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Omentoplasty and omentopexy post-pelvic lymph node dissection in surgical management of gynecological tumors

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***Abstract*---Background:** Lymphadenectomy is performed as a staging procedure in patients with pelvic gynecological malignancies, However, pelvic lymphadenectomy was associated with morbidities

such as lymphedema or lymphocysts, Omentoplasty-omentopexy has been utilized for prevention of lymphocysts that develop following pelvic lymphadenectomy. **Patients and methods:** This study is a randomized controlled trial. Forty-one consecutive patients who were candidates for pelvic lymphadenectomy during radical hysterectomy for cancer cervix or endometrium were enrolled in this study and were allocated to two groups. Intervention group (Omentoplasty-Omentopexy -A- group) included twenty-one patients who underwent omentoplasty-omentopexy. Control group -B- group included twenty patients who did not underwent omentoplasty-omentopexy. The two groups were compared regarding development of lymphocyst. The study was done at the National Cancer Institute, Cairo University from January 2020 to June 2021. **Results:** Forty-one consecutive patients were enrolled in this study from January 2020 to June 2021. with an average age 58.9±12.4 years, no statistically significant difference between the Omentoplasty-Omentopexy (A) and control group (B) regarding tumor site and histopathologic tumor types and tumor grade. No significant difference was found regarding primary tumor location either endometrial or cervical and its effect on post-operative complications. A significant higher proportion of cyst complication was detected among control group (B) (60%) compared to 14.3% in the Omentoplasty-Omentopexy group (A) (p- value= 0.002). ***Conclusions:*** Omentoplasty and omentopexy is a feasible surgical technique which helps in decreasing post-operative surgical complications following pelvic lymphadenectomy in surgical management of gynecological tumors.

Keywords: lymphocyst, pelvic lymphadenectomy, omentoplasty-omentopexy.

Introduction

Pelvic lymphadenectomy is an integral part of the surgical procedure for treatment of uterine cervical and endometrial carcinoma (1,2).

Pelvic lymphadenectomy is performed as a staging procedure in patients with pelvic gynecological malignancies. Nodal involvement is a worse prognostic factor that requires adjuvant treatments. histopathological examination of the lymphadenectomy specimen is the only reliable mean of determining whether the nodes are involved, despite of improvements in the performance of magnetic resonance imaging and positron-emission tomography for detecting lymph node metastasis (3,4).

However bilateral pelvic lymphadenectomy was associated with morbidities such as lymphedema or lymphocysts. Occasionally lymphocysts cause severe complications such as infection, urinary tract obstruction and compressive pressure symptoms related to their size or location. (5)

Lymphocysts are collections of lymph organized into thin-walled cysts with or without septations. Which may be due to incomplete lymphostasis with postoperative leakage of lymph in amounts too large to be completely resorbed by the peritoneum. The excess lymph accumulates within cyst-like structures

located in the spaces created by node removal, and nearly always develop within the first postoperative year (6), although delayed cases have been reported (7). The incidence of asymptomatic and symptomatic lymphocysts has ranged across studies from 0% to 58.5% (8,9).
There are various methods aimed at preventing complications associated with pelvic lymphadenectomy, like leaving the retroperitoneum or vaginal vault open (10,11), closed-suction drainage system (12), the omental J-flap (13,14) and administration of anticoagulants drugs (15) have been studied.
Omentoplasty-omentopexy has been utilized as a treatment for lymphocysts that develop following pelvic lymphadenectomy or renal transplant (5-16).
Many authors evaluated the role of the omentum in the prevention of lymphatic complications (8,17,18), on the basis that the omental tissue can capture fluids. As the omentum contains fenestrated capillaries whose structure transport the fluids and large molecules (18).
Omentoplasty-omentopexy was described by Logmans et al. in a previous study of 22 women treated for stage I/IIa cervical cancer (8). The omental flaps were then inserted into the retroperitoneal space and the edges of the flaps were sutured into the psoas muscle. and then the omental flap was covered by the peritoneum
We aim here to prospectively evaluate the effect of simple technique omentoplasty- omentopexy on preventing pelvic lymphadenectomy complications.

