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Outcomes of Lymphadenectomy for Early-Stage Mucinous Ovarian Cancer: A Retrospective Study Based on Surveillance, Epidemiology, and End Results (SEER) Database

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Abstract

Objective: To evaluate the efficacy of lymphadenectomy for early-stage primary mucinous ovarian cancer (MOC). Design: Retrospective observation study Setting: Surveillance, Epidemiology, and End Results (SEER) database for 2000-2018 Population or sample: The study population comprised 1848 patients with early-stage MOC Methods: MOCs were divided into two groups according to lymphadenectomy. Propensity score matching were performed to correct for deviations. Independent risk factors for overall survival (OS) were determined by multivariate analysis using Cox regression. The role of lymphadenectomy was performed in different populations by stratified analysis applying interaction analysis. OS was calculated by Kaplan-Meier curves and compared by log-rank test. Main outcome measures: Overall survival Results: In the study, almost 65.8% (n = 1214/1848) experienced lymphadenectomy. Lymphadenectomy (HR = 0.692, 95% CI = 0.516-0.927, P = 0.009), age at diagnosis (HR = 3.028, 95% CI = 1.477-6.208, P = 0.002), and laterality (HR = 2.013, 95% CI = 1.145-3.54, P = 0.015) were found to be associated with OS. The role of lymphadenectomy varied by age group and tumor laterality, and the 5-year survival rates of patients with bilateral tumors who had experienced lymphadenectomy with sampling and dissection, or for MOC over age 50 and were higher than that of patients who did not undergo lymphadenectomy. Conclusion: Lymphadenectomy with sampling and dissection has little impact on OS in patients with early MOC. Lymph node therapy can be discontinued in patients younger than 50 years, and lymph node sampling is recommended for patients older than 50 years or with bilateral tumors.

Outcomes of Lymphadenectomy for Early-Stage Mucinous Ovarian Cancer: A Retrospective Study Based on Surveillance, Epidemiology, and End Results (SEER) Database

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Keywords: Early-Stage mucinous ovarian cancer, Lymphadenectomy, SEER, Survival, Prognosis

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Main outcome measures: Overall survival

Results: In the study, almost 65.8% (n = 1214/1848) experienced lymphadenectomy. Lymphadenectomy (HR = 0.692, 95% CI = 0.516-0.927, P = 0.009), age at diagnosis (HR = 3.028, 95% CI = 1.477-6.208, P = 0.002), and laterality (HR = 2.013, 95% CI = 1.145-3.54, P = 0.015) were found to be associated with OS. The role of lymphadenectomy varied by age group and tumor laterality, and the 5-year survival rates of patients with bilateral tumors who had experienced lymphadenectomy with sampling and dissection, or for MOC over age 50 and were higher than that of patients who did not undergo lymphadenectomy.

Conclusion: Lymphadenectomy with sampling and dissection has little impact on OS in patients with early MOC. Lymph node therapy can be discontinued in patients younger than 50 years, and lymph node sampling is recommended for patients older than 50 years or with bilateral tumors.

Tweetable abstract

Lymphadenectomy for early-stage ovarian cancer deserves more attention because of its varying effectiveness in different populations.

Keywords: Early-stage mucinous ovarian cancer, Lymphadenectomy, SEER, Survival, Prognosis.

INTRODUCTION

Primary mucinous ovarian cancer (MOC) is a rare tumor that accounts for only about 3% of epithelial ovarian cancers (1). Its incidence is in the low range, as reported, primarily because of the difficulty in differentiating it from metastatic mucinous carcinoma arising from the gastrointestinal tract (2, 3). Unlike other epithelial ovarian tumors, MOCs usually present as large lateral masses and can be diagnosed at an earlier stage than serous ovarian cancer, which is conventionally diagnosed at an advanced stage (4). Surgical resection such as hysterectomy, bilateral oophorectomy, and lymphadenectomy has become the standard treatment for MOC (5, 6). However, the efficacy of lymph node dissection in early-stage primary mucinous ovarian cancer remains controversial. It is widely known that lymph node metastases are more likely to occur early in the course of the disease, increase the risk of recurrence and death, and contribute significantly to poor prognosis (7). Timely lymph node examination is of great value in determining adjuvant chemotherapy. However, the results of previous studies are not uniform. One study suggests that lymphadenectomy in surgical staging improves disease-free survival and overall survival (8, 9). In contrast, some studies report no effect of lymph node dissection on recurrence, disease-free interval, or overall survival in patients with early-stage MOC for whom lymphadenectomy can be discontinued (10-12). Lymph node dissection has been reported to be closely associated with postoperative complications such as macrovascular injury, excessive bleeding, neurologic involvement, increased operative time, lymphocyte formation, lymphocyte leakage, and leg edema (12). Due to the small sample size of these studies, more substantial evidence is needed to prove the role of lymph node dissection. Therefore, we searched the SEER (Surveillance, Epidemiology, and End Results) cancer registry database to examine the need for lymph node dissection in early-stage MOC and analyzed the population extraction effect.

