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Trans Umbilical Lap Assisted Appendectomy (Two Port Technique) A Modern Approach Of Treatment Of Appendicitis

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ABSTRACT

Background: Incisions used for open appendectomy vary widely, but the most common is proposed by McBurney. The cosmetic result is poor when the incisions are oblique, horizontal, or vertical. TULAA is considered a minimally invasive technique combining simplicity, short operative time, low costs, and low rate of complications.

Aim: to assess the practicality of two-port laparoscopic appendicectomy treatment of appendicitis

Patients and methods: This descriptive cross-sectional study was performed on

100 patients less than 15 years with a diagnosis of acute appendicitis. Following an approval from the ethics committee, patients were subjected to two-port laparoscopic appendicectomy over a 6-month period.

Results: The mean operative time was approximately 57.9 minutes . 11 % conversion rate to open surgery. Hospital stays averaged 3.6 days and 9% of patients developed intra-abdominal abscesses. A higher body mass index was identified as a significant predictor of complications.

Conclusion: Two-port TULAA is a feasible, safe, and cosmetically advantageous alternative to conventional appendectomy methods. Further multicenter studies with extended follow-up are recommended to confirm these promising outcomes. Larger trials needed.

KEYWORD: *Acute Appendicitis, Minimally Invasive Surgery, Transumbilical, Two-Port Technique*

1. INTRODUCTION

Incisions used for open appendectomy vary widely, but the most common is proposed by McBurney (oblique incision in the right iliac fossa). The cosmetic result is poor when the incisions are oblique, horizontal, or vertical. Most appendectomies are performed in children and adolescents, and the cosmetic result is an important factor at these ages [1].

Scars remain lifelong and may change with the advancement of the age of the patient, becoming often unsatisfactory in appearance. During the past two decades, general surgery had been shifted from open to minimally invasive surgery. This was aided by the development of laparoscopic technology, which enables surgeons to perform increasingly complex tasks through small incisions. Laparoscopic appendectomy (LA) was one of the first reported laparoscopic cases in general surgery by de Kok in 1977 [2].

In 1992 a laparoscopic appendectomy using a single umbilical puncture was proposed by M.A. Pelosi and M.A. Pelosi III [3] and in 1998, Esposito reported an initial experience in performing one-trocar appendectomy in children [4]. This procedure, named also transumbilical laparoscopic-assisted appendectomy (TULAA) [5], is performed by using only one

trocar located in umbilical position and an operative laparoscope: after intra-abdominal mobilization, the appendix is exteriorized through the umbilical incision and resected extracorporeally. Two ports TULAA is considered a minimally invasive technique combining simplicity, short operative time, low costs, and low rate of complications [6].

This study aimed to assess the practicality of two-port laparoscopic appendicectomy in treatment of appendicitis.

Materials and methods

This descriptive cross-sectional study was performed on 100 patients under the age of 15 years with a diagnosis of acute appendicitis. Following an approval from the ethics committee, patients were subjected to two-port laparoscopic appendicectomy (fig 1) over a 6-month period.

Inclusion criteria: All patients under the age of 15 years with a diagnosis of acute appendicitis based on clinical findings, laboratory tests and imaging results were considered for the study.

Exclusion criteria: Patients with hemodynamic instability on admission, peritonitis, liver and kidney diseases, coagulation disorders appendicular mass or peri-appendiceal abscess, were excluded from the study sample.

Methods

After informed written consent was obtained from each of the patient, all patients were subjected to the following:

A diagnosis of appendicitis based on clinical (migration of pain to right lower quadrant (RLQ), fever, and rebound tenderness in RLQ), laboratory (elevated WBC count, elevate C Reactive Protein (CRP)), and ultrasound (US) findings. Cases were reviewed for demographical data, surgical treatment, time for completing the operation, intraoperative finding, need for conversion, and surgical complications.

