

ORIGINAL RESEARCH

Clinical application of greater omentum plasty and fixation to prevent lymphocysts after lymphadenectomy in early-stage cervical cancer

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Abstract

To explore the clinical effects of omentum plasty and fixation in the preventing the formation of lymphocysts and lower limb edema after lymphatic dissection of cervical cancer. The method we adopted is, a retrospective analysis was performed based on the clinicopathological data of patients with early cervical cancer who underwent extensive total hysterectomy, with pelvic lymph node dissection and omentum shaping and fixation at the Jiaying Maternity and Child Health Care Hospital from January 2019 to January 2021. Greater omentum plasty and fixation was performed in 7 early-stage cervical cancer patients. The mean operation time was (210.71 ± 14.56) min, and had a recorded blood loss of 258.57 ± 39.77 mL, 18.14 ± 3.58 resected lymph nodes, 273.14 ± 34.50 mL postoperative abdominal drainage volume and 36.55 ± 2.12 g/L postoperative serum albumin. No lymphocysts were found on B-scan ultrasound reexamination one month after the surgery. However, 6 months post surgery asymptomatic Lymphatic cyst was identified via B-ultrasound in one patient but had no signs of lower extremity edema and intestinal obstruction. We found that Omentum shaping and fixation could reduce the risk of postoperative lymphatic cyst occurrence and infection pelvic lymphatic cyst and lower limb edema by absorbing the leaking lymph through the omentum. The operation was found to be safe and feasible in short-term follow-up, but long-term complications should be further explored to validate the clinical reliability of this procedure.

Keywords

Omentum plasty; Fixation; Cervical cancer; Lymphatic cyst edema; Intestinal obstruction

1. Introduction

Cervical cancer is one of the most common malignant tumors threatening women's health. It affects approximately 500,000 women worldwide and accounts for more than 260,000 deaths each year. About 80% of the patients are from developing countries with underdeveloped economies [1]. There are about 313,700 cervical cancer patients in China, which has a prevalence rate of about 47.8/100,000 people, and its impact is alarming as the number of cases is continuously growing [2]. Radical hysterectomy with pelvic lymph node dissection is the most common surgical treatment for stage IB1–IIA1 cervical cancer patients, but is often accompanied by the occurrence of pelvic lymphocyst, which is also one of the common complications after lymphadenectomy with an incidence rate of 25%–45% after pelvic and abdominal lymph node dissection [3]; The time to lymphatic cysts varies, but most cases (80%–96%) occur within 6 weeks after the surgery, although there have been reports of lymphocyst appearing, up to 1 year after operation [4]. Most lymphocysts are small and asymptomatic and are, usually found by imaging during post-

operative reexamination or follow-up. Only a small number of large lymphatic cysts show symptoms such as compression or combined with infection, which can be found upon further examination. The existence time of a lymphocyst is affected by its size, location, postoperative systemic condition, infection and treatments and could from several days to several months. The occurrence of lymphocyst after pelvic lymph node dissection may have serious consequences on the patients as it may affect their treatment outcomes, quality of life and prognosis [5]. In an attempt to improve the outcomes of these patients, this study investigated the application and of omentum plasty and fixation which performed by the gynecologic oncology team of Jiaying Maternity and Child Health Care Hospital on 7 cases of early cervical cancer after cervical cancer resection followed by lymphadenectomy operation.

2. Materials and Methods

Data source: The clinical data of 7 early-stage cervical cancer patients who underwent extensive transabdominal hysterectomy, bilateral adnexectomy, pelvic lymph node dissection,

