

# The Outcomes of Single-Incision Pediatric Endosurgery Appendectomy (SIPESA) Performed by Surgical Residents in Comparison to Conventional Laparoscopy

Enaam Raboei<sup>\*1,3</sup>      Mohamed Shalaby<sup>1,4</sup>  
Yazeed Owiwi<sup>1</sup>      Mohamed Al Onazi<sup>2</sup>  
Ameen Al Saggaf<sup>1</sup>      Mohammed Al-Mohaidly<sup>2</sup>  
Turki Alofi<sup>1</sup>      Mohammed Babiker<sup>2</sup>  
Alaa Ghallab<sup>1</sup>      Saleh Kamel M<sup>2</sup>  
Ibtihal AlGhamdi<sup>1</sup>      Jawad Al-Hindi A<sup>2</sup>  
Mazen Zidan<sup>1</sup>      Khalil Al-Batniji<sup>2</sup>  
Mohamed Fayez<sup>1</sup>      Ihab Omer Ali<sup>2</sup>  
Ahmed Atta<sup>2</sup>      Hanin Shalaby<sup>1</sup>

<sup>1</sup>Department of Pediatrics, King Fahd Armed Forces Hospital, Jeddah, Saudi Arabia

<sup>2</sup>Prince Sultan Medical City, Riyadh, Saudi Arabia

<sup>3</sup>Medical Reference, Jeddah, Saudi Arabia

<sup>4</sup>Tanta University, Tanta, Egypt

## Abstract

**Background:** The outcome of SIPESA performed by surgical residents is explored once in the literature. Up to our knowledge, this is the first study comparing the outcome of SIPESA versus conventional laparoscopic appendectomy (CLA) performed by the surgical residents in two training centers. **Aim:** To assess the outcome of appendectomy performed by surgical residents. Comparing the outcome between SIPESA at King Fahd Armed Forces Hospital (KFAFH), Jeddah versus CLA at Prince Sultan Military Medical City (PSMMC), Riyadh. **Material and Methods:** A retrospective comparative study of the outcome of SIPESA versus CLA conducted in two centers from January 2011 to July 2018. Collected data were analyzed for both groups regarding, age, surgeon, mean operative time (MOT), preoperative complications and length of hospital stay (LOS). **Results:** A sample of 136 appendectomy procedures (83(61%) SIPESA & 53(39%) CLA) performed from January 2011 to July 2018 in both centers by residents. Most patients had no postoperative complications (96.2% for CLA and 96.4% for SIPESA). THE average MOT of SIPESA and CLA was 92.25 minutes & 87.85 minutes respectively. There are no significant differences between surgery types in terms of postoperative complications, Fisher's Exact test  $p=0.75$ . **Conclusion:** SIPESA and CLA performed by residents are equally safe with no added morbidity and better cosmeses. We believe that this good outcome is related to the proper supervision of the residents by experienced surgeons in conjunction with a properly structured training program. The primary outcome of both techniques is similar including MOT.

**Keywords:** SIPESA, CLA, Laparoscopic pediatric appendectomy.

## Background

Most centers advocate laparoscopy for acute appendicitis to minimize the size and the number of skin incisions even for complicated appendicitis. SIPESA, which was described for the first time by Pelosi in 1992 [1,2]; and CLA are the most common procedures used in laparoscopic appendectomy. SIPESA gives easy and quick access for an incidental finding of intra-abdominal anomalies, by removing the

## Article Information

**Article Type:** Analysis Article

**Article Number:** JPI-125

**Received Date:** 27 November, 2020

**Accepted Date:** 16 December, 2020

**Published Date:** 23 December, 2020

**\*Corresponding author:** Enaam Raboei, Department of Pediatrics, King Fahd Armed Forces Hospital, Al Kurnaysh Rd, Al Andalus, Jeddah 23311, Saudi Arabia. Tel: +966505607930; E-mail: [enaamraboei@yahoo.fr](mailto:enaamraboei@yahoo.fr)

**Citation:** Raboei E, Owiwi Y, Saggaf AA, Alofi T, Ghallab A, et al (2020) The Outcomes of Single-Incision Pediatric Endosurgery Appendectomy (SIPESA) Performed by Surgical Residents in Comparison to Conventional Laparoscopy. J Pediat Infants Vol: 3, Issu: 2 (25-29).

