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Original Article

Laparoscopic free omentoplasty following pelvic lymphadenectomy can prevent protein loss: a case-control study

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Abstract: *Objectives:* To reveal the benefits of laparoscopic free omentoplasty following pelvic lymphadenectomy in the prevention of protein loss and lymphocysts. *Methods:* As the treatment group, 20 consecutive patients of cervical cancer underwent laparoscopic free omentoplasty following pelvic lymphadenectomy. Another 40 cases were historical controls. We compared the baseline characteristics, the duration of drainages, the loss of albumin and the pelvic lymphocele postoperatively of the two groups. *Results:* Less duration of drainages were observed in the treatment group than the control group. And the loss of albumin was less in the treatment group. The patients of pelvic lymphocele were more in the control group than in the treatment group postoperatively. Less duration of drainages and loss of albumin were observed in cases with BMI≥23 of the treatment group. There was no patient of pelvic lymphocele postoperatively in cases with BMI≥23 of the treatment group. *Conclusion:* It appeared that laparoscopic free omentoplasty following pelvic lymphadenectomy prevented protein loss and lymphocysts. And it also decreased the duration of drainages.

Keywords: Laparoscopy, lymphadenectomy, free omentoplasty

Introduction

Retroperitoneal lymph node dissection is a significant procedure in the surgical staging of some gynecologic malignancies, especially cervical cancer. Leaving the dorsal peritoneum open following lymphadenectomy allowed satisfactory lymph drainage in the abdominal cavity. However, postoperative drainage tube placement resulting in protein loss induced prolonged recovery of patients. Moreover, some patients will evolve abdominal lymphocysts or lymphedema of the legs, following the retroperitoneal lymph node dissection [1-5].

During clinical investigation, the prevalence rate of lymphocysts following pelvic lymph node dissection varies from about 1 to 30% [6, 7]. It seemed that the risk factors leading to the occurrence of lymphocysts were the number of lymph nodes surgically removed, metastatic disease in the lymph nodes, postoperative radiotherapy, and possibly the prophylactic administration of perioperative heparin [8]. Lymphocysts nearly always develop within the first postoperative year, although delayed cases have been reported [8]. Lymphocyst infection may result in sepsis, which in turn can cause complications.

As an controversial program, pedicled omentoplasty was performed to prevent the formation of lymphocysts and lymphedema [9, 10]. In this case control study, we detected the benefits of laparoscopic free omentoplasty following pelvic lymphadenectomy in the prevention of protein loss and lymphocysts.

Materials and methods

In the study, from July 2015 to December 2015, 20 consecutive patients (group 1) of cervical cancer treated by one medical team in the Shanghai Obstetrics and Gynecology Hospital of Fudan Universityi were assessed in the study. The study design and protocol were approved

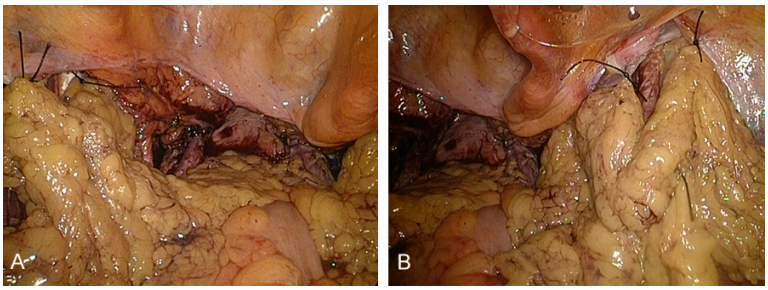

Figure 1. The free omentum was separated by Hamonic and each half was sutured to the peritoneum around the foramen obturatum. A. Left half. B. Right half.

Table 1. Baseline characteristics of two groups

	Treatment group (n=20)	Control group (n=40)	P
Age (years)	59.7±7.2	57.3±8.1	0.42
BMI	24.3±1.8	23.8±1.2	0.77
Stage			
Ia2	2	3	
Ib1	12	28	
Ib2	3	4	
IIa1	3	5	

by our Institutional Review Board. 40 cases of cervical cancer treated by the same team from June 2014 to June 2015 were chosen as historical controls (group 2). All the cases were performed systematic laparoscopic pelvic lymphoadenectomy and radical hysterectomy. Group 1 underwent free omentoplasty following pelvic lymphoadenectomy. All the cases were checked to exclude ovarian malignancies, previous radio- or chemotherapy, coagulation disorders, previous thromboembolic disease and lymphocysts or lymphedema. And the clinical characteristics were investigated. Prophylactic antibiotics were administered intraoperatively. The following parameters were registered at baseline: age, weight, height and body mass index (BMI). For all patients, preoperative investigations included pelvic magnetic resonance or pelvic computerized tomography.

