Hand-assisted Laparoscopic Splenectomy – Preliminary Experience in Southern Taiwan

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Background: A hand-assisted laparoscopic procedure allows the surgeon to insert the non-dominant hand into the abdomen, and helps to recover the tactile sensation. For a massively enlarged spleen, this technique overcomes difficulty in conventional laparoscopic splenectomy. The advantages of minimally-invasive surgery can still be preserved. We describe our preliminary experience in hand-assisted laparoscopic splenectomy.

Methods: The data of 5 patients who presented with splenomegaly and underwent hand-assisted laparoscopic splenectomy between April 2000 and January 2004 were reviewed retrospectively for analysis.

Results: The mean age was 45.4 ± 6.6 years, and the hospital stay was 6.6 ± 1.0 days. The splenic length and weight averaged 20.6 ± 5.9 cm and 1084.2 ± 647.8 g. The operative time and blood loss averaged 218.2 ± 40.2 minutes and 220 ± 166.1 ml. There was no conversion to open splenectomy. No mortality or morbidity was noted in our series.

Conclusion: Hand-assisted laparoscopic splenectomy is a safe and feasible procedure, even in our initial experience. It helps in exploration of the surgical field and handling of a fragile spleen, especially in patients with massively enlarged spleens. Although another incision is necessary, the advantages of laparoscopic surgery are still retained.

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Key words: hand-assisted laparoscopic splenectomy, splenomegaly, laparoscopic splenectomy

Before the era of laparoscopic surgery, surgeons performed open splenectomy (OS) through a subcostal incision with or without an upper midline extension. This was associated with a longer hospital stay and more postoperative comorbidity, because left lower lung atelectasis was a common complication after OS, and prolonged chest physical therapy was necessary. Postoperative pulmonary function following laparoscopic cholecystectomy proved better than open cholecystectomy because there were fewer small incisions than with a right subcostal incision.[1] With similar advantages, laparoscopic splenectomy (LS) is now thought to be a safe and feasible procedure,[2] and is accepted worldwide as a standard method to excise a normal-sized spleen.

Splenectomy is indicated in many hematological diseases, and splenomegaly usually presents in these patients. However, splenomegaly is traditionally

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considered a contraindication for LS.[3] The technical difficulties in manipulating an enlarged spleen with the use of instruments alone can lead to capsular tear and hilar injury, and conversion to open splenectomy may be necessary to achieve hemostasis. The hand-assisted system retains the advantages of minimally invasive surgery, and insertion of the hand enables the surgeon to obtain tactile feedback and facilitate exposure of the surgical field.[4] Controlling a huge, fragile spleen with hand assistance allows the procedure to proceed more easily. Thus, patients with splenomegaly are believed to be good candidates for this new technique.[5] The routine use of the hand-assisted technique is not necessary, but it is a bridge for the inexperience surgeon to advance to total laparoscopic splenectomy and is beneficial in patients with splenomegaly.[6,7]

Herein, we describe our preliminary experience in performing hand-assisted laparoscopic splenectomy (HALS) and removing the spleen through the hand-port incision in patients with splenomegaly.

METHODS

We retrospectively reviewed 5 patients, 3 men and 2 women, who underwent HALS at Chang Gung Memorial Hospital-Kaohsiung Medical Center between April 2000 and January 2004. The median age of these patients was 45.4 ± 6.6 years (range, 34–51 years). Splenomegaly was defined as an estimated splenic weight of >500 g or a splenic length >10 cm as measured by sonography or computed tomography scan. All patients were referred from the hematooncological department, and splenectomy was mainly indicated for hematological disorders. Splenectomy was indicated in 1 patient with hereditary spherocytosis, 1 with myelodysplastic syndrome, 2 with malignant lymphoma, and 1 with pseudotumor. Their symptoms included abdominal distension and mild orthopnea.

Surgical procedure

Under general anesthesia, patients were placed in the supine position with a 20-degree elevation on the left side. Laparoscopic splenectomy was performed as per the standard procedure. A left hand-assisted device (Omniport, Advanced Surgical Concepts Ltd., Ireland) was used. A 7–8 cm upper midline abdominal incision was made to create an airtight system allowing the introduction of the non-dominant hand of the surgeon into the abdominal cavity. This system allows the surgeon to manipulate the spleen and retract the colon and stomach during dissection of the splenic hilum. Three trocar portals were made, including a supraumbilical incision for the laparoscope and two left lateral incisions for instruments, at an appropriate distance from the subcostal margin (Fig. 1). The distance allows adequate space to manipulate the instruments. Carbon dioxide insufflation was maintained at a pressure of 12–14 mmHg. Mobilization of the spleen was carried out in a manner similar to that in open splenectomy, beginning with dissection and division of the splenocolic ligament with a harmonic scalpel, followed by gradual dissection and division of the gastrosplenic ligament. The splenic hilum was bluntly dissected along the pancreatic tail with the inserted hand. Care was taken to avoid damaging the pancreatic tail. The main splenic structures were transected with an EndoGIA vascular stapler (US Surgical, Norwalk, CT). Finally, the splenodiaphragmatic and splenorenal ligaments were dissected and divided. Thus, the spleen was totally free and ready for removal. The intact spleen was removed through the hand-port incision with minimal extension. A closed drain (Jackson-Pratt, Fortune Medical Instrument Corp., Taiwan) was implanted through the lateral trocar site. The fascia at the incision that was larger than 5 mm was sutured with Vicryl 1/0 and subcuticular skin closure was performed.

