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Primary Fallopian Tube Carcinoma: Clinicopathological Characteristics, Therapeutic Management and Prognostic Factors in a Cohort of 72 Patients

Mihaela-Mădălina Gavrilescu[1,2], Viorel Scripcariu[1,2], Bogdan Filip[1,2], Maria-Gabriela Aniței[1,2], Nicolae Ioanid[2], Dragoș-Viorel Scripcariu[1,2]*, Ana Grigoraș[1,2]*, Ionuț Huțanu[1,2]

[1]Faculty of Medicine, Grigore T. Popa University of Medicine and Pharmacy, Iași, Romania
[2]First Oncological Surgery Unit, Regional Institute of Oncology, Iași, Romania

***Corresponding author:**
Dragoș-Viorel Scripcariu, MD
E-mail: dragos-viorel.scripcariu@umfiasi.com
Ana Grigoraș, MD
E-mail: grigoras.ana@umfiasi.ro
Strada Universitatii nr 16, 700115, Iași
Romania

Abbreviations:
SEE-FIM: Sectioning and Extensively Examining the Fimbriated End;
IOTA: International Ovarian Tumor Analysis;
LR: Logistic Regression;
ADNEX: Assessment of Different NEoplasias in the AdneXa;
MRI: Magnetic Resonance Imaging;
CT: Computed Tomography;
O-RADS MRI: Ovarian-Adnexal Reporting and Data System Magnetic Resonance Imaging;
18F-FDG PET/CT: Fluor-18 Fluorodeoxyglucose Positron Emission Tomography / Computed Tomography.

Rezumat

Carcinomul primar al trompei uterine: caracteristici clinico-patologice, management terapeutic și factori de prognostic într-o cohortă de 72 de paciente

Introducere: Carcinomul primar al trompei uterine reprezintă o patologie malignă rară, ale cărei caracteristici clinice şi biologice se suprapun în mare măsură cu cele ale cancerului ovarian epitelial. Din cauza incidenței scăzute, datele privind factorii prognostici şi strategiile terapeutice optime sunt limitate.
Metode: Am realizat un studiu retrospectiv, incluzând pacientele care au beneficiat de tratament chirurgical pentru neoplasm primar al trompei uterine în perioada 2014–2025 în clinica I Chirurgie Oncologică, Institutul Regional de Oncologie, Iasi. Au fost evaluate caracteristicile clinicopatologice, tipurile de tratament şi rezultatele pe termen lung. Modele de regresie Cox univariate şi multivariate au fost utilizate pentru identificarea factorilor prognostici.
Rezultate: În studiu au fost incluse 72 de paciente. Majoritatea cazurilor au fost diagnosticate în stadiile FIGO III–IV. Chimioterapia neoadjuvantă a fost administrată la 33,3% dintre paciente, iar 95,8% au primit chimioterapie adjuvantă. Citoreducția completă a fost obținută la 75% dintre paciente. În analiza multivariată, utilizarea chimioterapiei neoadjuvante a fost asociată cu o supraviețuire mai redusă (p=0,042). Anexectomia bilaterală a fost asociată cu o supraviețuire îmbunătățită (p=0,031), în timp ce stadiul FIGO a fost aproape de pragul semnificației statistice.
Concluzii: Carcinomul primar al trompei uterine se prezintă frecvent în stadii avansate şi necesită o abordare terapeutică multimodală complexă. În ciuda progreselor în profilul molecular şi în tehnicile chirurgicale, depistarea precoce rămâne dificilă din cauza caracterului subtil şi nespecific al simptomelor, precum şi a accesibilității anatomice reduse a trompelor uterine.

