



A COMPARATIVE STUDY OF FEASIBILITY AND PRACTICALITY OF SINGLE INCISION LAPAROSCOPIC CHOLECYSTECTOMY IN INDIAN SET UP

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ABSTRACT

With the first case of trans abdominal single port laparoscopic cholecystectomy reported in 2007, the procedure has expanded greatly during the last decade. With patient experiencing less pain and practically no scar, patient enjoys their benefits. But the major disadvantages lie with surgeon, his ability to triangulate instruments around target is lost, which results in longer operative time besides the specific complications to laparoscopic surgery-bowel injury, bladder injury and vessel injury persists.

KEYWORDS : Single port laparoscopic cholecystectomy, NOTES, Cosmesis.

INTRODUCTION

Scarless surgery is the Holy Grail of surgery and the very *raison d'être* of Minimal Access Surgery was the reduction of scars and thereby pain and suffering of the patients. Since the first laparoscopic surgery was performed by Muhe in 1985 and later published by Mouret, Perrisat and Dubois in 1987 and 1988.^[1,2,3] laparoscopic surgery has expanded in leaps and bounds to become the standard procedure for many intra-abdominal surgeries. The greatest benefit is achieved in operations where the trauma of access exceeds that of the procedure. Figure 1. The quest for scar reduction beyond standard laparoscopy led to the experimentation with natural orifice surgery. The first description of the procedure known as natural orifice transluminal endoscopic surgery (NOTES) in human was reported by Dr. Rao and Reddy in 2004 which was a transgastric appendectomy.^[4]

NOTES remains a research technique with only a few clinical cases having been reported due to difficulties of access and inadequate instrumentation as of date. The lack of success of NOTES seems to have spurred on the interest in single-incision laparoscopy (SILS) as an eminently doable technique in the present with minimum visible scarring rendering a 'scarless' effect.

With the conventional laparoscopy for procedures in surgery, being usually carried out through four or more ports, the increased number of ports leads to reduced cosmesis, more pain and increased risk of complications due to port site infections and hernias.^[5,6]

One advantage of reducing the number of ports over cosmesis, would be to reduce these complications. The advantages of SILS are not yet clearly defined. It has been suggested that SILS has the potential advantages of reduced post operative pain, faster return to work, reduced port site complications and improved cosmesis.^[7]

NOTES has a long way to go before it can be used in a routine clinical practice because NOTES is technically challenging and current instrument need to be further improved. SILS on the other hand allows the Surgeon the freedom of using the existing laparoscopic instruments and technology.

In fact laparoscopic surgery is the procedure of choice for most benign gall bladder diseases unless obvious contraindication exists. The advantages of earlier return of bowel function, less post operative pain, improved cosmesis, shorter length of hospital stay, earlier return to full activity, decreased overall cost were immediately appreciated.

Laparoendoscopic single site surgery

It is a new technique through which laparoscopic surgery take place through a single umbilical incision, without a need for additional laparoscopic ports.

It is a novel technique which promises all advantages of minimally invasive surgery with additional advantages of reduced postoperative morbidity and improved cosmesis. One of the revolutionary methods of scarless surgery is the transumbilical single port laparoscopic technique, in which the surgical scar is virtually concealed within the umbilicus. In 1996, Kala and his colleagues^[17] reported the first case of transumbilical single port laparoscopic appendectomies. The first case of transumbilical single port laparoscopic cholecystectomy was reported in 2007 by Podolsky et al^[18].

In our study, we have made an attempt to evaluate the efficacy and effectiveness of single port laparoscopic cholecystectomy compared to the gold standard multiport laparoscopic cholecystectomy.

Advantage of less :

As there is only one incision the patient experiences much less pain as compared to traditional laparoscopic surgery & recovers faster. The healed incision leaves practically no scar, thus making LESS cosmetically a superior option. All patients enjoy their benefits, but LESS is of particularly great cosmetic value to ladies and to busy corporate executives who wish to recover rapidly from surgery so as to get back to work.

1. Cosmesis +++ (Scar less surgery)
2. Ease of tissue retrieval +
3. Combination procedure –
4. Patients acceptance & Satisfaction
5. Reduce port site complication
6. Reduce Post operative pain
7. Do not Violate Natural Orifice
8. Faster return to the normal functions
9. Quality of life analysis +
10. Standard equipment
11. Surgeon's Domain

Disadvantage of less

1. Major difficulty with this new technique is the sacrifice that has to be made in term of comfort & ergonomics. As all instruments & camera are inserted through the same incision, the ability to triangulate instruments around target is lost. Although this can

be partially rectified by the use of articulated instrument, the surgeon end up working with his hand very close together find himself often being impeded by the laparoscope & the assistance crowding of instrument at single incision leaves less room for movement.

