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Research Article

Study of Feasibility of Single Incision Laparoscopic Appendicectomy (SILA) Using Conventional Instruments

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Abstract: During the era of laparoscopic surgery common trend has been towards less invasive techniques and a natural extension of the trend is to perform operations without scars. The most prominent techniques representing scar less surgery are trans-umbilical single-incision laparoscopic surgery (SILS) and natural orifice trans-luminal endoscopic surgery (NOTES). SILS appendectomy may be even more advantageous to the patients by eliminating the scars and potentially diminishing postoperative pain. The study subjects were consists of follow up cases of acute appendicitis which was manage conservatively will underwent single incision laparoscopic interval appendectomy after one and half month of acute attack to know feasibility of Single Incision Laparoscopic Appendectomy using conventional equipments and to formulate preoperative guideline for appropriate selection of patients for above procedure.
Keywords: Appendicectomy, SILA, Feasibility, NOTES, Scar less, Interval.

INTRODUCTION

The open appendectomy, which was described first by McBurney [1] in 1894, has been accepted as the gold standard of an appendectomy for around 100 years. Furthermore, since its introduction by Semm [2] in 1983, the laparoscopic appendectomy has been conducted more frequently than the open appendectomy due to its advantages of being minimally invasive and having a shorter length of stay, a faster return of bowel function, decreased use of narcotics and lower rates of wound complications [1-3]. In addition, much attention has been paid to recent remarkable innovative developments and improvements in laparoscopic equip-ment, instruments and techniques. During the era of laparoscopic surgery common trend has been towards less invasive techniques and a natural extension of the trend is to perform operations without scars. The most prominent techniques representing scar less surgery are trans-umbilical single-incision laparoscopic surgery (SILS) and natural orifice trans-luminal endoscopic surgery (NOTES). As the latter is still struggling with some technical and equipmental difficulties, SILS seems to be more ready for wider use in surgical community. There are reliable and simple equipment available for SILS procedures, and the operative technique, although different than in conventional laparoscopy, is probably easier to learn compared to NOTES technique [4]. Several operations have, thus, been until now performed by SILS technique including, for example, cholecystectomy, appendectomy, splenectomy, and sleeve gastrectomy. The most abundant are publications presenting results of SILS cholecystectomy [5-8] and results obtained in pediatric surgery [9-11]. All these reports have indicated that the SILS technique is safe and feasible in these surgical populations and that the operative time with this new technique is reasonable.

Appendectomy is the most common abdominal operation performed as an emergency basis in the western world [12]. The advantage of laparoscopic technique over the conventional technique has been proven especially in fertile women and obese patients [13-15]. SILS appendectomy may be even more advantageous to the patients by eliminating the scars and potentially diminishing postoperative pain. However, the role of the SILS appendectomy is still evolving since all published reports of the technique should be regarded as preliminary [9,11,16]. More studies evaluating the technique in different clinical situations as well as randomized controlled trials are needed in order to assess the real benefits of the SILS appendectomy in general surgical practice. The open appendectomy, which was described first by McBurney[1] in 1894, has been accepted as the gold standard of an appendectomy for around 100 years. Laparoscopic appendectomy is a safe and effective procedure as compared to open appendectomy. It

decreases the length of post-operative hospital stay, earlier resumption of normal bowel movement, and less narcotic analgesia administration. Although the cost associated with laparoscopic appendectomy is higher than open appendectomy, the recovery and outcomes are more pronounced for laparoscopic appendectomy[17]. As emphasis has focused more on minimizing the surgical technique utilized to access the pathology and on the exponential development of procedures performed through a solitary small trans-abdominal incision. These procedures have been referred to as single-port access surgery, single-port laparoscopy surgery, single-incision laparoscopy surgery (SILS), or laparoendoscopic single-site surgery; consensus on the most appropriate name for the approach has not been achieved. Since the first report of single-incision laparoscopic surgery for acute appendicitis by Rispoli et al [3] in 2002, it has been proposed as the next evolution in minimally invasive surgery. However, evidence supporting the safety and efficacy of this innovative approach is limited. Nevertheless, the increased interest in single-incision laparoscopic appendectomy (SILA) has seemed to be primarily focused on better cosmesis (scar less abdominal surgery performed through an umbilical incision), less incisional pain, and conversion to standard multiport laparoscopic surgery if needed. SILA also has several disadvantages and limitations, such as the restricted degrees of freedom of movement, the number of ports that that can be used, and the proximity of the instruments to each other during the operation-all of which increase the complexity and the technical challenges of the operation. Many of these difficulties can be related to the technique of port placement and the utilization of instruments during single-incision laparoscopic surgery. In the year 2009, Dutta [10] described that single incision laparoscopic surgery (SILS) involves performing abdominal operations with laparoscopic instruments placed through a single, small umbilical incision. In the year 2010, Chouillard et al[18] shows that natural orifice trans-luminal endoscopic surgery (NOTES) is a major conceptual change in the field of modern surgery. In the year 2010, Kang et al[19] describe that recently, single incision laparoscopic surgery (SILS) has been studied for its being less invasive surgery and having cosmetic improvement. In the year 2010, Kössi and Luostarinen [20] showed that Single-incision laparoscopic surgery (SILS) is a new technique developed for performing operations without a visible scar. In the year 2011, Bhatia et al [21] did a study on Single-incision laparoscopic surgery (SILS) appendectomy seeks to further minimize the trauma of parietal access of laparoscopic appendectomy. In the year 2011, Chiu et al [22] described that laparoscopic appendectomy has gained wide acceptance. This study aimed to evaluate the feasibility, safety, and cosmetic results of a novel technique: single incision laparoscopic (SIL) appendectomy. In the year 2011, Feinberg et al [23] described that acute appendicitis is one of the most common causes of abdominal pain that a general surgeon will encounter. In the year 2011, Goel et al [24] described that laparoscopic appendectomy is widely accepted as a standard of care for acute appendicitis. In the year 2012, Amos et al [25] did a study to compare the short-term outcomes of single-incision and conventional three-incision laparoscopic appendectomy (LA) at a single surgical unit. In the year 2013, Frutos et al [26] described that the use of single-incision laparoscopic surgery may represent an improvement over conventional laparoscopic surgery.

