

Original Article

Clinical efficacy of ligasure vessel sealing system combined with total abdominal hysterectomy in treatment of cervical carcinoma

Ke Wang*, Huijuan Wu*, Dan Li, Wenxin Liu, Quan Hao

*Department of Gynecological Oncology, Tianjin Medial University Cancer Institute and Hospital, National Clinical Research Center of Cancer, Key Laboratory of Cancer Prevention and Therapy, Tianjin, China. *Equal contributors.*

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Abstract: This research was aimed to investigate the clinical efficacy of Ligasure vessel sealing system combined with total abdominal hysterectomy in the treatment of cervical carcinoma. Ninety-six patients with cervical carcinoma admitted to the Department of Gynaecology and Obstetrics of our hospital between October 2013 and October 2015 were selected. All patients received total abdominal hysterectomy. Using a number table, all patients were randomly divided into L group (Ligasure technology) and C group (conventional technology) equally. Intraoperatively, the L group was treated with Ligasure vessel sealing system while the C group with conventional suture system. Duration of surgery, intraoperative blood loss, postoperative drainage volume, visual analogue scale (VAS) score for postoperative pain, exhaust time of the digestive system, length of hospital stay, postoperative complications and clinical efficacy were observed. Duration of surgery, intraoperative blood loss, postoperative drainage volume, exhaust time of the digestive system and length of hospital stay in the L group were all significantly less than the C group ($P < 0.05$). The number of intraoperatively dissected lymph nodes of the two groups showed no significant difference ($P > 0.05$). Comparison of postoperative VAS score revealed that VAS score 1 and 3 days after surgery in the L group was evidently lower than the C group ($P < 0.05$), and no significant differences in VAS score 5 and 7 days after surgery between the two groups ($P > 0.05$). Compared with the C group, the incidence of postoperative complications in the L group was significantly lower ($P < 0.05$). As for postoperative clinical efficiency, the L group was obviously superior to the C group ($P < 0.05$). Ligasure vessel sealing system combined with total abdominal hysterectomy in the treatment of cervical carcinoma is characterized by a significant effect, high safety and effectively reduces postoperative complications. Therefore, it is suitable for wide clinical application.

Keywords: Cervical carcinoma, ligasure vessel sealing system, total abdominal hysterectomy

Introduction

At present, cervical carcinoma is a malignant tumor with a high incidence [1]; and surgical treatment is one of the most important methods for the treatment of cervical carcinoma [2]. Although conventional vascular suture technique during surgery can achieve the purpose of hemostasis, it tends to cause great damage to patients, a large amount of bleeding, poor postoperative recovery and a high incidence of complications [3]. With the continuous application of Ligasure vessel sealing system, the deficiency of conventional surgical technique in the treatment of cervical carcinoma is avoided [4, 5]. Research data demonstrate that the application of ligation-free techniques, such as Liga-

sure vessel sealing system, obviously improved surgical resection rate, reduced complication rate and shortened the duration of surgery, so as to provide the optimal treatment and rehabilitation efficacy for patients [6, 7].

Therefore, the present study applied Ligasure vessel sealing system combined with total abdominal hysterectomy in the selected 96 patients with cervical carcinoma admitted to the Department of Gynaecology and Obstetrics of our hospital between October 2013 and October 2015, and observed and compared the overall efficacy of Ligasure vessel sealing system combined with total abdominal hysterectomy and conventional suture system, which are reported as follows.

Table 1. The demographic information of cervical carcinoma patients

	L group (n=48)	C group (n=48)	X ² /t value	P value
Age (year)	42.08±3.27	43.36±4.13	-1.683	>0.05
Clinical stage				
IIA1	14	13	0.204	>0.05
IIA2	13	15		
IIB	21	20		

Materials and methods

General information

Inclusion criteria: after admission, all patients received histopathological examination and were confirmed as cervical carcinoma. Imaging examination was also carried out to observe lesion location and the range of lesions. All patients presented no distant metastasis and stage II cervical carcinoma (including stage IIA1, IIA2 and IIB) which was characterized by lesions beyond the cervix but below the pelvic wall, as well as involving the vagina but not reaching lower 1/3 vagina. Among them, stage IIA1 was defined as no parametrial infiltration and the maximum diameter of the visible cancer foci <4 cm; stage IIA2 as no parametrial infiltration and the maximum diameter of the visible cancer foci ≥4 cm; and stage IIB as parametrial infiltration. Exclusion criteria: patients with cardiac, brain, hepatic and renal dysfunction; patients with coagulation disorders and autoimmune diseases; patients with radiotherapy or chemotherapy before surgery; female patients with pregnancy; patients with a history of abdominal and pelvic surgery.