The nasogastric tube and the Foley catheter

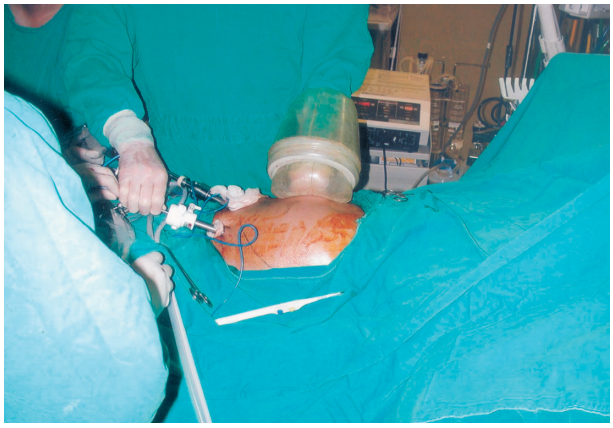

Fig. 1 Demonstration of the location of the trocar portals and the air-tight hand-assisted device.

were removed 24 hours after surgery. The drain was removed before discharge.

RESULTS

The surgical results of the 5 patients who underwent HALS are shown in Table 1. The median splenic weight was 1084.2 ± 647.8 g (range, 332–2106 g). The average splenic length was 20.6 ± 5.9 cm (range, 14–28 cm). No procedure was converted to OS. The average values of the parameters measured were as follows: operative time, 218.2 ± 40.2 minutes (range, 155–270 minutes); blood loss, 220 ± 166.1 ml (range, 50–500 ml); and length of hospital stay, 6.6 ± 1.0 day (range, 5–8 days). All spleens were removed intact through the hand-port incision with minimal extension when necessary. Seeding of the splenic tissue on the wound was not observed; the incision length ranged from 7 to 13 cm. No instances of mortality or postoperative complications were noted.

DISCUSSION

LS is a feasible and safe procedure for normal-sized spleens. The available literature indicates that LS is effective and advantageous in that it is associated with a shorter hospital stay, lower complication rate, and quicker recovery than OS.[8] Less pulmonary impairment in laparoscopic procedures may contribute to the preferred result.[3] For massive splenomegaly, the application of LS is controversial.[9-11] Large spleens are difficult to manipulate laparoscopically, and capsular tears and bleeding may occur in the fragile organ.[12] Targarona et al conducted a study in 69 patients who underwent LS and categorized them into 3 different groups on the basis of splenic weight (I ≤ 400 g; II = 400–1000 g; III ≥ 1000 g).[13] The results of the study revealed no significant differences in the complication rate between patients with different splenic weights (I = 12%; II = 33%; III = 30%) However, LS performed for spleens >2000 g in another study was associated with a high conversion rate, high degree of blood loss, and increased morbidity.[14] Thus, the definite threshold of splenic weight that warrants a surgical procedure has not yet been determined.

The application of the hand-port system enables the surgeon to receive tactile feedback and facilitates exposure and retraction in the surgical field during laparoscopic manipulation. Hand-assisted laparoscopic surgery is thought to be a suitable procedure for splenomegaly because the inserted hand helps manipulate the large mass and the hilar vessels. Several reports have indicated that HALS is associated with a shorter operative time and lower conversion rate than the traditional laparoscopic splenectomy in cases of splenomegaly.[15,16] The percentage of patients with postoperative pulmonary dysfunction according to surgical incision was reported as a sequence of upper midline > subcostal > lower midline.[17] The hand-port incision is relatively smaller

Table 1. Perioperative Data of HALS Patients

	Sex	Age	Diagnosis	Length (cm)	Weight (g)	OP time (minute)	Blood loss (ml)	Length of stay (day)
Patient 1	F	51	Anaplastic large cell lymphoma	14	541	215	250	8
Patient 2	M	34	Myelodysplastic syndrome	28	1500	200	500	6
Patient 3	M	50	Mantle cell lymphoma	27	2106	270	250	5
Patient 4	F	42	Hereditary spherocytosis	19	942	155	50	7
Patient 5	M	50	Spleen inflammatory pseudotumor	15	332	251	50	7
Mean ± SD		45.4 ± 6.6		20.6 ± 5.9	1084.2 ± 647.8	218.2 ± 40.2	220 ± 166.1	6.6 ± 1.0

Abbreviations: HALS: hand-assisted laparoscopic splenectomy; OP: operative.