Cuvinte cheie: carcinomul primar tubar, factori de prognostic, chirurgie citoreductivă

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Abstract

Background: Primary fallopian tube carcinoma is a rare gynecologic malignancy with

clinical and biological features overlapping epithelial ovarian cancer. Due to its low incidence, data regarding prognostic factors and optimal therapeutic strategies remain limited.
Methods: This retrospective study included patients who underwent surgical treatment for primary fallopian tube carcinoma between 2014 and 2025 at the First Oncological Surgery Unit of a tertiary cancer institut. Clinicopathological characteristics, treatment patterns and survival outcomes were evaluated. Univariate and multivariate Cox regression models were used to identify prognostic factors.
Results: Seventy two patients were included in our study. Advanced-stage disease predominated, with FIGO stage III–IV identified in the majority of cases. Neoadjuvant chemotherapy was administered to 33.3% of patients, while 95.8% received adjuvant chemotherapy. Complete cytoreduction was achieved in 75% of patients. On multivariate analysis, the use of neoadjuvant chemotherapy was associated with poorer survival (p=0.042). Bilateral salpingo-oophorectomy was associated with improved survival (p=0.031), while FIGO stage approached statistical significance.
Conclusions: Primary fallopian tube carcinoma frequently presents at an advanced stage and requires complex multimodal management. Despite advances in molecular profiling and surgical techniques, early detection remains elusive due to the subtle and non-specific nature of symptoms and the anatomical inaccessibility of the fallopian tubes.

Keywords: primary fallopian tube carcinoma, prognostic factors, cytoreductive surgery

Introduction

Primary fallopian tube carcinoma (PFTC), although rare, has gained increasing clinical relevance due to its diagnostic challenges, overlap with other pelvic serous malignancies—particularly ovarian cancer—and its implications for prevention in high-risk populations. Once considered exceptional, PFTC is now recognized as a likely site of origin for many high-grade serous carcinomas (HGSC) previously attributed to the ovary or peritoneum. This paradigm shift is supported by the identification of serous tubal intraepithelial carcinomas (STICs) in the distal fallopian tube, especially among BRCA mutation carriers undergoing risk-reducing surgery. PFTC is most commonly diagnosed in postmenopausal women aged 55–65 years and is likely underdiagnosed due to its clinical and morphological similarity to ovarian and peritoneal carcinomas (1-3).

Low-grade serous carcinoma (LGSC) and high-grade serous carcinoma (HGSC) are now regarded as biologically and molecularly distinct entities rather than different grades of the same disease (4). Advances in molecular pathology have identified the fimbrial end of the fallopian tube as a key origin site for many pelvic serous carcinomas (5). Current consensus criteria designate the fallopian tube as the primary site when STIC or mucosal HGSC is present, or when the tube is inseparable from a tubo-ovarian mass (4). Implementation of the SEE-FIM protocol has significantly improved detection of early tubal neoplasia, leading to reclassification of approximately 80% of HGSC cases as primary fallopian tube carcinomas (2, 4,6,7).

Clinically, PFTC presents with non-specific symptoms such as pelvic or abdominal pain, abnormal vaginal bleeding or discharge, and adnexal mass. The classic Latzko triad (watery discharge, pelvic pain, pelvic mass) is rarely complete (8). Vaginal bleeding and watery discharge appear more frequent in PFTC than in epithelial ovarian cancer, possibly due to tubal–uterine anatomical continuity (9-11). Although histopathology is definitive, imaging is crucial in evaluating tubal lesions. PFTC is often mistaken for ovarian carcinoma preoperatively. Ultrasound typically shows a complex adnexal mass with tubular morphology, papillary projections, and increased vascularity, but reliable distinction from ovarian cancer remains difficult (12,13).

Advances in imaging have led to the development of predictive models for adnexal mass evaluation, initially centered on CA-125. The IOTA group introduced ultrasound-based tools such as the Simple Rules, LR models, and the ADNEX model, which combines clinical and sonographic parameters to estimate malignancy risk (14, 15). According to IOTA criteria, malignancy is suggested by features including irregular solid areas, ascites, ≥4 papillary projections, irregular multilocular-solid tumors, or marked vascular flow (16). MRI is essential for evaluating indeterminate adnexal masses, and the O-RADS MRI score—based on standardized criteria—provides high diagnostic accuracy (>90% sensitivity and specificity) in differentiating benign from malignant lesions (17).

CT may underestimate small peritoneal disease but remains essential for assessing overall tumor burden and detecting distant metastases that influence treatment decisions (18), while routine 18F-FDG PET/CT is not recommended for primary staging (19).