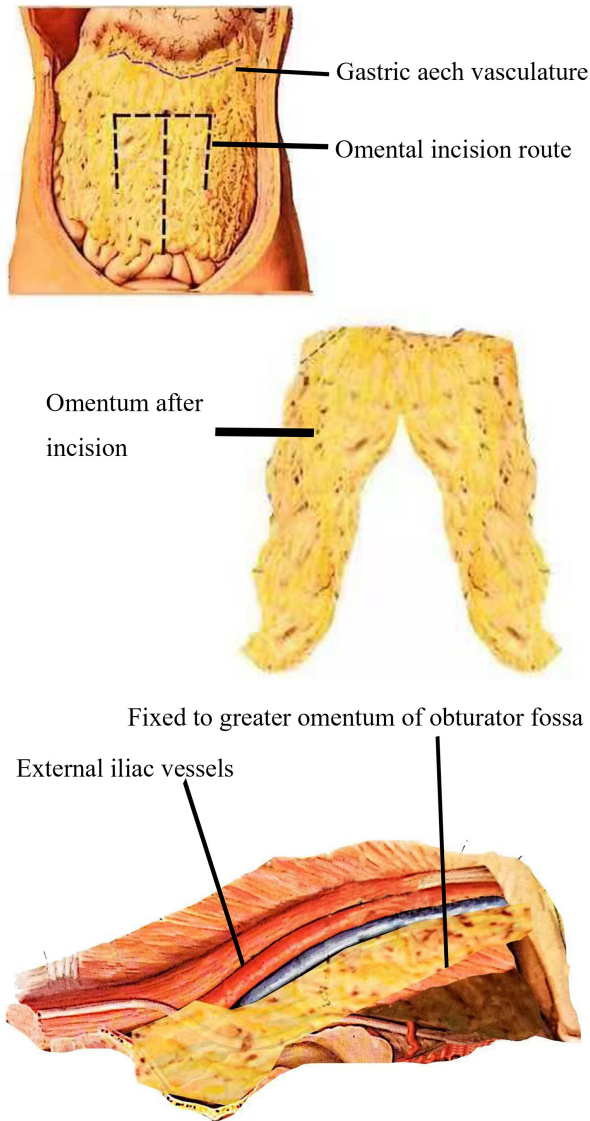


FIGURE 1. Schematic diagram of great omentum formation.

omentum plasty and fixation in the department of gynecology at Jiaying Maternity and Child Health Care Hospital from January 2019 to January 2021 were retrospectively assessed. They had an average age of (53.86 ± 4.81) years, and a body mass index (BMI) of (23.81 ± 5.62) kg/m². The pathological types and stages are of their disease shown in Table 1.

Surgical treatment: Radical hysterectomy combined with pelvic lymph node dissection was performed under general anesthesia with endotracheal intubation, infracolic omentum plasty and fixation were performed. First, the greater omentum below the colon was longitudinally separated, and its left, middle, and right arteries were preserved. The divided greater omentum was then extended to the bilateral pelvic walls along the para-colonic grooves on both sides and inserted into the obturator, and the edge was fixed to the psoas major muscle. Finally, it was covered with the peritoneum (Figs. 1, 2).

Patients' selection and additional surgical details: 1. The requirements for patient selection were, the greater infracolic should be hypertrophic, and the lower edge of the greater omentum should be able to reach the level of the pubic sym-

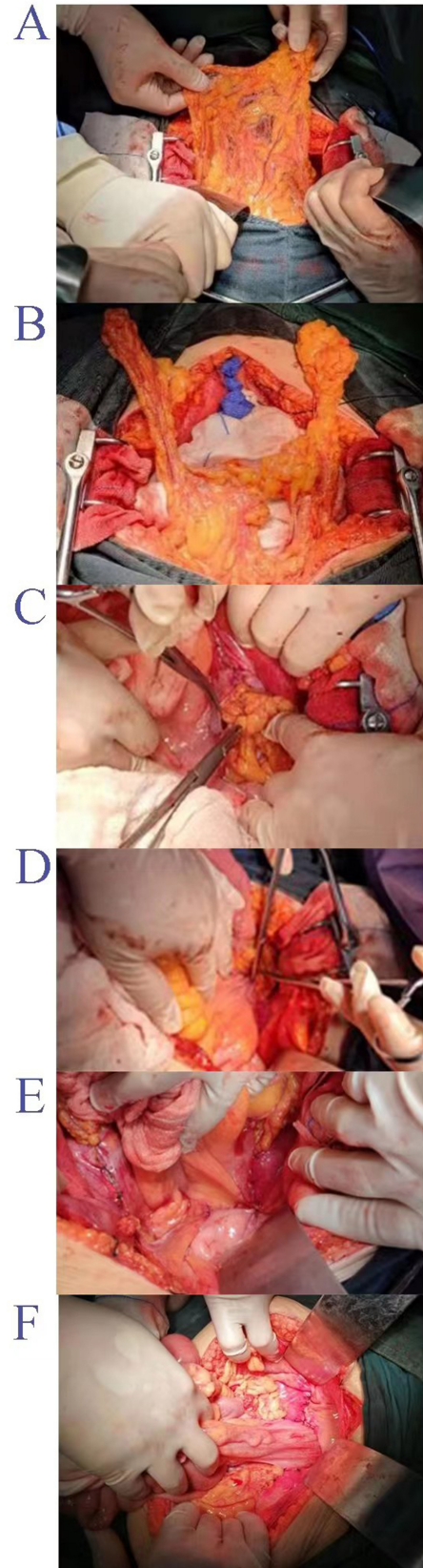


FIGURE 2. Greater omentum shaping photograph. (A) Greater omentum below the transverse colon. (B) The greater omentum after incision and shaping. (C) Coverage of the right posterior peritoneum. (D) Suturing and closed on the left. (E) Right posterior omentum. (F) Photos of bilateral pelvic omentum after shaping.

