

A Comparative Study between Laparoscopic Appendicectomy and Small Incision Open (Minilap) Appendicectomy in Cases of Acute Appendicitis

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Abstract: *Open appendicectomy is time tested technique while laparoscopic appendicectomy is newer concept. In present study total 75 patients with appendicitis were selected, 40 of which underwent SIOA (small incision open appendicectomy) and 35 underwent LA (laparoscopic appendicectomy). SIOA was done via 2-3 cm incision at McBurney's point and LA was done via standard 3 port technique. Both the techniques were compared in terms of operative time, post-operative pain, analgesic requirement, post-operative length of stay, time to return to daily activities, complications, conversion rate, cost and cosmetic outcome. The results showed that SIOA is better than LA in terms of operative time (mean 44.41 vs. 56.44 minutes), time to return to daily activity (mean 8.22 vs. 9.13 days) and complications (6.66% vs. 10%). SIOA and LA were comparable in terms of Post-operative pain (mean 7.09/4.75/1.34 vs. 6.94/4.94/1.28 at POD1/2/10), analgesics requirement (mean 2.53/5.19 vs. 2.84/5.97 for injectable/oral doses), post-operative hospital stay (mean 2.25 vs. 2.41 days) and cosmetic effect. The cost was higher in LA group compared to SIOA. Excluding obese patients, conversion rate from SIOA to OA and LA to OA was 5.17% for SIOA vs. 5.71% for LA. In obese patients SIOA was converted to OA in 5 out of 6 patients and in LA was done without much trouble in obese patients as well. SIOA is the method of choice in thin and lean patients as LA offers no advantage over SIOA in this group while increasing costs. LA is the preferable method for obese patients. SIOA takes less time than LA. SIOA is comparable to LA in terms of post-operative pain, analgesics requirement, hospital stay and return to daily activities. SIOA is more economic and cost-effective than LA. SIOA is cosmetically as good as LA.*

Keywords: LA-laparoscopic appendicectomy, SIOA-small incision open appendicectomy, cosmetic results, cost effectiveness, duration of surgery.

1. Introduction

The first report of an appendicectomy came from Amyand, a surgeon of the English army. Amyand performed an appendectomy in 1735 without anesthesia to remove a perforated appendix. Reginald H. Fitz, an anatomopathologist at Harvard who advocated early surgical intervention, first described appendicitis in 1886; however, because he was not a surgeon, his advice was ignored for a time.

Then, at the end of the 19th century, the English surgeon H. Hancock successfully performed the first appendectomy in a patient with acute appendicitis. Some years after this, the American C. McBurney published a series of reports that constituted the basis of the subsequent diagnostic and therapeutic management of acute appendicitis.

Thousands of classic appendectomies (ie, open procedure) have been performed in the last 2 centuries. Mortality and morbidity have gradually decreased, especially in the last few decades because of antibiotics, early diagnosis, and improvements in anesthesiologic and surgical techniques. Appendicectomy by McBurney's incision remained the procedure of choice for nearly a century until 1983 when Kurt Semm offered an alternative, "laparoscopic appendicectomy". During the early part of twentieth century with the development of technology and development in surgery, an era of minimal access surgery including NOTES (Natural Orifice Trans-luminal Endoscopic Surgery) and

SILS (Single Incision Laparoscopic Surgery) has emerged. Laparoscopy has gained a global popularity, which has been supported by the advances in anaesthesia, asepsis and anti-sepsis. The advances in imaging techniques, fibre-optic systems and introduction of microchip camera have globalised the laparoscopic technique. It is a newer technique but open appendicectomy although an older procedure is a time-tested technique and there is still debate rages on as to which technique is superior to another. Here in this study laparoscopic and small incision open appendicectomy are compared in various aspects and conclusion drawn from that.

2. Methodology

"A comparative study between laparoscopic appendicectomy and small incision open (minilap) appendicectomy" has been carried out in teaching institute where the availability of laparoscopy theatre, technical expertise and facilities for performing laparoscopic method is conducive. Randomly selected groups of 75 patients with appendicitis are taken. 40 patients underwent Small incision open appendicectomy (SIOA) (group A) and other 35 patients were treated with laparoscopic appendicectomy (LA) (group B). All patients with appendicitis were included in study except contraindication for laparoscopic or open method and age below 15 year.