Management of PFTC generally follows the treatment paradigm for epithelial ovarian/primary peritoneal cancer, with maximal cytoreductive surgery aiming for no macroscopic residual disease (R0) when feasible, followed by platinum–taxane chemotherapy. In patients with advanced disease in whom optimal upfront resection is unlikely or surgical risk is high, neoadjuvant platinum-based chemotherapy followed by interval debulking surgery is an accepted alternative, supported by randomized trials showing non-inferiority of the neoadjuvant approach compared with primary debulking in stage IIIC–IV tubo-ovarian cancers (20,21). According to ESGO–ESMO–ESP consensus recommendations, the management of primary fallopian tube carcinoma should be individuali-zed within a multidisciplinary team and includes comprehensive preoperative assessment, maximal effort cytoreductive surgery aiming at complete macroscopic resection (R0), platinum-based chemotherapy, molecular testing for BRCA1/2 and homologous recombination deficiency (HRD), and maintenance therapy with PARP inhibitors and/or bevacizumab in selected patients. These recommendations have progressively evolved during the study period covered by the present analysis (20).

Previous literature consistently identifies disease stage at diagnosis and the extent of residual disease following surgery as major prognostic factors influencing both time to progression and overall survival in patients with PFTC (22,23). Similarly, a large population-based registry analysis including 416 patients with PFTC reported 5-year survival rates of 95% for stage I, 75% for stage II, 69% for stage III, and 45% for stage IV, further underscoring the prognostic importance of disease stage (24).

Objectives

The aim of this study was to evaluate the surgical management and oncologic outcomes of patients with primary fallopian tube carcinoma treated between January 2014 and December 2025, with particular emphasis on treatment strategies, the extent of cyto-reduction and survival outcomes.

Material and Methods

This retrospective study included patients diagnosed with primary fallopian tube carcinoma who underwent surgical treatment at the First Oncological Surgery Unit, Regional Institute of Oncology, between January 2014 and December 2025. Patients were identified from medical records and surgical databases. Only cases with histopathological confirmation of primary fallopian tube carcinoma were included in the analysis.

Clinical, pathological and surgical data were retrospectively collected from medical records. The following variables were analyzed: patient age, CA-125 levels, FIGO stage, surgical procedures performed, type and extent of surgical procedures, residual disease status, histopathologic subtype and grade, BRCA mutation status (when available), neoadjuvant chemotherapy or adjuvant chemotherapy. In patients who received neoadjuvant chemotherapy, histopathological confirmation of malignancy before treatment initiation was obtained either by a cell block specimen or by diagnostic laparoscopy with biopsy. Available survival data were also recorded. Staging was determined according to the FIGO classification (*Table 1*) (19), while histopathological assessment followed the WHO classification (25).

Table 1. FIGO Staging for Ovarian Cancer/Fallopian Tube Cancer/Primary Peritoneal Cancer (19)

Stage	Description
I	Tumor confined to the ovary
IA	Tumor limited to one ovary (capsule intact); no tumor on surface of the ovary; no malignant cells in the ascites or peritoneal washings.
IB	Tumor limited to both ovaries (capsules intact); no tumor on surface of the ovary; no malignant cells in the ascites or peritoneal washings.
IC	Tumor limited to one or both ovaries, with any of the following:
IC1	Surgical spill.
IC2	Capsule ruptured before surgery or tumor on the surface of the ovary.
IC3	Malignant cells in the ascites or peritoneal washings.
II	Tumor involves one or both ovaries with pelvic extension (below pelvic brim) or primary peritoneal cancer.
IIA	Extension and/or implants on uterus and/or fallopian tubes.
IIB	Extension to and/or implants on other pelvic tissues
III	Tumor involves one or both ovaries or primary peritoneal cancer, with cytologically or histologically confirmed spread to the peritoneum outside the pelvis and/or metastasis to the retroperitoneal lymph nodes.
IIIA1	Positive retroperitoneal lymph nodes only (cytologically or histologically proven):
IIIA1(i)	Lymph nodes ≤10 mm in greatest dimension.
IIIA1(ii)	Lymph nodes >10 mm in greatest dimension.
IIIA2	Microscopic extrapelvic (above the pelvic brim) peritoneal involvement with or without positive retroperitoneal lymph nodes.
IIIB	Macroscopic peritoneal metastasis beyond the pelvis ≤2 cm in greatest dimension, with or without metastasis to the retroperitoneal lymph nodes
IIIC	Macroscopic peritoneal metastasis beyond the pelvis >2 cm in greatest dimension, with or without metastasis to the retroperitoneal lymph nodes (includes extension of tumor to capsule of liver and spleen without parenchymal involvement of either organ).
IV	Distant metastasis excluding peritoneal metastases.
IVA	Pleural effusion with positive cytology.
IVB	Parenchymal metastases and metastases to extra-abdominal organs (including inguinal lymph nodes and lymph nodes outside of the abdominal cavity).