TABLE 1. Stage, pathological type and lymphocyst infection of the cervical cancer patients.

Patient serial number	Staging	Pathological type	Lymphoid cyst after 1/6 month	Fever within 5 postoperation days
1	IB1	Keratinized large cell squamous cell carcinoma	Null/null	null
2	IB1	Highly differentiated adenocarcinoma	Null/null	null
3	IB2	Keratinized large cell squamous cell carcinoma	Null/null	null
4	IIA1	Non-keratinized large cell squamous cell carcinoma	Null/yes	null
5	IIA1	Keratinized large cell squamous cell carcinoma	Null/null	null
6	IB2	Keratinized large cell squamous cell carcinoma	Null/null	null
7	IB1	Non-keratinized large cell squamous cell carcinoma	Null/null	null

physis, to ensure sufficient length and amount of the omentum to be fixed to the obturator fossa, and to fix adhere adequately, which is conducive to the establishment of lymphatic reflux.

2. To avoid damaging the omental vessels of the left, middle, and right arteries and the gastric arch during dissection, the incision in the omental space is advised to be performed using an electric knife, and should be uniform; otherwise injury to small blood vessels could affect the functions of the greater omentum.

3. Although it is particularly important to retain as much pelvic peritoneum as possible, it is also necessary to fully explore and preserve the peritoneum without focal invasion. Intraoperative incision of the peritoneum along the round ligament and the 0.5 cm to the level adjacent to the infundibular ligament of the pelvis during the operation is beneficial to complete the coverage and closure of the greater omentum after its fixation. If the total coverage of the greater omentum cannot be completed during the operation, the peritoneum and the greater omentum can be sutured, but the suture needs to be dense. Further, the omental cavity should be completely closed to avoid incarceration of the small intestine. Because the greater omentum is rich in blood circulation, has a strong ability of absorption and anti-infection, through cell proliferation, fibrous tissue formation and surrounding lymphoid system tissue adhesion, so as to absorb lymph, to prevent the formation of lymphoid cyst and the occurrence of infection.

4. Hemostasis should be completed before greater omentum fixation is performed. When fixing the greater omentum with catgut, the maneuver should be carefully performed as greater omentum hemorrhage could produce hematoma, resulting in postoperative fever, lower abdominal pain, pelvic infection and other complications, which could have adverse surgical effects.

Statistical method: The SPSS v20.0 software (IBM, Armonk, NY, USA) was used for statistical analysis. The measurement data that obeyed the normal distribution and normality test are expressed as $x \pm s$.

3. Results

Observation indicators and results: The amount of operative blood loss, time of operation, the number of resected lymph nodes and postoperative drainage were recorded and assessed (Table 2). The patient's thigh and calf circumference were measured, using an inelastic tape. The midcalf circumference was measured in both groups before and 6 months after treatment, and the serum albumin levels before and after surgery were also compared. (Table 3). The patient's temperature was observed for 5 days after the operation to determine whether it would exceed 38.5 °C; however, no fever was observed in the 7 cases. B-ultrasound was performed 1 month and 6 months after the operation to observe for lymphatic cysts. Our result showed no lymphatic cyst at 1-month follow up, while although 1 case of asymptomatic lymphatic cyst was detected 6 months after the operation, the patient showed no signs of lower limb edema and intestinal obstruction. Pelvic CT follow-up 7 days after the operation, and found no pelvic encapsulated fluid and hematoma (Table 1).

Result: The 7 patients underwent extensive transabdominal hysterectomy, bilateral adnexectomy, pelvic lymph node dissection, omentum plasty and fixation. The operation time was (210.71 ± 14.56) min, blood loss (258.57 ± 39.77) mL, number of resected lymph nodes was (18.14 ± 3.58) , and the postoperative abdominal drainage volume was (93.00 ± 11.03) mL.

