

Original Article | **Monopolar Electrocautery, an Alternative Novel Method of Hemostasis During Radical Cystectomy: Preliminary Report**

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**ABSTRACT**

**Objective:** During radical cystectomy, local hemostasis is a critical factor for surgical success. It can be accomplished with a variety of techniques including mechanical compression, ligatures, cauterization and laser. The aim of this work was to evaluate monopolar electrocautery alone for achieving hemostasis during radical cystectomy.

**Patients and Methods:** In this prospective study 30 patients were scheduled for radical cystectomy over a period of 2 years at Al-Azhar University Hospitals using monopolar electrocautery as the only hemostatic tool. The parameters studied were: operative time, estimated blood loss and incidence of complications. The data were analyzed clinically and statistically.

**Results:** Monopolar electrocautery as the only hemostatic tool during radical cystectomy resulted in a short operative time ( $35 \pm 5$  minutes). The mean estimated blood loss was  $150 \pm 50$  ml. Intra-operative bleeding was encountered in 2 patients only and they received blood transfusion. The overall post-operative early (within the first month) complication rate was low (13.3%) and all complications were managed conservatively.

**Conclusion:** Monopolar electrocauterization is a safe method for achieving hemostasis during radical cystectomy, with a significantly short operative time, low cost, low blood loss, a low cystectomy-related complication rate and a short hospital stay.

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**Keywords :** Bladder cancer, radical cystectomy, hemostasis, monopolar electrocautery

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**Article Info:** Date received : 1/10/2007

Date accepted ( after revision): 25/11/2007

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**INTRODUCTION**

During radical cystectomy hemostasis is a fundamental technical step. Since the first cystectomy performed in 1880, bleeding has been controlled mainly by suture ligation during cystectomy<sup>1,2</sup>. With the advent of laparoscopy, new methods of tissue dissection, coagulation, cutting and vascular control have been introduced. These methods include harmonic scalpel (ultrasonic coagulation shear), LigaSure (electrothermal bipolar vessel sealer), surgical clips (titanium and plastic clips) or laser (CO<sub>2</sub>, Nd: YAG)<sup>3</sup>. Since 1999, the LigaSure vessel sealing system has been used in nearly 2 million surgical procedures worldwide as a safe and effective bipolar electro-surgical method of

sealing vessels, lymphatic and tissue bundles up to a size of 7 mm in diameter. The system consists of a 5 mm grasper / dissector connected to a bipolar electro-surgical generator. When the vascular structure is grasped in the instrument, a protein-based seal of the enclosed vessels is created<sup>4</sup>. Based on the idea of LigaSure we developed a new, similar technique of hemostasis (monopolar electrocauterization) using a simple cautery forceps and the traditional monopolar electro-surgical generator. Monopolar current is versatile, more effective and less expensive, and it offers the advantage of a shorter operative time<sup>1</sup>.

In our study we used monopolar electrocauterization as a hemostatic tool during radical cystectomy aiming at minimizing operative time and complications.

## PATIENTS AND METHODS

This prospective study included 30 consecutive patients, 23 males and 7 females, with invasive bladder cancer who underwent radical cystectomy at Sayed Galal and Al-Hussein University Hospitals, Cairo, Egypt. Their age ranged between 45 and 67 years (mean  $57 \pm 2$  years). Only patients with T2 (n=18) or T3 (n=12) bladder cancer without co-morbid diseases such as uncontrolled diabetes mellitus, uncompensated cardiac disease or morbid obesity were included. All patients were operated by the same surgeon and his assistant team.

Pre-operative assessment (clinical, laboratory, imaging, cystoscopy and biopsy) was routinely done for all patients.

All relevant patient data (age, sex, pre- and post-operative hemoglobin level, operating time for radical cystectomy only, intra-operative complications, especially bleeding, intra-operative and post-operative blood transfusion, hospitalization, infection rate) were documented. The data were statistically analyzed using the Chi-Square test and t-test with a p-value  $< 0.05$  considered statistically significant. Blood loss was estimated based on the pre- and post-operative hemoglobin level and hematocrit value, by weighing (before and after use) the gauze packs used and by measuring the amount of blood in the bottle of the suction apparatus. The only method of hemostasis used was monopolar electrocautery for all steps during cystectomy. A single electrosurgical current generator was used (PSD-20; Olympus) in all cases. Electric power was set at 30-60 Watt and automatically stopped after 4 seconds. We defined cystectomy-related complications as any event directly related to the procedure that necessitated further surgical or medical intervention.

