The fate of scarless surgery: a prospective randomized controlled study

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Background
Single-incision laparoscopic surgeries (SILS) promised improved cosmetic results and less postoperative pain, allowing early return to work, and although the first single-incision laparoscopic cholecystectomy (SILC) was described in 1997 by Navarra and colleagues this technique has spread slowly and its adoption was met with reluctance. One of the main problems was concern about its safety, for example, as regards common bile duct injuries in cholecystectomy.
Aim
Evaluation of feasibility, safety, and benefits of SILC and splenectomy.
Patients and methods
As regards cholecystectomy, 40 consecutive patients with gallbladder disease were included. Twenty patients were subjected to SILC and 20 controls were subjected to conventional laparoscopic cholecystectomy. As regards splenectomy, 26 consecutive patients with indication for splenectomy were included. Thirteen patients were subjected to single-port laparoscopic splenectomy and 13 control patients were subjected to conventional laparoscopic splenectomy. All cases were performed at Cairo University, Cairo, Egypt.
We compared those techniques for feasibility, safety, operative time, technical difficulties, complications, conversion rates, postoperative pain, duration of hospital stay, and finally, the aesthetic satisfaction.
Results
In the first cholecystectomies, no mortality was reported. Operative time of SILC was considerably longer (100.56 ± 44.8 min) compared with multi-incision laparoscopic cholecystectomy (MILC) (72.21 ± 32.2 min) and it inflicted a physical and mental toll on the operating surgeon. Concerning technical difficulties, gas leak was a problem with SILC occurring in 40% of our cases. Common bile duct injury occurred in one case with SILC and right hepatic artery injury in another case. One case was converted from SILC to MILC and another from SILC to open laparotomy. Pain in SILC was lower than in MILC, and this had resulted in a shorter hospital stay. The men hospital stay was 1.8 days in SILC and in MILC it was of 2.4 days. Port-site hernia was reported in one case in the SILC group. Patient satisfaction was highest in the SILC group.
For single-port laparoscopic splenectomy, no mortality was reported. Mean operative time was 145.76 min. Two cases required an additional assisting port. Average hospital stay was 4 days. Patient satisfaction was also very high.
Conclusion
SILS was found to be very demanding, inflicting a huge physical and mental toll on the operating surgeon. The SILS specialized instruments helped but did not solve the problem and increased the cost of practice. On the other hand, the technique do offer better aesthetic results and causes less postoperative pain, which reflects in a shorter hospital stay. More importantly, we believe that SILS will pave the way for the next step in the evolution of scarless surgery.

Keywords:
cholecystectomy, minimally invasive, scarless, single-incision, single-port, splenectomy

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Introduction

Innovation in surgery is an important aspect of ensuring improvement in both quality of health-care delivery and enhancement in surgical technology [1]. The development of laparoscopic surgery in the early 1990s has been heralded as one of the most

important advances in surgery, providing patients with the benefits associated with reduced tissue trauma [2]. The important advantages of laparoscopy result from preservation of the integrity of abdominal wall, including less operative trauma and complications; thus, the incidence of wound infections and incisional hernias, of which especially obese patients are affected has decreased greatly. After laparoscopic procedures, cosmetic results are much better compared with traditional operations. Postoperative pain is reduced, which results in faster mobilization and a lower number of immobilization-associated complications, such as venous thrombosis and pulmonary embolism and shorter hospital stay [3,4].

Several attempts have been made to reduce operative trauma further by decreasing the number and size of the trocars used in the procedure [5–7]. Then came the introduction of single-incision laparoscopic surgeries (SILS) [8–10], a step towards even less invasive surgical procedures [11,12].

Aim

Evaluation of feasibility, safety, benefits, and limitations of single-incision laparoscopic cholecystectomy (SILC) and splenectomy compared with conventional laparoscopic technique.

Patients and methods

This prospective randomized controlled study was conducted on 40 consecutive patients with gallbladder disease indicated for cholecystectomy and 26 consecutive patients with indication for splenectomy. It was conducted at Cairo University Hospital, Egypt between January 2017 and February 2018. All patients signed an informed consent before the surgeries. Patients excluded from this study included unwilling patients, pregnant women, and patients with comorbidities that may render laparoscopic surgery hazardous or those who had a previous upper abdominal surgical procedure. This research was performed at the Department of General Surgery, Cairo University Hospitals. Ethical Committee approval and written informed consent were obtained from all participants.

Concerning those who underwent cholecystectomy, 20 patients were subjected to SILC and 20 controls were subjected to multi-incision laparoscopic cholecystectomy (MILC). The SILC procedures were performed using the SILS Port System (Covidien, MN, Minnesota, USA) and the GelPoint system (Applied Medical, Santa Margarita, CA, USA) mainly in addition to an array of specialized instruments designed specifically for the SILS technique.

