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Reliability of Hem-o-Lok clip in laparoscopic appendectomy is an uncharted territory

AIM: Laparoscopic appendectomy is increasingly used in the treatment of acute appendicitis. We aimed in the present report to evaluate the reliability of the Hem-o-Lok clip used in appendix stump capping for occluding orifice.

MATERIAL AND METHODS: In this study, sequential laparoscopic appendectomy cases, in whom Hem-o-Lok clips was employed, in a single center between January 2017 and June 2020 because of acute appendicitis were retrospectively analyzed.

RESULTS: The study was completed with a total of 305 cases who underwent laparoscopic appendectomy with hem-o-lok clips within the specified date range. There were no intraoperative complications in any of the cases. The number of women was 94 (30.8%) and the number of men was 211 (69.2%). The average age was 32.7 years. There were 275 (90.2%) patients without appendix perforations and 30 (9.8%) patients with perforations. Postoperative complications occurred in 13 patients. Surgical site infection in five patients, mechanical intestinal in two patients, intraabdominal abscess in five patients, and hematoma at the trocar entry site in one patient were observed. There were no intraoperative complications in any of the patients.

CONCLUSIONS: Hem-o-Lok clip can be applied safely in laparoscopic appendectomy for the capping of the appendix stump, with its easy-to-use and low-cost features.

KEY WORDS: Acute appendicitis, Laparoscopic appendectomy, Hem-o-lok clip

Introduction

Laparoscopic appendectomy has evolved a frequently employed treatment method in the acute appendicitis since it was first defined by Semm in 1983^{1,2}. Laparoscopic appendectomy is becoming increasingly important in the cure of acute appendicitis, especially in obese, elderly patients and in patients in whom the diagnosis is vague³. The laparoscopic approach has clear benefits due to less pain and faster recovery time com-

pared to the open surgery^{4,5}. However, its disadvantages such as intra-abdominal collection, long operation time and high cost have been shown in studies⁶. The disadvantages of laparoscopic surgery may be due to the stump closure technique of the appendix. Therefore, the appendix stump closure technique is still the subject of research in laparoscopic appendectomy. While performing laparoscopic appendectomy, the stump of the appendix is normally closed with an endoloop ligature or linear stapler (Endo GIA)⁷. Many studies report that the stapler method provides the most confident closure of the appendix stump, however it is the most costly method (8). However, while the application of the endoloop requires manual skill and training, the usage of hem-o-lok clips is very simple and can be used by almost any surgeon without any prior practice (9). Hem-o-Lok (HOL) clip, which is simple to apply and cheaper than other methods, is increasingly used in laparoscopic appendectomies. However, complications after laparos-

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complications are substantial and can not be underestimated. The rationale of the study is to evaluate the security of using hem-o-lok clips in laparoscopic appendectomies and their effect on postoperative complications.

Material and Method

In this study, sequential laparoscopic appendectomy cases accomplished in a single center between January 2017 and June 2020 because of acute appendicitis were retrospectively evaluated. Patients aged 18 and over were included in the study. A hem-o-lok clip (Weck Hem-o-Lok XL, nonabsorbable polymer ligating clips, Dublin, Ireland) was used in all surgeries. Patients younger than the age of 18, cases who were intraoperatively converted from laparoscopic to the open method, patients who underwent an additional procedure other than appendectomy during surgery, and patients whose appendix stump was closed using a method other than hem-o-lok clip were excluded from the study.

The diagnosis was confirmed by ultrasonography (USG) or Computed Tomography (CT) as imaging methods in patients with preoperative clinical suspicion. Preoperative c-reactive protein (CRP) and white blood cell (WBC) were routinely ordered. Complications that developed during and after the operation were studied. The patients were evaluated in two groups as postoperative complications and those without complications. The data, preoperative and postoperative results of the cases were uploaded to the SPSS (Statistical Package for the Social Sciences) program. Factors affecting the development of postoperative complications were investigated.