2.1 A Comparison has been made in terms of

- Operative time
- Post-operative pain
- Post-operative Analgesic requirement
- Post-operative hospital stay
- Time of return to normal activity
- Complications
- Conversion rate
- Cost effectiveness
- Cosmesis

The duration of operative time is considered from the skin incision to the closure of wound in both the techniques. Post-operative pain was recorded in terms of Visual Analogue Scale (VAS) on day 1, 2 and 10. The requirements of analgesics in form of injectable and oral diclofenac sodium was noted in both groups post operatively. Choice of antibiotics was dependant on the appendicular pathology and not considering the method used. The postoperative hospital stay was considered from day of surgery to the day of discharge. The time taken to return to routine activities was defined as return to usual activity of domestic and social life at the discretion of the patient. Complications in both groups recorded.

The procedure considered converted to conventional open appendectomy when in group A incision had to extended and in group B when LA was not possible. The cost of hospitalization remains common to both laparoscopic surgery as well as open surgery irrespective of indication as daily expenditure incurred by the institute per patient remained same. The cost of drugs proscribed to the patient for procedure like endoloop, which were unavailable in the institute, were considered. The cost of initial establishment of laparoscopic unit is 15 lacks which was not consider in study.

- The cosmetic result was evaluated by patients themselves.
- Patients were followed up to 3 months post-op.
- SIOA was performed via a 2 to 3 cm muscle splitting curvilinear incision kept at McBurney's point. Attempt to deliver the caecum out of the wound was not done. Instead the appendix searched with finger and its tip grabbed. Mesoappendix sequentially ligated upto base while pulling the appendix out of the wound gradually taking care not to tear it. Base ligated with silk 2-0 free tie. Base not invaginated. Drains placed when necessary.
- LA was done in a standard 3 port technique.

3. Results

3.1 Age

Age of the patients ranged from 17-55 years. Mean age being 27.25. This confirms that appendicitis is primarily a disease of young age.

3.2 Sex

Male to female ratio was 3:4.5. There were 30 male and 45 female patients. This is opposite to incidence rate mentioned in various textbooks. This is probably attributed to selection

of patients. More female are selected for a surgery which may give better cosmetic results.

3.3 Operative Time

Table 1: time taken for surgery

Technique	SIOA	LA
Time(minutes)	44.41	56.44

$P < 0.001$

The operative time for SIOA ranged from 35 to 73 minutes, and for LA it ranged from 35 to 80 minutes. The mean time was 44.41 vs 56.44 minutes in SIOA vs LA respectively. As the above table shows, the time taken for surgery is significantly high in LA group. ($p < 0.001$). Time taken for surgery increases likelihood of anaesthetic related complication and cost as well.

3.4 Pain Perceived by Patient

Table 2: Pain perceived by patient in terms of VAS score at POD1, 2 and 10

Technique	Pain score (VAS)		
	POD1	POD2	POD10
SIOA	7.09	4.75	1.34
LA	6.94	4.94	1.28

The VAS scores for SIOA were 9-6 (POD 1), 7-3 (POD 2) and 2-1 (POD 10). For LA the VAS scores were 8-5 (POD 1), 7-3 (POD 2) and 2-1 (POD 10). As the above table shows there is no much difference in terms of pain perceived by patient at Post-Op Day (POD) 1, POD 2 and POD 10. The pain was recorded by visual analogue scale.

3.5 Analgesics Requirement

Table 3: Requirement of analgesics in doses

Technique	Analgesics	
	Injectable	Oral
SIOA	2.53	5.19
LA	2.84	5.97

Analgesic requirement is slightly higher in LA group. However the difference is not significant. $p > 0.05$

Analgesic requirement is determined by size of incision, number if incisions, presence of underlying incision, dissection done, patients own pain threshold etc. The requirement in LA group was slightly higher which may be attributed to longer cumulative size of incision, creation of pneumoperitoneum.

3.6 Hospital Stay

Table 4: Post-Operative Stay in Hospital in days

Technique	Stay, in days
SIOA	2.25
LA	2.41

Post-operative stay was comparable in both the groups. It ranged 2-4 days in both groups with mean 2.25 days in SIOA group as compared to mean 2.41 days in LA group.