We assessed the SILS techniques for feasibility, safety, operative time, and occurrence of technical problems such as gas leak, occurrence of complications either intraoperative as hemorrhage and visceral injury or postoperative as wound infection, conversion rates, postoperative pain intensity, duration of hospital stay, and finally, the aesthetic results. Also, all our patients were followed up for a period of 4 months postoperatively to detect any late postoperative complications as port-site hernias.

Operative technique for single-incision laparoscopic cholecystectomy

The technique followed to carry out the procedure no matter what single-access device used was almost the same. The only main difference was with installing the access device. We have put to test the 'SILS Port' together with their Roticulator line and their SILS Hand instrument line and the 'GelPoint' with their line of curved instruments.

So, after installing the access device and establishing pneumoperitoneum, which was maintained at 10–14 mmHg according to the patient's BMI, a 5-mm 30° or 45° long scope was introduced through one of the openings in the Port-System. The fundus of the gallbladder was grasped and pushed cephalad to expose the triangle of Calot. The infundibulum was laterally retracted using a Roticulator grasper. Subsequently, good exposure of the triangle of Calot was obtained and the critical view was achieved. The dissection was done using a monopolar hook and a Roticulator Maryland. The cystic artery and duct were first dissected and then separately clipped with a standard 5-mm clip applicator. Then the gallbladder was pushed upright and dissected free from the liver by means of the monopolar hook. Once the gallbladder was free from adjacent tissues, an exploratory sweep was performed to ensure good hemostasis and then the gallbladder was extracted together with the Port-System. No drain was placed. The umbilical fascia was closed using 2/0 absorbable Vicryl sutures, and the natural scar of the umbilicus was restored using 3/0 subcuticular stitches.

Operative technique for multi-incision laparoscopic cholecystectomy

Those who served as the control group and their cholecystectomies have been done according to the classic four-port American variable.

Operative technique for single-port laparoscopic splenectomy

All single-port laparoscopic splenectomy (SPLS) cases were carried out using the 'GelPoint' with their line of curved instruments. Patients were adjusted in the French position with the patient supine

making a 15° head-up tilt and a left upward tilt of about 30°. The operating surgeon stood between the legs and the cameraman on the right of the patient. The splenic flexure of the colon was fully mobilized allowing access to the lesser sac exposing the hilum, making it convenient to proceed. The splenic artery was controlled at the upper border of the pancreas with insertion of hemoclips. Using the LigaSure device (Covidien, Boulder, Colorado, USA), the gastrosplenic ligament was divided, including the short gastric vessels. The splenorenal ligament was then divided leaving only the superior most portion of the splenophrenic ligament intact. Next, the hilum of the spleen was secured with a laparoscopic stapling device. The spleen was then placed into a laparoscopic bag and brought out through the umbilical wound. The spleen was fragmented using an artery forceps and extracting it in a piecemeal way (not morcellated) keeping it in large parts to be easily pathologically assessed for any disease. The abdomen was reinsufflated and the surgical field was inspected for hemostasis. The Port-System was then extracted and the abdomen deflated. No drain was placed. The umbilical fascia was closed using 2/0 absorbable Vicryl suture, and the natural scar of the umbilicus was restored using 3/0 subcuticular stitches.

Results

In SILC, the 40 patients included in our study were divided into two groups. Group A included the 20 patients subjected to SILC and group B included the other 20 patients subjected to MILC as controls. Regarding the patient demographics, there was no significant difference between the two groups that may has interfered with our results in the end (Table 1).

Concerning the operative time, at the beginning of the learning curve for SILC, it was considerably longer but as the learning progressed, the curve sloped down and the operative time decreases (Fig. 1). However, there was a significant difference between the two groups (*P*=0.001) (Table 2).

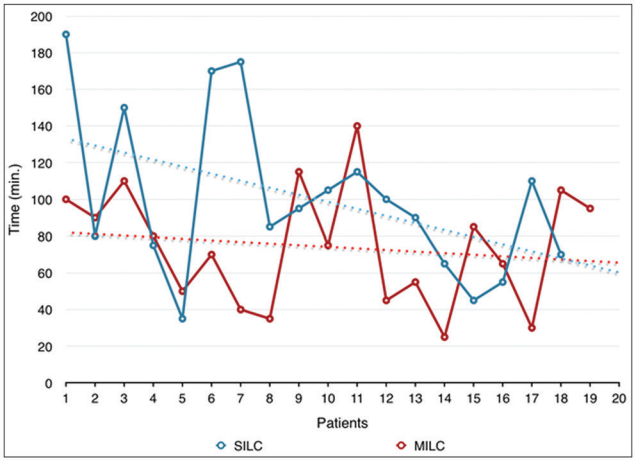
Concerning technical difficulties, we experienced gas leak in nine of our SILC cases resulting in prolongation of the operative time. On the other hand, that issue was absent in the MILC series (Fig. 2).

