Improve Of Gasless Laparoscopic Single-Site Suspension And Use In Surgery For Endometrial Cancer

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Research Article

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Abstract

Objective: To investigate the improve in Gasless Laparoscopic single-site suspension and use in surgery for endometrial cancer.And to compare the outcome of different surgical style in endometrial cancer.

Method: A tissue retractor is added to the routine step of Gasless Laparoscopic single-site(GLESS) to lift the abdominal wall upward. Lateral umbilical ligament was exposed, and 2-0 buckwheat thread was passed through the umbilical ligament and abdominal wall, then lift the umbilical ligament.Measure the changes of space length or height in different dimensions of improved GLESS. Measure the vertical height from the upper edge of the umbilical hole to the abdominal cavity, the length from the lower edge of the umbilical hole to the right Michaelis point, the height from the bottom of the uterus to the peritoneal cavity of the anterior abdominal wall, and the length from the lateral umbilical ligament to the ipsilateral psoas major muscle.To analyze the differences operations of 177 cases of endometrial carcinoma in operation time, hemoglobin change, number of lymph nodes removed, postoperative exhaust time and postoperative complications of open surgery, multi site laparoscopic surgery, single site laparoscopic surgery and gasless Laparoscopic single-site surgery for endometrial cancer.

Result: After improvement, the operation space increased significantly. There was no significant difference in the operation time, hemoglobin change, number of lymph nodes removed, postoperative exhaust time and postoperative complications of endometrial cancer.

Conclusion: The improvement of GLESS can exposed to a greater surgen space. At the same time, the way of suspending the umbilical ligament through abdominal silk thread can expose the anatomical structure of obturator position to a greater extent.The application of GLESS in the operation of endometrial cancer is safe and feasible.

Introduction

Laparoscopic surgery is a common minimally invasive surgery in gynecology, which is widely used in benign and malignant gynecology. However, laparoscopic surgery needs to be filled with CO₂. Whether CO₂ will lead to cancer cell metastasis has been controversial, and the patient's cardiopulmonary function will be greatly affected. Therefore, gasless laparoscopic surgery has gradually entered the clinic. Gasless laparoscopic surgery requires special instruments to suspend the abdominal wall, which can improve the effect of CO₂ on cardiopulmonary function and cancer metastasis [1–2]. In addition, with the continuous development and innovation of minimally invasive surgery technology, laparoendoscopic single-site surgery (LESS) has been applied clinically. LESS has the characteristics of more minimally invasive. The surgical incision is only in the umbilicus, and the scar is smaller, avoiding the possibility of injury caused by pelvic and abdominal organ adhesion of porous celioscope [3]. In order to reduce the possibility of cancer metastasis caused by CO₂ gas and the impact of cardiopulmonary function, and make the operation more minimally invasive, clinicians are trying to apply the combination of gasless surgery and single hole to gynecological tumor patients. However, both gasless surgery and LESS have their own

shortcomings. The space of gasless surgery is limited, and it is difficult to clearly expose the operation field like gas surgery. All operating instruments of LESS surgery enter in one hole, and the operation space loses the triangle effect. The instruments will interfere with each other to form the so-called "chopsticks" effect, which increases the difficulty of surgery [4]. LESS requires the the surgeon to complete all operations under the microscope alone. There is no surgical assistance to expose the operation field, and the exposure of visual field is not clear enough [5]. The operation GLESS will undoubtedly make the operation more difficult. Especially in the operation of gynecological malignant tumors, lymph node dissection or extensive parauterine tissue resection are required. The smooth progress of the operation requires sufficient space to show and expose the operation field. In general, the application of GLESS in gynecological malignant tumor surgery has the following problems: 1 The traditional gasless abdominal instrument suspension method cannot well create the space between the anterior abdominal wall and abdominal organs; 2. The traditional gasless abdominal suspension has limited exposure to the space between the lateral abdominal wall and abdominal organs; 3. The operation of GLESS is not easy to expose the distance from the right internal iliac vessel to the umbilical ligament, which makes pelvic lymph node dissection and extensive parauterine resection difficult to implement. In view of the above problems, this paper intends to improve the suspension mode and study the influence of different suspension modes on the operation space. To study the safety of open surgery, multi hole laparoscopic surgery, single hole laparoscopic surgery and gasless laparoscopic single-site surgery for endometrial cancer.