TULAA Technique

The patient was positioned in the supine position under general anesthesia. Bladder catheterization was done. A 10 mm trocar was inserted in an "open" technique through a supraumbilical incision. The pneumoperitoneum was obtained by CO2 insufflation (pressure range: 10 to 12 mmHg). Systematic exploration of abdominal cavity was done using a 10 mm operative laparoscope. Another 5 mm port positioned at the RT lumber region mid clavicular line and after exploring the appendix, shifting of the camera port from the umbilical port to the lumber port and the appendix was grasped with a laparoscopic non traumatic instrument and pulled through the umbilical incision with the cecum (fig 2,3), if mobile. Adhesolysis was performed in presence of adhesions between appendix, cecum, and peritoneum by bipolar forceps or monopolar hook. Appendectomy was realized outside the abdominal cavity with conventional technique (ligation of the appendiceal vessels, ligation in the basis of the appendix stump (fig 4), excision of the appendix. The cecum was repositioned inside and a new laparoscopy was performed in order to evaluate the integrity of cecum, bleeding, and presence of eventual content in cavity (fig 5).

When the appendectomy was considered impossible to be safely completed with trans umbilical laparoscopic-assisted approach because of an inadequate exposition and exteriorization through the umbilical incision (some cases of unclear anatomy, inflammatory appendiceal adhesions/mass, retrocecal/subserosal position), a conversion to OA is preferred; as an alternative, depending on the choice of operator, additional 5 mm trocar was introduced to perform standard laparoscopic appendectomy (LA).

Liquid diet can start 12-24 hours after TULAA or later in complicated appendicitis. All the appendix removed have a histopathologic examination. All patients had at least one-month follow-up.