Concerning structural injuries, as regards the common bile duct (CBD), it occurred in one case in the SILC group. As for vascular injuries, the right hepatic artery was injured in another case also in the SILC group. On the contrary, no injuries were reported in the MILC group (Fig. 3).

Regarding the outcome, in the SILC group, two (10%) cases recorded a failure. One case was converted to MILC to deal with CBD injury. The other case was converted to open laparotomy due to injury of the right hepatic artery (Fig. 4).

Regarding postoperative pain, we used the numerical rating scale with a 10-point score range from 'no pain' (1) to 'worst possible pain' (10). Postoperative pain analyses showed significant difference between the three groups postoperatively, early (*P*=0.000) (Fig. 5) and late (*P*=0.000) (Fig. 6).

Figure 1



Operative time and progression of the learning curve.

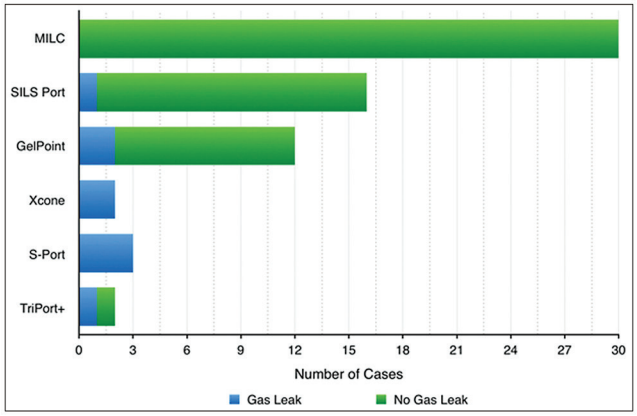
Table 1 Ages of patients included in our study

	Groups		
	Single-incision	Conventional	Total
Age (years)			
Number of cases	20	20	40
Mean	36.15	36.85	36.50
SD	11.681	8.810	10.218
Minimum	21	21	21
Maximum	64	58	64
Median	34.00	33.50	34.00

Table 2 Operative time parameters (in min)

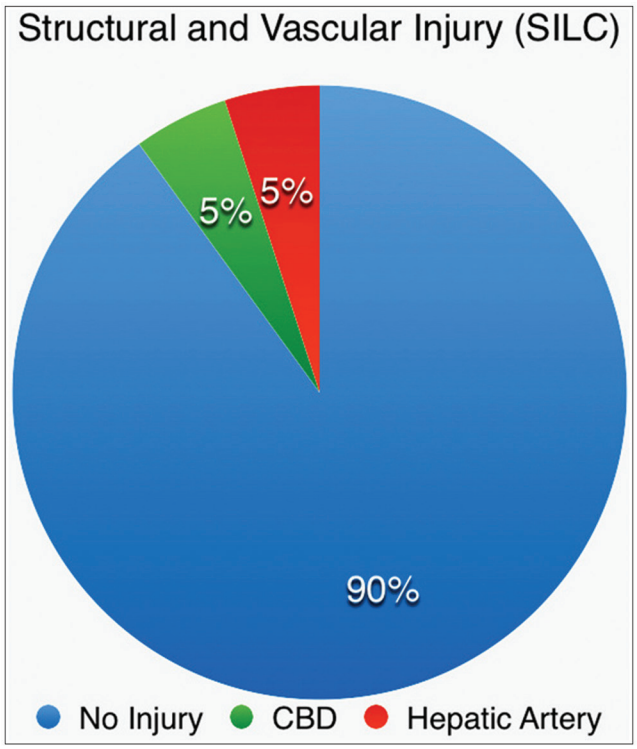
	Groups		
	Single-incision	Conventional	Total
Operative time (min)			
Number of cases	18	19	37
Mean	100.56	74.21	87.03
SD	44.882	32.243	40.611
Minimum	35	25	25
Maximum	190	140	190
Median	92.50	75.00	85.00

Figure 2



Gas control in relation to access devices.

Figure 3



Structural and vascular injuries.