Procedure

All surgeries were performed by the same surgical team. The patient was operated on in the supine position with the head down and the right side up. Both the surgeon and an assistant colleague worked on the left side of the patients, and the monitor was positioned on the right side of patient. Foley catheter was routinely employed to prevent bladder injury during suprapubic trocar insertion. Pneumoperitoneum was provided using a Veress needle. A 10 mm trocar was inserted below the umbilicus followed by the insertion of a laparoscope and inspection of the peritoneal cavity.

A trocar of 10 mm is entered on just medial to the left anterior-superior iliac spine and the second trocar of 5mm is emplaced 4 to 5 cm above the pubis in the midline. Mesoappendix was dissected and cut by the help of ligasure (Ligasure, Maryland Jaw Laparoscopic Sealer / Dider, 5 mm-37 cm, Covidien). The proximal part of the appendix was closed with two non-absorbable polymeric clips (Hem-o-lok MLX polymericclips, Weck



Fig. 1

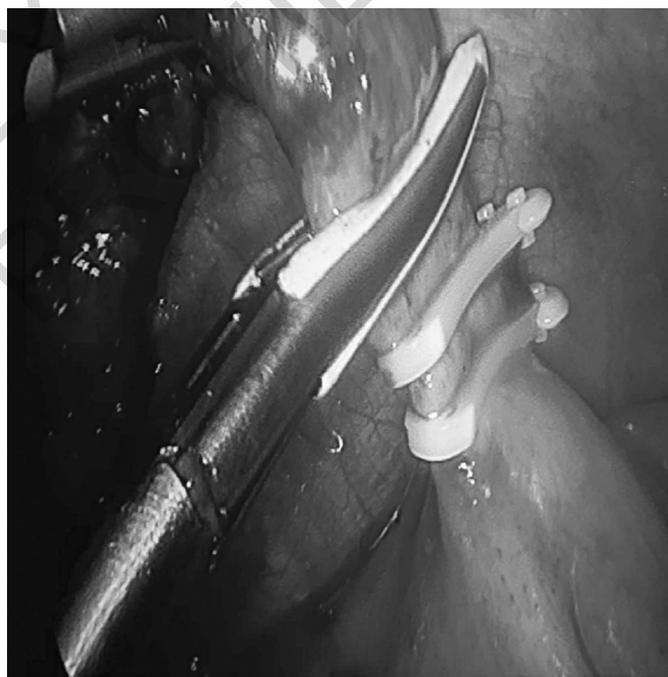


Fig. 2

Closure Systems, NC, USA) (Fig. 1). The distal part was transected with ligasure without clipping (Fig. 2). To prevent contamination; the appendix was removed with the aid of an endobag. Jackson-Pratt drain was used in patients for whom a drainage indication was considered. At the end of the operation, the fascia defect under the umbilicus, which was caused by 10 mm trocar, was repaired.

STATISTICAL ANALYSIS

SPSS 15.0 for Windows program statistical calculations were established. Regarding statistics of description; number and percentage for categorical variables; mean, standard deviation, minimum, maximum for numerical variables were evaluated. The rates in the groups were compared with the Chi-Square test. When the numerical variables did not meet the normal distribution condition, comparisons of two independent groups were made by Mann Whitney U test. The significance level of statistics was deemed as $p < 0.05$.

Results

The study was completed with a total of 305 cases in whom laparoscopic appendectomy with hem-o-lok clips within the specified date ranges were established. The number of women was 94 (30.8%) and the number of men was 211 (69.2%). The average age was 32.7 years. There were 275 (90.2%) patients without appendix perforations and 30 (9.8%) patients with perforations. Postoperative complications occurred in 13 patients. Surgical site infection in five patients, mechanical intestinal in two patients, intraabdominal abscess in five patients, and hematoma at the trocar entry site in one patient were observed. The demographic findings of the patients are listed in Table I. The patients meanage with postoperative complications, the presence of comorbidity, the onset of their complaints, the appendix perforation

rate, the average duration of surgery, and the duration of hospitalization were statistically significantly higher than those without postoperative complications (Table II). No intraoperative complications were encountered in any of the patients.

Discussion

Laparoscopic appendectomy is awaited to be accepted as the worthy standard in the surgical cure of acute appendicitis, similar to the evolution of laparoscopic cholecystectomy ¹. This study showed that the hem-o-lok clip could be used safely in patients who underwent laparoscopic appendectomy for acute appendicitis.

