# SINGLE INCISION MULTI-PORT LAPAROSCOPIC SURGERY (SIMPLS), A NOVEL TECHNIQUE IN IRAQ

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## ABSTRACT

### *Background*

Single incision laparoscopic surgery (SILS) is a natural evolution of minimally invasive surgery (MIS) era. The advent of SILS was in the field of gynecology 1969. The first published report in general surgery appeared in 1992 with appendectomies. The first report of SILS cholecystectomy came in 1997 in a letter to the editor in the British Journal of Surgery by Navarra.Curcillo et al., developed Single Port Access (SPA™) surgery in April 2007 as a novel and innovative platform of minimal access surgery. Saber et al. reported the first series of single-incision laparoscopic SG in 7 patients in 2008. SILS recently becoming an interest of both patients and minimally invasive surgeons. Purposes were esthetic (scarless surgery), minimize parietal trauma, less pain and fast patient postoperative recovery. Despite these advantages, there is a concerned report of complications. Aiming to overcome the SILS complications, this novel technique; Single Incision Multiport Laparoscopic Surgery SIMPLS innovated in Iraq.

### *Objectives*

To introduce SIMPLS (Single Incision Multiport Laparoscopic Surgery) as a novel technique in Iraq and assess safety, cost, aesthetic and any associated complications. To evaluate its use in some advanced laparoscopic procedures.

### *Materials and Methods*

SIMPLS is a single surgeon prospective study conducted from Aug. 2009- Dec. 2016, in four hospitals in Iraq with the same laparoscopic platforms. Technique tested in different laparoscopic operative procedures on 129 different cases.

### *Results*

Cholecystectomy (n=76), sleeve gastrectomy (n=20), appendectomy (n=9), diagnostic laparoscopy (n=8), hydatid cystectomy liver (n=4), fundoplication (n=4), ovarian cystectomy (n=3), renal cystectomy (n=3), combined sleeve gastrectomy and hiatal hernia repair (n=1), and small bowel tumor(n=1). Time spend initiating ports ranging from 9-12 minutes. No much difficulty or struggle faced using standard laparoscopy instruments. Time spend in procedures noticed to be acceptable and less than SILS. P value couldn't see any significant difference with SILS. No conversion was reported till today. The cosmetic outcome found to be extremely acceptable by patients.Specific complications and difficulties, one case difficult intra-corporal liver retraction, gall bladder retraction in a severely inflamed gall bladder, bleeding at (angle of His),hematoma and ecchymosis, no port incision infection, and no incisional hernia.

### *Conclusion*

SIMPLS technique is introduced by the author as a novel procedure in IRAQ 2009. Similar technique started few years before in some countries in the word. Benefits of the procedure: technically feasible, reproducible for expert devoted surgeons, shorter time ports initiation, excellent esthetic results, lowest cost, not associated with incisional hernia. I advise wider practice, more trials to confirm these findings and I suggest it for interested experienced minimally invasive surgeons.

**Keywords:** *Single Incision laparoscopic Surgery, SILS, Single Incision Multi-port Laparoscopic Surgery.*

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## INTRODUCTION

Single Incision Laparoscopic Surgery (SILS) is a natural evolution of minimally invasive surgery (MIS) era. The advent of SILS was in the field of gynecology. Wheeless reported on the first 4000 cases of SILS tubal ligation in 1969, [1]; tubal ligation being the first procedure routinely performed through a single incision at the umbilicus [1-3]. The first published report in general surgery appeared in 1992 with appendectomies [4]. SILS recently becoming an interest from both patients and minimally invasive surgeons. This MIS also known in the literatures as Single-port laparoscopy (SPL), single-port access surgery (SPA™)] [5], single-port incisionless conventional equipment-utilizing surgery (SPICES), single-incision laparoscopic surgery (SILS), Single-access endoscopic surgery (SAES), Single Site Surgery (S3), Single-Access surgery (SAS), laparo-endoscopic single-site surgery (LESS), natural-orifice trans-umbilical surgery (NOTUS), one-port umbilical surgery (OPUS), and trans-umbilical Endoscopic Surgery (TUES) [1, 2, 5] .

Aims of SILS are esthetic (scar less surgery), extra minimal parietal trauma, less pain and fast patient postoperative recovery. Operations variety that could be performed using (SILS) are now unlimited, nearly like the conventional laparoscopic surgery (CLS). In 2008, Saber et al. reported the first series of single-incision laparoscopic SG in 7 patients [6]. Operations diversity ranges from simple diagnostic laparoscopy up to pancreatic surgery, and other solid organs [2, 7-10] . Robotic surgery recently has shared the ambition of SILS evolution [2]. Despite these advantages, there is a concerned report of single incision laparoscopic surgery complications [8].