Synchronous tumors were defined as simultaneous presence of two independent primary malignancies with distinct histopathological features (26) and collision tumors defined as the coexistence of two morphologically and biologically distinct epithelial neoplasms occurring in the same organ without any histological intermixture or transitional zone (27).

All patients underwent surgical treatment with the intent of achieving complete cytoreduction whenever feasible. Surgical procedures included hysterectomy with bilateral salpingo-oophorectomy, omentectomy, lymphadenectomy and additional cytoreductive procedures as required. The extent of cytoreduction was classified as complete (no macroscopic residual disease), optimal (residual disease <1 cm) or suboptimal (residual disease ≥1 cm) (28). Patients were considered for neoadjuvant platinum-based chemotherapy following multidisciplinary evaluation when primary complete cytoreduction was considered unlikely based on preoperative imaging, extensive upper abdominal or diffuse peritoneal disease, poor performance status, relevant medical comorbidities increasing surgical risk, or when disease burden was judged unresectable at initial assessment. Interval debulking surgery was performed after clinical reassessment following neoadjuvant chemotherapy. Adjuvant platinum-based chemotherapy was administered in most cases in line with contemporary oncologic standards.

The primary endpoint was overall survival. Prognostic factors evaluated included age, CA-125 levels, FIGO stage, treatment strategy, extent of cytoreduction, lymph node involvement, histological subtype and major surgical procedures. Survival analysis was performed using Kaplan–Meier estimates. Univariate and multivariate Cox proportional hazards models were applied to identify variables associated with survival outcomes. Hazard ratios (HR) with 95% confidence intervals (CI) were calculated and a p-value <0.05 was considered statistically significant. Statistical analyses were conducted using standard statistical software.

Results

Between January 2014 and December 2025, a progressive increase in the number of surgically treated tubal cancer cases was observed, rising from 7 cases in 2014 to a peak of 12 cases in 2024. The patients' ages ranged from 34 to 82 years. One patient (1.4%) was younger than 40 years, 6.9% were in the fifth decade, 20.8% in the sixth decade, 47.2% in the seventh decade, and 23.6% were aged 70 years or older. Primary fallopian tube carcinoma was diagnosed at a mean age of 62.6 ± 9.81 years and half of the patients were older than 63 years at diagnosis. Baseline demographic and clinicopathological characteristics of the study cohort are summarized in *Table 2*.

A personal history of breast cancer was documented in 6 patients (8.3%), while the remaining 66 patients (91.7%) had no prior diagnosis of breast malignancy. Interpretation of BRCA status in patients with prior

Table 2. Clinicopathological characteristics of patients undergoing surgical interventions for fallopian tube tumors