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METHODS AND MATERIALS

Population registries

Primary ovarian mucinous carcinoma was searched in seer software version 8.3.9 because it owns the most study variables in seer research data,18 registries nov2020 sub (2000-2018). Patients classified as American Joint Committee on Cancer guidelines (AJCC, 7th edition) I or II were enrolled and excluded if they were not operated on or found only at autopsy, had no exact number of lymph node dissection, had the unknown number of months alive, or had more than 1 malignant tumor. The specific process can be seen in **Fig. 1** .

Study Variables

Information and definitions were collected, including the year of diagnosis, age at diagnosis, race, tumor laterality, stage according to AJCC guidelines, TNM stage, summary stage, regional lymph nodes examined and positive, surgery at a primary site, months alive, and life expectancy. The year of diagnosis was classified into two groups, patients diagnosed before 2010 and patients diagnosed after 2010, using 2010 as the cutoff. Age at diagnosis was classified into three groups, patients under 30 years old, patients between 30 and 50 years old, and patients over 50 years old. Regarding the number of lymph node dissections, all patients were divided into two groups, without lymph node dissection and with lymph node dissection, including lymph node sampling (1-19) and lymph node dissection ([?] 20), and the study endpoint was OS, survival to time of death from any cause.

Statistical Analysis

Statistical data were analyzed by IBM software version 22.0. Chi-square tests were performed for all variables to check the balance of variables in the different groups. 1:1 propensity score matching (PSM) was used to match clinical data characteristics between the two groups of patients, with a clipper value of 0.2. Multivariate and univariate analyses based on Cox regression were used to identify true independent risk factors, and survival and prognosis were compared with each other by log-rank test. Proportional hazards (PH) models were validated by constructing products of risk factors and time. Interaction analysis was performed by multiplying lymphadenectomy by other risk factors. Statistical analysis is significant only when P-value < 0.05.

RESULTS

Clinical Characteristics of Patients

The number of patients who initially met eligibility criteria was 1848, with 65.7% (n = 1214/1848) having experienced lymphadenectomy, including sampling and dissection, and about half of the patients (49.84%, n = 921/1848) being tested by lymph node sampling. Median lymph node resection was 6 (range 0-71), median OS follow-up was 74 months (range 1-179 months), and the median age was 51 years (range 9-85+). The clinical characteristics of the patients are shown in**Table 1** . Almost half of the patients were diagnosed after 2010 and were predominantly Caucasian, accounting for 78.7% (n = 1455/1848). Most patients were older (> 50 years, n = 942, 50.9%) and diagnosed early (stage I, n = 1731, 93.7%). Tumors were mostly unilateral (n = 1794, 90.9%). In addition, patients tended to present with either well-differentiated or moderately differentiated tumors, with approximately 68.5% (n = 1265/1848) and 74.13% (n = 1370/1848) of patients in this study undergoing hysterectomy and bilateral tubal oophorectomy, respectively. Since the chi-square test revealed large differences in the collected variables, 1:1 propensity score matching was employed to reduce the influence of bias, and a total of 1082 patients were studied, of whom 542 did not undergo lymphadenectomy and 542 did undergo lymphadenectomy. There was little difference in the matched variables, details of which are shown in **Table 2** , and changes in propensity score matching are shown in **Fig. 2** .

1:1 Identification of prognostic factors for OS in the PSM sample

In **Table 3** , univariate and multivariate analyses were performed to identify prognostic factors associated with age at diagnosis (HR = 3.028, 95% CI 1.477-6.208, P = 0.002), laterality (HR = 2.013,95%CI 1.145-

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3.54, P = 0.015) and lymphadenectomy (HR=0.692,95% CI 0.516-0.927, P=0.009). The proportional hazards model was the basis for the multivariate analysis and was valid, as shown in Table 4. Proportion hazard validation and interaction analysis revealed that age at diagnosis (HR = 0.331, 95% CI 0.183-0.59, p < 0.001) and laterality (HR = 0.974, 95% CI 0.505-0.899, p = 0.007) had an interaction effect on lymphadenectomy (**Table 4**).

Survival analysis

As shown in **Fig. 3a** , there was no significant difference in OS for lymphadenectomy, with a 5-year survival rate of 80.74% vs. 87.85% without versus with lymphadenectomy (P = 0.045). To further clarify the impact of lymphadenectomy, the population with lymphadenectomy was divided into two groups, lymph node sampling and dissection, and there was no difference in 5-year survival between the two groups (87.99% vs. 88.37%, p = 0.013, **Fig. 3b**). In a subsequent analysis, age at diagnosis had a significant impact on OS, with 5-year survival rates of 93.61%, 87.76%, and 80.59% for patients in different age groups, respectively (P < 0.001, **Fig. 3c**). On the lateral side, **Fig. 3d** shows that bilateral tumors were a poor survival factor, with unilateral versus bilateral 5-year survival rates of 85.33% versus 61.30% (P < 0.001).

Interactive analysis showed that OS in patients younger than 50 years did not differ from lymphadenectomy (**Fig. 4a, b**). In patients older than 50 years, lymph node-free was associated with lower OS than lymphadenectomy (5-year survival rate: 75.11% vs. 86.04%, P = 0.015,**Fig. 4c**). In patients over 50 years of age, sampling and dissection have little difference in OS (5-year survival: 87.23% vs. 85.71%, P=0.053, Figure 4d). In a subgroup analysis of tumor laterality, lymph node dissection showed no significant effect in unilateral tumors (5-year survival: 82.04% vs. 88.25%, P = 0.011,**Fig. 5a**). However, for bilateral tumors, lymphadenectomy significantly improved patients' OS (5-year survival: 52.94% vs. 72.73% vs. 66.67%, P = 0.041, **Fig. 5b, d**), and sampling rather than dissection has a higher 5-year survival rate.