Clinical Data And Method

177 patients with endometrial cancer in Guangxi Medical University Cancer Hospital from January 2020 to August 2021 were selected, including 25 cases in the gasless laparoscopic single site (GLESS) surgery group, 62 cases in the laparotomy group (LT), 60 cases in the multi hole laparoscopic surgery group (LS), 30 cases in the laparoscopic single site surgery group (LESS). Inclusion criteria: ① endometrioid adenocarcinoma was confirmed by pathology with definite diagnosis of endometrium; surgen preoperative assessment of patients was I stage. ② It is consistent with hysterectomy, bilateral adnexectomy and pelvic lymph node resection; ③ The patient or family member signed the informed consent of the operation. Exclusion criteria: ① patients with coagulation dysfunction; ② Severe organ dysfunction. This study was approved by the hospital ethics committee.

Improved Operation Of Gless Group

General anesthesia, preoperative routine disinfection, towel laying, indwelling urinary catheter, and taking the bladder lithotomy position with supine head low hip high position (30 °C). Routine suspension of GLESS: make a longitudinal incision in the middle of the umbilicus, about 3-4cm long, and place a protective sleeve on the incision (Fig. 1). Use Kirschner wire to penetrate subcutaneously along the abdominal white line, fix the suspension rod of gasless suspension equipment on the right side of the

patient, and fix the steel needle on the steel needle grip. Cross the lifting rod across the white line, hang the steel needle grab chain on the cross bar of the suspension rod, and the suspension height of the abdominal wall is adjusted by the chain (Fig. 2A). Improved suspension of GLESS: add a tissue retractor to the step of Routine suspension of GLESS and pull the abdominal wall upward (Fig. 2B). Open the lateral peritoneum with an ultrasonic scalpel, expose the right umbilical ligament, pass 2 – 0 buckwheat thread through the umbilical ligament, pass through the abdominal wall, and lift the umbilical ligament to the left .

The vertical height from the upper edge of the umbilical foramen to the abdominal cavity, the length from the lower edge of the umbilical foramen to the right Michaelis point, the height from the bottom of the uterus to the peritoneal cavity of the anterior abdominal wall, and the length from the lateral umbilical ligament to the ipsilateral psoas major muscle and iliac vessels were measured. The LT group, LS group, LESS group were performed in the conventional way.

To analyze the differences in operation time, hemoglobin change, number of lymph nodes removed, postoperative exhaust time and postoperative complications of different groups. Postoperative complications include intestinal obstruction, intestinal fistula, double-J tube insertion, poor healing of abdominal wound, lymphatic fistula, urinary fistula, urinary tract infection, incision hernia, reoperation for postoperative bleeding, injury of blood vessels, thrombosis, injury of bladder and bowel, etc.

Results

Different surgical fields presented in Routine suspension of GLESS and Improved suspension of GLESS. It can be seen that after the change, the operation space is significantly increased (Fig. 3).

The vertical height from the upper edge of the umbilical foramen to the abdominal cavity, the length from the lower edge of the umbilical foramen to the right Michaelis point, the height from the bottom of the uterus to the peritoneal cavity of the anterior abdominal wall, and the length from the lateral umbilical ligament to the ipsilateral psoas major muscle and iliac vessels were measured (Table 1).

Table 1
The effects of different surgical methods on the space of endometrial cancer

Measuring method	The vertical height from the upper edge of the umbilical foramen to the abdominal cavity(cm)	The length from the lower edge of the umbilical foramen to the right Michaelis point(cm)	The height from the bottom of the uterus to the peritoneal cavity of the anterior abdominal wall(cm)	The length from the lateral umbilical ligament to the ipsilateral psoas major muscle and iliac vessels were measured(cm)
Routine-GLESS	4.23 ± 2.5	9.9 ± 2.4	6.8 ± 1.9	
Improved-GLESS	7.25 ± 3.1	12.5 ± 3.6	10.3 ± 3.6	4.5 ± 0.79

There is no differences operations of 177 cases of endometrial carcinoma in operation time, hemoglobin change, number of lymph nodes removed, postoperative exhaust time and postoperative complications (Table 2).