Patients and Methods

This study is a randomized controlled trial. Forty-one consecutive patients who were candidates for radical hysterectomy for cancer cervix or endometrium were enrolled in this study and were allocated to two groups. Intervention group (Omentoplasty-Omentopexy (A) group) included twenty-one patients who underwent omentoplasty-omentopexy. Control group (B) group included twenty patients who did not underwent omentoplasty-omentopexy. The two groups were compared regarding development of lymphocyst. The study was done at the National Cancer Institute, Cairo University from January 2020 to June 2021.
This randomized controlled trial was conducted to evaluate the efficacy of omentoplasty – omentopexy after pelvic lymphadenectomy during radical hysterectomy for prevention of postoperative complications in the form of lymphocysts. It was done at the National Cancer Institute, Cairo University from January 2020 to June 2021.
Forty-one patients presenting with of cervical or endometrial cancer have been scheduled to undergo radical hysterectomy with bilateral pelvic lymphadenectomy.
After informed written consent was taken, full history taking, and examination were done.
Pre-operative investigations in the form of CT, MRI or PET-CT were performed. All patients underwent dilatation and curettage (D&C).
Patients were scheduled for radical hysterectomy. Nine of the cervical cancer patients were initially treated with Concurrent chemoradiotherapy. The prescribed radiotherapy dose was 45Gy over 25 fractions with weekly Cisplatin. Surgery was performed within 3 to 6 weeks from the end of the external beam radiotherapy due to the ineligibility for brachytherapy.
Patients were allocated to two groups. Intervention group (Omentoplasty-Omentopexy (A) group) included twenty-one patients who underwent

omentoplasty-omentopexy. Control group (B) group included twenty patients who did not underwent omentoplasty-omentopexy.
All patients received general and epidural anesthesia with central venous line. A parenteral broad-spectrum antibiotic was given just before induction of anesthesia and continued postoperatively for 7 days. Elastic stockings were used for prophylaxis of deep venous thrombosis.
Patients with suspected intraoperative omental metastasis, peritoneal spread of the disease or too short infra-colic omentum were excluded from the study.
At 2, 4, 12 months after surgery, patients were evaluated for the occurrence of lymphocyst, intestinal complications, lymphedema, or severe complications related to lymphocele such as infections or stenosis of the urinary tract. Imaging was performed on each visit to measure the size of lymphocysts and to check for hydronephrosis. Any cystic formation more than 1 cm in the pelvic lymph node area was considered to be lymphocyst as shown in the MRI image figure (1). And CT image figure (2).

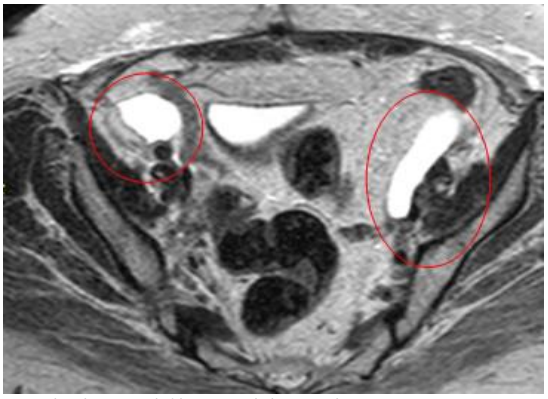

Figure 1. T2 MRI revealed two bilateral lymphocysts are seen along the external iliac vessels on both sides measuring about 5.6x2.6 cm on left side and about 4.7x1.9 cm on right side post-pelvic lymphadenectomy during radical hysterectomy.

Figure 2. CT image revealed left side lymphocele along left external iliac vessels 3.2 x 2.8 cm post-pelvic lymphadenectomy during radical hysterectomy

Surgical technique
Lymphadenectomy

Standard pelvic lymphadenectomy had been performed, dissection of all lymph node groups along internal & external iliac vessels till bifurcation of common iliac artery, bilateral iliac vessels and obturator nerve were skeletonized as shown in (Figure. 3).

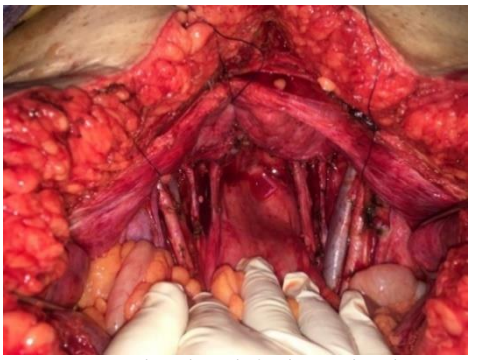

Figure 3. Standard pelvic lymphadenectomy

Omentoplasty and omentopexy

Bilateral omental flaps pedicled on the right and left gastroepiploic arteries were performed as shown in figure (4).