Unlike open technique appendectomy, numerous diverse modalities different techniques have been employed for laparoscopic appendectomy ¹⁰. The entry sites of the trocars and the closure of the stump of the appendix differ greatly in addition to many other aspects. This has shown that no technique has ever been significantly superior to each other ¹¹. Most investigators have used a stapler or endoloop to close the appendix stump ¹². Stapler use is fast and reliable ¹³. With the exception of an inflamed or perforated appendix stump, the use of staplers has not been found to be superior to endoloop or polymeric clips in terms of postoperative complications and is not recommended as a standard treatment by many authors ¹⁴. Although the use of Endoloop is cheaper than staples, it requires skilled laparoscopic technique and training, which makes this method disadvanta-

TABLE I

Sex N (%)	Female	94 (30,8)
	Male	211 (69,2)
Age Ort.±Sd (Min-Maks)		32,7±11,5 (18-81)
Comorbidity N (%)	(-)	265 (86,9)
	(+)	40 (13,1)
Pain Onset Date(Days): Med.±Sd (Min-Max)		1,94±0,87 (1-7)
Asa N (%)	1	296 (97,0)
	2	9 (3,0)
Perforated N (%)	Perforated (-)	275 (90,2)
	Perforated(+)	30 (9,8)
Operation Time Med.±Sd (Min-Max)		69,0±25,2 (30-135)
Drain N (%)		44 (14,4)
Hospitalization Day		2,26±1,26 (1-14)
Preop Imaging N (%)	Ultrasonography	14 (4,6)
	Computed Tomography	291 (95,4)
Preoperative Wbc Med.±Sd (Min-Max)		13032,8±4198,9 (4000-31000)
Preoperative Neutrophil Med.±Sd (Min-Max)		9890,1±4087,2 (2000-25000)
Preoperative Crp Med.±Sd (Min-Max)		47,5±69,2 (1-373)
Postoperative Complication N (%)	(-)	292 (95,7)
	Abdominal Abscess	5 (1,6)
	Superficial Wound Infection	5 (1,6)
	Ileus	2 (0,7)
	Trocar Site Hematoma	1 (0,3)

TABLE II

		Postoperative Complication		P	
		(-)	(+)		
Sex N(%)	Female	87 (29,8)	7 (53,8)	0,120	
	Male	205 (70,2)	6 (46,2)		
Age Med.±Sd (Med)		32,5±11,4 (30)	39,2±11,2 (42)	0,028	
Comorbidity N(%)	(-)	257 (88,0)	8 (61,5)	0,018	
	(+)	35 (12,0)	5 (38,5)		
	Hypertension	13 (4,5)	2 (15,4)		0,129
	Diabetes	8 (2,7)	2 (15,4)		0,062
	Coronary Artery Disease	6 (2,1)	1 (7,7)		0,265
	Chronic Obstructive Pulmonary Disease	5 (1,7)	0 (0,0)	1,000	
Pain Onset Date(Days): Med.±Sd (Median)		1,92±0,86 (2)	2,38±0,96 (2)	0,041	
Asa N(%)	1	284 (97,3)	12 (92,3)	0,328	
	2	8 (2,7)	1 (7,7)		
Perforated	(-)	267 (91,4)	8 (61,5)	0,005	
	(+)	25 (8,6)	5 (38,5)		
Operation Time Med.±Sd (Median)		68,2±24,8 (60)	87,7±26,6 (90)	0,006	
Drain N(%)		37 (12,7)	7 (53,8)	0,001	
Hospitalization Day Med.±Sd (Median)		2,18±0,97 (2)	4,08±3,71 (2)	0,004	
Preop Imaging N(%)	Ultrasonography	14 (4,8)	0 (0,0)	1,000	
	Computed Tomography	278 (95,2)	13 (100)		
Preoperative Wbc Med.±Sd (Median)		13116,4±4229,8 (13000)	11153,8±2967,8 (11000)	0,082	
Preoperative Neutrophil Med.±Sd (Median)		9967,6±4111,4 (10000)	8148,5±3139,6 (7430)	0,114	
Preoperative Crp Ort.±Sd (Median)		46,2±68,9 (14)	77,9±71,5 (80)	0,112	

Asa: American Society Of Anesthesiologist, Sd: Standard Deviation, Wbc: White Blood Cell, Crp: C-Reactive Protein

geous¹⁵. Surgical sutures performed outside the abdomen, on the other hand, decrease the cost and increase the duration of the operation¹⁶. The use of HOL clips becomes advantageous in laparoscopic appendectomy compared to other methods in terms of similar operation time, ease of use and seriously very low operation cost.