than the traditional upper midline wound or subcostal wound with or without midline extension for splenectomy. HALS preserves the laparoscopic advantage of minimal invasiveness, and causes less pulmonary impairment than OS. So, it is considered a well-established procedure for splenectomy in massively enlarged spleens.[18,19]

In our preliminary experience, we found that splenectomy could be performed safely with a hand-assisted laparoscopic procedure for splenomegaly, even with splenic weights > 2000 g. With the assisted hand to retract and expose, the EndoGIA stapler can be applied to the hilar vessels appropriately. Injury to the adjacent organs can also be reduced by protection with the inserted hand. No conversion to an open procedure was required in our series. Because we selected patients with splenomegaly, a longer operative time and more blood loss were found compared with OS in our experience. But all the patients recovered well, and no mortality or morbidity was noted.

Table 2 demonstrates published reports and the present results.[4,6,15,20] The operative time in this study was not much longer than that in the other series. This procedure was not very difficult and could be performed step by step in the initial experience, and the results were satisfactory. There was no mortality. The conversion rate with massively enlarged spleens ranged from 5 to 37% in the other studies compared with no conversion to open procedure in this study. The splenic weight was considered to be correlated not only with the conversion rate but also with the incidence of morbidity. With these favorable results, the hospital stay in this study was longer; we expect that this is because the Taiwan national healthy insurance system allows longer hospitalization than systems in other countries.

Most surgeons morcellate the specimens by ringed forceps or a morcellator and remove the spleen piece by piece.[21] We believe that the intact spleen is a better specimen for the pathologist, who can examine the margin and make an accurate diagnosis in the presence of malignant disease. Therefore, we removed the intact spleen through the incision which was created for the hand-port system. In all cases of splenomegaly, the spleens were removed successfully after extending the incision if necessary. The extension is limited, so it doesn't diminish the advantage of HALS. By careful manipulation and wound protection, no splenic rupture or disease spread occurred in our cases.

Conclusion

LS is a safe and effective procedure in splenic disease, and the procedure is well established in Taiwan. The application of the hand-port assisted system facilitates better exposure of the splenic hilum in laparoscopic procedures and lowers the conversion rate. In particular, this procedure is appropriate for patients with massive splenomegaly or a good bridge for an inexperienced surgeon to advance to a total laparoscopic procedure. Although an additional incision is needed, the advantages of laparoscopic surgery can still be preserved. In our preliminary experience, the enlarged spleen can be

Table 2. Published Reports on Hand-assisted Laparoscopic Splenectomy for Splenomegaly

First author (year)	N	Operative time (minutes)	Conversion	Morbidity	Hospital stay (days)	Splenic weight (g)
Litwin (2000)	8	177 ± 33	37%	12%	4.7 (2-9)	NA
Hellmann (2000)	7	133 (110-115)	14%	28%	7 (5-13)	4200 (3500-5800)
Targaroma (2001)	20	135 (85-270)	5%	10%	4 (2-15)	1753 (700-4500)
Borrazzo (2003)	16	240 (165-360)	0%	0%	3.3 (2-7)	2008 (543-4090)
Lee (2009)	5	218 ± 40 (155-270)	0%	0%	6.6 (5-8)	1084 (332-2106)

Abbreviation: NA: not available.

excised and removed intact through the incision, with favorable outcomes.

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手助式腹腔鏡脾臟切除手術──南台灣的經驗

李韋鋒 吳世重 楊志權 陳肇隆 王植熙

前 言： 手助式腹腔鏡手術允許手術者將一隻手伸入腹腔內，同時維持氣腹的狀態並重獲得回饋力的感覺。對於脾臟腫大的病患而言，手助式裝置的使用克服了傳統腹腔鏡脾臟切除手術的困難性。微創手術較少侵襲性及較快恢復的特性仍可以被保留。我們在此發表藉由這樣的技術切除脾腫大病患完整脾臟的經驗。

方 法： 我們收集自 2000 年 4 月至 2004 年 1 月期間於本院接受手助式腹腔鏡脾臟切除手術的病患資料進行分析。五位病患都有脾臟腫大的情形。

結 果： 手助式腹腔鏡脾臟切除手術的五位病患，平均年紀爲 45.4 ± 6.6 歲、平均脾臟大小爲 1084.2 ± 647.8 克重及 20.6 ± 5.9 公分長、平均手術時間爲 218.2 ± 40.2 分鐘、平均失血量爲 220 ± 166.1 毫升，平均於手術後第 6.6 ± 1.0 天出院。沒有病患轉換爲開腹脾臟切除手術，沒有術後併發症或是死亡發生。五位病患的脾臟都經由手助式裝置的腹壁切口完整取出。

結 論： 手助式腹腔鏡脾臟切除手術是相當安全的步驟，特別是對脾腫大的病患。相對於開腹脾臟切除術，它還保有腹腔鏡手術恢復快的優點。

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關鍵詞： 手助式腹腔鏡脾臟切除手術，脾臟腫大，腹腔鏡脾臟切除手術

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