2. Similarly the surgeon's right hand will control the left sided instrument on the screen & the left hand control the right sided instrument on screen. The use of crossed over articulating instruments requires a longer operative time for achievements of careful & precise dissection & some adjustment in the strategy of exposure are necessary, particularly because less strength is applied to the tissue than with the standard laparoscopic techniques.
3. Complication specific to laparoscopy include injury to the bowel, bladder & blood vessels at the time of insertion of the surgical instrument & hernia formation at an incision site.
4. Other complication specific to laparoscopy-
 - Infection
 - Bleeding
 - Deep Vein Thrombosis

The most significant risk is from trocar- injury to either blood vessel or small or large bowel. The risk of such injuries is increase in patients who are obese or have a H/O prior abdominal surgery. The initial trocar is typically inserted blind: Vascular injury can result in Haemorrhage that may be life threatening.

Less feasibility:

LESS is a new technique through which laparoscopic surgery take place through a single umbilical incision without need for additional laparoscopic ports.

In recent year, LESS has been focused upon as a bridge between NOTES & traditional laparoscopic surgery.

Most importantly, it is easy to convert LESS to conventional laparoscopy by adding a few trocars or even needles or 2-mm needlescopic instruments. 'Reduced port surgery' is another term used to denote performance of these laparoscopic procedures through anything less than the standard number of ports used or if additional ports are used/needed in LESS. This ensures the safety of the patient during the surgeon's early experience and learning curve with this sort of surgery. Most of the reported LESS procedures seem to have equivalent efficacy to conventional laparoscopy including operative times, blood loss and length of hospital stay. More importantly the complications like bile duct injuries or incisional hernias have not seen a rise as in the initial years of laparoscopy. The only randomized study carried out between transumbilical surgery and standard laparoscopic cholecystectomy showed improved pain scales.

Another exciting technology being brought out is the MAGS or the magnetic anchoring and guidance system. In this a magnetic camera is placed in the abdominal cavity through the umbilical incision taken to insert the single-port access device. The magnetic camera is then controlled by a stack of magnets placed on the abdominal wall, which are used to move it to the organ of interest. The camera transmits the image via a wire which exits the abdomen through the single-port device or by the side of it. Cadeddu and Rao did the first clinical human cases using the prototype magnetic camera for a single-port nephrectomy and appendectomy, respectively. The obvious advantages of MAGS for single-port surgery are that it leaves one more portal of the access device free to house another instrument. Current limitations include inability to clean the lens, a cumbersome wire that has to exit the abdomen, insufficient lighting and a magnetic strength that can only accommodate a thin abdominal wall. There is also the danger of a magnetic footprint if left in place for a long time. Future cameras could be wireless, have lens cleaning systems and better lighting and magnetic controls. This MAGS technology could be also extrapolated to magnetic retractors, hooks and dissecting instruments in the future.

Ergonomics in Laparoscopic Surgery

Incidence = 73% to 86% of lap surgeons report some type of discomfort.

5 factors affecting the stress placed on surgeon-

1. Table height
2. Monitor position
3. Use of foot pedal
4. Static body posture
5. Instrument design

Static body posture and instrument design are the two factors which have maximum effect and in SILS surgeon stand in line with the instrument so that the 3 points of reference are in single line i.e. the arms of surgeons the instrument and the dissection site improving the ergonomics of the procedure.

AIMS AND OBJECTIVES

Aims: To do a comparative study of the feasibility, practicality advantages and shortcomings of Single Incision Laparoscopic Surgery, using conventional ports and instruments; with conventional laparoscopic surgery.

Objectives: To evaluate operative feasibility of SILC using conventional laparoscopic instruments.

o To evaluate complication and disadvantages of SILC by conventional laparoscopic instruments in comparison to multiport laparoscopic procedures.

o To evaluate the advantage of SILC procedure for cholecystectomy in comparison to Conventional Laparoscopic procedures.

The comparison will be done on following parameters

- Operative time
- Intraoperative complications
- Post operative complications
- Post operative pain score
- Hospital stay
- Cosmesis

MATERIAL AND METHOD:

The present study will be conducted on patients undergoing SILC in the emergency or outpatient Department of MLB, Medical College, Jhansi in the Department of Surgery over from September 2014 to September 2016.

METHODOLOGY:

176 consecutive patients who fit into the inclusion criteria were included in the study. Patients were included in the 3 port cholecystectomy arm and in the single port cholecystectomy arm.

Patients selection:

The inclusion criteria were:

1. Age of patient between 10 and 85 years
2. Diagnosis of chronic/acute cholecystitis, symptomatic cholelithiasis, recurrent mild biliary pancreatitis, Gall Bladder (GB) polyp, GB Sludge, empyema, mucocele.

The exclusion criteria were:

1. Choledocholithiasis
2. Severe Acute Calculus Pancreatitis
3. Severe co-morbid conditions (uncontrolled diabetes, hypertension, severe direct hyperbilirubinemia)
4. ASA Grade-4

Randomization:

Random allocation of patients presenting with symptoms suggestive of gallbladder disease with confirmatory USG study was done to the two groups after matching for age and sex, using the sealed envelope technique which was opened just before the skin

incision. The two groups were as follows

Group1: SINGLE PORT LAPAROSCOPIC SURGERY

Group2: STANDARD/ 3 PORT LAPAROSCOPIC SURGERY

Data collection:

Patient data were kept in computer data files and also a hand written proforma has been filled by residents of dept.

