## ORIGINAL ARTICLE

# PREOPERATIVE SPLENIC ARTERY EMBOLIZATION IN HAND-ASSISTED LAPAROSCOPIC SPLENECTOMY FOR MASSIVE SPLENOMEGALY: OUTCOME ANALYSIS

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## Abstract

**Aim:** We tried to evaluate the role of preoperative splenic artery embolization (SAE) with hand-assisted laparoscopic splenectomy (HALS) in massive splenomegaly.

**Methods:** This study was conducted for patients who underwent HALS with preoperative SAE at Surgery and Radiology Departments, Minia University Hospital between March 2008 and March 2010. Patients with craniocaudal spleen length at least 20 cm on preoperative imaging using ultrasonography were included. Data collected included patient characteristics, diagnosis, operative details, conversion to open procedure, spleen weight from the pathology report and postoperative complications. The patients underwent abdominal ultrasound on postoperative days 7 and 30 to screen for splenic vein thrombosis (SVT) and portal vein thrombosis (PVT). All patients were followed up for 6 months postoperative.

**Results:** Seventeen patients fulfilled criteria for massive splenomegaly. Mean spleen length was 20.4+3.2 cm. Mean spleen weight was 1512+15.1. SAE was successfully performed in all patients. Mean operative time was 123.2+20.1 min. Mean hospital stay was 2.2+0.4 days. Severe blood loss occurred in one patient (5.9%) requiring intraoperative conversion to open splenectomy. Mean blood loss was 214+62.3 ml. Rate of postoperative complications was 17.6%.

**Conclusions:** HALS after preoperative SAE for massive splenomegaly is feasible, safe procedure reducing conversion rate without increasing postoperative morbidity.

**Keywords:** Huge spleen, Laparoscopy, Portal vein thrombosis, arterial embolization.

## INTRODUCTION

Significant improvements in the management of various abdominal conditions have recently brought about by laparoscopic procedures, including the removal of solid organs.[1] Laparoscopy splenectomy (LS) for adults was first reported in 1991[2] and for children in 1993.[3] Since this date, LS for normal-sized spleens have become safe and feasible procedure and replacing largely the open approach.[4,5] However, challenge still exists regarding its application in cases of massive splenomegaly[6-8] due to limited working space, difficult retrieval of spleen and increased risk of bleeding.[9] Reports demonstrate high conversion rates, perioperative transfusion rates and postoperative morbidity.[7,10,11] However, open

splenectomy for massive splenomegaly also associated with significant morbidity and mortality.[12,13] Selective splenic artery embolization (SAE) has been proposed to diminish the danger of perioperative bleeding.[14] Several studies reported reduction in both intraoperative blood loss and operative time with use of SAE before LS.7,[15,16] In this study, we describe our institutional experience in LS for massive splenomegaly using preoperative SAE.

## PATIENTS AND METHODS

This study was conducted for patients who underwent HALS with preoperative SAE at Surgery and Radiology Departments, Minia University Hospital between March 2008 and March 2010.

### *Patient demographic data*

Patients were included in the study were 18 years or older. They underwent preoperative SAE before LS and had a craniocaudal spleen length at least 20 cm on preoperative imaging using ultrasonography. Data collected included patient characteristics, diagnosis including spleen length, operative details including blood loss and conversion to open procedure, spleen weight from the pathology report and postoperative complications. The radiologist performed the SAE procedure the morning of surgery. Gel foam was used to perform SAE (Fig. 1, 2).