DISCUSSION

MOC is rare cancer in which the role of lymphadenectomy remains unclear. In this retrospective analysis of the SEER database, we examined the impact of lymphadenectomy on OS and found other independent risk factors associated with OS. Through the analysis of the interaction between lymph nodes and other factors, this study adds some new insights into lymphadenectomy.

Francesca et al. reported that approximately 80% of MOC were diagnosed at stage I, with a median age of 57 years (1, 13, 14). MOC tends to be a well-differentiated, unilateral tumor; the lymph node metastasis rate for MOC is very low, 0.1% in our study. Previous studies have reported lymph node metastasis in MOC to be about 2.6% (15, 16), and 16 reports on lymph node metastasis in MOC have reported lymph node metastasis ranging from 0.1% to 2.9% (17).

In our study, lymph node dissection was associated with OS and prolonged survival of patients who received lymph node therapy, but this was not obvious. In addition, there is no significant difference in prognosis between lymph node sampling and dissection. This result differs slightly from other previous studies, which may be due to the limited size and design of the reported studies (10, 11, 18). Similarly, age and laterality are independent risk factors, and related studies have confirmed these risk factors (18, 19). With increasing average age, many patients have one or more other serious illnesses at the time of diagnosis of MOC, which may decrease patient tolerance to treatment, and older patients may be less compliant and less aggressive in treatment. tumor laterality may also represent tumor staging to some extent, and bilateral tumors may be staged later. Hysterectomy and oophorectomy are not associated with OS, which is consistent with previous reports (20, 21), so it is feasible and safe for early-stage MOC patients to undergo fertility-sparing surgery. AJCC stage has been reported not to be associated with OS, which is consistent with the Aurelia Busca study, and univariate and multivariate analysis showed that stage I or II had no statistically significant effect on prognosis. The lack of a significant difference in prognosis when only stage I to stage II patients were included (23), can be adequately explained by the low percentage of stage II patients, which is not enough to cause a statistically significant difference. It has also been observed that tumor grade is not associated with OS, as demonstrated by Li Yang et al. (23).

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Our study also found recommendations for special populations. In patients younger than 50 years, lymph node procedures have little impact on OS, suggesting that lymph node examination may be discontinued in younger patients. In contrast, lymph node sampling may be more appropriate in patients older than 50 years, as lymph node dissection is associated with a higher prognosis and is associated with less trauma and postoperative complications compared to dissection with the same OS. These results are consistent with a study using the SEER database to assess the prognostic value of age in MOC(24). This can be explained by the fact that MOC is usually diagnosed at an early stage and that older patients have a higher probability of metastatic cancers, especially those originating in the gastrointestinal tract, and that gastrointestinal metastases can occur at an earlier stage when they can benefit more from lymphadenectomy. We also investigated the role of lymph node dissection according to tumor laterality and found that in our study, patients with bilateral tumors benefited more from lymph node dissection than those with unilateral tumors. This can be explained by the finding of Ditto et al. that bilateral tumors are closely associated with lymph node metastasis (19, 25). More excessively, the same prognostic effect of dissection and sampling recommends that patients undergo lymph node sampling to achieve higher quality survival.

Propensity matching was performed on MOC cases, which had not been done in previous papers, greatly improving offsets by variables and making the analysis highly convincing. The independent risk factor interaction analysis provides implications for lymph node therapy in specific populations and has certain guiding significance in the selection of lymph node resection for early MOC. However, there are still some shortcomings that need to be overcome by future studies. It is impossible to analyze whether lymphadenectomy affects recurrence since there are no patient recurrence data in the SEER database. In addition, information on chemotherapy, which has a significant impact on survival, cannot be obtained due to limited access rights.

Disclosure of interests

None declared. Completed disclosure of interest forms are available to view online as supporting information.

Contribution to authorship

XQ performed statistical analyses, interpreted the results and drafted the manuscript. JD designed the study, provided guidance on the statistical methods and interpretation of the results and contributed to writing the manuscript. LY and ZZ searched SEER database and contributed to writing the manuscript. All authors discussed the results, were involved in revisions, read and approved the final manuscript.

Consent for publication

The authors confirm this work is original and has not been published elsewhere.

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Figure and Table Legends

Figure 1: Flowchart for screening patients. 1848 patients with mucinous ovarian cancer (MOC) initially met the eligibility criteria, and after propensity score matching (1:1), only 1048 patients were enrolled in the study.

Figure 2: Map of propensity score matching. (a): Distribution map of propensity scores before and after matching. (b): Histogram of propensity scores before and after matching. Control: Without lymphadenectomy, Treated: With lymphadenectomy.

Figure 3: Kaplan-Meier survival curves for risk factors for mucinous ovarian cancer versus overall survival. (a): Lymphadenectomy. (b): Lymphadenectomy subgroup. (c): Age. (d): Laterality.