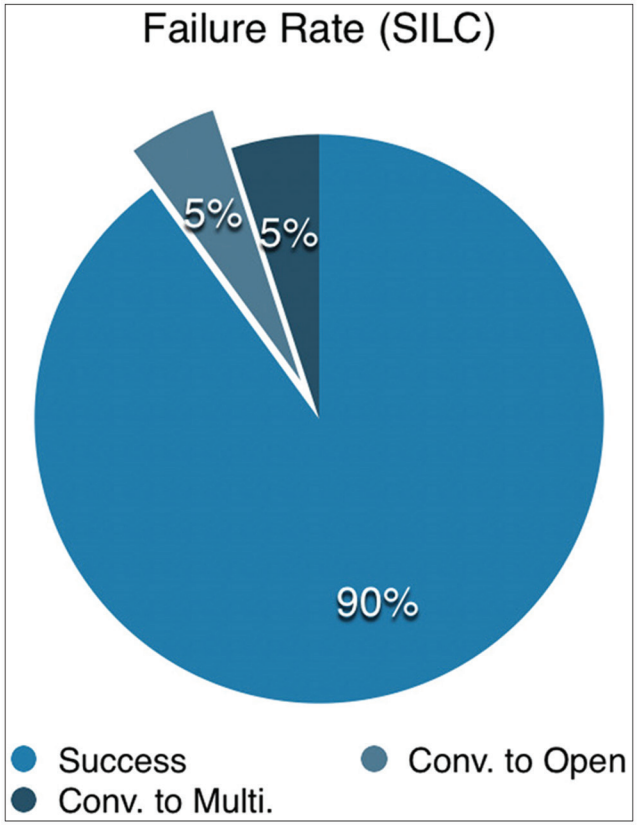
This has translated into lower analgesic demands for the SILC patients, early postoperatively (*P* value for the intravenous analgesic demand=0.013) and during the follow-up (*P* value for the oral analgesic demand=0.035) (Figs 7 and 8).

Regarding the duration of postoperative hospital stay, it was quite shorter for the SILC group in comparison to the MILC group. However, that was statistically insignificant (*P*=0.065) (Table 3, Fig. 9).

As for port-site hernias, only one case came presenting with a port-site hernia in the SILC group during the follow-up. However, that was statistically insignificant (*P*=0.381).

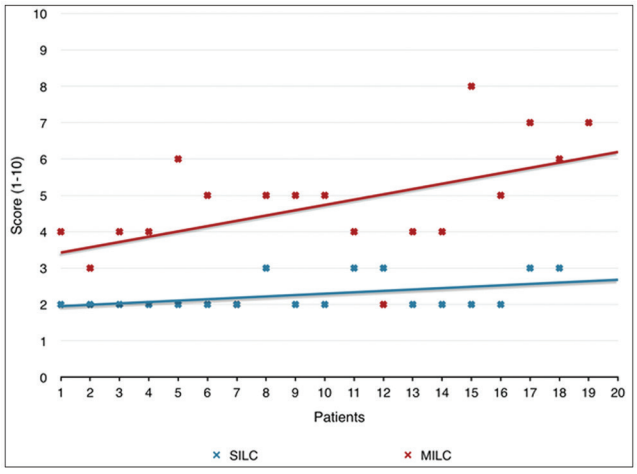
As for wound infection, there was a significant statistical difference between the two groups (*P*=0.020). In the MILC group, six (32%) cases came presenting with wound infection during the follow-up period (Fig. 10). Four of them were at the epigastric port-site. On the other hand, no cases of wound infections were reported in the SILC group during the follow-up period.

Figure 4



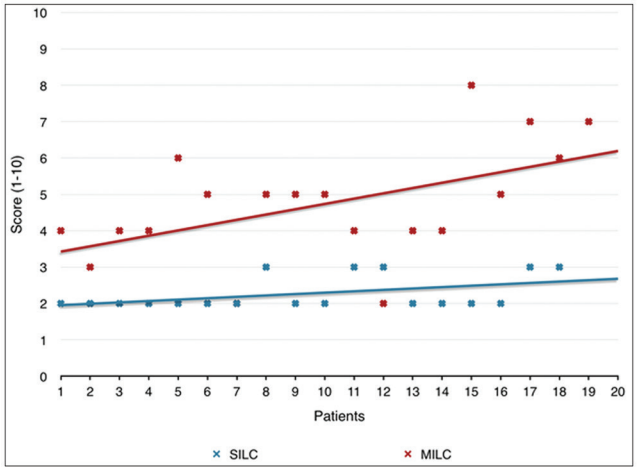
Failure rate.

Figure 5



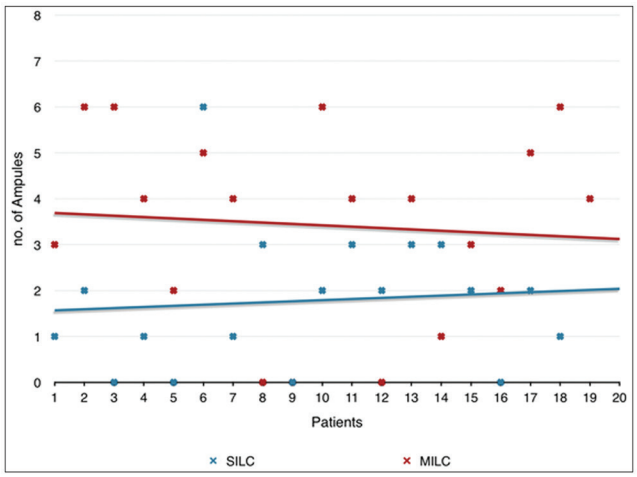
Port-site pain (early postoperative), score (1–10).