MATERIALS AND METHODS

The study subjects were consists of follow up cases of acute appendicitis which was manage conservatively will underwent single incision laparoscopic interval appendectomy after one and half of acute attack during 2012-13 at S.P. Medical College and Associated Group of Hospital Bikaner. Patients were interviewed for detailed clinical history according to a definite performa. All the patients were examined and underwent routine blood investigations.

Inclusion criteria - Patients with history of acute appendicitis proven by clinical examination and USG abdomen and considered fit for elective laparoscopic appendectomy was included in the study.

Exclusion criteria: history of previous abdominal surgery, Suspicion of a malignancy, BMI >30kg/m^2, Patient's age <14 and >70 years, Acute Appendicitis

Equipment and instruments used-

1. Electronic carbon dioxide insufflator.
2. High intensity halogen light source
3. High definition three chip camera
4. Video monitor compatible with camera
5. Fiber optic light cable
6. Mono polar Cautery
7. Video recorder
8. Telescope 0 degree 10mm size
9. Telescope 30 degree 10mm size
10. 11mm trocar 2
11. 6mm trocar 2
12. Maryland forcep 5mm 1
13. Tooth Grasper 5mm 1
14. Curved scissor 5mm 1
15. Clip applicator 10mm 1
16. Suction irrigation canula 5mm 1
17. Reducer 1
18. Liga Clip 300
19. Vicryl Suture 1-0 round body 1
20. Nylon 3-0 cutting body 1

Open instruments

1. Needle Holder 1
2. Bald Parker handle with blade no. 15 1
3. Tooth Forceps 1
4. Medium size artery forceps 1
5. Curved Scissors 1
6. Babcock's Forceps 2
7. Allis tissue holding forceps 2

A set of instruments for major laparotomy was always kept ready.

RESULTS AND DISCUSSION

The study includes 25 patients admitted under surgery unit I through outdoor basis for follow up cases of acute appendicitis planned for single incision laparoscopic interval appendectomy aged between 14-70 years and having BMI <30kg/m^2.

Table-1: Mean values of different parameters in study

Parameters	Mean	SD	SE	Range	
				Minimum	Maximum
Age	27.00	11.32	2.26	15	60
BMI	23.11	3.26	0.65	19.35	28.31
Duration	38.40	6.08	1.22	30	50
VAS 6 hour	4.08	0.40	0.08	4	6
VAS 24 hour	2.92	1.15	0.23	2	6
VAS 7 days	0.16	0.55	0.11	0	2
Hospital Stay	2.76	1.13	0.23	2	7
Suture Removal	7.16	0.37	0.07	7	8
Return to Normal Work	8.64	4.75	0.95	7	30

Table- 2: Distribution of cases according to Intra-operative Findings

Intra-operative Findings	No. of Patients	%
Inflamed Appendix with dense Adhesion	2	8
Inflamed Appendix with Lump & Dense Adhesion	1	4
Mildly Inflamed Appendix, Mild Adhesion	2	8
Mildly Inflamed Appendix, No Adhesion	1	4
Normal Appendix, Mild Adhesion	5	20
Normal Appendix, No Adhesion	14	56
Total	25	100

Table-3: Distribution of cases according to conversion

Conversion	No. of Patients	%
No	23	92.0
Yes	2	8.0
Total	25	100

Table-4: Distribution of cases according to cause of conversion

Cause of conversion	No. of Patients	%
Lump with Dense Adhesion	1	50.0
Dense Adhesion	1	50.0
Total	2	100

Table- 5: Distribution of cases according to return to normal work (days)

Return to Normal Work (days)	No. of Patients	%
7	15	60
8	7	28
10	1	4
15	1	4
30	1	4
Total	25	100

Table-6: Distribution of cases according to Cosmetic outcome

Cosmetic Outcome	No. of Patients	%
Highly satisfactory	20	80.0
Satisfactory	3	12.0
Not satisfactory	2	8.0
Total	25	100