Figure 4: Kaplan-Meier survival curves for overall survival of lymphadenectomy in different populations. (a): Patients younger than 30 years. (b): Patients between 30 and 50 years. (c): Patients older than 50 years. (d): Lymphadenectomy subgroups in patients older than 50 years.

Figure 5: Kaplan-Meier survival curves for overall survival after lymphadenectomy in different populations. (a): Patients with unilateral tumor. (b): Patients with bilateral tumor. (c): Lymphadenectomy subgroup in patients with unilateral tumor. (d): Lymphadenectomy subgroup in patients with bilateral tumor.

Table 1: Clinical characteristics of patients.

Variables	without lymphadenectomy (n=634) No	without lymphadenectomy (n=634) No	with lymphadenectomy (n=1214) Sampling (n=921)	with lymphadenectomy (n=1214) Sampling (n=921)	with lymphadenectomy (n=1214) Dissection (n=293)	with lymphadenectomy (n=1214) Dissection (n=293)	P value
Year of diagnosis							0.994

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<2010	261	41.20%	386	31.80%	114	9.39%	
[?]2010	373	58.80%	535	44.07%	179	14.74%	
Race							**0.014**
White	484	76.30%	728	59.97%	243	20.02%	
Black	59	9.30%	51	4.20%	14	1.15%	
Other	87	13.70%	136	11.20%	36	2.97%	
NA	4	0.60%	6	0.49%	0	0.00%	
Age (years)							**0.016**
<30	89	14.00%	107	8.81%	28	2.31%	
30-50	208	32.80%	353	29.08%	121	9.97%	
>50	337	53.20%	461	37.97%	144	11.86%	
Laterality							0.312
Unilateral	612	96.50%	900	74.14%	282	23.23%	
Bilateral	22	3.50%	21	1.73%	11	0.91%	
Grade							**<0.001**
Well	310	33.30%	104	8.57%	625	51.48%	
Moderately	298	22.40%	96	7.91%	536	44.15%	
Poorly	57	6.30%	23	1.89%	120	9.88%	
Undifferentiated	20	1.70%	5	0.41%	36	2.97%	
NA	236	36.30%	65	5.35%	531	43.74%	
Summary stage							0.116
Localized	576	90.90%	856	70.51%	272	22.41%	
Regional	58	9.10%	65	5.35%	21	1.73%	
AJCC Stage				0.00%		0.00%	0.437
I	590	93.10%	864	71.17%	277	22.82%	
II	44	6.90%	57	4.70%	16	1.32%	
T stage							0.437
T1	590	93.10%	864	71.17%	277	22.82%	
T2	44	6.90%	57	4.70%	16	1.32%	
Hysterectomy							**<0.001**
No	263	41.50%	207	17.05%	49	4.04%	
Yes	350	55.20%	682	56.18%	233	19.19%	
NA	21	3.30%	32	2.64%	11	0.91%	
Oophorectomy							**<0.001**
No	41	6.50%	11	0.91%	2	0.16%	
Unilateral	136	21.50%	72	5.93%	18	1.48%	
Bilateral	406	64.00%	724	59.64%	240	19.77%	
NA	51	8.00%	114	9.39%	33	2.72%	

Table 2: Clinical characteristics of patients after propensity score matching.

Variables	Without lymphadenectomy (n=542) no (n=542)	Without lymphadenectomy (n=542) no (n=542)	With lymphadenectomy (n=542) Sampling (n=424)	With lymphadenectomy (n=542) Sampling (n=424)	With lymphadenectomy (n=542) Dissection (n=118)	With lymphadenectomy (n=542) Dissection (n=118)	P value

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Year of diagnosis							0.805
<2010	225	41.50%	176	32.47%	45	8.30%	
[?]2010	317	58.50%	248	45.76%	73	13.47%	
Race							0.323
White	417	76.90%	326	60.15%	94	17.34%	
Black	52	9.60%	31	5.72%	6	1.11%	
Other	70	12.90%	64	11.81%	18	3.32%	
NA	3	0.60%	3	0.55%	0	0.00%	
Age(years)							0.855
<30	67	12.40%	59	10.89%	14	2.58%	
30-50	166	30.60%	128	23.62%	34	6.27%	
>50	309	57.00%	237	43.73%	70	12.92%	
Laterality						0.00%	0.87
Unilateral	522	96.30%	409	75.46%	114	21.03%	
Bilateral	20	3.70%	15	2.77%	4	0.74%	
Grade						0.00%	0.146
Well	189	34.90%	131	24.17%	41	7.56%	
Moderately	134	24.70%	125	23.06%	38	7.01%	
Poorly	33	6.10%	34	6.27%	10	1.85%	
Undifferentiated	10	1.80%	7	1.29%	3	0.55%	
NA	176	32.50%	127	23.43%	26	4.80%	
Summary stage							0.914
Localized	495	91.30%	388	71.59%	108	19.93%	
Regional	47	8.70%	36	6.64%	10	1.85%	
AJCC Stage							0.539
I	504	93.00%	396	73.06%	113	20.85%	
II	38	7.00%	28	5.17%	5	0.92%	
T stage							0.539
T1	504	93.00%	396	73.06%	113	20.85%	
T2	38	7.00%	28	5.17%	5	0.92%	
Hysterectomy							0.798
No	173	31.90%	136	25.09%	31	5.72%	
Yes	348	64.20%	276	50.92%	81	14.94%	
NA	21	3.90%	12	2.21%	6	1.11%	
Oophorectomy							0.976
No	13	2.40%	10	1.85%	2	0.37%	
Unilateral	82	15.10%	70	12.92%	17	3.14%	
Bilateral	396	73.10%	306	56.46%	87	16.05%	
NA	51	9.40%	38	7.01%	12	2.21%	

Table 3: Univariate and multivariate analysis of risk factors.