Figure 6



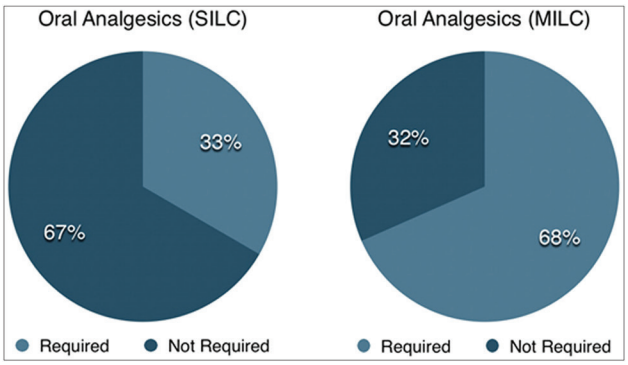
Port-site pain (10 days postoperative), score (1–10).

Figure 7



Postoperative intravenous analgesic requirements.

Figure 8



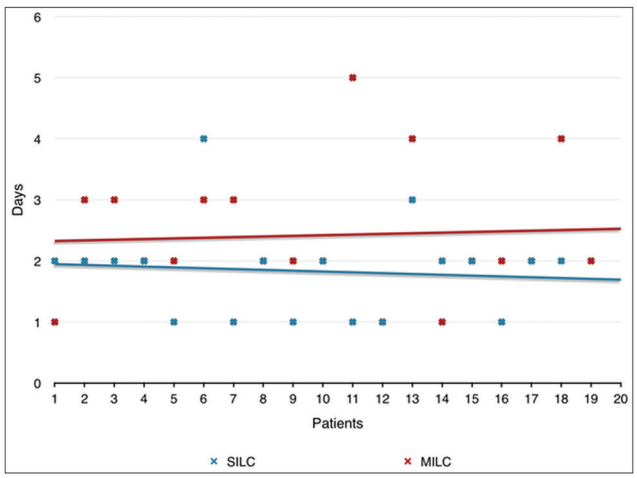
Postoperative oral analgesic requirements.

Finally, the aesthetic results. For reporting and comparing the patient satisfaction with the aesthetic results, we used a numerical scale with a 10-point vertical score ranging from 'very dissatisfied' (score 1) to 'very satisfied' (score 10). Scar satisfaction analysis showed a significant difference between the two groups

Table 3 Postoperative hospital stay duration

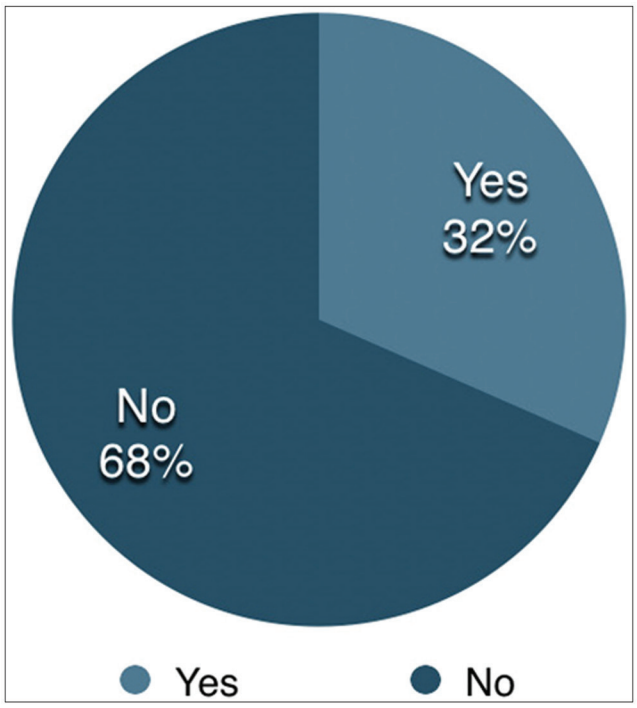
	Groups		
	Single-incision	Conventional	Total
Hospital stay (days)			
Number of cases	18	19	37
Mean	1.83	2.42	2.14
SD	0.786	1.071	0.976
Minimum	1	1	1
Maximum	4	5	5
Median	2.00	2.00	2.00

Figure 9



Postoperative hospital stay duration.