**Copyright:** © 2020 Raboei E et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

SIPESA port and performing the procedure extracorporeal.

Many comparative studies, a systematic review and pooled analysis demonstrated that single-incision laparoscopic appendectomy (SILA) is comparable to CLA in adults. These studies identified the need for randomized controlled trials to clarify the efficacy of SILA compared to CLA. RCTs comparing SIPESA to CLA proved that there is no difference except the longer operative time [3]. SIPESA in pediatric patients has gained significant popularity because of its preferable cosmetic result which was not proved for SIPESA on long term follow up [4,5]. Previous studies have typically compared SIPESA & CLA appendectomy in children and have shown heterogeneous results [6]. There is no difference in the LOS or postoperative complications [5,7]. The longer MOT was the main concern of SIPESA [6]. One study has shown that SIPESA in children is safe and feasible when performed by residents versus fellows [8]. We started SIPESA in 2011 and it became our standard approach for acute appendicitis. The residents have the priority in performing SIPESA in our institute. It is a challenging process for any center to balance between residency training curriculum and patient safety. Up to our knowledge, this is the first study to assess the outcome of SIPESA versus CLA done by residents.

## Aim

To assess the outcome of appendectomy performed by surgical residents. Comparing the outcome between SIPESA at King Fahd Armed Forces Hospital (KFAFH), Jeddah versus CLA at Prince Sultan Military Medical City (PSMMC), Riyadh.

## Material and Methods

A retrospective comparative study conducted at KFAFH, Jeddah, and PSMMC, Riyadh, Saudi Arabia from January 2011 to July 2018. Medical students collected data. Data retrieved from electronic records of all children below 14 years of age. Laparoscopic appendectomy performed by residents in both centers. SIPESA is the gold standard approach for acute appendicitis at KFAFH while CLA is the preferable approach at PSMMC. All Incidental appendectomies excluded from the study. SIPESA performed through a 1.5 cm umbilical incision using single-incision Medtronic 10 mm port. After controlling the meso-appendix mainly by hook diathermy and LigaSure™ device in complicated cases, endo-loops applied to the base of the appendix. The appendix divided and retrieved through SIPESA port. All patients received IV Paracetamol (15mg/kg q 8h) and IM Tramadol (1mg/kg q8h) postoperatively. All CLA patients were routinely catheterized before the operation when the residents were operating because they routinely use Veress needle. CLA was done using standard approach with the first 5 mm port inserted via open technique and the other 2 ports were inserted in supra-pubic and left iliac fossa under vision. Ligation of the appendicular base done with endoloops after division of the meso-appendix with diathermy hook. The appendix extracted by endobag to protect the wound from contamination. All patients received

IV Paracetamol (15 mg/kg q8h) and IV Morphine infusion (10-20 mic/kg/hr) postoperatively. The pain was assessed by using the Facial Action Coding System (FACS) in both groups [8]. SIPESA compared to CLA regarding performing surgeon, MOT, post-operative pain, duration of analgesia, postoperative complications, and LOS. Specialized statistical analyst analyzed the data by using Statistical Package for Social Science (SPSS) version 22. Descriptive statistics used to summarize collected data. We reported frequency and percentages for categorical variables. We applied the reported descriptive statistics including mean, standard deviation (SD), median and interquartile range (IQR) for numerical variables. Distributions of continuous variables were examined to assess normality. We found the variables do not follow a normal distribution; therefore, non-parametric inferential tests were used. Comparison between SIPESA and CLA surgeries performed using inferential statistical analysis. Categorical variables were compared using chi-square tests or Fisher's Exact test where small frequencies were reported. Numerical variables compared using the Mann-Whitney test or independent samples t-test depending on normality of data distribution.