Variables	Univariate analysis Hazard Ratio (95%CI)	P value	Multivariate analysis Hazard Ratio (95%CI)	P value
Year of diagnosis				
<2010	1.0(reference)			?¿?
2010	0.818(0.593-1.127)	0.218		
Race				

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White	1.0(reference)			
Black	1.469(0.928-2.323)	0.101		
Other	0.918(0.591-1.428)	0.705		
NA	0(0-3.86E+131)	0.95		
Age(years)				
<30	1.0(reference)			
30-50	1.819(0.881-3.757)	0.106	1.567(0.736-3.334)	0.244
>50	3.665(1.867-7.195)	**<0.001**	3.028(1.477-6.208)	**0.002**
Laterality				
Unilateral	1.0(reference)			
Bilateral	2.737(1.614-4.643)	**<0.001**	2.013(1.145-3.54)	**0.015**
Grade				
Well	1.0(reference)			
Moderately	1.059(0.734-4.528)	0.759	1.028(0.712-1.485)	0.882
Poorly	1.484(0.888-2.482)	0.132	1.462(0.869-2.457)	0.152
Undifferentiated	2.309(1.056-5.047)	**0.036**	2.185(0.995-4.798)	0.052
NA	1.044(0.708-1.542)	0.827	0.996(0.673-1.473)	0.982
Summary stage				
Localized	1.0(reference)			
Regional	2.193(1.39-3.459)	**0.001**	0.001(0-1.03E+49)	0.908
AJCC Stage				
I	1.0(reference)			
II	2.274(1.442-3.585)	**<0.001**	1882.622(0-2.32eE+55)	0.902
T stage				
T1	1.0(reference)			
T2	2.274(1.442-3.585)	**<0.001**	a*	
Hysterectomy				
No	1.0(reference)			
Yes	1.694(1.191-2.409)	**0.003**	1.205(0.828-1.755)	0.331
NA	1.372(0.582-3.236)	0.47	1.087(0.456-2.592)	0.851
Oophorectomy				
No	1.0(reference)			
Unilateral	0.47(0.15-1.477)	0.196		
Bilateral	1.404(0.52-3.789)	0.503		
NA	1.092(0.362-3.29)	0.876		
Lymphadenectomy				
No	1.0(reference)			
Yes	0.692(0.516-0.927)	**0.013**	0.692(0.516-0.927)	**0.009**

a*: Reduced degrees of freedom due to constant or linear dependent covariates.

Table 4: Proportional Hazards (PH) model and interaction validation.

Variables	PH model Hazard Ratio (95%CI)	P Value	P for interaction Hazard Ratio (95%CI)	P Value
Age(years)	1.005(0.998-1.013)	0.127		
<30			1.0(reference)	
30-50			0.549(0.333-0.903)	**0.018**
>50			0.966(0.699-1.334)	0.833
Laterality	0.995(0.981-1.01)	0.537		

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unilateral			1.0(reference)	
Bilateral			0.744(0.564-0.983)	**0.037**
Lymphadenectomy	1.002(0.995-1.009)	0.609		
No				
Yes				

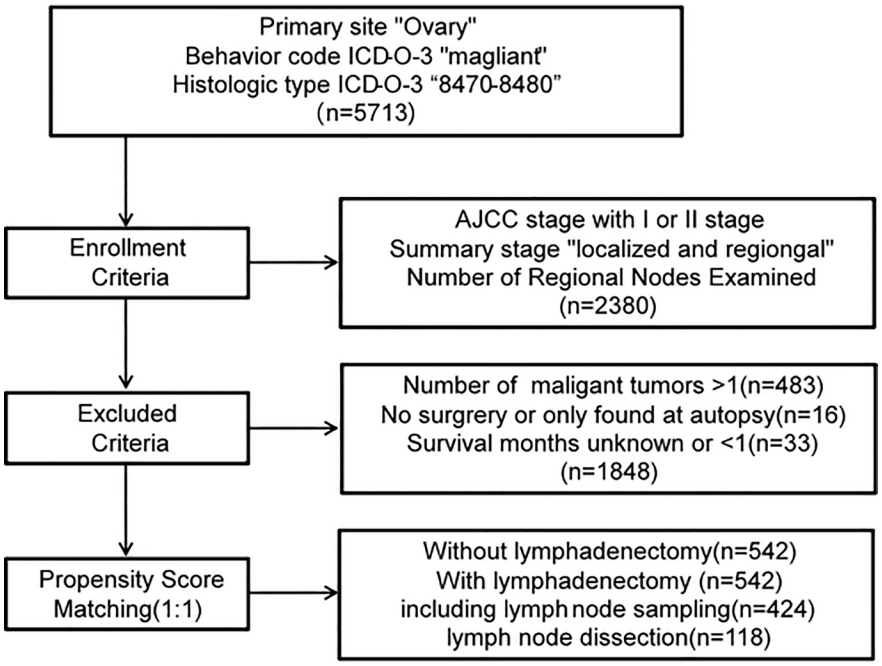

Figure 1: Flowchart for screening patients. One hundred eighty-eight patients with mucinous ovarian cancer (MOC) initially met the eligibility criteria, and after propensity score matching (1:1), only 1048 patients were enrolled in the study.