4. Discussion

Although pelvic lymphatic cyst after radical hysterectomy of cervical cancer is not fatal, it is often accompanied by fever, chronic pelvic pain, lower limb edema and other symptoms, which affects the patients' quality of life. Therefore, it is of great clinical significance to perform necessary intervention measures to prevent the formation of lymphatic cysts. Currently, the underlying pathogenesis for the formation of

TABLE 2. Perioperative data of the cervical cancer patients.

Variables	Mean	Standard value (±)	Range
Operation time (min)	210.71	±14.56	195–230
Intraoperative blood loss (mL)	258.57	±39.77	200–310
Number of lymph nodes dissected	18.14	±3.58	13–23
Postoperative abdominal drainage volume (mL)	273.14	±34.50	223–320

TABLE 3. The pre-and post-operative data of the 7 cervical cancer patients.

Variables	Preoperative mean	Standard value (±)	Postoperative mean	Standard value (±)	Range
Serum albumin (g/L)	41.56	±2.50	36.55	±2.12	33.12–45.30
Mid-thigh circumference (mm)	52.44	±2.99	51.13	±2.11	48.00–55.12
Calf midshaft circumference (mm)	33.13	±2.85	30.23	±1.56	28.88–35.55

TABLE 4. Omentum plasty procedure and routine operation postoperative drainage volume comparison.

Variables	Omentum plasty procedure (n = 7)	Routine operation (n = 9)	<i>p</i> value
Postoperative abdominal drainage volume (mL)	273.14 ± 34.50	323.38 ± 42.27	0.0232

pelvic lymphatic cyst is unclear. The lymphatic system has the following particularities: 1. Before reflux into the venous system, lymph collects local tissue fluid, rich in protein. 2. The lymphatic vessel wall lacks smooth muscle cells and cannot close itself after injury, due to its poor contractility. 3. Lymph only contains few platelets, and cannot coagulate like blood, thus unable to form a fibrotic closure. At present, the prevailing consensus is that the formation of lymphatic cysts could be due to intraoperative lymphatic stump not being effectively closed or thoroughly treated, and partially or completely open damaged lymphatic vessels. As a result, the accumulation of refluxed lymph, tissue fluid, wound exudate, and others, are retained in the narrow retroperitoneal cavity, leading to the formation of lymphatic cysts [6–8].

The current clinical measures for preventing lymphatic cysts and their pros and cons are as follows: The clinical use of instruments such as bipolar electrocoagulation, ultrasonic scalpel and Biclamp forceps are effective in dissecting and closing to arteries and veins, stopping bleeding and blocking the lymphatic vascular pathway, and thus play key roles in prevention of postoperative lymphatic cysts [9]. However, due to the lack of smooth muscle cells in the lymphatic wall and lack of platelets in the lymph, only sealing the lymphatic vessels may not be effective since the surrounding connective tissue is fully ligated with the main lymphatic vessels. Some patients experience lower limb edema, which may be related to the obstruction of lymphatic reflux. The opening of the peritoneum can promote the direct absorption of lymph by the peritoneum and greater omentum, and reduce the risk of lymph accumulation and infection after the operation [10]. Related studies have shown that the placement of drainage tubes might not be beneficial preventing the formation of lymphatic cysts regardless of whether the retroperitoneum is open or not. On

the contrary, delayed removal of drainage tubes is a risk factor for the formation of symptomatic lymphatic cysts [11]. The application of octreotide after the operation can inhibit the vasodilator secreted by the viscera, reduce the absorption of fat, slow down the flow rate of lymph in lymphatic vessels, reduce the tension of lymphatic vessels, and reduce the formation of lymph, thus preventing the formation of lymphatic cysts [12]. However, the moderate curative effect of clinical application is general, and it is only used as an adjuvant therapy. Although the above methods may reduce the incidence of lymphatic cysts to some extent, they lack evidence from clinical studies with large samples, and currently there is still no effective method that can eliminate the formation of lymphocysts.