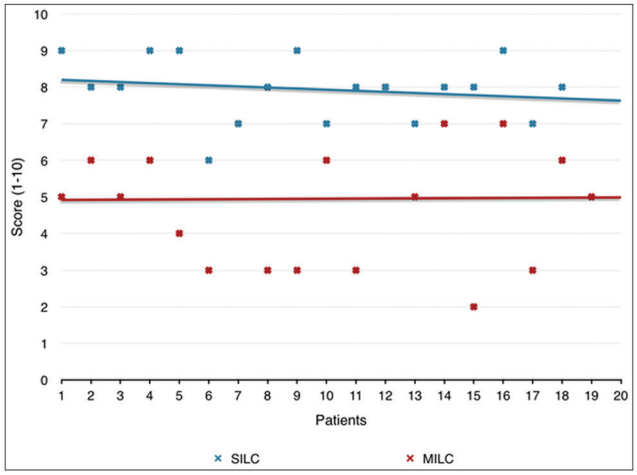
Figure 10



Wound infection in the MILC group. MILC, multi-incision laparoscopic cholecystectomy.

(*P*=0.000). The subjective cosmetic outcomes for all the patients in the SILC group were excellent, with barely perceptible scars, while on the other hand, many of the

Figure 11



Scar satisfaction score (1–10).

cases in the MILC group were somewhat dissatisfied with the aesthetic results (Fig. 11).

Concerning splenectomy patients, ages of the 13 patients who underwent SPLS ranged between 19 and 39 years with a mean age of 28 years, 85% of them were females. Hemolytic anemia was the most common splenic pathological diagnosis (53.8%) of cases. Other pathologies were immune thrombocytopenic purpura and thrombotic thrombocytopenic purpura. The BMI of patients ranged between 22 and 40 kg/m^2 with a mean of 29.2 kg/m^2. The average spleen size ranged from 12 to 28 cm. Preoperative platelet count ranged from 40 to 161 × 10^3/μl.

All cases were completed laparoscopically, but an additional port was used in two cases: one of them was due to the large size of the spleen and the other due to extensive adhesions around the spleen. The mean operative time was 145.76 min. The average estimated blood loss in most cases was less than 50 ml, with only two patients having lost more than 100 m but less than 250 ml of blood. No perioperative transfusion of packed red blood cells was required in any of the cases. The median length of postoperative hospital stay was 3 days. No perioperative complications or mortalities were encountered. Patient satisfaction with the aesthetic results was very high (Tables 4 and 5).

Discussion

The SILS technique aimed at achieving the concept of scarless surgery and promised less postoperative pain, which would translate into shorter hospital stay and early return to work. Our study investigated those claims, experiencing the technique's safety and feasibility, constructing an idea regarding the benefits and limitations of this technique.

Table 4 Outcomes of single-port laparoscopic splenectomy

Operative data	Distribution
Operation time (min.)	
Median	140 (120–180)
Mean	145.76
Estimated blood loss [*n* (%)]	
>50 ml	7 (53.8)
50–100 ml	4 (30.8)
<100 ml	2 (15.4)
Additional ports [*n* (%)]	
Yes	2 (15.4)
No	11 (84.6)
Retrieval incision [*n* (%)]	
Yes	2 (15.4)
No	11 (84.6)
Conversion to open [*n* (%)]	
Yes	0
No	13 (100)
Complication [*n* (%)]	
Yes	0
No	13 (100)
Narcotic requirement [*n* (%)]	
NSAIDS	10 (76.9)
Morphia	3 (23.1)
Hospital stay [*n* (%)]	
>4 days	10 (76.9)
<4days	3 (23.1)
Mortalities [*n* (%)]	
Yes	0
No	13 (100)

First, as regards single-incision laparoscopic cholecystectomy

Concerning the feasibility of the SILS technique, operative time, and the learning curve, various studies have demonstrated difficulties in the acquisition of SILS skills with impaired performances compared with standard laparoscopic surgery. These studies revealed significantly longer learning curves for SILS compared with standard laparoscopic surgery. A review by Pucher *et al.* [13] assessed the evidence for training in SILS and showed that laparoscopic expertise did not necessarily translate to SILS proficiency. The review elucidates the presence of a significant learning curve for the surgeons adopting SILS with greater operative time and increased rate of conversion to multiport laparoscopy in their initial cases. A 'SAGES' learning center study and the Montero and colleagues showed that the performance in a basic peg transfer task was significantly worse for SILS compared with conventional laparoscopy [14,15]. Also in 2011, Rieder *et al.* [16] observed a greater mental strain in surgeons using a single-incision approach. A high percentage of surgeons reported occasional or frequent problems with eyesight, traction, triangulation, and interference with the other members of the surgical team.

