Comparative Study of Monopolar Cautery and Bipolar Vessel Sealing System in Laparoscopic Appendectomy

Dr. K A Bhadreshwara*, Dr. A B Amin**

*Associate Professor, Department of General Surgery, v s hospital, N H L Municipal Medical College,
**Assistant Professor, Department of General Surgery, civil hospital, B J Medical College, Ahmedabad 380006.

Abstracts: Background: Laparoscopic appendectomy has gradually become widespread especially in the last decade. Although laparoscopic techniques are similar, different instruments, such as endoscopic stapler, endoscopic clip, monopolar hook cautery, harmonic scalpel, and vessel sealing instrument, can be used in appendiceal mesentery dissection [1, 2]. BVS is an effective and safe system to be used at the dissection of appendiceal mesentery and haemostasis and is definitely effective in decreasing the operation period. **Objectives**: The main objective of the present study was to studyretrospectively, the effects of using monopolar cautery and vessel sealing system on the operation period in the appendix mesentery dissection.
Methods: Hundred patients, operated laparoscopically for acute appendicitis in between June 2010 and June 2011, are evaluated retrospectively. Monopolar cautery was used in 50 patients and bipolar vessel sealer was used in 50 patients. No intraoperative or postoperative complication was seen in any of the patients. None of the patients required conversion to open surgery due to dissection problems of the appendiceal mesentery.
Results and Interpretation: The mean duration of operation was 51.08 min in the monopolar cautery group whereas 36.68 minutes in the bipolar vessel sealing system group. **Conclusion**: Bipolar vessel sealeris safer and time saving as compared toMonopolar cauteryin laparoscopic appendectomy. [Bhadreshwara K NJIRM 2014; 5(6):53-55]

Key Words: Monopolar cautery, vascular sealing system, laparoscopy, appendectomy.

Author for correspondence: Dr. Kamlesh A Bhadreshwara, 104-Shubharambh flats, opp- Rajuratna society, Chandranagar, N N Road, Paldi, Ahmedabad –380007. **Email:** kmlsh_b@yahoo.co.in

Introduction: Laparoscopic appendectomy has been gradually becoming widespread especially in the last decade in Routine surgical practice. Although laparoscopic techniques are similar, different instruments, such as endoscopic stapler, endoscopic clip, monopolar hook cautery, harmonic scalpel,and vessel sealing instrument,can be used in appendiceal mesentery dissection[1, 2]. In this study, the effects of using monopolar cautery and vessel sealing system on the operation period in the appendix mesentery dissection are compared retrospectively.

Material and Methods: Permission of IRB was not taken. The operations were performed for acute appendicitis at our Hospital in between June 2010 and June 2011 were investigated retrospectively using patient medical records. Patients' age, sex, operation period, method of dissection of appendiceal mesentery, duration of hospital stay and complication were noted. Hundred patients aging between 15 and 35 years and undergoing appendiceal mesentery dissection were separated into 2 groups: monopolar cautery patients (group 1) and bipolar vessel sealer patients (group 2).The time between the skin incision for first trocar insertion and the skin incision suturing at the end of the operation was accepted as the operation period. Patients with perforated appendicitis and those who were converted to open surgery were excluded. P values less than 0.05 were accepted significant.

Technique: Patients were operated on supine position, when needed Trendelenburg and left lateral position was added to the initial position. Pneumoperitoneum was introduced by Open port 10 mm trocar placed infraumbilically, later on was used for camera and CO2 at 10 mmHg pressure was used. Two 5 mm working ports were placed at the right lower quadrant and suprapubic region. In group 1, appendiceal mesentery dissection was performed using a laparoscopic marry land forceps attached to the monopolar cautery. In group 2, mesentery was freed and resected with a 5 mm bipolar vessel sealer (Liga-SureTM Valley lab). Appendiceal stump was secured by absorbable chromic catgut roader's pretied knot. Afterwards, appendectomy was performed and taken out of the abdomen via the 10 mm umbilical port.

Result: Hundred patients operated for acute appendicitis in between June 2010 and June 2011 was evaluated. Fifty patients were in group 1 and fifty patients were in group 2.The mean age was 25.48 years in group 1 and 25.60 years in group 2 with minimum age was19 and 17 years respectively.Male to Female ratio was 3:2 and 3.2:1.8 in group 1 and group 2 respectively.

Average duration of hospitalisation was 2.4 days and 2 days in group 1 and group 2 respectively, suggesting almost 20% reduction in stay, morbidity with $p < 0.432$.

