder lithiasis, diagnosed by preoperative ultrasonography performed in all cases. Preoperative ultrasonography and/or computed tomography scan showed the longitudinal diameter of the spleen in all cases. The mean longitudinal diameter of the spleen, indicated by preoperative ultrasonography and computed tomography scan, was 14 cm (range, 10–20 cm).

The laparoscopic procedure was accomplished through the insertion of a Hasson trocar and 4 other trocars (three 5-mm trocars and one 12-mm trocar). With patients lying in the right lateral position with the left flank elevated about 30° above the operating table, the trocars were positioned in the subxiphoid region (5-mm trocar), above the transverse umbilical line in the left hypochondrium (Hasson trocar), in the left flank at the level of the transverse umbilical line (12-mm trocar), and in the left subcostal area in the anterior axillary line (5-mm trocar). An additional 5-mm trocar was introduced at the right subcostal line in the anterior axillary line (**Figure 1**). After introduction of the trocars, diagnostic laparoscopy and detection of accessory spleens were accomplished. Then, laparoscopic cholecystectomy was performed in the standard fashion, tilting the operating table to the left and in the anti-Trendelenburg position. Attention was taken not to damage the common bile duct, with division of the cystic duct at the junction with the gallbladder neck.[11]

The table was tilted in the right lateral position, and splenectomy was started. The procedure began with the division of the splenocolic ligament, followed by sectioning of the gastrosplenic ligament by means of the ultrasonic dissector. At this point, the splenic artery was usually recognized, mobilized, and double clipped to avoid bleeding during the following steps of the procedure. After division of the splenocolic and splenodiaphragmatic ligaments and complete dissection of the splenic hilum from the pancreatic tail, the splenic arteries and veins were secured with an endostapler. The spleen was then inserted in a plastic laparoscopic bag, which was pulled through the Hasson trocar site and removed after its fragmentation. The operation was completed by positioning of a drain in the left subdiaphragmatic region. In no case an additional drain was left in the subhepatic region.

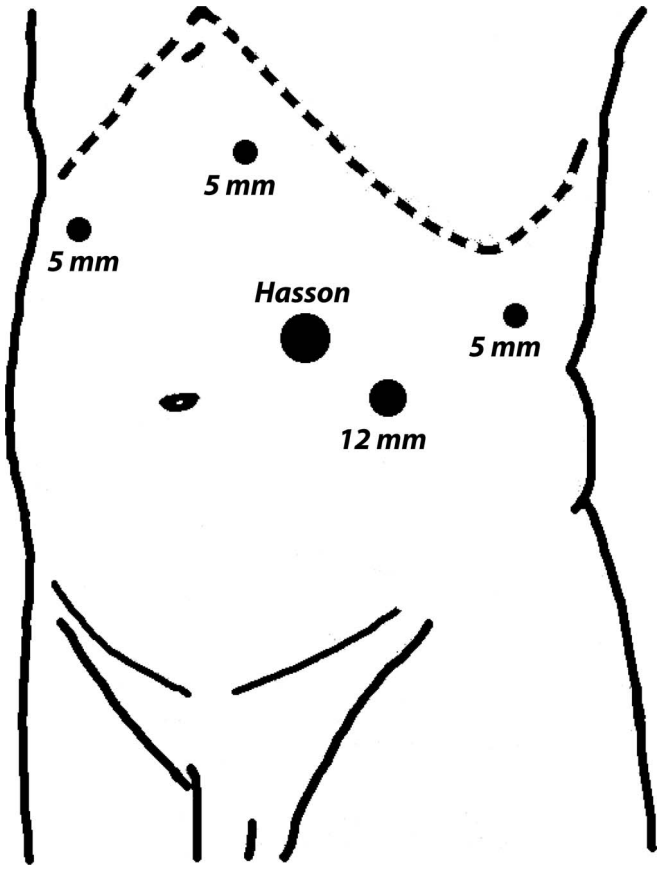


**Figure 1.** Trocar positions for combined laparoscopic splenectomy and cholecystectomy in our experience.

## RESULTS

The results of this series are summarized in **Table 2**. The mean operative time was 100 minutes, ranging from 80 to 160 minutes. Intraoperative blood loss in this series varied from 0 to 150 mL (mean, 40 mL). No patients required blood transfusion, and a platelet apheresis transfusion was

**Table 2.**
Results

| | Data |
|---|---|
| Mean operative time (range) (min) | 100 (80–160) |
| Mean intraoperative blood loss (range) (mL) | 40 (0–150) |
| Platelet apheresis transfusion | 1 patient (8.3%) |
| Conversion rate | 1 patient (8.3%) |
| Mean length of hospital stay (range) (d) | 5 (4–8) |

necessary only in one idiopathic thrombocytopenic purpura patient (8.3%). Conversion to open surgery was required in one patient (8.3%) because of lack of anatomic definition of the Calot triangle's structures. An accessory spleen was detected and removed in one case (8.3%). Patients were discharged from the hospital on day 5 (range, 4–8 days), without postoperative complications.