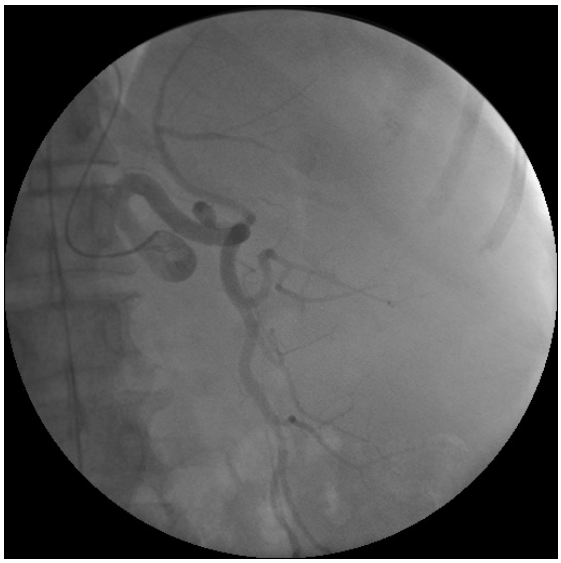

***Fig 1. Arterial phase of splenic artery angiography shows branches and the course of the splenic artery.***

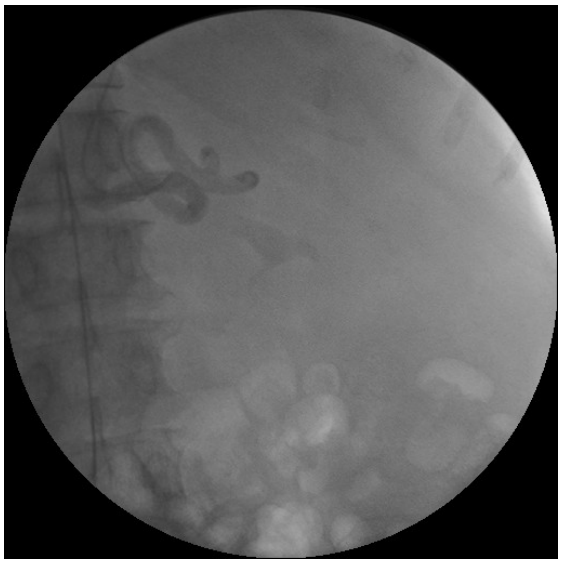

***Fig 2. Splenic artery angiography after embolization.***

### *Technique of Laparoscopic splenectomy[17,18]*

The patient was in a modified right lateral position. The operating table was flexed to expose the region between the iliac crest and left costal margin. A 12-mm trochar between the umbilicus and the left costal margin, two 5-mm trochars to the left of midline along the costal margin and 12-mm trochar in the left anterior axillary line below the costal margin were placed. A 10-mm, 30° laparoscope was used. The splenic flexure of the colon was mobilized. The short gastric vessels were divided with Harmonic scalpel. Phrenosplenic attachments were left intact to prevent torsion of the spleen. Then the spleen was retracted toward the abdominal wall to allow good visualization of the splenic hilum and the tail of the pancreas. The splenic hilum then was divided with the endo-GIA stapler. Division of the remaining Phrenosplenic attachments and splenorenal ligament was completed. The spleen was then retrieved through an 8- to 10-cm left upper paramedian muscle splitting laparotomy incision to allow for hand-assisted splenectomy (HALS).

The patients underwent an abdominal ultrasound on postoperative days 7 and 30 to screen for splenic vein thrombosis (SVT) and portal vein thrombosis (PVT). All patients were followed up for 6 months postoperative.

***Study definition:*** Craniocaudal length was chosen as the most reliable measurement to assess the size of the spleen. Craniocaudal spleen length exceeding 20 cm and spleen weight exceeding 1 kg define massive splenomegaly as in the literature.[7,10,19]