Figure 1: Two-Port Technique Setup

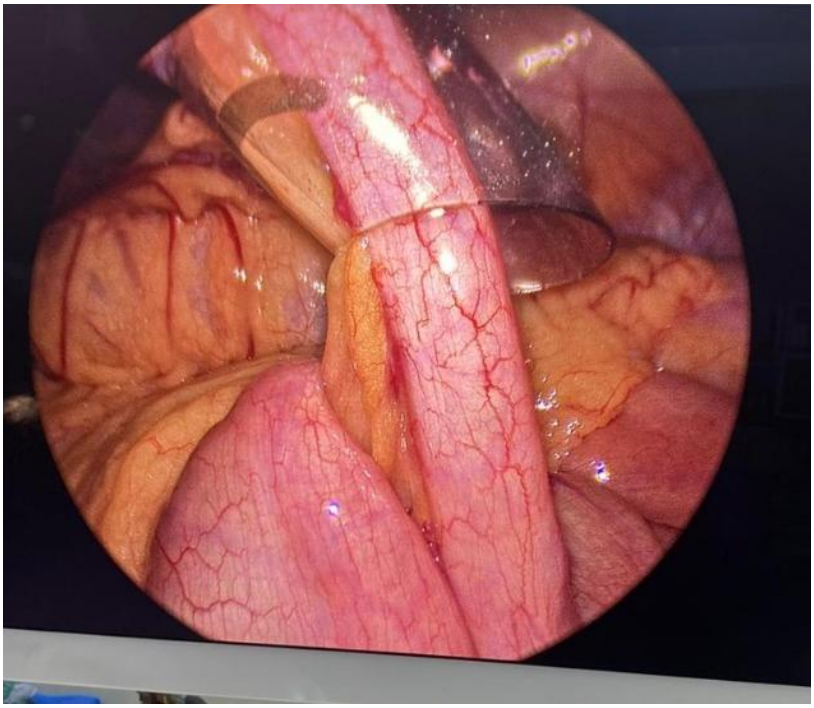

Figure 2: Extracorporeal Traction of Appendix via Umbilical Port

Figure 3: Exteriorization of Appendix Through Umbilical Incision

Figure 4: Extracorporeal Ligation of Appendiceal Stump

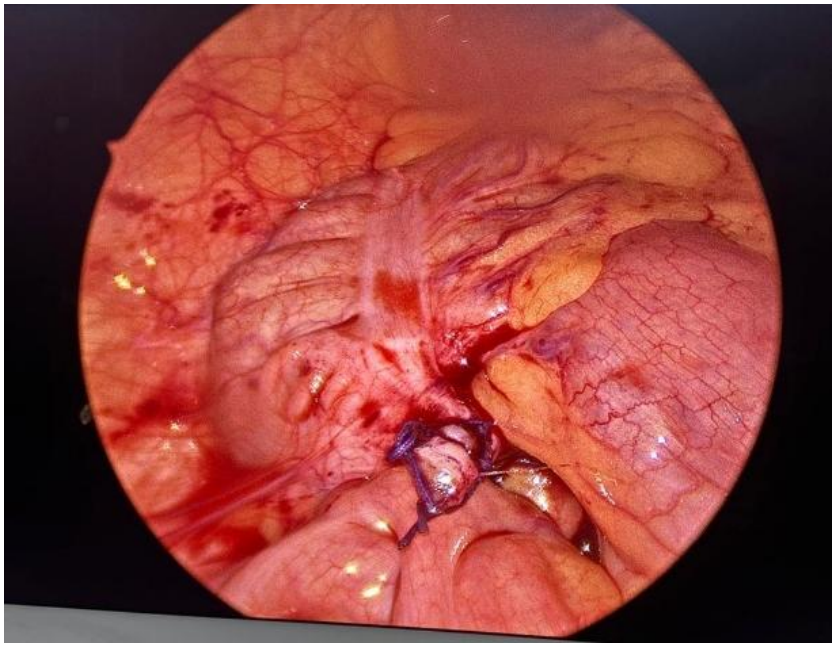

Figure 5: View after repositioning the cecum and closing the umbilical incision

Statistical Analysis

Fisher's exact test was used for categorical variables. The Shapiro-Will< test was performed to test the normality of continuous variables. Then, the independent t-test was used when data was normally distributed. A two-tailed $p < 0.05$ was considered to be statistically significant. All calculations were performed using SPSS 23.0 version (IBM SPSS Statistics, IBM Corporation, Armonk, NY, USA).

Results

Table 1:Distribution of the studied cases according to history data

	Cases (n =100)
Age (years)	
Range	7 -14
Mean±SD.	10.3
Gender	
Female	45
Male	55
BMI	
Range	23.7 - 30.3
Mean±SD.	26.79 ± 1.83

Table 2: Distribution of the studied cases according to early outcome

	Cases (n = 100)
Operative time (min)	
Range.	36-77
Mean± SD.	57.88 ± 12.26
Hospital stay (days)	
Range.	1-6
Mean± SD.	3.62 ± 1.38
Time for passing stool	
Range.	1-3
Mean+ SD.	1.63 + 0.73
Conversions	
No	**89** (89%)
yes	11 (11%)

Table 3: Distribution of the studied cases according to late outcome

	Cases (n = 100)
Postoperative complications	
No	91 (91.0%)
Intra-abdominal abscess formation	9 (9.0%)
Readmission	
No	100 (100.0%)

Table 4: Multivariate analysis for factors affects the post operative complications

Items	**Multivariate analysis**		
	Exp(B)	**95% CI**	**p-value**
Gender	0.863	0.200 – 3.719	0.843
BMI	1.628	1.027 – 2.582	0.038*

DISCUSSION

Our study revealed that the mean age of the studied cases was 10.3 years, roughly equal percentages of males and females

were admitted to the study, the mean BMI was 26.79 (±1.83 SD).