## DISCUSSION

Laparoscopic surgery, because of its well-known advantages, such as a faster return to workaday activity and minor trauma on the abdominal wall, has expanded quickly in many surgical specialties.[2] The innovation of laparoscopic procedures has enlarged the variety of general surgery procedures amenable to a minimally invasive approach.[2,3,12–16]

After the first case of laparoscopic splenectomy reported by Delaitre and Maignien,[1] this procedure has been widely adopted by surgeons in the management of hematologic diseases. Laparoscopic splenectomy is nowadays performed safely even in the presence of splenomegaly[17] and has become the gold standard for the treatment of elective hematologic disease of the spleen at several referral centers.[2,18–20]

Cholelithiasis is often associated with splenic disorders in patients who require splenectomy. However, only a few reports with significant numbers of patients[2,4,6–10] (**Table 3**) have been published in the literature on concomitant laparoscopic splenectomy and cholecystectomy.[3] Most of these reported series lack data related specifically to patients who underwent concomitant laparoscopic splenectomy and cholecystectomy. Knowledge of the data and results after concomitant laparoscopic splenectomy and cholecystectomy is, however, important to confirm the safety and feasibility of these combined procedures, especially to encourage the association of cholecystectomy and prophylactic splenectomy in patients with hereditary spherocytosis. It is interesting to know that not performing a prophylactic splenectomy during a cholecystectomy for cholelithiasis might result in an 18% rate of subsequent therapeutic splenectomy over the lifetime of these patients.

In the literature there is no standardization of the technique. Some authors perform cholecystectomy first whereas others perform splenectomy first,[7] and there is no standardization of the patient's position on the operative table or the number of trocars and their placement site.[2,4,6–10]

Yamagishi and Watanabe[12] reported their technique in which a 1-cm incision was made below the umbilicus and a 1-cm trocar was inserted to allow the introduction of the laparoscope. Three 5-mm trocars were placed in the subxiphoid and right and left subcostal regions. Then, the splenocolic and gastrosplenic attachments were divided and the main splenic hilum vessels were surgically stapled. After that, the short gastric vessels were clipped and sectioned, and the spleen was removed and was placed in a transparent bag that was tractioned from a 5-cm enlargement of the umbilical incision. Cholecystectomy was successfully performed in a standard laparoscopic fashion.

Sasaki et al[3] described their technique in which the laparoscopic splenectomy was commenced by first using a 4-trocar technique in the right semilateral position. The splenic hilar vessels were transected with a 45-mm endostapler. The retrieval bag was inserted directly through the left umbilical trocar incision after removal of the trocar, and the excised spleen then underwent morcellation with Pean forceps. One 2- or 5-mm trocar was added, and then a cholecystectomy was carried out in the supine position. A drain was placed in the left upper quadrant at the surgeon's discretion, when it was thought that the pancreatic tail might have been injured.

In the series of Nobili et al,[2] cholecystectomy was performed with the table placed supine and then the table was titled for splenectomy, performed in a semilateral position. In their experience, as well as that of other authors,[2,5,17] the use of 5 trocars provided the opportunity for dissection of the gallbladder and the spleen without difficulties and offered the surgeon a good view of the operative field. In the last 5 cases they were able to perform a combined 4-access approach. This new technique was not limited by the patient's age or physical characteristics or by the presence of splenomegaly, and the results are comparable with the 5-trocar techniques in terms of mean operative time, blood loss, need for conversion, and morbidity.

**Table 3.**
Concomitant Laparoscopic Splenectomy and Cholecystectomy: Review of Large Series in Literature

| Author | No. of Laparoscopic Cases | Indications | Technical Aspects | | | Complication Rate | Hospital Stay or Costs |
|---|---|---|---|---|---|---|---|
| | | | No. of Trocars and Sequence of Steps | Operative Time | Conversion Rate | | |
| Patkowski et al[4] | 16 | — | 5 trocars (cholecystectomy first) | 174 min (range, 135–270 min) | — | — | — |
| Corcione et al[6] | 12 | — | — | — | — | — | — |
| De Lagausie et al[7] | 16 | — | 5 trocars (splenectomy first) | — | — | — | — |
| Palanivelu et al[8] | 10 | — | 5 trocars (cholecystectomy first) | — | — | — | $6244 ($5713 for splenectomy alone) |
| Rescorla et al[9] | 10 | — | — | 131 min (range, 75–195 min) | — | — | — |
| Nobili et al[2] | 30 | Hereditary spherocytosis, 22 patients<br>Thalassemia, 4 patients<br>Idiopathic thrombocytopenic purpura, 4 patients<br>Sickle cell disease, 1 patient | 5 trocars (cholecystectomy first) | 150 min (range, 90–240 min) | 3.3% | 16.6% | 3.5 d (range, 2–11 d) |
| Park et al[10] | 11 | — | — | — | — | — | — |