Table 5 Outcomes of conventional splenectomy

Operative data	Distribution
Operation time (min.)	
Median	115 (90–150)
Mean	119.6
Estimated blood loss [*n* (%)]	
>50 ml	8 (61.5)
50–100 ml	3 (23.1)
<100 ml	2 (15.4)
Additional ports [*n* (%)]	
Yes	0
No	13
Retrieval incision [*n* (%)]	
Yes	5 (38.5)
No	8 (61.5)
Conversion to open [*n* (%)]	
Yes	0
No	13
Complication [*n* (%)]	
Yes	0
No	13
Narcotic requirement [*n* (%)]	
NSAIDS	9 (69.2)
Morphia	4 (30.8)
Hospital stay [*n* (%)]	
>4 days	11 (84.6)
<4days	2 (15.4)
Mortalities [*n* (%)]	
Yes	0
No	13

In our study, SILS was found to be very challenging in the beginning. Even our expert surgeons found it difficult to perform and they suffered a huge physical and mental toll to accomplish the surgeries safely. Also, one of the major factors that had affected our performance is the unfamiliarity with the ergonomics of this technique. This had crippled our performance and prolonged our operative time up to 190 min. But as our experience grew, our operative time started to improve. The mean operative time for our SILC cases was 100.5 min, while that for our MILC cases was 74.2 min.

The mean operative time for the first case series of 30 patients published by Navarra *et al.* [17] was 123 min. Cuesta *et al.* [18] reported a series of 10 patients in 2008 with an average operative time of 70 min. Also in 2008, Rao *et al.* [19] performed 20 SILS cholecystectomies using the 'TriPort+.' They reported an average operative time of 40 min. In 2009, Merchant *et al.* [20] have reported the completion of 21 SILC cases using the 'GelPoint.' The operative times ranged from 45 to 90 min however, the average time per procedure was not reported. Another series by Rivas *et al.* [21] in 2010 investigated 100 patients undergoing SILC. Their operative times were initially longer but improved over time, with an average time of 51 min Hirano *et al.* [22] performed a review of all case series of SILC published in 2010 and reported longer operative times compared with the standard approach.

As for safety and conversion rate, safety should and must always be the cornerstone for assessing and judging any new emerging technique. Navarra *et al.* [17] in his series of 30 patients had reported the occurrence of one wound complication only. While Piskun and Rajpal [23] presented a series of 10 patients in 1999 and they reported the occurrence of no complications. Of the 12 patients who underwent this operation in the study by Tacchino *et al.* [12], two complications were observed (16.6%). In one case, the patient sustained trauma to the abdominal wall due to the multiple trocars inserted at the single umbilical incision and developed a subcutaneous hematoma that required evacuation. Another patient experienced persistent postoperative abdominal pain secondary to an intra-abdominal collection that most likely occurred due to bleeding from the liver which spontaneously resolved but extended the patient's hospital stay to 7 days. In 2009, Zhu *et al.* [8] performed six SILS cholecystectomies. They were able to successfully remove the gallbladder using this technique in all but one case which needed conversion for uncontrolled bleeding. In 2010, Roberts *et al.* [24] reported on 56 SILC cases. They reported three complications including a gallbladder fossa abscess, a duct of Luschka bile leak, and a retained CBD stone. In their series in 2010, Rivas *et al.* [21] had also reported that the complications were similar in number and nature to those of MILC. In their review in 2010, Hirano *et al.* [22] had reported a rate of 5.6% for conversion to MILC and a 1.9% complication rate.

In our study, concerning structural injuries, as regards the CBD, it occurred in one case in our SILC series. As regards vascular injuries, the right hepatic artery was injured in another case in the SILC series and required conversion to open surgery and the case was considered a failure.

Regarding the outcomes, in the SILC series, the failure rate was 10% (two cases), where one case was converted from SILC to MILC to deal with a CBD injury. The other case was converted from SILC to open laparotomy due to the seriousness of the injury inflicted where the right hepatic artery was injured in that case and that resulted in massive bleeding.

Concerning postoperative pain, hospital stay, and the rate of clinical improvement, less pain decreased the use of pain medication, and faster return to work have been also shown with SILC. A report from Bresadola

et al. [25] in 1999 had also demonstrated lower pain scores in their single-port group.

In our study, pain score analyses showed significant difference between the two groups both, early and late, where patients in the MILC group usually reported higher pain scores.

As regards analgesic requirements, lower analgesic demands were recorded in the SILC group both early postoperatively and during the follow up and this goes in line with the pain intensity that the two groups had experienced.

That had translated into a shorter hospital stay for the SILC patients. The mean postoperative hospital stay for the SILC patients in our study was 1.8 days while that for the MILC patients was 2.4 days.

Navarra *et al.* [17] in his case series reported that the mean postoperative hospital stay was 1.8 days, which was similar to our results and Piskun and Rajpal [23] reported in their case series in 1999 that all patients were discharged within the first 24 h postoperatively.