SILS and other similar procedures nearly share the same obstacles and complications. Starting form incision which take relatively longer time, port device choice variety, instruments struggle (sword crossing), port site pain, port site bleeding, internal bleeding, wound site infection, intestinal adhesions, scarring, port incisional hernia and lastly extra cost of the disposable and reusable single access port devices used like, [SILS port™ by Covidien, SLASS™ by Ethicon, Air Seal™ by Surgiquest, Octoport™, Daikin Surgical, Korea and X-Cone™ by Karl Storz] [2, 11].

Aiming to overcome some of the SILS complications I have introduced the Novel Single Incision Multi-Port Laparoscopic Surgery (SIMPLS) technique.

## MATERIALS AND METHODS

SIMPLS is a single surgeon descriptive prospective study conducted from Aug. 2009- Dec. 2016, in four hospitals in Iraq with the same laparoscopic platform. Technique tested in different operative procedures on 129 cases, performed in a stepwise plan, ranging from diagnostic laparoscopy to vertical sleeve gastrectomy.

### *Technique*

A single curvilinear incision is applied, ranging from 2.5-4 cm in the umbilical radius (Figure 1, 2, 3), sparing fascial layer. Insufflation (pneumoperitoneum) with Veress needle initiated, followed by three ports introduced per to the procedure (5 mm camera, 5 mm surgeon, 5-15 mm surgeon), and in rare difficult cases a micro-laparoscopic port used for retraction of liver. Ports are separated in the same wound as far as it allows, leaving a significant fascial bridge (Figure 4, 5, 6) (proposed to offer fascial wound healing, avoid weakness and future incisional hernia). This make a triangle its head facing down. The distance between ports wound range from 3-5 cm making use of slight skin elasticity to gain extra space. It is preferable to use low profile trocars to minimize instrument clashing. Regarding the optic port, I usually use either a long 7 mm Karl Storz telescope, or 5mm EndoEye flex tip Olympus telescope.

Procedures were performed accordingly in the same standard laparoscopic technique, using straight instruments, 5 mm energy devices, grasping forceps and stapler, and retrieval pages. Port wound fascial closure found easy and performed with the assistance of S-shape retractor.

Bigger ports from 10-15mm are utilized in insertion of suturing devices, clip applicators, staplers, specimen extraction bags. For liver retraction in sleeve gastrectomy and gall bladder retraction, a novel intra-corporal method using bulldog forceps and hook is adopted. In case the intra-corporal retraction failed another novel Foley catheter method or a micro-laparoscopic alligator forceps with rolled gauze used for liver retraction. Instruments used are straight standard laparoscopy forceps, hook, scissor, energy vessel sealer. Data recorded in predesigned form, method and outcome were analyzed.


**Figure 1. A curvilinear lower umbilical incision, Nissen fundoplication.**


**Figure 2. A curvilinear incision infra umbilical, in cholecystectomy.**

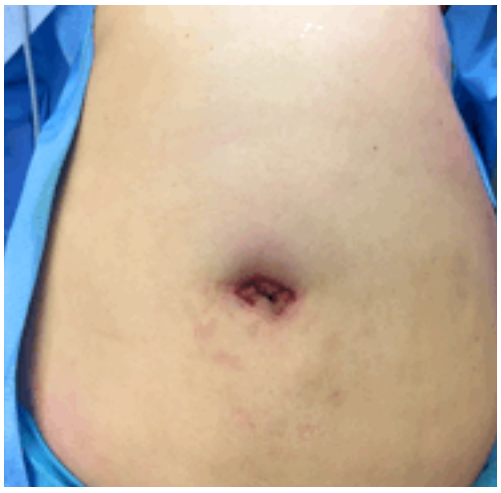

**Figure 3. A curvilinear upper umbilical incision, in sleeve gastrectomy & cruroplasty.**

**Figure 4. Camera port initiation.**

**Figure 5. Ports inserted in a case of nissen fundoplication for hiatal hernia.**


**Figure 6. Sleeve gastrectomy. Port insertion in (SIMPLS).**

## RESULTS

Total procedures performed were 129 of different surgeries. Including cholecystectomy (n=76), sleeve gastrectomy (n=20), appendectomy (n=9), diagnostic laparoscopy (n=8), hydatid cystectomy liver (n=4), fundoplication (n=4), ovarian cystectomy (n=3), renal cystectomy (n=3), combined sleeve gastrectomy and hiatal hernia repair (n=1) and small bowel tumor (n=1) (Figure 7).

Initially the 5 first procedures were cholecystectomies, in which I used the standard SILS port™, and X-Cone™ by Karl Storz, these were not included in the study.