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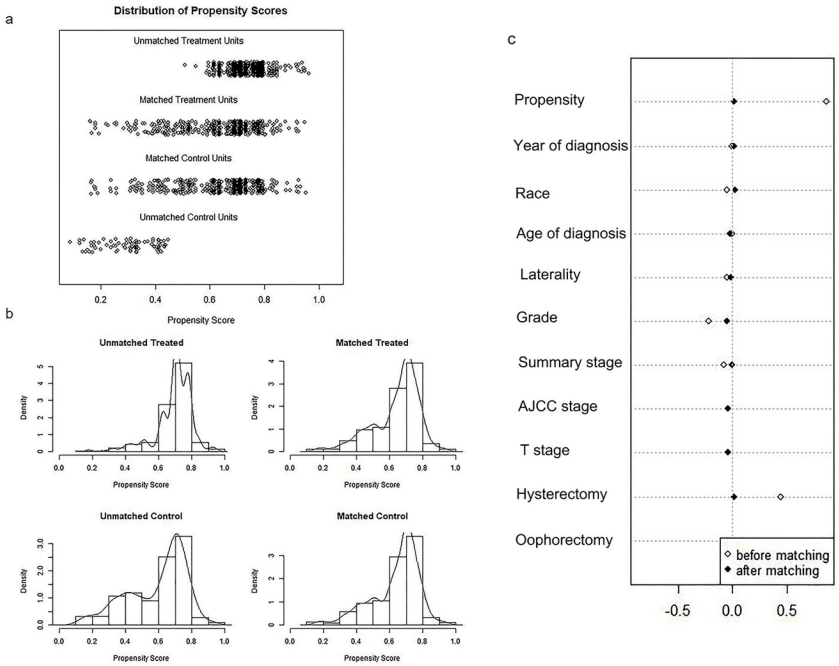

Figure 2: Map of propensity score matching. (a): Distribution map of propensity scores before and after matching. (b): Histogram of propensity scores before and after matching. Control: Without lymphadenectomy, Treated: With lymphadenectomy. (c): Dotplot of standardized mean differences before and after matching

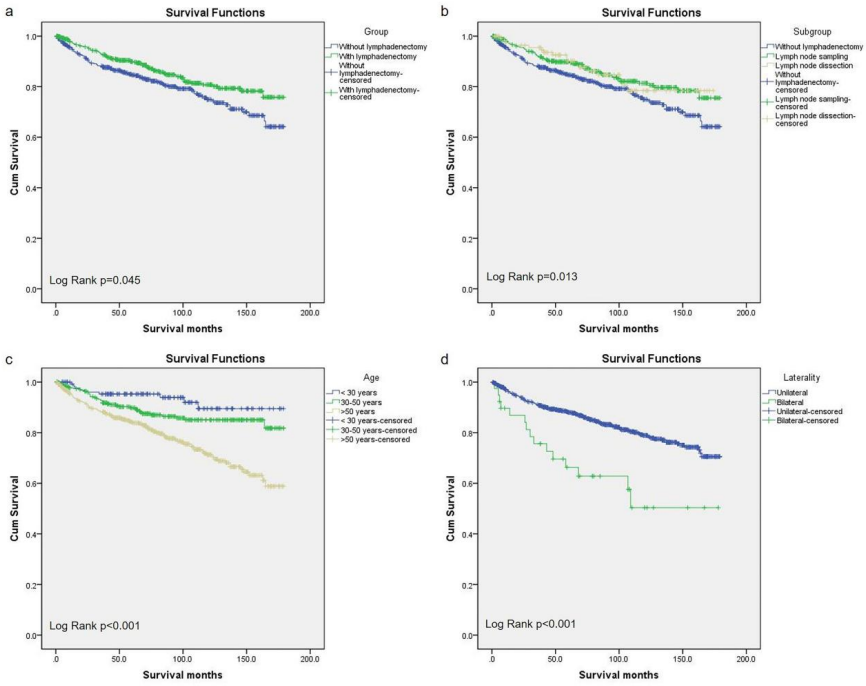

Figure 3: Kaplan-Meier survival curves for risk factors for mucinous ovarian cancer versus overall survival. (a): Lymphadenectomy. (b): Lymphadenectomy subgroup. (c): Age. (d): Laterality.