Laparoscopic systematic pelvic lymphadenectomy was performed, followed by radical hysterectomy. Lateral peritoneum along the external iliac vein and artery was opened, further proceeding proximally to the bifurcation of the common iliac artery. Then the lymph nodes between the external iliac and hypogastric arteries were removed along the vessels. In the obturator fossa, the obturator nerve and the obturator artery and vein were isolated and preserved. The obturator lymph nodes beneath and above the obturator nerve were removed. Prophylaxis for venous thrombosis (nadroparin calcium) was administered for 15 days after surgery. All procedures were performed by laparoscopy by the same well-trained surgical team (J.D., X.Z.).

A free omentoplasty was performed after systematic laparoscopic pelvic lymphoadenectomy and radical hysterectomy. The splenic flexura of the tranverse colon is mobilized. The transverse colon is then fixed by an assistant with atraumatic forceps. The avascular blade connection between transverse colon and omentum has to be dissected by Harmonic. Sometimes the hemorrhagic spots was controlled by cauterization. After dissection, the lesser peritoneal sac is opened. Finally the connections between the omentum and the mesocolon were totally dissected. The omentum was free and it was moved to the pelvis. Then the free omentum was separated by Hamonic and each half was sutured to the peritoneum around the foramen obturatum by delay-absorbed or no absorbed stitches. And the pelvis was filled up (**Figure 1A**, **1B**). A drainage tube was placed at the end of the surgical procedure.

The amount of fluid in the drainages was evaluated every day postoperatively. Pelvic drainages were removed when the drained volume decreased to 150 ml per day. The hepatic function including albumin was evaluated 72 h postoperatively. The volume of blood loss, the time of operation, complications intraoperatively, the number of lymph nodes, the duration of drainages, the loss of albumin, transfusion and the time of evacuating were recorded. 30 days after surgery all patients underwent a ultrasonography and a CT scan of the abdomen and pelvis. Lymphocele was considered as the presence of a collection of lymphatic fluid, especially along the iliac vessels or collections

Table 2. The surgical details of the two groups

	Treatment group (n=20)	Control group (n=40)	P
Number of lymphonodes removed (n)	23.5±4.6	21.6±5.8	0.55
The volume of blood loss (ml)	160.8±48.4	186.9±66.1	0.21
The time of operation (min)	125.5±33.3	168.2±24.2	0.002
Complication intraoperatively	0	0	
Transfusion (n)	0	0	
The duration of drainages (d)	3.5±1.7	10.3±4.2	<0.001
The loss of albumin (g)	3.2±1.1	6.7±2.5	0.003
The time of evacuation (d)	2.5±0.8	2.8±1.1	0.64
Deep vein thrombosis	0	0	
Pelvic lymphocele	3	13	<0.001

Table 3. Characteristics of BMI<23 and ≥23 in the treatment group

	BMI<23 (n=9)	BMI≥23 (n=11)	P
The duration of drainages (d)	4.7±2.1	1.8±1.2	0.002
The loss of albumin (g)	4.3±1.5	1.9±0.6	0.001
Pelvic lymphocele	3	0	

of lymph organized into thin walled cysts. The incidence of lymphocele 30 days postoperatively of the two groups was recorded.

Statistical analyses were performed using SPSS 16.0 software (SPSS, Inc, Chicago, IL). Data are expressed as the mean ± standard deviation (SD). Student's *t*-test or chi-square tests were used, as appropriate. Differences were considered to be significant at $P<0.05$.

Results

No statistical differences were observed in baseline characteristics between the two groups (**Table 1**).