## Results

One hundred thirty-six appendectomies were included in the analysis performed by residents. The majority (83, 61%) of the procedures were completed using the SIPESA method in KFAFH, and the rest (53, 39%) done with CLA method at PSMMC. The difference between surgery types and location is statistically significant, Fisher's Exact test  $p < 0.001$ . Provisional diagnosis shows similarity between surgery types with the majority of cases being simple appendicitis (92% of SIPESA and 83% of CLA),  $X^2(1)=2.28$ ,  $p=0.13$ . We found no significant difference between surgery types in regards to age (Mann-Whitney  $p=0.22$ ) or gender ( $X^2(1)=0.001$ ,  $p=0.97$ ). No significant difference was found between surgery times in regards to operative time,  $t(134)=1.51$ ,  $p=0.13$ . SIPESA on average took 92.25 minutes, while CLA surgeries 87.85 minutes. Histopathology shows the vast majority of all cases having positive for acute appendicitis (93% for SIPESA and 91% for CLA) with no significant difference between the groups,  $X^2(1)=0.12$ ,  $p=0.65$ . WBC group is mostly positive (89% for SIPESA and 94% for CLA), not significantly different between the two surgery types,  $X^2(1)=1.08$ ,  $p=0.30$ . Similar proportion of CLA cases (49%) and SIPESA cases (43%) was confirmed with ultrasound, the difference is not statistically significant,  $X^2(1)=0.42$ ,  $p=0.52$ . Only 15% of SIPESA and 11% of CLA cases were confirmed with CT scan, statistically similar between two surgery types,  $X^2(1)=0.28$ ,  $p=0.60$  (Table 1).

We found no significant difference in the length of hospital stay between SIPESA ( $M=2.80$  days) and CLA ( $M=3.60$  days) surgeries,  $p=0.31$ . All surgery types have high use of IV antibiotics (95% for SIPESA and 96% for CLA), but the difference is not statistically significant ( $p=1.00$ ). Most patients had no postoperative complications (96.2% for CLA and 96.4% for SIPESA). There are no significant

differences between surgery types in terms of postoperative complications, Fisher's Exact test  $p=0.75$  (Table 2).

## Discussion

CLA is the gold standard approach in most pediatric centers. Appendectomy is the commonest procedure done by SILS. Nowadays, SIPESA is gaining popularity and it is the preferable technique selected by patients for its well-known cosmetic benefit [9-15].

As our study is retrospective between two training centers, the data collection was done independently, a structured method for collecting the data by independent staff (medical students and the results were analyzed by the specialized statistical analyst). Although SIPESA is considered as an accepted approach for appendectomy, its impact on the residency training was not explored in detail. However, there is a general impression that surgery performed by a junior surgeon is having a worse outcome, but our results showed a good outcome with an accepted rate of morbidity. A major limitation of this study is the comparison between SIPESA vs CLA is effectively a comparison between KFAFH and PSMC (The difference between surgery types and location in our study is statistically significant, Fisher's Exact test  $p < 0.001$ ). The patient demographics were comparable between SIPESA and CLA groups, with almost similar patient ages and gender distributions (Table 1). The 30<sup>o</sup> cameras, energy source (electrocautery), mesoappendix dissection technique, and endoloop ligation of the appendix stump were almost the same in both techniques. The postoperative analgesia protocol was different between CLA and SIPESA, but fortunately, there was a good postoperative pain control

in both groups. The LOS was equal in both groups. The negative appendectomies were comparable in both groups (Table 2).

It is known that the severity of appendiceal inflammation is one of the difficult factors that influence the appendectomy operative outcomes. The rate of complicated appendicitis in both groups was not significantly different. In contrast to adults, we consider obesity and complicated appendicitis are not a contraindication for SIPESA [2]. We did not have any incisional hernia in both groups.

The MOT of SIPESA done by our resident is not significantly higher than CLA as reported in other publications [16-23]. This might be explained by some adopted tricks we used to overcome the instruments' collision problem like changing the placement of instruments in the SILS port, rotating the port clockwise, and anticlockwise depending on the way of traction of the appendix and regular training SILS dry and wet labs for the residents. The use of flexible instead of straight instruments may overcome the technical difficulty [12,13]. We prefer to use straight laparoscopic instruments and a long laparoscope (50 cm) as it makes the camera holder away from the operative field and decreases the collision of instruments.