In our series we performed cholecystectomy as the first step in all patients. The rationale is that the conversion rate during cholecystectomy is very low, and if conversion is reported during the following steps of splenectomy, a left subcostal incision could be performed, avoiding large abdominal incisions. This occurred in only one case in our series. In our opinion the use of 5 trocars offered the opportunity for dissection of the gallbladder and the spleen without difficulties and helped the surgeon by providing a good view of the operative field.

In our series cholecystectomy was performed without intraoperative and/or postoperative complications. This is probably related to the fact that we perform adequate dissection of the Calot triangle and accurate identification of the gallbladder–cystic duct junction, as well as the cystic duct–common bile duct confluence. We also always try to minimize tenting of the common bile duct, which can lead to its injury, laterally retracting the gallbladder's neck.

In our series the blood loss seems to differ from values reported in the literature and ranged from 0 to 150 mL (mean, 40 mL); in contrast, in the literature, it ranges from 10 to 700 mL.[2,3] Blood transfusion was required in 1 of 29 patients in the series of Nobili et al[2] and 0 of 9 patients in the series of Sasaki et al.[3] None of our patient required blood transfusion.

In our large series of laparoscopic splenectomies reported elsewhere,[13,18] the rate of bleeding responsible for conversion was very low. To lower the risk of bleeding during the following laparoscopic splenectomy step, after the division of the short gastric vessels, we usually isolate and double clip the main trunk of the splenic artery. The splenic vascular hilum is controlled by an endostapler, provided that the pancreatic tail has been isolated to reduce the risk of pancreatic injury.[18]

Data collected from the literature report a conversion rate ranging from 3% to 8%.[2,3,14] Our overall conversion rate was comparable with data reported in the literature because only 1 of 12 patients required conversion to an open procedure (8.3%). In our case the reason for conversion was lack of anatomic definition of the Calot triangle's structures.

Data from the literature report that the operative time for combined laparoscopic cholecystectomy and splenectomy ranges from 70 to 300 minutes.[2,3] With increasing experience, in our series the mean operative time was 100 minutes, ranging from 80 to 160 minutes. This is only 30 to 45 minutes longer than the mean operative time when splenectomy was performed alone in one of our previous series reported in the literature.[13,18]

The mean hospital stay in the literature ranged from 3.5 to 15 days.[2,3] In our series the hospital stay did not differ from these data, ranging from 4 to 8 days. Furthermore, the length of hospital stay was similar to that in our series of patients operated on by splenectomy alone.[13]

Portal vein thrombosis (PVT) is a severe complication after splenectomy, especially in patients with thrombocytosis, splenomegaly, and congenital thrombophilia disorders.[2–4,13] Various investigators have described PVT as a rare complication, and its true incidence in the literature is unknown because several asymptomatic cases are not diagnosed by a systematic imaging examination.[3,13] The more extensive use of radiologic imaging now seems to indicate that it probably occurs more often than earlier thought. A recent report showed that the incidence of post-splenectomy PVT is between 6.6% and 55%.[15] In laparoscopic surgery it seems that the incidence of PVT differs from the incidence reported after the open procedure because laparoscopic surgery might increase the risk of PVT developing because it reduces the blood flow in the portal system due to the pneumoperitoneum; however, on the other hand, it seems to be associated with fewer postoperative modifications of coagulation parameters and of fibrinolytic postoperative pathways than open surgery, thus preventing PVT itself.[16,21] In our series we reported no cases of PVT, as did Nobili et al,[2] whereas Sasaki et al[3] reported PVT in 2 of 9 patients (22%). The same authors reported in another series that postsplenectomy PVT occurred in approximately 9% of the 71 patients undergoing laparoscopic splenectomy alone.[3] According to them, there was no significant difference when the combined laparoscopic splenectomy and cholecystectomy was compared with the laparoscopic splenectomy alone. Perhaps the major incidence of PVT with the combined procedure is because of the longer operative time and therefore the longer exposure to the pneumoperitoneum.

## CONCLUSION

Provided that the technique is standardized and performed by a skilled surgical team, concomitant laparoscopic splenectomy and cholecystectomy could be a safe, feasible, and effective procedure for the treatment of several hematologic diseases. The technique can be performed without additional risks and therefore may be considered for coexisting spleen and gallbladder diseases.[2,3,20]

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