The surgical details of the two groups were reported in **Table 2**. The surgery time of the treatment group was significantly longer than the control group due to the free omentoplasty. Less duration of drainages were observed in the treatment group than the control group. And the loss of albumin in patients in the treatment group was less than the control group. The patients of pelvic lymphocele were more in the control group than in the treatment group postoperatively. No intraoperative complications, transfusion and deep vein thrombosis were detected in both groups. The number of lymphonodes removed, the volume of blood loss and the time of evacuation postoperatively were similar in both groups.

Less duration of drainages and loss of albumin were observed in the cases with BMI≥23 of the treatment group. There was no case of pelvic lymphocele postoperatively in the patients with BMI≥23 of the treatment group. On the contrary, 3 cases of pelvic lymphocele postoperatively were detected in the patients with BMI<23 of the treatment group (**Table 3**).

Discussion

It was reported that several techniques have been applied to reduce the incidence of lymphocele. For example, leaving the peritoneum open at the end of the surgical procedure was assumed allowing the lymph to flow into the peritoneal cavity. And the peritoneum can reabsorb the lymph [11, 12]. As a traditional technique, the placement of retroperitoneal drainages was performed in some studies. However, recent researches doubted the method and revealed that there is no advantage in the use of retroperitoneal drainage following radical hysterectomy and pelvic lymphadenectomy. Furthermore, the use of drainages was correlated with an increased incidence of symptomatic lymphocytes [4, 5]. It was also reported that intraoperative application of n-butyl cyanoacrylate reduced lymph production after pelvic lymphadenectomy, providing a useful additional treatment option for reducing drainage volume and preventing lymphocele development after pelvic lymphadenectomy. However, all the pelvic lymphadenectomy were performed by laparotomy in the previous studies [13].

As a controversial technique, omentoplasty was recommended in a pilot study of 22 women treated for stage I/IIa cervical cancer [9]. The technique consists in creating an omental flap pedicled on the right or left gastroepiploic artery so that the flap can be brought down to the lymphadenectomy sites [14]. It was suggested that the omentum can absorb fluids because it had fenestrated capillaries which

permitted the transportation of fluids and large molecules [15]. However, it was dissented that the reduced lymphocele and lymphedema were on account of the omentoplasty procedure or the peritoneal surface being left open [16]. It was hard to say that the lymph fluid was absorbed directly from the peritoneal surface or by a freely mobile omentum. Shanti considered an omentoplasty was not necessary [10]. In our opinion, regardless of the occurrence of lymphocele and lymphedema, omentoplasty contributed to the less protein loss and the duration of drainages, compared with the control group.

Another characteristic in this study was that free omentum instead of pedicled omental flap was collected. It was revealed that a free greater omentum flap was useful for anatomical repair after chest osteoradionecrosis and simultaneous functional repair of chronic lymphedema [17]. In the previous study, we selected the pedicled omental flap according to the literature. However, 2 patients suffered incomplete intestinal obstruction postoperatively. We suspected the flap was inflexible and the segment of bowels entered beneath the omental flap, which caused intestinal obstruction. Of course, it needs more investigations. The free omentum flap contributed ductile and flexible filler and it did not affect the movement of bowels. Another advantage of free omentoplasty was the free state. Then the thin patients with low BMI who had insufficient omentum can benefit from the procedure with the completely free omentum flap.

It was revealed that the duration of drainages, the loss of albumin and the cases of pelvic lymphocele were all reduced in patients with BMI≥23 than BMI<23 in this study. Perhaps the results was ascribable to the abundant free omentum. We emphasized that all the omentum majus should be captured for immobilization. More omentum can cover the more lymphadenectomy sites.

It seemed to be the first time to report the laparoscopic free omentoplasty following pelvic lymphadenectomy in the prevention of protein loss and lymphocysts.

Alexander reported the laparoscopic free omental lymphatic flap for the management of breast cancer-related lymphedema as a novel technique [18]. It was considered that the minimally invasive harvest successfully avoids both the previously associated morbidity of this flap and the risk of iatrogenic lymphedema to the donor site.

However, it had to be emphasized that successful laparoscopic free omentoplasty depended on the advanced minimally invasive expertise and experience of the surgeon.

In conclusion, the data obtained in this case control study demonstrated that laparoscopic free omentoplasty prevented protein loss and lymphocysts. It also decreased the duration of drainages following pelvic lymphadenectomy. Larger series and multi center trials were required to formulate a guideline.

Disclosure of conflict of interest

None.

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