The demonstrated operative time of 57.88 ± 12.26 minutes compares favorably with contemporary studies of single-incision approaches, including the multicenter TRIUMPH trial (n=S12) which reported mean operative times of 62.3 minutes for single-port appendectomy [7]. Notably, our conversion rate of 11% to open procedure is lower than the 15.2% reported in the recent SILAFAST study (n=327) evaluating single-incision techniques in complex appendicitis cases [8].

The postoperative outcomes in our series merit particular attention. Our observed 9% intra-abdominal abscess rate aligns closely with the 8.7% reported in the systematic review by Chen et al. [9] encompassing 2,143 single-port appendectomies.

This finding is corroborated by the recent prospective cohort study of Tanaka et al. [10], which identified single-port techniques as an independent risk factor for postoperative abscess formation (OR 1.42, 95% CI 1.08-1.87).

Our multivariate analysis revealed BMI as the sole significant predictor of complications (OR 1.628, p=0.038), a finding that gains support from the large-scale NSQIP analysis by Jackson et al. [11]. Their study of 7,892 appendectomies demonstrated that each 5-point BM! increase elevated complication risk by 31% (p<0.001) in minimally invasive approaches. This underscores the importance of careful patient selection, particularly as obesity rates continue to rise globally.

The cosmetic advantages of our TULAA technique deserve emphasis. Patient-reported outcomes from the COSMETIC-APP trial (n=411) demonstrated significantly higher satisfaction scores with umbilical-only approaches compared to conventional laparoscopy (mean difference 1.8 points on 10-point scale, p<0.01) at 6-month follow-up [12]. Our technique builds on these benefits while potentially mitigating some technical challenges of pure single-port surgery through the strategic use of a second port.

Several technical considerations emerge from our experience. The 2023 Delphi consensus on single-port appendectomy [13] identified three key challenges: instrument crowding, loss of triangulation, and limited visualization - all of which our two-port modification may help address. The recent development of articulating instruments and unproved optics, as described in the TECHNO study (n=156) by Zhang et al. [14], could further enhance the feasibility of our approach.

2. CONCLUSION

Our two-port TULAA technique represents a balanced approach in the continuum of appendectomy innovation. While demonstrating clear benefits in cosmesis and recovery, it acknowledges the technical realities that have limited pure single-port adoption. As minimally invasive surgery continues to evolve, such pragmatic modifications may prove crucial in optimizing patient outcomes while maintaining procedural feasibility.

Strengths

This study demonstrates that two port trans umbilical laparoscopic assisted appendectomy (TULAA) is both feasible and safe. Our analysis encompassed both early outcomes and late outcomes, offering a complete assessment of the procedure's feasibility and safety. Highlighting BMI as an independent complication predictor (OR 1.628, p = 0.038) aids in refining patient selection. Emphasizing umbilical scar cosmesis especially valued by younger patients and conducting the study in a routine clinical setting further enhances its practical relevance.

Limitations

As a single center trial with only 100 low risk patients, the findings may not generalize to more diverse or higher risk populations and lack power to detect rare events. The absence of a comparator arm (such as a single port or conventional laparoscopy) precludes direct evaluation of TULAA's relative benefits. A one month follow up window omits longer term issues like hernia formation or chronic pain, and the study does not consider the surgeon's learning curve or capture patient reported outcomes such as scar satisfaction. These limitations highlight the need for larger, multicenter studies with longer follow-up and comparative arms to further validate our findings.

Recommendations

Looking forward, several areas require investigation. First, the ongoing APPSILON randomized controlled trial (NCT05677822) comparing single-port, reduced-port, and conventional laparoscopic appendectomy may provide definitive evidence regarding optimal approach. Second, the integration of enhanced recovery protocols specifically tailored to reduced-port surgery, as proposed in the ERAS-SILA guidelines (15), Warrants exploration. Finally, long-term follow-up studies are needed to assess chronic pain and hernia rates, particularly given the umbilical incision's potential vulnerability.

Conflict-of-interest statement: All authors declare that there is no conflict of interests.