Fig-1: Ssupra umbilical position of conventional Ports and instruments

Fig-2: Application of endo loop over base of appendix

Fig- 3: Postoperative supra umbilical interrupted skin suture

Fig-4: Minimal supra-umbilical scar after removal of stitch in sila

The mean operative time of various studies were: Dutta [10] in 2009 (33 min), Kossi and Luostarinen [20] in 2010 (40min), Bhatia et al [21] in 2011 (63±20), Chui et al in 2011 [22] (58 min), Feinberg et al [23] in 2011 (56±16min), Goel et al [24] in 2011 (80.4 min), Rehman et al [26] in 2012 (41.3 min). In our study group, operative time ranges from 30min to 50 min with mean operative time was 38.4±3.26 min which was comparable to Dutta[10], Kossi and Luostarinen [20] and Rehman et al[26]. All above studies shows feasibility of SILA with conventional instruments, it concluded that our study is feasible in respect to operative time with above studies.

The conversion rate was as follows: Villalonga et al [30] in 2012 (0.87%). In our study, out of 25 cases, 2 cases (8%) needed conversion to open procedure. One due to lump with dense adhesion and another due to dense adhesion. From above study it was concluded high rate of conversion in our study was due to incomplete resolution of lump, inappropriate selection of patients and learning curve of surgeon. It further concluded that decision of SILA should be taken after putting the scope and once it visualized that there is dense adhesion or significant lump, and then it is better to go directly for either conventional 3 port lap appendectomy or open procedure.

In the year 2011, Feinberg et al[23] and in 2011 Goel et al [24] were found no intraoperative complication in their studies. In present study, initial one case which was converted to open procedure due to lump with dense adhesion had small ceacal injury during adhenolysis laparoscopically which was repaired by taking two sutures during open procedure. Rest 24 cases had no intraoperative complications. It was concluded from our study that cause for intra-operative gut injury was due to inappropriate selection of patients, learning curve of surgeon and inappropriate decision making for SILA after putting scope.

No major postoperative complication was found in various studies like Bhatia et al [21] in 2011, Chiu et al [22] in 2011, Feinberg et al [23] in 2011, Goel et al [24] in 2011, Park et al [29] in 2012 and Liao [31] in 2013. In present study, there was no major postoperative complication, no patient had stitch line abscess. Our study is comparable with all above studies. From above it was concluded that postoperative complication rate of SILA with conventional instruments are not significant and major and it is safe procedure to perform in selected group of patients.

Cosmetic outcome of various studies was excellent like Dutta [10] in 2009, Kang et al [27] in 2010, Kossi and Luostarinen [20] in 2010, Bhatia et al [21] in 2011, Chiu et al [22] in 2011, Feinberg et al [23] in 2011, Amos et al [25] in 2012 and Park et al [29] in 2012. In our study, maximum number of cases had highly satisfactory cosmetic outcome while not satisfactory cosmetic outcome was present in 2 patients which were converted to open procedure. From all above and our study it is concluded that SILA with conventional instrument have highly satisfactory cosmetic results.

The mean postoperative length of hospital stay of different studies was as follows: Dutta[10] in 2009 (1day), Kossi and Luosarinen [20] in 2010 (2days), Goel et al[24] in 2011 (1.9days), Rehman et al[26] in 2012 (2.79 days). In our study, the mean postoperative hospital stay was 2.76±1.13 days (range from 2 to 7 days). The results are somewhat comparable to Kossi and Luosarinen [20], Goel et al[24] and Rehman et al[26].

The mean postoperative pain (by visual analogue scale) of the study conducted by Bhatia et al [21] in 2011, Goel et al [24] in 2011 Mayer et al [32] in 2011, Lee et al[28] in 2012, was not significant. In our study mean VAS score at 6 hours was 4.08±0.40, mean VAS at 24 hours was 2.92±1.15. Decrease in pain from 6 hours to 24 hours was significant and at 24 hours patient had no significant pain which is comparable to all above studies.

In present study, mean time of return to normal work was 8.64±4.75 days which is satisfactory for the patient.

Although all above results shows that SILA with conventional instruments and ports is feasible, safe, cost effective with excellent cosmetic results, the task of performing the above procedure is challenging for the operating surgeon due to various difficulties encountered during operation like collision of instruments, loss of triangulation, interference of laparoscope's light by operating instruments, interference of tubing that connects perpendicularly to instruments, leakage of gas from port site and difficulty in mind setting of surgeon leads to a tiresome procedure for surgeons. All these difficulties could be overcome by learning curve and patience of the operating surgeon.

CONCLUSION

From our study, it is concluded that single incision laparoscopic appendectomy (SILA) with conventional instruments and ports is feasible, safe, cost effective with excellent cosmetic results. In future, the above procedure could be ideal especially young females who are more concerned about cosmetic results and have uncomplicated cases and have favorable intra-operative finding after putting the scope. Umbilical hernia can also be repaired at the same time. Although the above procedure is feasible and safe, it needs further research to come on a firm conclusion and formation of preoperative guide line for appropriate selection of patients for above procedure.

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