This is a retrospective study of 96 patients who underwent abdominal hysterectomy in our hospital from October 2013 to October 2015. 48 patients treated with Ligasure sealing vessel system were selected as the L group. Meanwhile, another 48 patients treated with conventional suture system were selected as the C group. In the L group, there were 48 patients aging from 30 to 59 years old (average age, 42.08±3.27 years old), among which 14 patients had stage IIA1 cervical carcinoma, 13 had stage IIA2 cervical carcinoma and 21 had stage IIB cervical carcinoma. In the C group, there were also 48 patients aging from 29 to 60 years old (average age, 43.36±4.13 years old), among which 13 patients had stage IIA1

cervical carcinoma, 15 had stage IIA2 cervical carcinoma and 20 had stage IIB cervical carcinoma. No statistical significance was found in age or the clinical stage of cervical carcinoma between the two groups ($P>0.05$) (Table 1). All patients and their families participated voluntarily in this study and signed informed consent and surgical consent. This study was approved by the Medical Ethics Committee of our hospital.

Both groups were treated with tracheal intubation and intravenous anesthesia combined with general anesthesia

L group: Abdominal exploration was performed to observe metastatic lesions and adnexal exploration to detect pelvic metastasis. At 50 mm outside the uterine horn, the round ligament of the uterus, the peritoneum of the pelvic funnel ligament, and free ovarian arteries and veins were cut off using Ligasure. After the peritoneum was cut open till 20 mm above the common iliac artery, the ureter was dissociated, using Ligasure, lymph nodes and adipose tissue as well as deep inguinal lymph nodes inside the lower segment of external iliac arteries were separated and removed. Then, the obturator fossa was probed, and Ligasure was used to remove lymph nodes. Branches of uterine arteries were dissociated and cut off at 10 mm away from internal iliac arteries, rectouterine and uterovesical reflexed peritoneum was cut open, anterior ureteral tunnel of the cervix was cut open using Ligasure, the ureter and the bladder were reversed to the uterus, uterosacral ligament and the cardinal ligament of the uterus were cut off using Ligasure, the anterior and posterior vaginal walls were cut off at 25-35 mm away from the cervix, vaginal stump was sutured with microbridge line, drainage tube was indwelled, and the incision was closed.

C group: Abdominal and adnexal explorations were conducted the same as above. Right pelvic cavity was exposed; after 2 curved forceps were placed in the right round ligament at 40 mm away from the uterine horn, forceps holder was removed and the ligament was cut off using an electric knife between the 2 forceps, followed by the suture of the broken ends, cutting off of the anterior leaf of the broad liga-

Ligasure vessel sealing for cervical carcinoma therapy

Table 2. Intraoperative and postoperative general information between the two groups

	L group (n=48)	C group (n=48)	t value	P value
Duration of surgery (min)	161.79±32.47	212.56±31.05	4.2281	<0.05
Intraoperative blood loss (ml)	473.28±96.43	738.15±102.81	7.3974	<0.05
The number of intraoperatively dissected lymph nodes (n)	18.12±6.53	18.05±7.74	0.6492	<0.05
Postoperative drainage volume (ml)	326.13±115.06	672.64±126.27	5.6729	<0.05
Exhaust time of the digestive system (d)	2.13±0.62	3.94±0.98	2.2845	<0.05
Length of hospital stay (d)	13.28±3.62	16.97±4.25	3.0119	<0.05

ment and the upper peritoneum of the pelvic funnel ligament, complete dissociation of right ovarian arteries and veins, cutting off of the arteries and veins at the pelvic entrance using forceps holder, and suture ligation. Afterwards, the ureter was gradually dissociated, lateral lymph nodes and adipose tissue above the common iliac arteries, internal iliac arteries and external iliac arteries were dissociated and removed, and inguinal lymph nodes were also dissociated and removed. Then, the obturator fossa was probed, inside lymph nodes and adipose tissue were removed, with obturator nerve exposed. Branches of uterine arteries were separated and cut off at posterior forceps holder, followed by hemostasis. Next, the left was treated following the above steps, rectouterine reflexed peritoneum was cut open to divorce the rectum from lateral rectal fossa; and then uterovesical reflexed peritoneum was cut open, anterior ureteral tunnel of the cervix was cut open, para-uterine tissues were pushed off, the uterosacral ligament was cut off in lateral rectal fossa at 20 mm away from the uterosacral ligament using forceps holder and the broken ends were sutured, the cardinal ligament was cut off using forceps holder and the broken ends were sutured. The vaginal wall was cut off using forceps holder, vaginal stump was sutured, drainage tube was indwelled, and the incision was closed.