Table 2
The effects of different surgical methods on endometrial cancer

	Groups			
	GLESS	LT	LS	LESS
Operation time	180.34 ± 25.76	205.24 ± 42.16	190.85 ± 59.03	210.85 ± 34.28
hemoglobin change	14.64 ± 7.34	20.48 ± 16.38	17.14 ± 11.37	12.64 ± 7.31
number of lymph nodes removed	12.72 ± 9.07	17.47 ± 7.163	14.05 ± 7.64	13.84 ± 6.99
postoperative exhaust time	2.20 ± 0.65	2.42 ± 1.18	2.03 ± 1.44	2.35 ± 0.84
postoperative complications	0/25	10/62	7/60	3/30

Discussion

With the gradual improvement of medical level and technology, the diagnosis and treatment of diseases is not limited to treatment. How to avoid the damage of normal tissues and protect organ function is the higher pursuit of medical quality in contemporary clinical medicine. Gynecological minimally invasive surgery has the characteristics of less trauma and rapid recovery. In recent years, it has been widely used in clinic. Fanfani conducted a prospective study of 20 cases of LESS surgery for endometrial carcinoma, and the results showed that there was no conversion to open perforation or open surgery, and patients had good postoperative pain and aesthetic results. Cai [6] et al reported 18 cases of LESS surgery for endometrial cancer. Compared with the staging of porous laparoscopy for endometrial cancer, there was

no conversion to laparotomy. The operation time, number of lymph node dissections, blood loss and complications within 30 days after surgery in the two groups were not statistically significant, and the cosmetic effect was better than that of porous laparoscopy. It can be seen that the application of single site laparoscopic surgery in gynecological malignant tumors is safe and feasible, but previous reports are single site laparoscopic surgery with pneumoperitoneum. The use of CO₂ pneumoperitoneum during operation is the key step of laparoscopic surgery. Previous studies have shown that the use of laparoscopic CO₂ will have a great impact on cardiopulmonary function and may also lead to cancer cell metastasis [7]. In particular, in October 2018, Ramirez et al from M.D. Anderson Cancer Center and Melamed et al from Harvard Medical School published the results of a prospective randomized controlled clinical trial in the New England Journal of Medicine [8]. They believe that among patients with early cervical cancer, open surgery has higher disease-free survival (DFS) and overall survival (OS) than minimally invasive radical hysterectomy. At the same time, it shows a low mortality and recurrence rate. Part of the reason may be related to the application of CO₂ in minimally invasive radical hysterectomy. Gynecological malignant tumor surgery involves pelvic lymph node dissection or extensive parauterine tissue resection. Based on the limited application of the above-mentioned single site gasless laparoscopy technology, it is generally used in clinical benign diseases, such as patients with ovarian tumors during pregnancy who need surgery, and its application in malignant tumors is still limited.

The exposure of visual field and space in gynecological malignant tumor surgery includes several important dimensions, including the vertical height between the anterior abdominal wall and abdominal organs (intestinal tube surface, etc.), the length from the single hole operation point to the lateral abdominal wall, and the vertical height from the anterior abdominal wall peritoneum to the bottom of the uterus. During lymph node dissection, it is also necessary to expose and measure the gap between the umbilical ligament, psoas major muscle and external iliac vessels. Expand the operation space to avoid the damage to the intestines and blood vessels during the operation, and better cut, suture, ligation, hemostasis and other operations can be carried out.

The traditional gasless abdominal suspension equipment still has limitations in exposing the spatial visual field of the above dimensions. The results of this study show that the space of gasless laparoscopic single site surgery is improved by improving the suspension mode. By improving the way of tone selection, we have made progress in the following aspects: 1 Adding a thyroid retractor at the single hole of the abdominal wall can lift the abdominal wall upward, increase the distance between the anterior abdominal wall and abdominal organs, and increase the vertical height between the anterior abdominal wall and abdominal organs. Due to the upward lifting effect of the tissue retractor, the suspension position of the anterior abdominal wall is higher, and the lifting of the steel needles on both sides can also increase a greater distance upward. Therefore, the midpoint of the whole anterior abdominal wall and the lifting point of the lateral abdominal wall are lifted upward at the same time, which not only increases the vertical height from the operation hole to the abdominal cavity, but also increases the vertical height of the lateral abdominal wall. 2. When the lateral abdominal wall is pulled upward, the vertical distance from the lateral abdominal wall to the abdominal organs increases, and the length from

the operation hole to the lateral abdominal wall increases, which increases the operation space and widens the operation field of vision. Especially in the lymph node dissection of gynecological malignant tumors, the wide space of the lateral abdominal wall will make the hand operation more smooth. 3. During pelvic lymph node dissection, the umbilical ligament can be lifted by silk thread penetrating the abdominal wall, which can fully expose the anatomical structure of obturator fossa. In the single hole operation, the operation of the operator in the abdominal cavity needs to be completed by one person. After improvement, it can more fully expose the external iliac artery and vein, obturator nerve and other blood vessels, nerves and adipose tissue, so that the pelvic lymph node dissection can be carried out smoothly.