## RESULTS

The data on the various parameters studied are presented in Table 1.

The indication for radical cystectomy was invasive bladder carcinoma: transitional cell carcinoma in 24 and squamous cell carcinoma in 6 patients. Urinary diversion was done by ileal pouch in 18 patients and sigmoid pouch in 12 patients. The mean pre-operative hemoglobin level was  $12.7 \pm 1.6$  gm/dl compared to a post-operative hemoglobin level of  $11.5 \pm 0.9$  gm/dl. The mean operative time for radical cystectomy only (without urinary diversion) was clinically and statistically reduced ( $35 \pm 5$  minutes) when compared to the traditional method of hemostasis. Only 2 patients required blood transfusion and received 2-3 units. The estimated blood loss, the rate of blood transfusion and hospitalization were clinically considered significant. No sutures and no extra devices for securing the blood vessels and achieving good hemostasis were needed.

The overall post-operative early (within the first month) complication rate was 13.3% (Table 2). All complications were managed conservatively. No serious complications were seen peri-operatively. Intra-operative bleeding was encountered in the first 2 patients with electrocautery control and they were given 2-3 units of whole blood.

## DISCUSSION

Electrosurgery is a commonly used technology in urologic procedures. Electrosurgical devices are being used in many medical sub-disciplines in order to coagulate, cut and ablate tissue and to produce hemostasis. The latest advance in electrosurgery is the introduction of novel simultaneous hemostatic sealing and cutting bipolar devices that minimize force by delivering energy as high current and low voltage output. One of these systems is the LigaSure system based on bipolar technology<sup>5</sup>. It is safe and effective in

**Table 1 :** The pre-operative and intra-operative observations of both groups

Item	Monopolar electrocautery	P value
Mean age (range)	57±2 (45-67) years.	--
Sex	23 males (76.7%) 7 females (23.3%).	--
Mean pre-operative hemoglobin level	12.7±1.6 g/dl	--
Mean post-operative hemoglobin level	11.5±0.9 g/dl	<1.1
Mean pre-operative hematocrit value	41±1.0 %	--
Mean post-operative hematocrit value	38 ±1.2 %	<1.0
Clinical staging of the tumor	T2 (18 patients) T3 (12 patients)	-- --
Operative time of cystectomy only	35 ± 5 min	--
Estimated blood loss	150 ± 50 ml	--
Blood transfusion	2 patients (2 and 3 units)	--
Hospital stay	5 ± 1.4 days	--

**Table 2.** Early post-operative complications

Complications	No. of Patients	%
Pelvic collection	1	3.3%
Wound infection	2	6.7%
Wound dehiscence	1	3.3%
<b>Total</b>	<b>4</b>	<b>13.3%</b>

dissection and hemostasis. The urologist is familiar with electrosurgery, as we have become comfortable using LigaSure to dissect, cut and coagulate tissue. It has been reported in the literature that LigaSure is used on a very limited scale in radical cystectomy<sup>6</sup>. Because the LigaSure system is very expensive, we feel that it can be used only in laparoscopic procedures, since the traditional «open» methods of controlling bleeding (mechanical compression, cauterization and suture ligation) are not as easily applied in the laparoscopic arena<sup>7</sup>.

In our study, we introduced a novel method of hemostasis, based on the principle of LigaSure, but less expensive (monopolar electrocautery). The instrumentation consists of a simple cautery forceps and the traditional monopolar electrosurgical generator.