Mean time spend for initiating ports was in the initial five SILS procedures (16 minutes), and (9 minutes) in SIMPLS. P value couldn't see any significant difference with SILS. The difficulty, struggle using standard laparoscopy instruments and sword crossing was less than the early 5 cases of SILS. Also, better (task precision performance) in SIMPS, according to surgeon experience in previous pilot SILS procedures. Operative time found within acceptable limits for similar studies, and as an example it ranges between 28-90 minutes, with average 43 minutes in cholecystectomies. while the operative time in SIMPS sleeve gastrectomy was in a range between 55-160 minutes and mean of 95 minutes. Specimen extraction like stomach in sleeve, appendix and gall bladder or cysts found easy through 11-15 mm port, not easier than SILS wide fascial incision.

Analgesia used was usually acetaminophen 1-3 gm daily, rarely we use pethidine 50 mg on need. Pain scores were in a range of 1-7/10 and average 3/10 in time progress within 2 days of hospitalization.No conversion was reported in this series. No port incision infection, neither incisional hernia recorded during 3 months to 7 years follow up.

The resulting port incision scar mark considered from cosmetic view very acceptable for both surgeon and patients.

***Specific Complications of SIMPS technique:***

1. One case difficult intra-corporal retraction of huge liver left lobe in sleeve gastrectomy, solved by using micro-alligator forceps in 3 mm epigastric port.
2. Similar use of micro-alligator forceps for gall bladder retraction in a severely inflamed gall bladder failed to be retracted with intracorporeal retraction.
3. Bleeding at angle of His in one sleeve gastrectomy, controlled by gauze compression and further Ligasure use, no conversion to standard laparoscopy or open surgery.
4. Subcutaneous incision site hematoma and ecchymosis in a sleeve gastrectomy, resolved spontaneously.

Refer to Table 1. For overall possible complications.