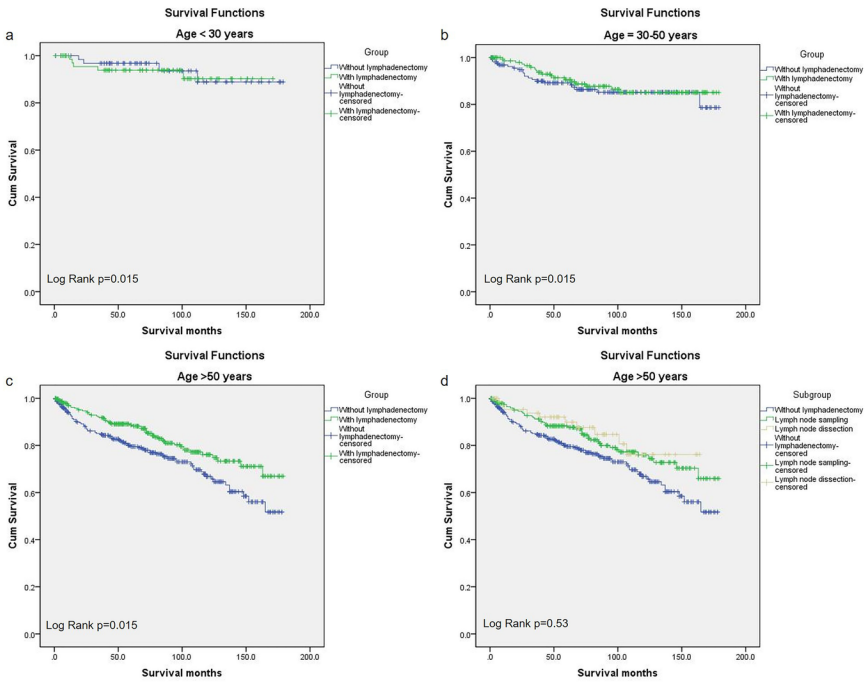

Figure 4: Kaplan-Meier survival curves for overall survival of lymphadenectomy in different populations. (a): Patients younger than 30 years. (b): Patients between 30 and 50 years. (c): Patients older than 50 years. (d): Lymphadenectomy subgroups in patients older than 50 years.

Figure 5: Kaplan-Meier survival curves for overall survival after lymphadenectomy in different populations. (a): Patients with unilateral tumor. (b): Patients with bilateral tumor. (c): Lymphadenectomy subgroup in patients with unilateral tumor. (d): Lymphadenectomy subgroup in patients with bilateral tumor.

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`Table.pdf` available at https://authorea.com/users/490252/articles/573673-outcomes-of-lymphadenectomy-for-early-stage-mucinous-ovarian-cancer-a-retrospective-study-based-on-surveillance-epidemiology-and-end-results-seer-database

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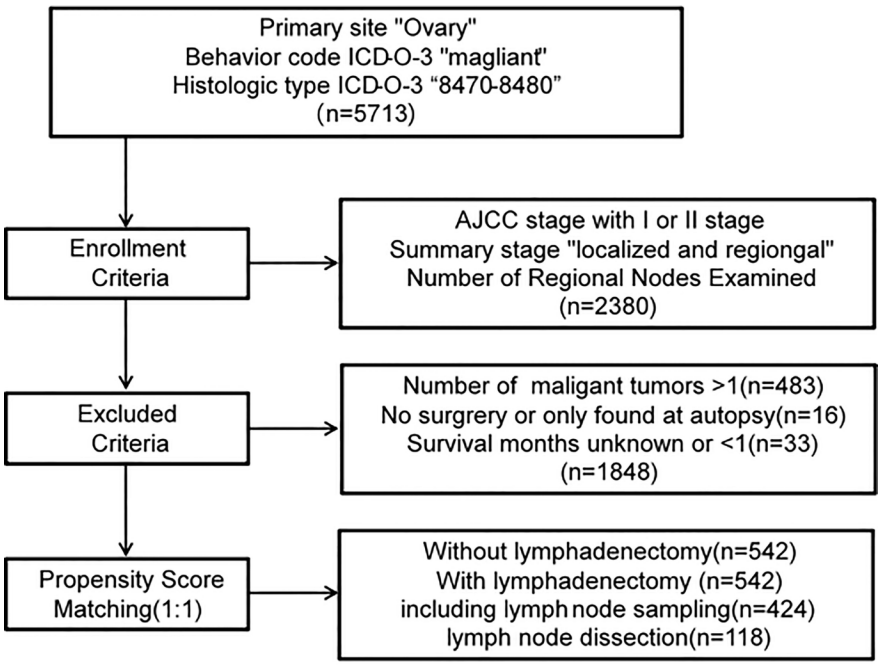