Through improvement, this study can effectively improve the operation space and visual field of single site gasless abdominal surgery, so that the operation will be carried out more smoothly, so as to provide a better basis for the development of operation and the study of its clinical effect. Of course, in the process of clinical application, we also need to pay attention to other problems, such as the patient's BMI index, there are still many difficulties in abdominal paraaortic lymph node dissection, and how to improve the surgical method needs to be further studied.

Declarations

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Compliance with Ethical Standards

Conflict of interest

The authors declared that we have no conflicts of interest to this work. We declare that we do not have any commercial or associative interest that represents a conflict of interest in connection with the work submitted.

Authors' Contributions

Bingbing zhao: project development, study selection, datacollection, data analysis, and manuscript writing and revision. Xinqiu Lu :study selection, data collection, and manuscript editing. Xuli Gan:study selection, data collection, and manuscript editing. Lili: literature search, study selection, and data collection. Jieqing Zhang: literature search, study selection, and data collection. All authors read and approved the final manuscript.

References

- [1]Khadra Galaal , Hannah Donkers, Andrew Bryant,et al.Laparoscopy versus laparotomy for the management of early stage endometrial cancer.Cochrane Database Syst Rev. 2018 Oct 31;10(10):CD006655.
- [2] Xiang Yang, Jiang Fang Controversy and strategy of laparoscopic surgery for cervical cancer Chinese Journal of Practical Gynecology and obstetrics 2019,35(10).
- [3]Laura M Chambers , Caitlin Carr , Lindsey Freeman et al.Does surgical platform impact recurrence and survival? A study of utilization of multiport, single-port, and robotic-assisted laparoscopy in endometrial cancer surgeryAm J Obstet Gynecol. 2019 Sep;221(3):243.e1-243.e11.
- [4] Sun Dawei, Zhang Ying Application of single hole laparoscopic surgery in the diagnosis and treatment of ectopic pregnancy Chinese Journal of Practical Gynecology and obstetrics 2017,33(09).
- [5] Sun Dawei Gynecological single hole laparoscopic surgery [M] Beijing: Peking University Medical Press, 2015:68-74 [6] Wright JD,Burke WM,Tergas AI,et al.Comparative effectiveness of minimally invasive hysterectomy for endometrial cancer[J].J Clin Oncol,2016,34:1087-1096.
- [7]Hiroyuki Kanao , Erica J Chang , Shinya Matsuzaki ,et al.Survival effect of intra-operative tumor spillage during minimally invasive hysterectomy for early-stage endometrial cancer: a call for research.Int J Gynecol Cancer. 2021 Feb;31(2):308-309.
- [8] Pedro T Ramirez , Michael Frumovitz , Rene Pareja ,et al.Minimally Invasive versus Abdominal Radical Hysterectomy for Cervical Cancer.N Engl J Med. 2018 Nov 15;379(20):1895-1904.

Figures

Figure 1

It shows the surgical incision protective sleeve, It is an elastic device, the shape is easier to match with surgical incision

Figure 2

Use Kirschner wire to penetrate subcutaneously along the abdominal white line, fix the suspension rod of gasless suspension equipment on the right side of the patient, and fix the steel needle on the steel needle grip. Cross the lifting rod across the white line, hang the steel needle grab chain on the cross bar of the suspension rod, and the suspension height of the abdominal wall is adjusted by the chain (2A). Improved suspension of GLESS: add a tissue retractor to the step of Routine suspension of GLESS and pull the abdominal wall upward (F2B).

Figure 3

Expose the right umbilical ligament, pass 2-0 buckwheat thread through the umbilical ligament, pass through the abdominal wall, and lift the umbilical ligament to the left

Figure 4

The picture shows a minimally invasive surgical incision