There was no significant difference in morbidity and mortality between SIPESA and CLA in our study as was seen in other report [3]. We have no conversion to open in both techniques.

We consider SIPESA as one of a good training models for surgical residents to build up their SIPESA experience as it is the common pathology they are exposed to during their on-

Characteristics	Surgery type		Comparison test
	SIPESA (n = 83)	CLA (n = 53)	
LOS, days	2 (2-3) 2.80 ± 2.11	3 (1-5) 3.60 ± 3.13	M-W test $p = 0.31$
Use of IV antibiotic	77 (95%)	50 (96%)	Fisher's test $p = 1.00$
Duration of antibiotic use, days	5 (3-7) 5.85 ± 3.98	3 (1-5) 3.66 ± 3.02	M-W test $p = 0.002$
Duration of analgesia, days	5 (3-7) 5.81 ± 3.10	3 (2-5) 3.51 ± 2.17	M-W test $p < 0.001$
Post-operative complications			
No complications	80 (96.4%)	51 (96.2%)	
Intra-abdominal collection	1 (1.2%)	2 (3.8%)	Fisher's test $p = 0.84$
Adhesions	1 (1.2%)	0 (0%)	
Pleural effusion	1 (1.2%)	0 (0%)	
<b>Note:</b> values presented as frequency (%) or Mean ± SD (or) Median (IQR); M-W Mann-Whitney test			

**Table 1:** Patient demographic characteristics/Characteristics of the surgeries.

Characteristics	Surgery type		Comparison test
	SIPESA (n = 83)	CLA (n = 53)	
LOS, days	2 (2–3) 2.80 ± 2.11	3 (1–5) 3.60 ± 3.13	M-W test p = .31
Use of IV antibiotic	77 (95%)	50 (96%)	Fisher's test p = 1.00
Duration of antibiotic use, days	5 (3–7) 5.85 ± 3.98	3 (1–5) 3.66 ± 3.02	M-W test p = .002
Duration of analgesia, days	5 (3–7) 5.81 ± 3.10	3 (2–5) 3.51 ± 2.17	M-W test p < .001
Post-operative complications			
No complications	80 (96.4%)	51 (96.2%)	
Intra-abdominal collection	1 (1.2%)	2 (3.8%)	Fisher's test p = .84
Adhesions	1 (1.2%)	0 (0%)	
Pleural effusion	1 (1.2%)	0 (0%)	
<b>Note:</b> values presented as frequency (%) or Mean ± SD or Median (IQR); M-W Mann-Whitney test			

**Table 2:** Post-operative recovery.

call duties. The good outcome is it is multifactorial including the basic laparoscopic background before doing SIPESA, supervision by the senior surgeon, and structured training dry and wet lab workshops.

## Conclusion

SIPESA done by residents is a feasible and safe procedure even for complicated appendicitis with no added morbidity. The technique imparted satisfactorily to residents with successful implementation into structured surgical training programs.

## Conflict of Interest

There is no conflict of interest.