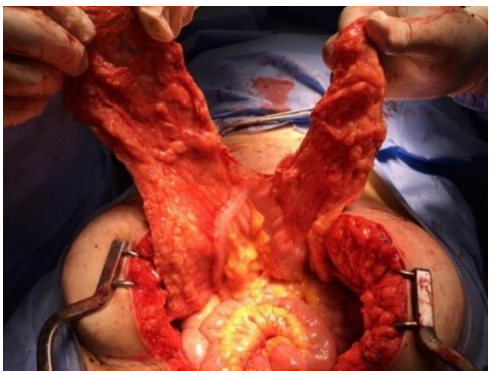

Figure 4. Bilateral omental flap rising

The flaps were brought down to the pelvic lymphadenectomy bed, allocated into retroperitoneal space & edges of flaps were fixed to psoas muscle as illustrated in figure (5)

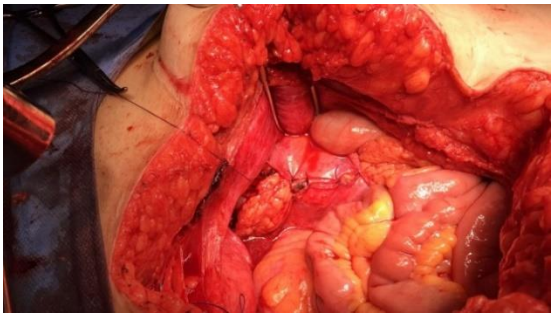

Figure 5. Omental flap fixation

Finally, the omental flap was covered with parietal peritoneum as shown in figure 6.

Figure 6. Omentopexy final appearance

Statistical methods

SPSS win statistical package version was used to analyse the data 28. Means & standard deviations & median & range were used to summarise numerical data. Student t-test was used to compare numerical variety among 2 categories. Frequencies & percentages were used to show qualitative data. Chi-square experiment or Fisher's exact examination was used to show relationship among qualitative data. P-values less than or equal 0.05 were considered significant. 41 consecutive studied cases were enrolled in this research from January 2020 to June 2021. With an average age 58.9±12.4 years, with no significant variations between both groups regarding age (p- value= 0.345). Tumors were classified histopathologically as stated by World Health Organization (WHO, 2020) diagnostic criteria for pathological classification of female reproductive system tumors.

Table 1
Sociodemographic and tumor characteristics among the participants

	Total (n=41)	Omentoplasty and Omentopexy category (A) (n= 21)	Control category (B) (n=20.0)	The P-value
Years old				
Mean ± SD*	58.9±12.4	57.1±12.1	60.8±12.6	
Median (range)	62 (25 -78)	58 (25-74)	64 (28-78)	0.345
Tumor site				
Cervix	9 (22.0%)	6 (28.6%)	3 (15.0%)	
Endometrial	32 (78.0%)	15 (71.4%)	17 (85.0%)	0.454
Histologic tumor type				
Adenocarcinoma	27 (65.9%)	12 (57.1%)	15 (75.0%)	
Others**	14 (34.1%)	9 (42.9%)	5 (25%)	0.228
Grade				
1&2	30 (73.2%)	19 (90.5%)	11 (55.0%)	
3	11 (26.8%)	2 (9.5%)	9 (45.0%)	0.010
Lymph node				
Negative	28 (68.3%)	15 (71.4%)	13 (65.0%)	
Positive	13 (31.7%)	6 (28.6%)	7 (35.0%)	0.685

*SD= Standard deviation, ** other histologic tumor types included squamous cell carcinoma, leiomyosarcoma, Mullerian tumor, clear cell carcinoma, undifferentiated carcinoma and carcinosarcoma.

Endometrial cancer accounted for more than three fourth of the participants (78.0%). The most frequently encountered tumor type was adenocarcinoma (cervical adenocarcinoma and endometrioid adenocarcinoma) in 65.9% of patients. No statistically important variation between Omentoplasty-Omentopexy (A) & control group (B) regarding tumor site and tumor type (p-value 0.454, 0.228 respectively). Grade 1 & 2 occurs in 73.2 % of the patients. The Omentoplasty-omentopexy group has higher lower grades (grade 1&2) than control group (90.5% versus 55%, p-value 0.010). More than two third of the participants (68.3%) have negative lymph nodes with no significant differences between the Omentoplasty-omentopexy group (p-value 0.685) as presented in table 1.