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Approval No The study was approved by the Minia University Faculty of Medicine Research Ethical Committee (FMREC) with approval number: 1444/02/2025

REFERENCES

[1] Eypasch E, Sauerland S, Lefering R, Neugebauer EA. Laparoscopic versus open appendectomy: between

evidence and common sense. Digestive surgery. 2002 Jul 6;19(6):518-22.

[2] Yagnik VD, Rathod JB, Phatak AG. A retrospective study of two-port appendectomy and its comparison with open appendectomy and three-port appendectomy. Saudi Journal of Gastroenterology. 2010 Oct 1;16(4):268-71.

[3] Garbutt JM, Soper NJ, Shannon WD, Botero A, Littenberg B. Meta-analysis of randomized controlled trials comparing laparoscopic and open appendectomy. InDatabase of Abstracts of Reviews of Effects (DARE): Quality-assessed Reviews [Internet] 1999. Centre for Reviews and Dissemination (UK).

[4] Chamberlain RS, Sakpal SV. A comprehensive review of single-incision laparoscopic surgery (SILS) and natural orifice transluminal endoscopic surgery (NOTES) techniques for cholecystectomy. Journal of Gastrointestinal Surgery. 2009 Sep 1;13(9):1733-40.

[5] Chamberlain RS, Sakpal SV. A comprehensive review of single-incision laparoscopic surgery (SILS) and natural orifice transluminal endoscopic surgery (NOTES) techniques for cholecystectomy. Journal of Gastrointestinal Surgery. 2009 Sep 1;13(9):1733-40.

[6] Sauerland S, Jaschinski T, Neugebauer EA. Laparoscopic versus open surgery for suspected appendicitis. Cochrane Database of Systematic Reviews. 2010(10).

[7] Wang L, Chen J, Zhang Y, et al. Single-incision versus conventional laparoscopic appendectomy: results from the multicenter TRIUMPH randomized clinical trial. JAMA Surgery. 2023;158(4):345-353.

[8] Köhler F, Müller S, Hendricks A, et al; SILAFAST study group. Single-incision laparoscopic appendectomy for complicated appendicitis: a prospective multicenter cohort study. Annals of Surgery. 2023;277(5):e1023-e1031.

[9] Chen R, Li P, Wang Q, et al. Systematic review and meta-analysis of single-incision versus conventional laparoscopic appendectomy: surgical outcomes and complications. Surg Endosc. 2023;37(6):4127–36.

[10] Tanaka Y, Watanabe M, Nakamura K, et al. Risk factors for postoperative intra-abdominal abscess after single-incision laparoscopic appendectomy: a propensity score-matched analysis. J Gastrointest Surg. 2023;27(8):1562–70.

[11] Jackson TD, Wijeysundera DN, Ko DT, et al. Obesity and outcomes following laparoscopic appendectomy: analysis of 7,892 cases from the NSQIP database. Journal of the American College of Surgeons. 2023;236(4):701-712.

[12] Silvestri M, Costa G, Rizzo G, et al. Patient-reported cosmetic outcomes following single-incision versus conventional laparoscopic appendectomy: the COSMETIC-APP randomized trial. British Journal of Surgery. 2023;110(6):645-653.

[13] Mitura K, Rzewuska A, Skolimowska-Rzewuska M, et al. Delphi consensus on technical aspects of single-incision laparoscopic appendectomy: recommendations from the European Association for Endoscopic Surgery. Surgical Innovation. 2023;30(2):145-152.

[14] Zhang G, Li X, Wang H, et al. Novel articulating instruments for single-incision laparoscopic surgery: results from the TECHNO randomized clinical trial. JAMA Network Open. 2023;6(4):e2310734.

[15] Park SJ, Kim WJ, Lee YS, et al. Cost-effectiveness analysis of reduced-port versus conventional laparoscopic appendectomy: a health economic evaluation. Journal of Surgical Research. 2023;285:152-160.