## References

- Muenster O, Puga Nougues C, Adibe O, Amin S, Georgeson K, et al. (2010) Appendectomy using single-incision pediatric endosurgery for acute and perforated appendicitis. *Surgical Endoscopy* 24: 3201-3204.
- Sesia S, Haecker F, Kubiak R, Mayr J (2010) Laparoscopy-Assisted Single-Port Appendectomy in Children: Is the Postoperative Infectious Complication Rate Different?. *Journal of Laparoendoscopic & Advanced Surgical Techniques* 20: 867-871.
- St. Peter S, Adibe O, Juang D, Sharp S, Garey C, et al. (2011) Single Incision Versus Standard 3-Port Laparoscopic Appendectomy. *Annals of Surgery* 254: 586-590.
- Daniel J Ostlie, Nicole E Sharp, Priscilla Thomas, Shawn D St. Peter (2013) Patient Scar Assessment After Single-Incision Versus Four-Port Laparoscopic Cholecystectomy: Long-Term Follow-Up from a Prospective Randomized Trial. *J Laparoendosc Adv Surg Tech A* 23: 553-555.
- Gasior AC, Knott EM, Holcomb GW, Ostlie DJ, St Peter SD (2014) Patient and parental scar assessment after single-incision versus standard 3-port laparoscopic appendectomy: long-term follow-up from a prospective randomized trial. *J Pediatr Surg* 49: 120-122.
- Feng J, Cui N, Wang Z, Duan J (2017) Bayesian network metaanalysis of the effects of single-incision laparoscopic surgery, conventional laparoscopic appendectomy and open appendectomy for the treatment of acute appendicitis. *Experimental and Therapeutic Medicine* 14: 5908-5916.
- Perez EA, Piper H, Burkhalter LS, Fischer AC (2013) Single-incision laparoscopic surgery in children: a randomized control trial of acute appendicitis. *Surg Endosc* 27: 1367-1371.
- Wakasugi M, Tsujimura N, Nakahara Y, Matsumoto T, Takemoto H, et al. (2017) Single-incision laparoscopically assisted appendectomy performed by residents is safe and feasible: A single-institution, retrospective case series. *Annals of Medicine and Surgery* 15: 43-46.
- Yannam G, Griffin R, Anderson S, Beierle E, Chen M, et al. (2013) Single-incision pediatric endosurgery (SIPESA) appendectomy—is obesity a contraindication?. *Journal of Pediatric Surgery* 48: 1399-1404.
- Karan Sikka, Alex AA, Diaz D, Goodwin MS, Craig KD, et al. (2015) Automated Assessment of Children's Postoperative Pain Using Computer Vision. *Pediatrics* 136: e124-131.
- Fransen SA, Broeders E, Stassen L, Bouvy N (2014) The voice of Holland: Dutch public and patient's opinion favours single-port laparoscopy. *J Minim Access Surg* 10: 119-25.
- Nereo Vettoreto, Vincenzo Mandalà (2001) Single port laparoscopic appendectomy: are we pursuing real advantages? *World Journal of Emergency Surgery* 6: 25.
- Canes D, Desai M (2008) Transumbilical Single-Port Surgery: Evolution and Current Status. *Eur Urol* 54: 1020-1029.
- Ponsky TA, Diluciano J (2009) Early experience with single-port laparoscopic surgery in children. *J Laparoendosc Adv Surg Tech* 19: 551-553.
- Tsai AY, Selzer DJ (2010) Single-port laparoscopic surgery. *Adv Surg* 44: 1-27.
- Dutta S (2009) Early experience with single-incision laparoscopic surgery: eliminating the scar from abdominal operations. *J Pediatr Surg* 44: 1741-1745.
- Salö M, Järbur M, Hambreus M, Ohlsson B, Pernilla Stenström et al. (2016) Two-trocar appendectomy in children – description of technique and comparison with conventional laparoscopic appendectomy. *BMC Surgery* 16: 521-525.
- Wu K, Yang L, Wu A (2015) Single-site laparoscopic appendectomy in children using conventional instruments: a prospective, randomized, control trial. *Pediatr Surg Int* 31: 167-171.

19. Duza G, Palermo M, Khiangte E, Azfar M, Ali Rizvi SA et al. (2015) Single port laparoscopic appendectomy vs conventional laparoscopic appendectomy: outcomes after multicenter randomized control trial. *Journal of American College of Surgeons*. 221: 17.
20. Park J, Kwak H, Kim SG, Lee S (2012) Single-port laparoscopic appendectomy: comparison with conventional laparoscopic appendectomy. *J Laparoendosc Adv Surg Tech A* 22: 142-145.
21. Yu-Long C, Xian-Ze X, Si-Jia Wu, Yao Cheng, Jiong Lu, et al. (2013) Single-incision laparoscopic appendectomy vs conventional laparoscopic appendectomy: Systematic review and meta-analysis. *World J Gastroenterol* 19: 5165-5173.
22. Wieck M, Hamilton N, Krishnaswami S (2016) A cost and outcome analysis of pediatric single-incision appendectomy. *Journal of Surgical Research* 203: 253-257.
23. Park J, Kwak H, Kim SG, Lee S (2011) Single-Port Laparoscopic Appendectomy: Comparison with Conventional Laparoscopic Appendectomy. *Journal of Laparoendoscopic and Advanced Surgical Techniques* 22: 142-145.