Characteristic	Values	Missing
Age	62.6 (9.81)	
Age>63	36 (50%)	
<40 years	1 (1.4%)	
40-49 years	5 (6.9 %)	
50-59 years	15 (20.8%)	
60-69 years	34 (47.2%)	
≥ 70 years	17 (23.6%)	
CA125	763.5 (1259.26)	9.7%
CA125>35U/l	50 (69%)	
Prior breast cancer surgery	6 (8.3%)	
BRCA known status	20 (27.77%)	72.22%
BRCA positive status	6 (8.3%)	
BRCA negative status	14 (19.44%)	
Laparoscopy	9 (12.5%)	
Neoadjuvant chemotherapy	24 (33.3%)	
Neoadjuvant chemotherapy scheme Carboplatin+Paclitaxel /other	19/5	
Adjuvant chemotherapy	69 (95.8%)	
Adjuvant chemotherapy scheme		
Carboplatin-Paclitaxel/other	34/16	26%
Complete cytoreduction (no visible tumors)	54 (75%)	
Optimal cytoreduction	66 (91.66%)	
Surgical procedures		
Hartmann' s procedure	9 (12.5%)	
Partial colectomy	7 (9.7%)	
Small bowel resection	4 (5.5%)	
Appendectomy	5 (6.95%)	
Bilateral salpingo-oophorectomy	69 (95.8%)	
Omentectomy	57 (79.16%)	
Para-aortic lymphadenectomy	12 (16.5%)	
Unilateral adnexectomy	3 (4.16%)	
Pelvic lymphadenectomy	24 (33.3%)	
No lymphadenectomy	44 (61.11)	
Pelvic peritonectomy	17(23.61%)	
No of lymph nodes harvested	10.31 (14.55)	
No of positive lymph nodes harvested	1 (3.28)	
Tumor histotype		
Serous carcinoma	62 (86.11%)	
Other type	10 (13.88%)	
Bilateral tumor (Yes/No)	13 (18.05)	
Tumor grade G1-2/G3/Gx	6/46/20	
T stage I/II/III/IV	10/20/42/0	
FIGO stage I/II/III/IV	7/16/45/4	
Follow-up (Months)	35.74 (31.07)	5.56%
1 year survival (percentage)	81%	

breast cancer is limited by the small sample size and incomplete genetic testing. Among the six patients with a history of breast cancer, BRCA status was available in four cases. One patient (16.7%) harbored a BRCA mutation, while three patients (50.0%) were BRCA wild-type. In two cases (33.3%), BRCA status was unavailable (*Table 2*).

In the study cohort of 72 patients with primary fallopian tube carcinoma, the mean preoperative CA-125 level was 763.5 ± 1259.26 U/L, with elevated values (>35 U/L) observed in 50 patients (69%).

Primary surgery was performed in 48 patients (66.7%), while 24 patients (33.3%) received neoadjuvant chemotherapy followed by interval debulking surgery. The choice between primary surgery and neoadjuvant chemotherapy with interval debulking reflected individualized clinical decision-making, with neoadjuvant treatment preferentially applied in patients with advanced disease or anticipated suboptimal cytoreduction.

Neoadjuvant chemotherapy was administered to 24 patients (33.3%), most commonly consisting of carboplatin plus paclitaxel (19 cases), while alternative regimens were used in 5 patients. Adjuvant chemotherapy was delivered to 69 patients (95.8%), predominantly based on carboplatin–paclitaxel combinations, although treatment scheme data were unavailable in 26% of cases.

All patients underwent surgical treatment, most frequently consisting of total hysterectomy with bilateral salpingo-oophorectomy (95.8%). Omentectomy was performed in 79.16% of cases, while pelvic and both para-aortic and pelvic lymphadenectomy were carried out in 33.3% and 16.5% of patients, respectively. Additional surgical procedures required to achieve complete cytoreduction included small bowel resection (5.5%), partial colectomy (9.7%), Hartmann procedure (12.5%) and pelvic peritonectomy (23.61%). Complete cytoreduction (R0) was achieved in 75% of patients.

Histopathological analysis showed high-grade tumors (G3) in the majority of cases (46 patients), while low-grade tumors (G1–2) were identified in 6 patients; tumor grade could not be assessed in 20 cases (Gx). Histopathological analysis also revealed that serous carcinoma was the predominant tumor type, accounting for 62 of 72 cases (86.11%). Adenocarcinoma of the fallopian tube was identified in 5 cases (6.9%), while carcinosarcoma and neuroendocrine carcinoma were rare, each observed in 1 case (1.4%). Histological collision tumors were reported in 5 patients (6.9%), synchronous tumors in 9 patients (12.5%), and bilateral tubal involvement was documented in 13 cases (18.05%) (*Table 2*).

Regarding tumor extent, most patients presented with advanced disease, with T stage III identified in 42 cases, followed by T stage II in 20 cases and T stage I in 10 cases; no patients were classified as T stage IV. According to FIGO staging, the majority of patients were diagnosed at an advanced stage, with FIGO stage III in 45 cases and stage IV in 4 cases, while early-stage disease (FIGO I–II) was observed in 23 patients.