We hypothesize that irrespective of underlying mechanism associated with lymphocysts formation, it could be associated with blockage of lymphatic reflux of the pelvis and lower extremities after lymphatic dissection, thus establishing new lymphatic circulation pathways could be theoretically the best solution. Due to the specific biological characteristics and physiological functions of human greater omentum tissue, it has been widely used as an efficient autologous material in clinical surgery, such as repairing defects, improving local blood supply, promoting edema absorption and anti-infection. Fixing the greater omentum to the bilateral obturator sockets after shaping makes it easier to adhere to surrounding tissues to form extensive collateral circulation. The absorption of leaked lymph can effectively prevent lymph leakage through the omentum. Logmans *et al.* [13] reported omentoplasty for the first time on 10 patients with cervical cancer after pelvic lymph node dissection and found that it led to no lymphocyst formation. Fujiwara *et al.* [14] performed a multicenter prospective study on 64 patients with uterine cancer who underwent semiradical or radical hysterectomy and complete

pelvic lymph node dissection. Their omentum below the colon was longitudinally divided into two pelvic walls and inserted into the retroperitoneal space, and the edge was fixed in the psoas major muscle and covered with the peritoneum. After a follow-up for at least 1 year, they found only 12 cases (18.8%) of asymptomatic lymphatic cysts, which 3 cases (4.7%) of cysts demonstrated compression symptoms.

Omentoplasty and fixation are rarely reported in literature, and the operation is often of long duration.

As this method is relatively complex, it has not been reported in China so far. With the improvement of surgical skills and the accumulation of clinical experience of the gynecologic oncology teams at Jiaxing Maternity and Child Health Care Hospital over the past few years, omentoplasty fixation after pelvic lymphadenectomy was performed in 7 patients with early-stage cervical cancer. It was found that postoperative drainage fluid was significantly reduced compared with previous procedures (Table 4), with no lymphocyst found by B-ultrasound 1 month after the operation. Although after a 6 months follow-up, only one case of asymptomatic lymphatic cyst was found by B-ultrasound, the patients demonstrated no signs of lower limb edema, intestinal obstruction, obvious fever, severe pain in the lower abdomen or obvious local tenderness. It has been reported that the incidence of lymphocyst is higher in obese elderly patients with poor medical conditions (diabetes and hypertension). When the age of patients over 65 years old increases by one year, the incidence of lymphocyst after pelvic lymph node dissection increases by 5% [15]. Therefore, this surgical scheme is more suitable for the above types of patients. Thus, these findings indicated that the operation proposed in this study could be highly effective in preventing lymphocysts and edema of the lower extremities, but the following points should be noted prior to clinical implementation: Patients' selection and additional surgical details: 1. The requirements for patient selection were, the greater infracolic should be hypertrophic, and the lower edge of the greater omentum should be able to reach the level of the pubic symphysis, to ensure sufficient length and amount of the omentum to be fixed to the obturator fossa, and to fix adhere adequately, which is conducive to the establishment of lymphatic reflux. 2. To avoid damaging the omental vessels of the left, middle, and right arteries and the gastric arch during dissection, the incision in the omental space is advised to be performed using an electric knife, and should be uniform; otherwise injury to small blood vessels could affect the functions of the greater omentum. 3. Although it is particularly important to retain as much pelvic peritoneum as possible, it is also necessary to fully explore and preserve the peritoneum without focal invasion. Intraoperative incision of the peritoneum along the round ligament and the 0.5 cm to the level adjacent to the infundibular ligament of the pelvis during the operation is beneficial to complete the coverage and closure of the greater omentum after its fixation. If the total coverage of the greater omentum cannot be completed during the operation, the peritoneum and the greater omentum can be sutured, but the suture needs to be dense. Further, the omental cavity should be completely closed to avoid incarceration of the small intestine. Because the greater omentum is rich in blood circulation, has a strong ability of absorption and anti-infection, through cell proliferation, fibrous tissue formation

and surrounding lymphoid system tissue adhesion, so as to absorb lymph, to prevent the formation of lymphoid cyst and the occurrence of infection. 4. Hemostasis should be completed before greater omentum fixation is performed. When fixing the greater omentum with catgut, the maneuver should be carefully performed as greater omentum hemorrhage could produce hematoma, resulting in postoperative fever, lower abdominal pain, pelvic infection and other complications, which could have adverse surgical effects.

5. Conclusions

From the observation and analysis of the 7 cases 6 months after the operation, the proposed procedure seems to be safe and feasible in preventing lymphocysts and lower limb edema. However, the potential occurrence of long-term complications should be further examined through a larger cohort of patients using multicenter settings to confirm its reliability.

AUTHOR CONTRIBUTIONS

JQZ—designed the research study. JQZ and XDT—performed the research. JQZ and XDT—analyzed the data. JQZ—wrote the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

All 7 cases provided signed informed consent before the operation, which was discussed and approved by the Ethics Committee of Jiaxing Maternity and Child Health Care Hospital (approval number: 2018 (Ethic)-17). The surgical procedure was also approved by the Ethics Committee of the hospital.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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