3.7 Time to return to daily activity

Table 5: Time required returning to daily activity (RDA)

Technique	RDA, in days
SIOA	8.22
LA	9.13

The time required to return to daily activity means patient is able to do his daily routine work. The time taken for return to daily activity was 8.22 days (5-15 days) in SIOA group compared to 9.13 days (6-15 days) in LA group which was significantly lower. $P < 0.05$. This may be attributed to lesser invasiveness of SIOA technique which invades only RIF while LA invades whole peritoneal cavity.

3.8 Complications

In both groups one patient returned with Intestinal obstruction and two patients developed wound infection. Total infection rate was 6.66% in SIOA group as compared to 10% in LA group. SIOA is associated with lower incidence of complications.

3.9 Conversion Rate

In SIOA group out of 45 cases, in 8 cases the incision had to be extended. (17%). In one patient there was appendicular lump formation so surgery was abandoned, in two patients the appendix was perforated and/or adhered to surrounding structures making dissection very difficult. 5 patients were obese in whom excessive fat obscured the vision through small incision and hence incision was extended. In LA group two procedures converted to OA because of adhesion and perforated appendix in each case. Excluding obese patients conversion rate was 5.17% (2 out of 39) in SIOA group compared to 5.71% (2 out of 35) in LA group. (Non-significant, $p > 0.05$)

3.10 Effect of Obesity

Various studies have shown that in obese patients LA is a better choice than OA or SIOA because thick abdominal wall and excessive intra-abdominal fat obscures the vision necessitating extension of the incision. The bigger incision is associated more pain, analgesic requirements and complications such as wound infection. In present study, in SIOA group, in out of 6 obese patients (BMI > 24.9) incision had to be extended in 5 patients. This confirms the fact that LA is a better choice for obese people. In non-obese patients there was no significant difference in conversion rate or complications showing that SIOA and LA are comparable.

3.11 Cost Effectiveness

Equipment: SIOA doesn't require any special instruments. The routine OT instruments set costs around 2.3 lacs. LA requires, apart from routine instruments, laparoscopy set which costs additional 15-20 lacs. LA is done with endo-

loop costs Rs 500/- more and LA done with endo stapler costs Rs 5000 to 10000 more to the patient. SIOA doesn't require such special equipment. SIOA is done under SA and LA done under GA. GA costs more than SA. Thus overall SIOA costs less to the patient and to the hospital as well. If the difference in time taken to return to daily activity is included the cost per patient increases in LA group. In our country, where cost a very important factor SIOA should be considered in eligible group of patients.

3.12 Cosmetic Effect

Cosmetic result was recorded by patients own perception. Patients were asked to grade satisfaction in three grades. 1: not satisfied, 2; equivocal and 3: satisfied with cosmetic result.

Table 6: Cosmetic result as perceived by the patient at 3 months

Procedure	Cosmetic results perceived by patient
SIOA	2.84
LA	2.78

The cosmetic result was slightly but non-significantly better in LA group. The main advantage in LA is, the umbilical and supra-pubic scars are hidden by natural camouflages. Only visible scar is in LIF or RIF depending on the port placement. Even this scar is hardly visible as it is hardly a centimetre long. In SIOA group the final scar is 2-3cm (2.45 cm mean) long which is when sutured by sub-cuticular sutures becomes almost invisible. Sucullu I. et al in 2009 observed no difference in cosmetic outcome between LA or OA.

3.13 Role of Anaesthesia

General Anaesthesia (GA) is associated with more complications as compared to Spinal Anaesthesia (SA). GA costs more and associated with more complications. GA is more invasive than SA. After GA patient may have respiratory tract complications ranging from sore throat to pneumonia as GA requires endotracheal intubation. Besides the expertise, equipment, man power, drugs, etc. required for GA are costlier than SA. SIOA and OA are usually done under SA and LA always done under GA. Thus SIOA costs less than GA and associated with lesser anaesthesia related complications.

4. Discussion

The treatment of acute appendicitis remained essentially unchanged since its first description by Charles McBurney in 1889 before the New York surgical society. Appendectomy by McBurney's incision remained the procedure of choice for nearly a century until 1983 when Kurt Semm offered an alternative, "laparoscopic appendectomy". But as McBurney's operation is well tolerated with less morbidity the benefits of laparoscopic appendectomy have been difficult to establish. The putative advantages of the laparoscopic approach are quicker and less painful recovery, fewer postoperative complications and better cosmesis. It allows better assessment of other intra-abdominal pathologies. But the validity of these points

remains unconvincing. LA is significantly associated with higher costs and higher incidence of intra-abdominal abscess formation.