The mean follow-up period was 35.74 ± 31.07 months, with missing follow-up data in 5.6% of cases. The estimated one-year survival rate was 81% (*Table 2*). The univariate analysis identified several variables associated with survival; however, only some retained statistical significance in the multivariate model, indicating an independent prognostic role (*Table 3*). Survival analysis was performed using univariate and multivariate Cox proportional hazards models to identify factors associated with overall survival. On univariate analysis, neoadjuvant chemotherapy, bilateral salpingo-oophorectomy, FIGO stage (*Fig. 1*) and T stage were significantly associated with survival outcomes (*Table 3*).

Age over 63 years was not significantly associated with survival (p = 0.57), suggesting that advanced age alone did not adversely impact prognosis in this cohort.

Similarly, preoperative CA125 levels >35 U/L showed no statistically significant association in either univariate (p = 0.15) or multivariate analysis (HR = 1.0, 95% CI: 1–1, p = 0.89). This indicates that elevated tumor marker levels were not predictive of survival outcomes. The presence of complete cytoreduction (no visible tumors) did not reach statistical significance (p = 0.162). Although complete tumor removal is often considered prognostically favorable,

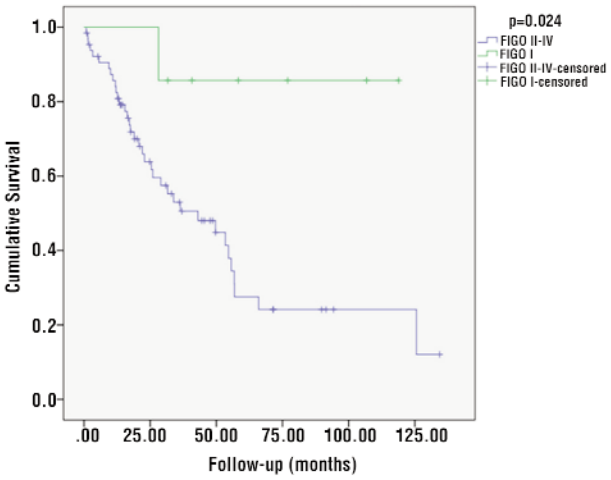

Figure 1. Overall survival according to FIGO stage

Table 3. Univariate and multivariate analysis of factors influencing overall survival

Variables	Univariate* analysis	Multivariate ** analysis			
	p-value	Hazard ratio	95% Confidence interval		p-value
AGE>63	0.57				
CA125>35u/l	0.15	1	1	1	0.89
Neoadjuvant chemotherapy	<0.01	2.235	1.031	4.845	0.042
Complete cytoreduction - no visible tumors (Yes/No)	0.162				
Optimal cytoreduction tumor deposits <1 cm (Yes/No)	0.34				
Serous type vs other	0.32				
Positive lymph nodes (Yes vs No)	0.96				
Hartmnann's procedure	0.38				
Small bowel resection	0.80				
Colon resection (Yes vs No)	0.45				
Bilateral salpingo-oophorectomy	0.02	0.172	0.035	0.849	0.031
Omentectomy	0.64				
Pelvic peritonectomy	0.07	1.061	0.456	2.497	0.89
FIGO I-II vs III-IV	0.02	0.146	0.019	1.096	0.061
T 1-2 vs T3-4	0.02	2.642	0.319	21.860	0.37

*Log rank test. **Cox regression model.

this dataset did not demonstrate a measurable survival advantage. Likewise, optimal cytoreduction with tumor deposits <1 cm was not associated with improved survival (p = 0.34), suggesting that the threshold used to define optimal debulking may not have translated into a survival benefit within this population.

Histological subtype, specifically serous versus non-serous tumors, showed no significant relationship with survival (p = 0.32), implying comparable outcomes regardless of tumor histology. Lymph node status (positive vs. negative) was also not predictive of survival (p = 0.96), indicating that nodal involvement alone did not independently affect prognosis.

Regarding surgical procedures, Hartmann's procedure (p = 0.38), small bowel resection (p = 0.80), and colon resection (p = 0.45) were not associated with survival differences. These findings suggest that the need for more extensive bowel surgery likely reflects disease burden rather than acting as an independent prognostic determinant. Omentectomy similarly showed no survival impact (p = 0.64).