Table 2
Treatment and complications among the participants

	Total (n=41)	Omentoplasty and Omentopex category (A) (n= 21)	Control category (B) (n=20.0)	The p-value
Neoadjuvant treatment				
No	33 (80.5%)	17 (81.0%)	16 (80.0%)	0.623
Yes (concurrent chemo-irradiation)	8 (19.5%)	4 (19.0%)	4 (20.0%)	

Operation				
Laparoscopy	4 (9.8%)	2 (9.5%)	2 (10%)	
Open	37 (90.2%)	19 (90.5%)	18 (90%)	----
Cyst				
No	26 (63.4%)	18 (85.7%)	8 (40.0%)	
Yes	15 (36.6%)	3 (14.3%)	12 (60.0%)	0.002

---no p-value due to small number

There was no significant difference between post-operative complication rate and neoadjuvant therapy in both groups, Neoadjuvant chemo irradiation was received in six of the nine cervical cancer patients, almost all patients (90.2%) were operated via conventional open surgery, while ten percent of patients were operated via minimally invasive laparoscopic approach presented in table 2.

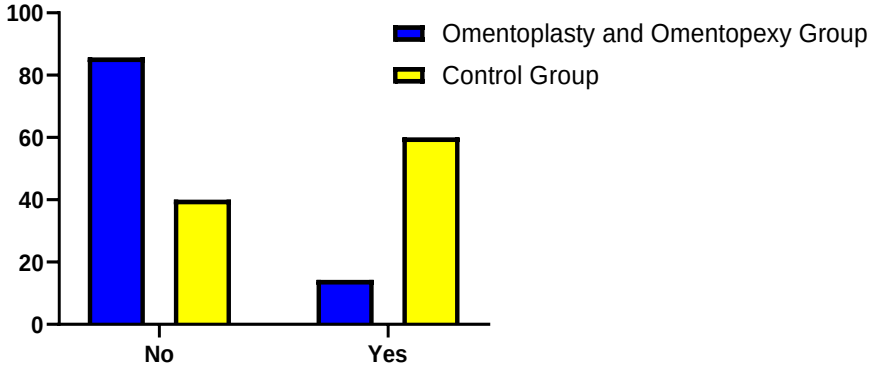

Figure 7. Cyst complication among Omentoplasty-Omentopexy group and control group

Table 3
Relation between sociodemographic, tumor characters, treatment, and cyst formation

	Total (n=41)	No Cyst (n= 26)	Cyst (n=15)	p-value
Tumor site				
Cervix	9	8 (88.9%)	1 (11.1%)	
Endometrial	32	18 (56.3%)	14 (43.8%)	0.197
Histologic tumor type				
Adenocarcinoma	27	16 (59.3%)	11 (40.7%)	
Others**	14	10 (71.4%)	4 (28.6%)	0.443
Grade				
1&2	30	19 (63.3%)	11 (36.7%)	
3	11	7 (63.6%)	4 (36.4%)	1.000
Lymph node				
Negative	28	19 (67.9%)	9 (32.1%)	
Positive	13	7 (53.8%)	6 (46.2%)	0.498
Neoadjuvant treatment				
No	33	20 (60.6%)	13 (39.4%)	
Yes (chemotherapy and radiotherapy)	8	6 (75.0%)	2 (25.0%)	0.687
Operation				
Laparoscopy	4	1 (25.0%)	3 (75.0%)	
Open	37	25 (67.6%)	12 (32.4%)	-----
Groups				
Omentoplasty-Omentopexy	21	18 (85.7%)	3 (14.3%)	
Control	20	8 (40.0%)	12 (60.0%)	0.002

No statistically significant differences were found regarding primary tumor location and its effect on post-operative complications (p=0.197),
On comparing tumor pathological types (p= 0.443), tumor grades (p=1.00) and lymph node statuses (p =0.498), we found no statistically significant differences regarding incidence of lymphocyst formation.
Again, on comparing patient received neoadjuvant treatment versus upfront surgery (p=0.687), there was no statistically significant difference regarding incidence of lymphocyst formation.
Finally, the correlation between cyst formation and type of surgery (open versus laparoscopic) cannot be assessed due to small number of patients operated on via laparoscopic approach (4 patients only).
None of the patients who developed lymphocysts or lymphedema was complicated with 2ry infection. Three patients had postoperative paralytic ileus in both groups which who managed conservatively.