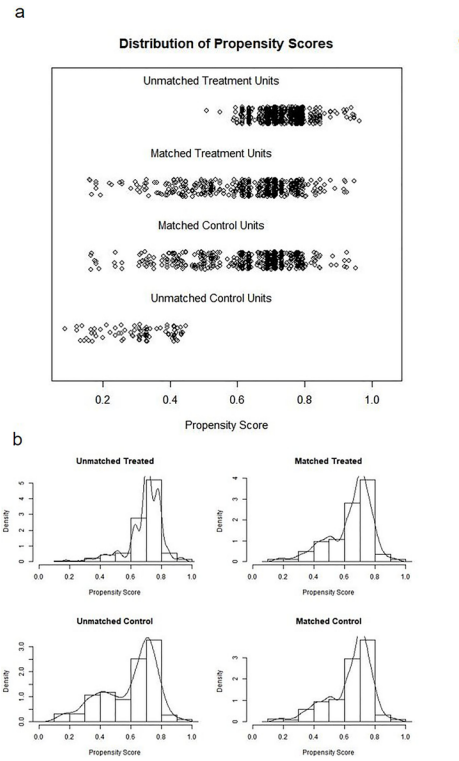

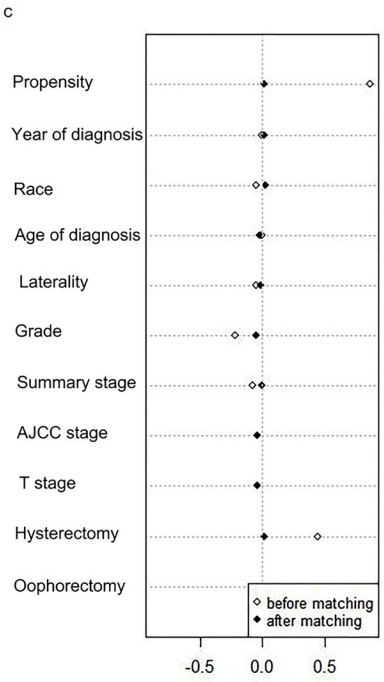

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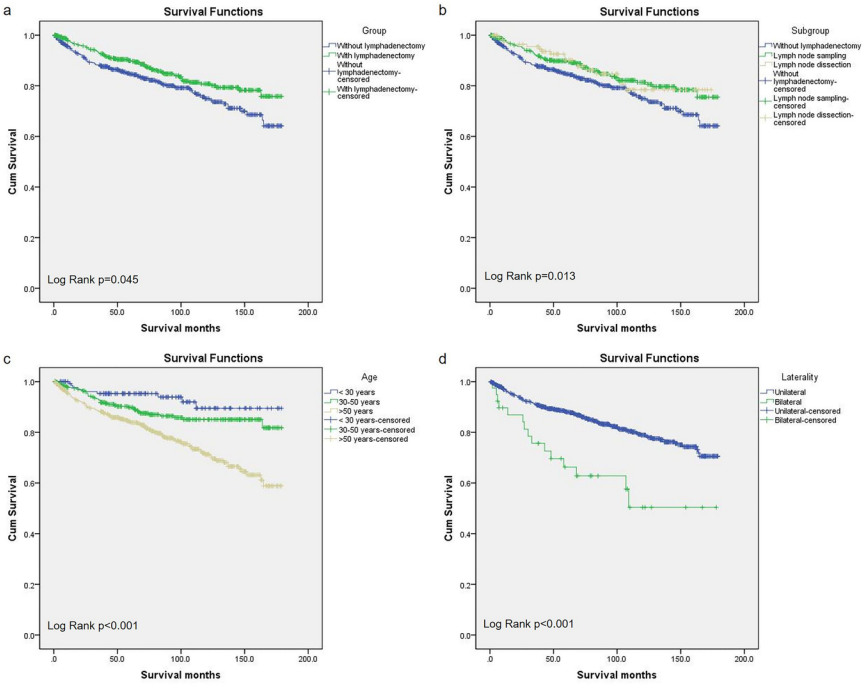

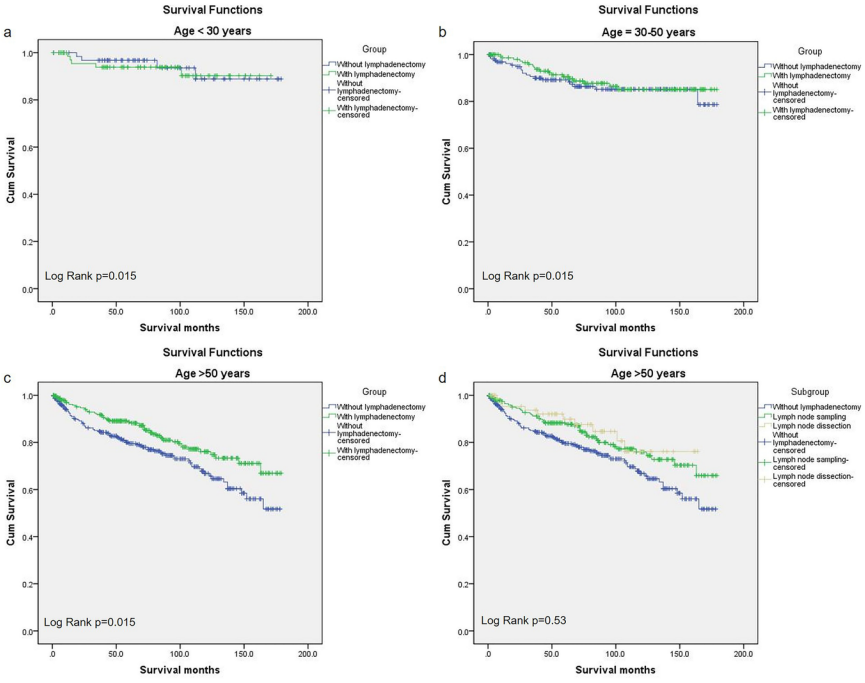

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