The details of preoperative assessment, intraoperative observation, postoperative course and postoperative follow up with reference to following points were recorded in a proforma (Annexure) and analyzed by Unpaired t test.

Operative technique:

The technique of laparoscopic cholecystectomy SLC was performed using a three-trocar approach in routine cases, SILC has been performed using single umbilical incision as described below.

Operative method:

In Single incision laparoscopic cholecystectomy

RESULT AND OBSERVATION:

The study was done on 176 patients. Out of which 88 were included in group I (Single Incision Lap Chole/SILC) and 88 patients were included in Group II Standard Lap Chole (SLC) and patients now converted to 3 port cholecystectomy.

	Variable	SILC (Mean±SD)	SLC (Mean±SD)	p value
Relationship between patient with operative time in the SILC and SLC	Time Up to Removal of GB (in min.)	25.73±9.26	15.77±7.1	0.0001
	Port site stitching (in min.)	4.06±1.12	4.23±1.56	0.7160
Mean of pain score of 1st and 2nd day in the SILC & SLC	1 st day pain score	2.63±0.51	4.22±0.75	0.0001
	2 nd day pain score	1.56±0.49	1.89±0.59	0.0001
Per operative complication	Vascular injury	0 (0%)	0 (0%)	-
	Ductal injury	4 (4.54%)	5 (5.68%)	-
	Biliary leakage	3 (3.40%)	4 (4.54%)	-
Post operative complication	Seroma formation	4 (4.54%)	3 (3.40%)	
	Biliary peritonitis	2 (2.27%)	2 (2.27%)	-
	Flap necrosis & others	0 (0%)	0 (0%)	-
Hospital stay SILC & SLC (Mean Hospital Stay).	Hospital stay	2.70±1.01	2.86±1.23	0.3470
Cosmosis in SILC & SLC (Mean cosmosis).	Cosmoses	7.94±0.74	4.84±0.80	0.0001

DISCUSSION:

Operative time:

In our study operating time in SILC was 25.73 minutes which is significantly longer than 15.77 minutes in SLC (p<0.001). The results were significant different.

Our study result match with Markar SR *et al.*, Brittney L. Culp *et al.*, Lianhyuan Geng study, A Agrusa *et al.*, L.N. Jorgensen *et al.*, Sinha *et al.*, Mathew Zapf *et al.* and moc.liamtoh@eifosnesnarf Partelli, S. *et al.* but does not match with Ugurlu Umit *et al.*

Postoperative pain score:

In our study post operative pain on VAS scale in group I after 6 hours (1st day score) was 2.63 and 4.22 in group II (SLC). But 2nd day (after 24 hrs) in SILC it was 1.56 and in SLC 1.89, which was significant. Our

study results match with Waldemar Kurpiewski *et al.*, Zahid Mehmood *et al.*, Lianhyuan Geng *et al.*, A Agrusa *et al.*, Sinha Rajeev *et al.*, and Partelli *et al.* but does not match with Markar SR *et al.*, Zahetner *et al.* and Kimbely M. Brown *et al.*

Peroperative complication

In our study CBD injury / CHD injury was 4 in SILC and 5 in SLC in both groups no vascular injury were found. Our study result match with Pierre Allemann *et al.* and opposite to Joseph Mark *et al.*

Postoperative complication:

In our study out of 88 patients who underwent SILC 4 patients developed seroma and 2 patient developed biliary peritonitis due to possible duct injury. While in the SLC group (88) 3 patient developed seroma, 2 patients got developed biliary peritonitis. Our study results match with Hauters P. *et al.*, Partelli, S. *et al.* and Pulkit Gupta *et al.* and partially match with Zahid Mehmood *et al.*, Lianhyuan Geng.

Hospital stay:

In our study cosmesis is better with SILC. Our study result match with both study Partelli S *et al.*, Sinha Rajeev *et al.*, Mathew Zapf *et al.*, ^{HallTC} *et al.*, Zahid Mehmood *et al.*, and opposite to study Pankaj *et al.*

CONCLUSION:

In our study the following conclusions were made

1. Patients presenting to M.L.B Medical College with gall stone diseases belong to significantly middle age group (31-50 yrs).
2. No significant rise in intra and post operative complications occurred in the single port surgery as compared to standard lap cholecystectomy, even with the technical difficulties of the procedure.
3. Time required for single port surgery is higher than 3 port cholecystectomy because it is technically difficult.
4. Length of postoperative hospital stay for single port cholecystectomy is almost same as for 3 port cholecystectomy.
5. Significant difference was found in duration and intensity of pain between two procedures. SILC patients had less postoperative pain.
6. Cosmesis is far better in SILC than SLC group.

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