There are plethora of Randomized Control Trials and meta-analysis demonstrating superiority of one technique over another.

The SAGES appropriateness conference in 2003 concluded that OA is always better in average patient. However LA may be beneficial in morbidly obese.

Saurland S. et al [1] in the Cochrane database review analyzed 54 studies comparing LA vs. OA. They observed, incidence of Wound infections was less LA. There was threefold increase in Intra Abdominal Abscesses after LA. The operative cost in LA is significantly higher. OA offers shorter operative times. Return to work was similar in LA and OA with a difference of 0 days. Not a single study reported a significant increase in hospital stay. There was less pain after LA. Though wound infection rate was high in OA, incidence if Intra Abdominal Abscess was high in LA which is more dangerous complication. Reduction of pain in LA was statistically significant, but not a clinically relevant outcome.

Omar Aziz et al [2], performed a meta-analysis in LA vs OA in children, found no significant complication rate. 18% less hospital cost in OA. 0.48 days less hospital stay in LA group but it is of no significance in paediatric population. Kathkuda N et al [3] in 2005 performed a double blind study between LA vs OA.

- Wound infection rate: LA 6.2% vs. OA 6.7% (p=1.00)
- Intra-abdominal abscess: LA 5.3% vs. OA 3% (P<0.05)
- Operative time: LA 80 min vs. OA 60 min (p=0.00)
- No difference in activity of pain QOL scores.

Time to liquid/solid, length of stay, pain, oral analgesics – Not statistically significant. Cohran C.C. et al [5] in 2005 studied LA vs. OA at a teaching hospital and observed,

- OR time (min) - LA 95.7 vs. OA 90.5 (p<0.05)
- Operating time (min) - LA 57.4 vs. OA 56.3 (p<0.05)
- Length of stay(days) - LA 2.2 vs. OA 2.6 (p<0.05)
- Equipment charge: OA \$125.32 vs. LA \$1,078.70 (p<0.005)
- Operative time charge: OA \$3,022.16 vs. LA \$4065.24 (p<0.05)
- Total Hospital Charges
- All appendectomies: OA \$12,310 vs. LA \$16,773 (p<0.05)
- Non-perforated: OA \$9,632 vs. LA \$14,251 (p<0.05)
- Perforated: OA \$12,215 vs. LA \$27,639 (p<0.05)

Unless patient factors warrant a laparoscopic approach (questionable diagnosis, obesity), open appendectomy remains the most cost-effective procedure in a teaching environment.

Wei B. et al [5] conducted a meta-analysis in 2010. They observed, Compared with OA, LA showed advantages of fewer postoperative complications (p = 0.04), less pain

(length of analgesia: weighted mean difference [WMD], -0.53), earlier start of liquid diet (WMD: -0.51), shorter hospital stay (WMD, -0.68), and earlier return to work (WMD, -3.09) and normal activity (WMD,-4.73), but a comparable hospital cost (WMD of LA/OA ratio, 0.11) and a longer operative time(WMD,10.71).

Xiaohang Li [6] et al in 2011 in their meta-analysis observed, Operating time was 12.35 min longer for LA. Hospital stay after LA was 0.60 days shorter. Patients returned to their normal activity 4.52 days earlier after LA and resumed their diet 0.34 days earlier. Pain after LA on the first postoperative day was significantly less (p = 0.008). The overall conversion rate from LA to OA was 9.51%. With regard to the rate of complications, wound infection after LA was definitely reduced, while postoperative ileus was not significantly reduced. However, intra-abdominal abscess (IAA), intraoperative bleeding and urinary tract infection (UIT) after LA, occurred more frequently (p = 0.05).

Sporn E. et al analyzed 235473 patients who underwent appendectomy from 2003 to 2009 published data in Journal of American College of Surgeons that LA is associated with 22% and 9% more cost than OA in respectively uncomplicated and complicated appendectomy.[7]

McGrath B. et al in 2011 reported, LA (\$19,978) is costlier than OA (\$15,714) based on normalized cost for simple and complex diseases (P < 0.001). Cost and complications increase if the case is converted to open. OA remains the most cost effective approach for patients with acute appendicitis [8].

