Single Incision Extra-Corporeal Appendectomy: A More Cost-Effective Alternative than Conventional Laparoscopic Appendectomy

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Introduction

- Appendectomy was first performed in the 18th century by Claudius Amyand.
- The first laparoscopic appendectomy was performed in 1982 by Kurt Semm.
- What commonly unites these events is the drive to continuously innovate surgical techniques to be safer, easier, smaller, and cheaper.
- Single incision appendectomy has emerged as an alternative to the conventional three port appendectomy.
- In this study we aim to demonstrate that single incision extracorporeal appendectomy (SIEA) is noninferior to conventional laparoscopic appendectomy (CLA) and cost effective (figure 1-4).

Methods and procedures

- This study is a retrospective chart review of patients who underwent SIEA and CLA was performed.
- Both groups were analyzed in terms of demographic data, comorbidities, symptoms, white cell count, Alvarado score, image positivity, American society of Anesthesia (ASA) score, operative time, intraoperative findings, case performance by surgeon level, length of stay, time to advancement of diet, complication rates, readmission rate, as well as cost.
- Wilcoxon test was used to compare continuous data. Fischer's exact test compared proportions. Significance was defined as p<0.05.

Surgical technique

Patient in supine position, both arms tucked in. Umbilicus everted, skin divided until rectus sheath encountered and divided proceeding to pneumoperitoneum insufflation.

Insert two 5mm ports, visualize appendix through a 5mm camera, grasp the appendix and retrieve it through umbilicus.

Proceed to appendectomy, return stump back to the abdomen, closure of rectus sheath followed by subcuticular skin closure.

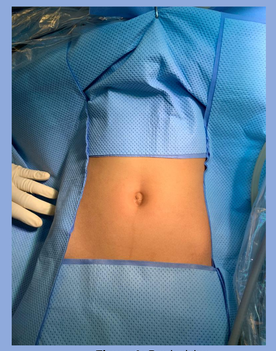


Figure 1: Pre-incision



Figure 2: Port insertion.



Figure 3: Delivery of the appendix.



Figure 4: Final result.

Results

- A total of 156 patients (27 SIEA vs. 129 CLA) were reviewed (table 1).
- SIEA and CLA were similar in mean age, gender, comorbidities, laboratory investigations, Alvarado score, image positivity, ASA score, and intraoperative findings (p>0.05 for all).
- Outcomes were similar between the two groups with regards time to advancement of diet (median time 6 hours vs 6 hours), post-operative complications (wound infection, deep seated infections 3.7% vs 4.7%), and readmission rates (3.7% vs 2.3%) (p>0.05 for all).
- Complications in the SIEA group were low over-all due to a number of factors such as length of follow up and small sample size.
- Length of stay was shorter in the SIEA than the CLA group, approaching statistical significance (mean 1.7 days vs 2 days p=0.05).
- Operative time in SIEA was shorter than CA (median time 50 min vs 75 min, (p<0.001).
- The cost of performing SIEA was lower than CA (mean cost 236 USD vs 632 USD) since less disposable equipments were used, however other factors such as bed costs, anesthesia, staff, and maintenance related costs were not taken into consideration.

Conclusion

33% reduction in operative time

63% reduction in cost

SIEA is noninferior to laparoscopic appendectomy

Variables	SIEA (n=27)	Conventional (n=129)	p-value
Gender			
Male	16 (59%)	94 (73%)	0.16
Female	11 (41%)	35 (27%)	
Age (year) mean ± SD	27.1 ± 12	28.3 ± 11.4	0.61
Preoperative data			
Healthy	20 (7%)	111 (86%)	0.12
ASA (1/2/3)	(23/4/0)	(106/19/4)	0.66
Symptoms			
Abdominal pain	93%	98%	0.07
Nausea	74%	57%	0.1
Vomiting	67%	50%	0.1
Anorexia	48%	47%	0.87
Fever	19%	11%	0.26
Diarrhea	7%	6%	0.81
Constipation	4%	3%	0.87
Dysuria	11%	8%	0.56
Image positivity	95%	96%	0.8
Duration of symptoms in days, median (IQR)	1 (-1.5)	1(1-2)	0.53
White cell count (mean ± SD)	12.2 ± 4.3	13.4 ± 3.9	0.16
Alvorado score median (IQR)	2 (1-3)	2 (1-3)	0.91
Intra-operative data			
Intraoperative findings			
Acutely inflamed appendix	23	97	0.12
Acute suppurative appendix	0	5	
Perforated appendicitis	1	20	0.1
Necrotizing appendicitis	0	4	
Normal appearing appendix	1	0	
Post-operative data			
Case performed by			
Consult	24 (89%)	5 (4%)	< 0.001
Resident	3 (11%)	124 (96%)	
Operative time (min) median (IQR)	50 (45-60)	75 (60-90)	< 0.001
LOS (days) mean ± SD	1.7± 2.6	2 ± 1.9	0.05
Time to advancement to diet (hours) median (IQR)	6 (6)	6 (6-8)	0.71
Histologically proven appendicitis	93%	88%	0.45
Readmission	1 (3.7%)	3 (2.3%)	0.54
Reoperation	0	0	
Wound infection	0	0	
Dehescince	0	0	
Deep space infection	1 (3.7%)	6 (4.7%)	0.98
Stump leak	0	0	

Table 1: Patient characteristics and results.

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