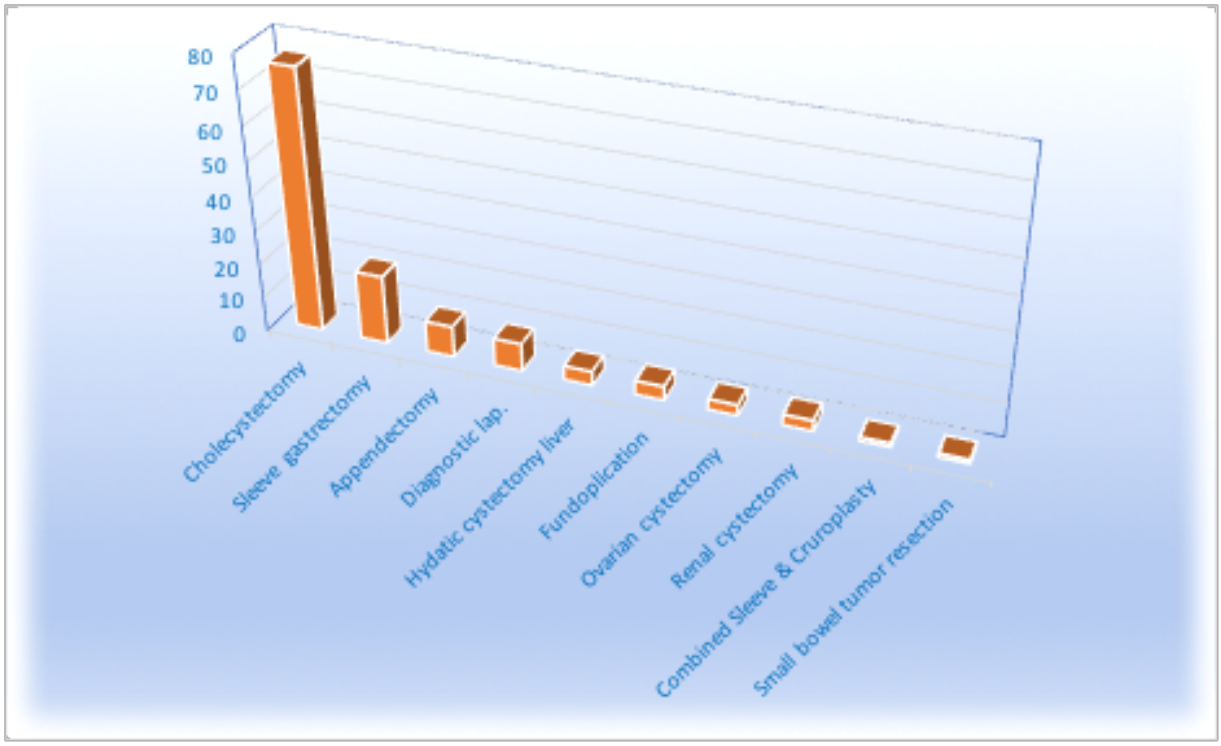


**Figure 7. Number and variety of (SIMPLS) procedures**

**Table 1 .Postoperative complications, specific and general for all types of SIMPLS procedures.**

| Type of surgery | Number of cases | Internal bleeding | External port bleeding | Port visceral injury | Specific procedure visceral injury | Leak | Port site Hematoma | Port site infection | Port site hernia | Pulmonary embolism | DVT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **cholecystectomy** | 76 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **sleeve** | 20 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| **appendectomy** | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Diagnostic laparoscopy** | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Hydatid cystectomy** | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **fundoplication** | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Ovarian cystectomy** | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Renal cystectomy** | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Combined sleeve and hiatal hernia cruroplasty** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Small bowel tumor** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total cases** | 129 | 1 (0.77%) | 0 | 0 | 0 | 0 | 1 (0.77%) | 0 | 0 | 0 | 0 |

## DISCUSSION

This technique is considered novel in Iraq. Reviewing literatures in PubMed, and Ovid, could find; similar single incision multi-port laparoscopic procedure with different synonym, like; SIMPL, SITUS, SIMPLE, SIMPLA, [12-17]. In this study the concentration was made on the SIMPLS as a technique and not a specific operative procedure analysis.

Single incision multi-trocar surgery has cosmetic advantage over standard laparoscopic approach [18].

The curvilinear incision inside the umbilicus looks esthetically logical and gives excellent post-operative cosmetic outcome (Figure 9-11). while many similar studies or SILS use linear trans-umbilical longitudinal incision, which needs to dissect umbilical scar and reflect flaps on both side, this is time consuming and gives no much cosmetic advantage.

Other study asking (Is there a cosmetic advantage to single-incision laparoscopic surgical technique over standard laparoscopic surgery? A systematic review and meta-analysis) conclude; A cosmetic advantage is stated by many authors, but has not been found to be universally present or even of considerable importance by patients [18,19]. In SIMPLS and similar techniques there is no record of incisional hernia [20-22].

Despite that some articles conclude that the single port laparoscopy has low rate of trocar site hernia [23]. The advantage of SIMPLS procedure of passing ports in separate fascial wound; the first is minimizing the struggle and sword crossing faced in SILS procedures [2, 21] the second; incisional hernia and wound infections reports are more likely in patient undergoing SILS procedures in comparison to CLS [24,25]. Nearly all types of straight and pre-curved instruments can be passed easily through the separate ports, including staplers with ease. The gradual progress within time from easy to difficult procedures (like sleeve gastrectomy, hiatal hernia repair and fundoplication, gave us the confidence and make the technique stood the test of time with progress in the learning curve.

Single incision multi-trocar technique has a unique advantage of allowing surgeon to work in different quadrants of abdomen using the same incision and ports [18].

The operative time in different SIMPLS like procedure found less than in SILS technique in reference [1, 2, 6], so we found due to the ease with which the surgeon can move his instruments comparable to standard laparoscopy with slight angulation. There is no doubt now that SILS has proven itself to result in less postoperative pain in comparison to standard multi-port surgery. The postoperative pain and post-operation lengths of hospital stay in the TUSI-LDP group were also less [10, 18] .

Thousands of studies mentioned this fact, but still there is some article which shifted the attention to significant pain in SILS, this is due to bigger incision up to 6 cm and more port trauma [26].

The SIMPLS procedure usually flow easy, may be due to some comfort in instrument layout, and conversion was nil in this study. But if conversion is found mandatory, you just put one or two extra port to change to standard multi-port laparoscopy, as in SIMPLE study [27] , as mentioned in results above.It is evident that there are technical challenges posed by single-site surgery, thus some robotic Endowrist technology with three-dimension visualization was designed to overcome this difficulty [28].

### *Conclusion*

The SIMPLS technique was introduced by the author as novel procedure in IRAQ 2009. Similar technique started few years before by other surgeons in some countries of the word. It is technically easy for expert devoted surgeons, low cost reproducible, shorter time ports initiation, excellent esthetic results, and not associated with incisional hernia report after 1-7 years of follow-up.

I advise wider practice and more trials to confirm these findings, and suggest it for interested experienced minimally invasive surgeons.


**Figure 8. immediate postoperative SIMPLS fundoplication umbilical wound closure.**


**Figure 9. Immediate postoperative sleeve gastrectomy, umbilical wound closure.**

**Figure 10. Two weeks post SIMPLS cholecystectomy, umbilical wound.**


**Figure 11. Four months postoperative umbilical mark, nearly invisible.**

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