A Cochrane database survey by Moore D.E. et al was carried out in order to compare cost between LA and OA. In that study, A decision analytic model was developed to evaluate laparoscopic and open appendectomies. The institutional perspective addressed direct health care costs, whereas the societal perspective addressed direct and indirect health care costs. Baseline values and ranges were taken from randomized controlled trials, meta-analyses, and Medicare databases.

From the institutional perspective, open appendectomy was the least expensive strategy, with an expected cost of \$5,171, as compared with \$6,118 for laparoscopic appendectomy. The laparoscopic approach was less expensive if open appendectomy wound infection rates exceed 23%. From the societal perspective, laparoscopic appendectomy was the least expensive strategy, with an expected cost of \$10,400, as compared with \$12,055 for open appendectomy. The decision analysis demonstrated an economic advantage to the hospital of open appendectomy. In contrast, laparoscopic appendectomy represents a better economic choice for the patient [9].

In terms of cost OA is better than LA but advocates of LA argue that high direct cost associated with LA is compensated by reduction in LOS and decreased indirect cost in LA. Thus there are conflicting results and no surgery is superior over another. In our study we tried to combined benefits of both techniques. The technical simplicity, operative time reduction, cost related issues are addressed by

open access and pain and cosmetic aspect addressed by small incision. The patients selected were non-obese with no significant co-morbidity. There are many studies done exploring this aspect and revealed promising results. Below is the comparison between present and other studies:

Table 7: Results of present study

Technique	SIOA	LA
Operative time, minutes	44.41	56.44
Post-op pain(POD 1)	7.09	6.94
Analgesic req.	2.53	2.84
Analgesic req., oral	5.19	5.97
Post-op Stay, days	2.25	2.41
RDA, days	8.22	9.13
Complications	6.66%	10%
Conversion rate	5.17%	5.71%
Cosmetic result out of 3	2.78	2.84

Table 8: In a similar study done by Meirong LIU et al¹⁰, in 2009, they reported

Technique	SIOA	LA
Operative time, minutes	39.5	63.2
Post-op pain(POD 1)	7.9	7.5
Post-op Stay, days	3.5	3.2
RDA, days	12.2	11.4

Table 9: Bhasin SK et al [11] did a similar study in 2005 where they did mini-appendectomy in 72 patients. They observed following results

Length of incision	2.5 – 3.5 cm (2.7 cm)
Operation tome	16 – 45 min (22.3 min)
Incision extension	3 cases
Analgesic used	2 – 5 doses (2.2 doses)
Hospital Stay	2 – 7 days (2.3 days)
Return to routines	7 – 10 days (8.2 days)
Satisfaction to sacr	96% (n = 72)
Minor complications	4% (n = 3)

Li Huochuan et al [12], in 2004 did a similar study in a general hospital in china, they reported following figures

- Length of incision: 2.7cm
- Duration of Surgery:30 minutes
- Post-operative analgesics:6 doses
- Post op stay:5 days
- Return to daily activity:7 – 10 days
- Cosmetic result: all patients satisfied
- Jia Zhong et al [13], in 118 case study observed parallel results.

LUO Zhi-fu et al[14], in 200 cases study in 2008 did small incision appendectomy in selected group of patients under local anaesthesia and observed similar findings, comparable to LA. Hae-Hyeon S[15], back in 1998 performed open appendectomy after putting small incision (1.5-2 cm in McBurney's point, microceliotomy) and examining the abdomen via a laparoscope through that incision. The appendix identified and brought out through that small incision with help of laparoscopic guidance and appendectomy was done. Findings are as follows:

- Length of incision: 1.5 – 2 cm

- Duration of Surgery: 30.7 minutes
- Post-operative analgesics: 0.9 doses (nalbuphine 0.2 mg/kg)
- Post op stay: 4.1(2-7) days
- Return to daily activity: 7.6 (5 – 14) days

Liu Ling et al [16] in 316 case study in 2009, JIN Li-ming et al [17] in 155 case study in 2007, ZHAO Xu et al[18] in 73 patient case study in 2005,Zhang gongnian,et al[19] in 2003, 150 case study reported similar results for Small incision Appendectomy.