Discussion

postoperative pelvic lymphadenectomy complications such as lymphocyst varies from 0.4 to 58% (9,19,20,21,22 ,23 ,24). This wide reported variation is probably due to different surgical techniques (open& minimally invasive surgery) and variable diagnostic modalities used for detection (U/S, CT, or MRI). (25).and This is probably because of the different ways of pelvic lymph node dissection.
In this research the same standard lymphadenectomy procedure was performed in all 41 patients, Significant higher proportion of cyst complication among control group (B) (60%) which align with historical control group done by Tanaka et al, in 101 patients who studied the incidences of lymphedema, clinically palpable lymphocyst, and severe complications such as, thrombosis, infection and/or urinary tract compressive symptoms were, 68%, 27% and 22%, respectively (15) compared to 14.3% in Omentoplasty-Omentopexy group (A) with (p- value= 0.002).
The omentum contains fenestrated capillaries whose structure permit fluids and large molecules transportation (22). They have a high functional potential and play an important antibacterial defense role. This may be due to high absorptive power of the omentum due to its lymphatics which form a delicate, interconnecting network that originate as blind endothelial sacculations (40-60 pm) within the milky spots. They converge to form collecting channels that contain valves. They course most lateral in the trabeculae and empty to subpyloric lymph nodes in the right side and to the splenic nodes on the left side (23).
The majority of patients (85.7%) who underwent omentoplasty and omentopexy did not have postoperative complications. Lymphocysts occurred in 3 patients (14.3%), who were asymptomatic and discovered radiologically during follow up. On the other hand, in group (B) 12 patients suffered from lymphocyst formation with variable symptoms like urinary bladder compression, mild to moderate hydronephrosis, loin and pelvic pain. (p- value= 0.002).
Although lymphocysts are generally asymptomatic, they adversely affect management and may increase surgeon frustrations and patients anxiety.(19,28), Hydronephrosis related to cyst formation observed in group (B), mild to moderate Hydronephrosis was observed in 3 patients, resolved by time (6 months) in 2 patients, the third patient need image guided aspiration (6cm).

No secondary infections associated with lymphocysts, or lymphedema were found in this series. Three patients had postoperative paralytic ileus in both groups and were managed conservatively. The association of ileus with omentoplasty and omentopexy was not clear which may be due to manipulation of the omentum.

Many risk factors have been associated with lymphocyst formation, including lymphadenectomy extent , gynecological cancer type, lymph nodes positivity, and type of surgery (open or minimally invasive surgery) (19,22,24,28). However, data regarding these risk factors are controversial, and a limited number of prospective clinical trials have evaluated them.

Kim et al. (22) reported that the highest lymphocyst formation rate was found in patients with cervical cancer, whereas Zikan et al. (24) . On the other hand, we found as no significant differences regarding cancer site endometrial or cervical (p=0.197). type nor the pathological grade with p value (= 0.443- =1.00)

Lymphocyst varies from 0.4 to 58% (9,19,20,21,22,23,24). This wide reported variation is probably due to inclusion of different surgical techniques (open or minimally invasive surgery). In our study, the correlation between lymphocyst formation and type of surgery technique (open versus laparoscopic) cannot be assessed due to small number patients operated on via laparoscopic approach, which was utilized in 4 patients only.

Petru et al. and (23) Zikan et al. (24) reported a significant relationship between positive lymph nodes and occurrence of lymphocysts. Achouri et al.(28) found no relationship between positive lymph nodes and formation of lymphocysts. We found no significant relationship between lymph node status and lymphocyst formation (p =0.498).

The relationship between neoadjuvant chemo-radiotherapy and lymphocyst formation are controversial (19,22,24,28). Kim et al.(22) reported a higher incidence of lymphocysts in patients who received RT, whereas Zikan et al. (24) and Achouri et al.(28) reported no association between RT and an increased incidence of lymphocysts. Which align with our study, as no significant relationship was found between neoadjuvant treatment and lymphocysts development.

Patsner B. (13) and Logmans et al. (14) demonstrated that the omental J-flap was a useful and safe procedure in the prevention of lymphocysts or lymphedema. Our technique is slightly easier from the J-flap. Instead of separating the omental flap from the hepatic flexure of the transverse colon after right gastroepiploic artery ligating, we simply divided the infra colic omentum in two halves and omentoplasty was done so that the omental flap could reach to the base of pelvic floor.

Several different surgical techniques, such as suction drainage system, omental flaps or non-closure of the retroperitoneum, an open-vaginal vault, use of different energy sources for lymphadenectomy, and postoperative use of SC octreotide (19,28). have been proposed to reduce the incidence of or to prevent the occurrence of pelvic lymphadenectomy-related complications.

Omentoplasty and omentopexy appears to be a simple and safe procedure to reduce the incidence of complications following pelvic lymphadenectomy in surgical management of gynecological tumors.

Conclusion

Omentoplasty and omentopexy is a feasible surgical technique which helps in decreasing post operative surgical complications following pelvic lymphadenectomy in surgical management of gynecological tumors. Further prospective randomized controlled trials are warranted with large sample size to ascertainits role in decreasing the post operative complications and improving the quality of life.

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