As with all surgical procedures, postoperative complications are undesirable and should be minimized in laparoscopic appendectomies. As laparoscopic appendectomy has become current and popular, the effects of the techniques performed on postoperative complications have been the subject of study¹⁵⁻¹⁷. In the study conducted by Hue et al.¹, complications (wound infection) were observed in only one of 39 patients whose appendix stump was closed with HOL clips (2.5%). Partecke et al.¹⁰ found postoperative complications in only one of 26 patients in which HOL clips were used (3.9%) in their prospective non-randomized study, and no significant difference was found when compared with the stapler group. Similarly, in a prospective randomized study by Çolak et al.¹⁵, superficial surgical infection was observed in two of 26 patients in the HOL clip group (7.7%), and they did not find a statistically significant difference compared to the endoloop group. Again, Al-Temimi et al.¹⁸ observed postoperative complications in one of

38 HOL patients in their study (2.6%). In this study, postoperative complications were observed in 13 (4.3%) of 305 laparoscopic appendectomy patients using HOL. Although our results are compatible with the literature, the recommendation power of our study is higher than other studies, since the number of our cases is quite high compared to previous studies.

Factors affecting postoperative complications and hospital stay after laparoscopic appendectomy are still the subject of research¹⁹. In studies performed, it was found that preoperative WBC and CRP levels in addition to postoperative complications were significantly higher in patients with appendix perforations²⁰. In this study, although most of the patients with complications were in the perforated group, preoperative WBC and CRP levels were not found to be significantly different than those without complications. Even if WBC and CRP levels do not increase significantly preoperatively, care should be taken in terms of postoperative complications. The time from the moment of diagnosis and the onset of complaints to surgery is also a risk factor for postoperative complications²⁰. In the work at hand, the onset of complaints in patients with postoperative complications was statistically longer than the group without complications. Being retrospective and not having a control group were the limitations of the study.

Conclusion

The HOL clip can be applied safely in laparoscopic appendectomy for the closure of the appendix stump, with its easy-to-use and very remarkable low-cost features. As with other methods, care should be taken in terms of postoperative complications in patients with perforated appendicitis, longer time from complaints to surgery, and a long operation time.

Riassunto

L'appendicectomia laparoscopica è sempre più utilizzata nel trattamento dell'appendicite acuta. Abbiamo cercato di valutare con questo studio l'affidabilità della clip Hem-o-Lok utilizzata nella chiusura del moncone dell'appendice al suo impianto.

Nello studio sono stati analizzati retrospettivamente i casi di appendicite laparoscopica eseguiti in sequenza, in un unico centro tra gennaio 2017 e giugno 2020 per appendicite acuta, in cui sono state impiegate clip Hem-o-Lok. Lo studio è stato completato con un totale di 305 casi. Non ci sono state complicanze intraoperatorie in nessuno dei casi. Il numero delle donne era 94 (30,8%) e il numero degli uomini era 211 (69,2%). L'età media era di 32,7 anni. C'erano 275 (90,2%) pazienti senza perforazione dell'appendice e 30 (9,8%) pazienti con perforazione. Complicanze postoperatorie si sono verificate in 13 pazienti. Sono state osservate infezioni del sito chirurgico in cinque pazienti, occlusione intestinale meccanica in due pazienti, ascesso intraddominale in cinque pazienti ed ematoma nel sito di ingresso del trocar in un paziente.

Non c'è stata complicanza intraoperatoria in nessuno dei pazienti.

Dunque la clip Hem-o-Lok può essere usata in modo sicuro nell'appendicectomia laparoscopica per la chiusura del moncone appendicolare, per le sue caratteristiche di facile utilizzo e basso costo.

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