As for port-site hernias, one of the clear benefits of multiport laparoscopy has been the reduction of large incisional hernias that used to occur with open surgery. However, early in the experience of laparoscopy, we saw some reports surface that addressed port-site hernias. Two lessons became clear back then: increased port size results in a higher incidence for hernia to occur and the most likely port site to result in a hernia is the paraumbilical area. Whether this is due to the larger trocars being inserted in this position or the inherent weakness of the muscles at this site is not clear. Regardless of the reason, we absolutely need to follow closely the possible increased incidence of hernia formation rate that we might see with the use of larger access devices with SILS.

In 2011, Gangl *et al.* [26] and Krajinovic *et al.* [27] showed that the frequency of incisional hernias after SILS amounted to 1.9–2.0%. By adequate closure of the abdominal fascia, the incidence of incisional hernia is not increased after SILS.

In our study, only one case came presenting with a port-site hernia in the SILC group during the follow up and no port-site hernias were reported in the MILC group. This low incidence of port-site hernias is probably attributed to the close attention payed to the fascial closure done for all patients.

As regards wound infection, in the MILC group, six (32%) cases came presenting with wound infection during the follow-up period. Four of them were at the epigastric port-site. On the other hand, no cases of wound infection were reported in the SILC group.

Finally, the aesthetic results; many have mentioned that improved cosmesis is the strong foothold of this technique, where the careful reconstruction of the umbilicus leaves the abdominal wall virtually with no scars. Studies by Aprea *et al.* [28] and Bucher *et al.* [29] in 2011 have shown improved cosmesis for patients undergoing SILC, as shown by postoperative surveys.

In our study, great care had been taken to the reconstruction of the umbilicus by the end of each procedure and scar satisfaction analyses later on had shown a significant difference between the two groups. Most of the cases in the SILC group were highly satisfied with the aesthetic results of the single-access approach. On the other hand, many of the cases in the MILC group were somewhat dissatisfied with the aesthetic results of the conventional approach.

Second, as regards single-port laparoscopic splenectomy

SPLS was reported in many small case series in the literature [30,31].

Concerning the operative time, in our study, the operative time ranged from 120 to 180 min with a mean of 145.76 min and median of 140 min. The average time needed for specimen extraction ranged between 12 and 25 min, influenced mainly by the size of the spleen.

In 2015, Han *et al.* [32] published a study on 29 patients who underwent SPLS and the mean operative time was 113.6 ± 39.9 min. Boone *et al.* [33] conducted their study of SPLS on eight patients and the mean operative time was 101.6 ± 31.2 min. Barbaros *et al.* [30] in 2015 documented a mean operative time of 112 ± 13 min in their study that was done on 19 patients. Fan *et al.* [34] conducted a similar study on 13 cases and found that the median operative time was 165 min. All these studies reported an average time – more or less – similar to that in our study.

Concerning the outcome, in our study, 11 cases were completed successfully without the need for additional ports. While in two cases, due to the larger spleen size, we added an extra port for assisting with dissection. No cases required conversion to open surgery.

Han *et al.* [32] reported that two cases out of 29 required adding additional ports for spleen removal and one case was converted to open surgery, but there was no need for another retrieval incision. Barbaros *et al.* [30] documented that only one case was converted to open surgery in their series.

As regards intraoperative complications and bleeding, the estimated blood loss in our series did not exceed 100 ml except in two cases, but was still less than 200 m. Perioperative blood transfusion was not required in any of our cases and there were no reported mortalities.

Boone *et al.* [33] reported two cases requiring perioperative blood transfusion. They also reported a 25% incidence of morbidities with no mortalities in their study. Han *et al.* [32] documented that the estimated blood loss in their study was 295.8 ± 301.3 ml but there was also no need for blood transfusion. They reported 6.8% morbidities with no mortalities. The study by Barbaros *et al.* [30] documented an average blood loss of 0–400 ml and reported two cases out of 19 developing complications and no mortalities. Fan *et al.* [34] reported a complication rate of 7.7% in their study.

Finally, as regards the postoperative hospital stay, in our study, the length of postoperative hospital stay did not exceed 5 days with only three cases hospitalized for more than or equal to 4 days.

Comparing our result to what is published in the literature, it was found that our rate is better than that reported by Fan *et al.* [34], Han *et al.* [32], and Boone *et al.* [33] (average hospital stay was 8.8, 5.8, and 4.4 days, respectively) but was longer than that reported by Barbaros *et al.* [30] (average stay was 3 days).

Conclusion

SILS was found to be very demanding, inflicting a huge physical and mental toll on the operating surgeon. The SILS specialized instruments help but do not solve the problem and increase the cost of practice. On the other hand, the technique do offer better aesthetic results and causes less postoperative pain, which reflects in a shorter hospital stay. More importantly, we believe that SILS will pave the way for the next step in the evolution of scarless surgery.

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Conflicts of interest
No conflict of interest.

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