No intraoperative and postoperative complication was encountered in any of the patients. None of the patients required conversion to open operation due to a problem of appendiceal mesentery dissection. The mean operation period was 51.08 min in group 1 and 36.68 min in group II with p value of <0.003.

Discussion: Different techniques and instruments are used for appendiceal mesentery dissection at laparoscopic appendectomy operations [1]. Cutting the appendiceal mesentery by laparoscopic scissors and suturing take more time and require experience for intracorporeal knot tieing. On the other hand, endoscopic stapler is expensive. Classical bipolar electrosurgical systems and ultrasonic thermal energy are inadequate for the haemostasis of vessels greater than 2 mm in diameter. Electro thermal Bipolar Vessel Sealer (BVS) (Liga-Sure TM, Valley Lab) is a bipolar electrosurgical haemostasis instrument, which can be used for haemostasis in open and laparoscopic surgery. These instruments operate with high current and low voltage. However, the standard monopolar or bipolar cauteries run on high voltage and low current. BVS denatures the collagen and elastin on the vessel wall and neighbouring tissues with its energy. In addition, it applies pressure to the tissue by its handle forceps. This enhances the refiguration of the denatured tissue resulting in mutual sealing of the vessel wall, which is then cut by scissors. The haemostatic plug is composed of denatured and reformed collagen and elastin of the tissue and blood vessel. Microscopically, vessel walls seal and the lumen obliterates. This tissue is characterized by intrinsic fibrosis and minimal inflammation on day 20.

Energy dispersion distance to the adjacent tissue was found to be 1.5 mm experimentally in BVS whereas it was found to be 1.6 mm in ultrasonic instruments [3]. BVS has also been found effective and safe in preclinical studies. It has been widely used in many surgical approaches in several fields, including endocrinology, gastrointestinal system, urology,and gynaecology. The calculated operative time benefit differs between 9.8and 48 min with an average of 26.8 min [4]. Our study is in line with the literature Average operating period in BVS usage is approximately 15 min less in respect to monopolar cautery (36.68 and 51.08 min). Marcello et al. calculated the cost of disposable clip and that of BVS at colectomies and reported that BVS provides evidently low costs compared to stapler and clip. In the same study, they also found 9,2% instrument failure in the stapler and clip group in respect to 3% in the BVS group[5].

Several shortcomings associated with conventional monopolar cautery, such as thermal injury risk, difficulty in haemostasis, smoke production, the need of use of additional tools, such as bipolar graspers, sutures and clips, have been reported. Sharp dissection has the advantage of high heat production with thermal spread in surrounding structures and charring. It has some risks of direct coupling to another metal instrument, direct sparking, and the passage of current from recently coagulated, electrically isolated tissue [6]. Although monopolar cautery is very useful for the dissection of the gall bladder, thermal injury after monopolar cautery application has been described in many studies [7, 8.]

Table 1: Comparison of Monopolar Cautery and BVS

	MONOPOLAR CAUTERY	BVS(BIPOLAR VESSEL SEALING SYSTEM)	P
No Of Patients	50	50	
Age(Year)	19-35	17-35	
Male/Female	30/20	32/18	

Duration Of Operation(Min)	51.08	36.68	0.003
Duration Of Hospitalisation (Days)	2.4	2.0	0.432
Intraoperative Complications	Nil	Nil	
Postoperative Complication	Nil	Nil	

Landmen et al. compared BVS with bipolar- electro surgery, harmonic scalpel, and titanium clip application in animal model studies and reported BVS as the most effective and sufficient method. They determined that the collateral tissue damage was 1-3 mm in BVS and 1-6 mm in standard bipolar instruments and also they found BVS effective in haemostasis of arteries reaching to 6 mm in diameterand veins reaching to 12 mm in diameter [9].

Makario et al. compared the studies of BVS, ultrasonic energy, suture ligation, and electro-cauterization in their meta-analysis. Operation period was 28% less inrespect to classical haemostasis method. Also, less blood loss, lower complication,and less postoperative pain were noted in the BVS used operations [10]. In conclusion, BVS is an effective and safe system to be used at the dissection of appendiceal mesentery and haemostasis and is definitely effective in decreasing the operation period.

Conclusion: comparing to monopolar cautery, bipolar vessel sealer can be used effectively and safely in the dissection and hemostasis of appendiceal mesentery and is definitely an effective system in decreasing the operation time. We recommend the use of bipolar vessel sealer in case of laparoscopic appendectomy to reduce postoperative stay in hospital as well as the post-operative morbidity.

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Conflict of interest: None
Funding: None