## RESULTS

Seventeen patients fulfilled the criteria for massive splenomegaly (spleen length>20 cm). These patients included 8 men and 9 women with a median age of 47 years (range, 19–77 years) Table 1. Treatment indications for splenectomy are listed in Table 2. The majority of our patients had hypersplenism secondary to cirrhosis Table 2. The mean spleen length was 20.4+3.2 cm. The mean spleen weight was 1512+15.1. SAE was successfully performed in all patients. HALS approach was used for all patients. The mean estimated blood loss was 214+62.3 ml. Severe blood loss occurred in one patient (5.9%) requiring an intraoperative conversion to open splenectomy. The median interval from SAE to LS was 3 h (range, 1.5–21 h). The mean operative time was 123.2+20.1 min. The mean hospital stay was 2.2+0.4 days. The rate of postoperative complications in this study was 17.6%. The complications included minimal pleural effusion in one patient, DVT in one patient and paralytic ileus in one patient. All these patients were managed conservatively Table 3. Routine postoperative abdominal ultrasound examinations revealed SVT in four patients (23.5%) without clinical findings and PVT in one patient (5.9%) who presented with moderate ascites. No mortality was recorded during the follow up period.

**Table 1. Patients and operative characteristics.**

| | |
|---|---|
| Age (y, mean±SD) | 32±13.5 |
| Sex (M / F) | 8 / 9 |
| Craniocaudal spleen length (cm, mean±SD) | 22.4±3.2 |
| Spleen weight (gm, mean±SD) | 1512±15.1 |
| Operating time (min, mean±SD) | 123.2±20.1 |
| Blood loss (ml, mean±SD) | 214±62.3 |
| Conversion to open (no, %) | 1 (5.9) |
| Hospital stay (d, mean±SD) | 2.2±0.4 |

| Diagnosis | Patients |
|---|---|
| Hypersplenism secondary to cirrhosis | 13 (76.4) |
| Lymphoma | 2 (11.8) |
| Myeloproliferative disorder | 1 (5.9) |
| Splenic cyst | 1 (5.9) |

**Table 3. Postoperative complications.**

| Complication | No. of patients (%) |
|---|---|
| Pleural effusion | 1 (5.9) |
| Deep venous thronbosis | 1 (5.9) |
| Ileus | 1 (5.9) |

## DISCUSSION

The clinical value of preoperative SAE in laparoscopic splenectomy has been shown in many studies.[15,16,20] In this study, we found that the use of HALS is safe and feasible for massive spleens with low conversion rates and low complication rates.[5,21-25] We found that the use of preoperative SAE to HALS for massive splenomegaly decreased operative time, blood loss and rate of conversion without increase in morbidity compared with previous reports.[21,22,24] On the other hand, LS for massive splenomegaly remains controversia[l8,10,26] with high conversion rate and postoperative morbidity.[6] The overall morbidity of 17.6% in our study is lower than the rates in other studies that did not use preoperative SAE, for example, 26% in the series of Reso et al,[9] 30% in the series of Owera et al[19] and 28% in the series of Targarona et al.[25] Conversion to open in our study occurred in one patient (5.9%) due to intraoperative bleeding comparable to rates ranging from 6.6 to 18% in other studies.[10,19] With the use of preoperative SAE, Poulin et al[8] reported a conversion rate of 17%. Estimated blood loss in this study was 214+62.3 ml. It was reported that preoperative SAE can reduce intraoperative blood loss and the need for perioperative transfusion in open splenectomy for splenomegaly.[20,27] Poulin et al[8] concluded that SAE is not necessary in LS for spleens shorter than 20 cm. In our study, the mean operative time for HALS was 123.2+20.1 minutes which is less than that reported in previous studies using LS.[21-24,25] PVT occurred in 5.9% in our study compared to 8% by Winslow et al,[5] 4% by Patel et al,[6] 5% by Pietrabissa et al[28] and 12.5% by Stamou et al.[29] The patients in our studies underwent routine ultrasound examination on postoperative days 7 and 30. We identify four patients with SVT (23.5%) without clinical findings and one patient with PVT (5.9%). This was comparable to results by Reso et al[9] who reported 27% SVT and 15% PVT. Our findings are, however, limited due to small sample size in our study. In Conclusion: HALS after preoperative SAE for massive splenomegaly is a feasible, safe procedure and has the advantage of reducing the conversion rate without increasing the postoperative morbidity.

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