ZHOU Bing-kun [20] in Minimally Invasive Medical Journal of China in 2006 reported a study of 204 cases of appendectomy performed through a mini-incision in the right lower abdomen. The length of incision was 2-3cm in the right lower abdominal wall. The average postoperative hospital stay was 3.5 days. The procedure improved wound healing and reduced postoperative pain. Normal activities were resumed 8-15 days after operation. Conclusion Appendectomy performed through a mini-incision in the right lower abdomen can improve wound healing, reduce post-operative pain, and resume normal activities earlier. It can be applied to simple appendicitis, early-stage suppurative or gangrenous appendicitis. In paediatric age group also, in an article published in International Journal of Surgery, Malik AH et al [21] from Srinagar, India reported the feasibility of similar approach in 2007.

The above data shows, the present study is in parallel with other similar studies. All the studies show, SIOA is comparable to LA in terms of post-operative pain, analgesic requirement, length of stay, conversion rate and cosmetic effect. SIOA is better than LA in terms of operative time, return to daily activity, complications and cost.

It is noticeable that studies on Small incision open appendectomies are done mostly in China and India, where public health system is bursting at the seams, patient load is huge and cost factor is very important. All studies have reported that in patients diagnosed with appendicitis, and who are not obese, Small incision appendectomy is a good choice.

However, in obese patients Laparoscopic appendectomy is a better choice. In an article published in American Journal of Surgery, Varela JE, Hinojosa MW, Nguyen NT reported: "Compared to open appendectomy, laparoscopic appendectomy was associated with a shorter length of stay (3 vs. 4 days) and a lower overall complication rate (9% vs. 17%). Most notably, a lower rate of wound infection was noted (1% vs. 3%). Within a subset analysis of morbidly obese patients who underwent appendectomy for perforated appendicitis, there was a higher overall complication rate (27% vs. 18%) and cost (\$16,600 vs. \$12,300) in the open appendectomy group. Laparoscopic appendectomy should be the procedure of choice for the treatment of appendicitis in obese population."

5. Summary and Conclusion

Over last 30 years numerous studies have been done comparing OA and LA. Some studies show OA better than LA and some studies show vice versa. This study was

undertaken to compare small incision open appendectomy SIOA and LA. SIOA combines benefits of both the techniques. The operative time, simplicity of procedure and cost are addressed by open access, while post-operative analgesic requirement, post-operative stay and cosmetic effect are addressed by small incision. In present study total 75 patients with appendicitis were selected, 40 of which underwent SIOA and 35 underwent LA. SIOA was done via 2-3 cm incision at McBurney's point and LA was done via standard 3 port technique. Both the technique were compared in terms of operative time, post-operative pain, analgesic requirement, post-operative length of stay, time to return to daily activities, complications, conversion rate, cost and cosmetic outcome.

The results showed that SIOA is better than LA in terms of operative time (mean 44.41 vs. 56.44 minutes), time to return to daily activity (mean 8.22 vs. 9.13 days) and complications (6.66% vs. 10%). SIOA and LA were comparable in terms of Post-operative pain (mean 7.09/4.75/1.34 vs. 6.94/4.94/1.28 at POD1/2/10), analgesics requirement (mean 2.53/5.19 vs. 2.84/5.97 for injectable/oral doses), post-operative hospital stay (mean 2.25 vs. 2.41 days) and cosmetic effect. The cost was higher in LA group compared to SIOA. Excluding obese patient, conversion rate from SIOA to OA and LA to OA was 5.17% for SIOA vs. 5.71% for LA. In obese patients SIOA was converted to OA in 5 out of 6 patients and in LA was done without much trouble in obese patients as well.

It can be concluded, thus that, Small incision appendectomy is a feasible approach. When diagnosis of appendicitis is certain SIOA should be performed. SIOA is the method of choice in thin and lean patients as LA offers no advantage over SIOA in this group while increasing costs. LA is the preferable method for obese patients. SIOA takes less time than LA. SIOA is comparable to LA in terms of post-operative pain, analgesics requirement, hospital stay and return to daily activities. SIOA is more economic and cost-effective than LA. SIOA is cosmetically as good as LA.

6. Future Scope of the Study

Though laparoscopic appendectomy is newer technique it is costly and it is as cosmetic as small incision appendectomy and has added disadvantage of more complication rate. So why to waste these resources in this procedure in thin and lean diagnosed patients of appendectomy? In obese patients it is more advantageous than open procedure but still open procedure is gold standard.

7. List of Abbreviations

SIOA: Small Incision Open Appendectomy

LA: Laparoscopic Appendectomy

OA: Open Appendectomy

VAS: Visual Analogous Scale

RDA: Return to Daily Activity

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