Drainage volume and color of drainage liquid of the two groups were observed. Antibiotics were routinely used for 3 d after the surgery to prevent and treat incision infection. Three days after the surgery, patients were allowed to get out of bed for appropriate activities; 7-9 d after the surgery, catheter could be removed.

Observation indicators

Duration of surgery, intraoperative blood loss, the number of intraoperatively dissected lymph nodes, postoperative drainage volume, visual analogue scale (VAS) score for postoperative

pain, exhaust time of the digestive system, length of hospital stay, postoperative complications and clinical efficacy of the two groups were observed.

Evaluation of clinical efficacy: significantly effective was defined as good postoperative recovery in patients, no complications, and unnecessary further radiotherapy or chemotherapy; effective as good postoperative recovery in patients, the presence of related complications which are cured after symptomatic treatment, and unnecessary further radiotherapy or chemotherapy; and invalid as necessary further radiotherapy or chemotherapy after the surgical treatment.

Statistical methods

SPSS 19.0 statistical software was applied to establish database and conduct statistical analysis. Measurement data were expressed as mean \pm standard deviation ($\bar{x} \pm s$), and compared by the *t* test. Enumeration data were expressed as % and compared by the χ^2 test. $P < 0.05$ was considered as statistically significant.

Results

Intraoperative and postoperative general information between the two groups

Duration of surgery, intraoperative blood loss, postoperative drainage volume, exhaust time of the digestive system and length of hospital stay in the L group were all significantly less than the C group ($P < 0.05$). The number of intraoperatively dissected lymph nodes of the two groups showed no significant difference ($P > 0.05$) (Table 2).

VAS score 1, 3, 5 and 7 d after surgery between the two groups

Comparison of postoperative VAS score revealed that VAS score 1 and 3 days after sur-

Table 3. VAS score 1, 3, 5 and 7 d after surgery between the two groups

	L group (n=48)	C group (n=48)	t value	P value
1 d after surgery	6.29±0.79	7.36±0.64	2.1936	<0.05
3 d after surgery	3.26±0.83*	5.01±0.87*	3.5814	<0.05
5 d after surgery	2.61±0.92*	2.85±0.85*	0.8925	>0.05
7 d after surgery	2.25±0.84*	2.41±0.72*	0.4492	>0.05
F value	257.357	388.01	-	-
P value	<0.05	<0.05	-	-

Note: variance analysis was used to compare the difference of VAS score between the same group in different time points. *3 d vs 1 d, 5 d vs 1 d, 7 d vs 1 d. P<0.05.

Table 4. Postoperative complications between the two groups

	L group (n=48)	C group (n=48)	X ² value	P value
Total postoperative complications	9 (18.8%)	18 (37.5%)	4.174	<0.05
Intestinal obstruction	1 (2.1%)	3 (6.3%)		
Vaginal stump infection	2 (4.2%)	6 (12.5%)		
Delayed wound healing	2 (4.2%)	4 (8.3%)		
Retention of urine	4 (8.3%)	5 (10.4%)		

Table 5. Postoperative clinical efficiency between the two groups

	L group (n=48)	C group (n=48)	X ² value	P value
Significantly effective	39 (81.3%)	20 (41.7%)	15.883	<0.05
Effective	5 (10.4%)	15 (31.3%)		
Invalid	4 (8.3%)	13 (27.1%)		

gery in the L group was evidently lower than the C group ($P<0.05$), and no significant differences in VAS score 5 and 7 days after surgery between the two groups ($P>0.05$) (Table 3).

Postoperative complications between the two groups

Compared with the C group, the incidence of postoperative complications in the L group was significantly lower ($P<0.05$) (Table 4).

Postoperative clinical efficiency between the two groups

As for postoperative clinical efficiency (significantly effective plus effective (L group: 91.7% vs C group: 73.0%)), the L group was obviously superior to the C group ($P<0.05$) (Table 5).

Discussion

Ligasure vessel sealing system is a bipolar electrothermal vessel sealing device including

a host, a bipolar radio frequency generator and various closure forceps [8, 9]. Combined with real-time feedback technique and intelligent host technique, it can automatically recognize the continuously and immediately reflected impedance of tissue between forceps, instantaneously adjust output current and voltage, dissolve and degenerate the collagen and fibrin in the blood vessel wall through increasing the pressure between electric coagulation forceps, which leads to the fusion of vascular wall, generating a transparent band and permanent lumen closure, be used for safe closure of various blood vessels <7 mm, and be applied for the treatment of ligaments and tissue bundles [10-12].

In total abdominal hysterectomy, the lesions have a deep location and a difficulty in the exposure of visual fields, and thereby increasing the difficulty of the suture of vaginal stump [13].