Monopolar electrocautery has been (and remains) the mainstay in surgical dissection

and hemostasis for the majority of practising surgeons. Despite advances in technology and bioengineering, this instrument remains widely used and is often preferred<sup>8</sup>. A basic understanding of conventional monopolar electrocautery is imperative to understand the benefits and shortcomings of the newer dissection tools. Tissue ablation with the Bovie monopolar cautery unit, a conventional electrosurgical tool, is achieved by introducing current across the physical gap between the source electrode and electrically conductive tissue using an electrode pair. Air or water molecules in the gap are dissociated into charge-carrying ions. Kinetic energy transfer between charge-carrying ions and tissue molecules results in heating of intracellular and extracellular fluids and injures localized tissue cells<sup>9</sup>. Compared with a standard scalpel, monopolar electrocautery provides an excellent tool for achieving cutting, ablation, coagulation, desiccation, and rapid surgical hemostasis because the heat generated

denatures proteins. Suture ligation using 0 silk sutures is a procedure commonly performed by urologists in radical cystectomy.

In this prospective study on using the new method of monopolar electrocauterization we found that the main advantage of the technique is its cost-effectiveness compared to suture ligation. In addition, the operative time was significantly shorter and the mean blood loss was less than that encountered with the traditional technique. A shorter operative time is translated to a shorter exposure to anesthetics and an overall more cost-effective technique. Bleeding was seen in only 2 cases that required blood transfusion. The complication rate in our study was low, with rare serious morbidity. Other studies comparing suture with non-suture techniques of hemostasis in gynecologic surgery have shown similar results<sup>10</sup>.

We are aware that this preliminary study included a small group of patients, but the authors have started a prospective randomized study to be carried out over the coming 5 years comparing the results of this technique with those of suture ligation on a wide scale using a clear endpoint of assessment.

In conclusion, the novel method of monopolar electrocautery is based on the idea of LigaSure. Our preliminary results suggest that it is a good method of achieving hemostasis during radical cystectomy. The low cost, low blood loss, short operative time, as well as short hospitalization make the monopolar electrocautery method an efficient and cost-effective technique for hemostasis during radical cystectomy.

## REFERENCES

1. Diamantis T, Kontos M, Arvelakis A, Syroukis S, Koronarchis D, Papalois A, et al. Comparison of monopolarelectrocoagulation, bipolarelectrocoagulation, ultracision, and ligasure. *Surgery Today*. 2006; Oct;36(10):908-13.
2. Skinner DG, Stein JP, Lieskovsky G, Skinner EC, Boyd SD, Figueroa A, et al. 25-Year Experience in the Management of Invasive Bladder Cancer by Radical Cystectomy. *Eur.Urol*. 1998;33 Suppl 4:25-6.
3. Entezari K, Hoffmann P, Goris M, Peltier A, Van Velthoven R. A review of currently available vessel sealing systems. *Minimally Invasive Therapy and Allied Technologies*. 2007;16(1):52-7.
4. Peters CJ, Botterill I, Ambrose NS, Hick D, Casey J, Jayne DG. Ligasure trademark vs conventional diathermy haemorrhoidectomy: long-term follow-up of a randomised clinical trial. *Colorectal Dis*. 2005; Jul;7(4):350-3.
5. Gözen AS, Teber D, Rassweiler JJ. Principles and initial experience of a new device for dissection and hemostasis. *Minimally Invasive Therapy and Allied Technologies*. 2007;16(1):58-65.
6. Crawford ED, Kennedy JS. Use of the LigaSure vessel sealing system in urologic cancer surgery. *Grand Rounds Urol*. 1999;1(4):10-7.
7. Lantis JCI, Durville FM, Connolly R, Schwaitzberg SD. Comparison of coagulation modalities in surgery. *J.Laparosc. Adv.Surg.Tech.A*. 1998;8(6):381-94.
8. Peterson SL, Stranahan PL, Schmaltz D, Mihaichuk C, Cosgriff N. Comparison of healing process following ligation with sutures and bipolar vessel sealing. *Surg. Technol.Int*. 2002; Sep;10:55-60.
9. Stoker KE, Don DM, Kang DR, Hauptert MS, Magit A, Madgy DN. Pediatric total tonsillectomy using coblation compared to conventional electrosurgery: A prospective, controlled single-blind study. *Otolaryngol.Head Neck Surg*. 2004; Jun;130(6):666-75.
10. Tangtrakul S, Srisupundit S, Linasmita V, Bullangpoti S, Israngura N, Wilailak S, et al. A randomized study comparing suture with non-suture cold-knife conization. *J.Obstet.Gynaecol*. 1995; Dec;21(6):587-91.