During the suture, the stump should not be sutured too tightly, to avoid the reduction of the opening and the impediment of the formation of the upper vagina, which have an effect on vaginal function during postoperative wound healing [14]. On the contrary, loose suture is likely to cause postoperative bleeding in vaginal stump [15]. Related studies hold that Ligasure vessel sealing system is superior to conventional suture system in better efficacy for arteries and veins with a diameter <0.7 cm [16]. Ligasure vessel sealing system is able to clamp and concrete blood vessels into bundles using electrical energy, within which blood residue is not observed, eschars are not generated and intraoperative smog is little, which will not affect surgical visual fields; moreover, heat conduction is small and thereby improving the safety [17].

In this study, results demonstrated that duration of surgery, intraoperative blood loss, post-

operative drainage volume, exhaust time of the digestive system and length of hospital stay in the L group were all significantly less than the C group ($P<0.05$). In Ligasure surgery, tedious operation steps, such as knotting and hemostasis, could be effectively avoided, the time of surgical instrument replacement was reduced, and the duration of surgery was shortened as compared with conventional method. Shortened duration of surgery can reduce the amount of bleeding and the postoperative rate of organ or tissue injury, and further preventing postoperative formation of deep venous thrombosis of lower extremity. As for drainage volume, during intraoperative pelvic lymph node dissection using Ligasure, tissue bundles attached on forceps holder were cut off by electrocoagulation, which is more helpful for the closure of small lymphatic vessels, and can effectively prevent the occurrence of postoperative lymphorrhagia and the increase of lymph drainage volume. However, conventional suture system cannot achieve the above efficacy. Comparison of postoperative VAS score revealed that VAS score 1 and 3 days after surgery in the L group was evidently lower than the C group ($P<0.05$). Our study believed that the application of Ligasure vessel sealing system combined with total abdominal hysterectomy in the treatment of cervical carcinoma could reduce the pain of patients in a short period of time after the surgery, which may be related to small traction degree of tissues in the operation area during the surgery, low intraoperative blood loss and reduced postoperative pain response as compared with conventional suture system. Due to relatively small sample size in this study, further study is needed. However, this conclusion has not been reported in clinical studies yet.

As for postoperative complications, because of its safety, permanent closure and low heat conduction, Ligasure vessel sealing system caused fewer cases of delayed healing of vaginal stump in the L group after the direct closure of vaginal stump as compared with the C group, and no stump bleeding or necrosis. In addition, some studies suggest that the relatively simple operation process of Ligasure may be directly related to the occurrence of vaginal stump granulation. After the closure of vaginal stump using Ligasure, good wound healing, no residual foreign body and reduced postoperative infection

were found; also, follow-up detected no formation of vaginal stump granulation. Records of postoperative complications in this study showed that in the L group, postoperative intestinal obstruction occurred in 1 patient, vaginal stump infection in 2 patients, delayed wound healing in 2 patients and retention of urine in 4 patients, presenting an incidence of 18.75%, which was significantly lower than the C group, consistent with the above views.

Ligasure vessel sealing system needs no suture line and generates few eschars and basically no residual foreign body in vivo. However, in the process of using, it always needs gauze with paraffin oil to wipe tissue between forceps and clean eschars. The key for the surgery lies in: 1) forceps holder, concretion, and cutting off of ovarian arteries and veins; 2) mastering of tissue dissection, and requirement that apparatus should be operated close to uterine tissue to avoid the damage to adjacent tissues; 3) only the dangerous road in the inferior segment of the ureter through the urinary bladder cervix, where connective tissue is dense and blood vessels are abundant, is opened up, can the ureter be complete dissociated and the bladder and the upper vagina be separated. Most ureteral and urinary bladder leakage occurs in this step mainly caused by thermal damage. Ligasure cannot completely replace traditional suture, ligation and hemostasis in that its cutter head is relatively thick, and traditional suture, ligation and hemostasis are still needed in vaginal stump bleeding and some parts where clamping is unavailable. Moreover, for thick arteries, only electric coagulation hemostasis can achieve ideal efficacy, and in a few cases, only traditional suture can stop bleeding.

In summary, Ligasure vessel sealing system combined with total abdominal hysterectomy in the treatment of cervical carcinoma shows significant efficacy and high safety, as well as effectively reduces postoperative complications. Therefore, it is suitable for wide clinical application.

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Disclosure of conflict of interest

None.

Address correspondence to: Ke Wang, Department of Gynecological Oncology, Tianjin Medial University Cancer Institute and Hospital, National Clinical Research Center of Cancer, Key Laboratory of Cancer Prevention and Therapy, Huan-Hu-Xi Road, Ti-Yuan-Bei, He Xi District, Tianjin 300060, China. Tel: 86-22-23340123; Fax: 86-22-23340123; E-mail: wangketjmucih@163.com

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