Tumor stage comparisons demonstrated borderline findings. FIGO stage I–II vs. III–IV was significant in univariate analysis (p = 0.02), but lost significance after adjustment (HR = 0.146, 95% CI: 0.019–1.096, p = 0.061). Although suggestive of improved survival in earlier stages, the wide confidence interval indicates uncertainty. Similarly, tumor category T1–2 vs. T3–4 was significant in univariate analysis (p = 0.02) but not in multivariate analysis (HR = 2.642, 95% CI: 0.319–21.860, p = 0.37), likely reflecting limited statistical power or confounding.

Two variables emerged as independent predictors of survival. Neoadjuvant chemotherapy demonstrated a significant association with poorer survival in both univariate (p < 0.01) and multivariate analyses (HR = 2.235, 95% CI: 1.031–4.845, p = 0.042). Patients receiving neoadjuvant treatment had more than twice the risk of mortality compared to those who did not (*Fig. 2*). This finding likely reflects selection bias, as neoadjuvant chemotherapy is typically reserved for patients with more advanced or unresectable disease. Bilateral salpingo-oophorectomy was independently associated with improved survival. While significant in univariate analysis (p = 0.02), the multivariate model confirmed a strong protective effect (HR = 0.172, 95% CI: 0.035–0.849, p = 0.031). This corresponds to an approximately 83% reduction in mortality risk,

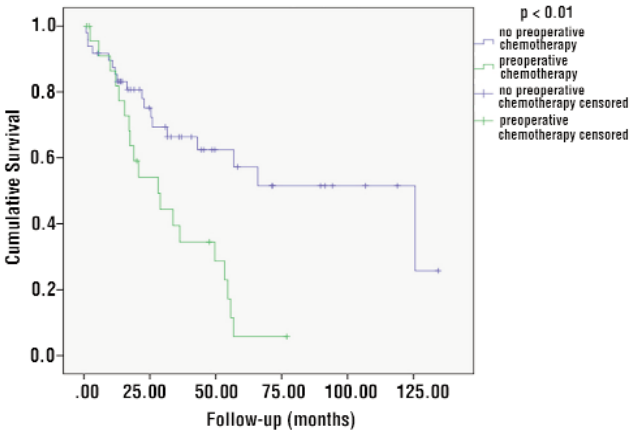

Figure 2. Overall survival according to preoperative chemotherapy

suggesting that comprehensive surgical removal of adnexal structures plays a critical role in prognosis.

Incomplete data were noted for selected variables; however, their distribution was not considered sufficient to compromise the validity of the analysis (*Table 2*).

Discussion

The annual number of primary fallopian tube carcinoma cases treated at our department showed a gradual increase over the study period, between 2014 and 2025. The highest number of cases was recorded in the later years of the study. This trend likely reflects increased recognition of the tubal origin of high-grade serous carcinomas and changes in diagnostic and pathological classification, rather than a true population-based increase in incidence.

Most women with symptomatic primary fallopian tube carcinoma are reported to be between 50 and 80 years of age, with large series describing a mean diagnostic age of 56–64 years (29). Our findings align with these reports, as the mean age at diagnosis was 62.6 ± 9.81 years, and 50% of patients were older than 63 years, further supporting the predominance of this malignancy in postmenopausal women.

The relatively high proportion of serous carcinoma observed in our study is likely influenced by improvements in pathological assessment, particularly the widespread adoption of standardized examination protocols of the fallopian tube, such as the SEE-FIM protocol (2,30). Previous studies have shown that detailed fimbrial evaluation increases the detection of serous tubal intraepithelial carcinoma and facilitates more accurate assignment of tubal origin, thereby contributing to higher reported rates of serous carcinoma in more recent series (3,30).

Preoperative diagnosis is challenging, and PFTC is often diagnosed postoperatively or intraoperatively. CA-125 levels may be elevated but are not specific. Retrospective studies continue to support that CA 125 is elevated preoperatively in a substantial but not universal proportion of primary fallopian tube carcinoma cases. In a 2024 cohort of 47 patients, 53.2% had levels ≥ 35 U/mL (31). In another single institution 2025 analysis comparing PFTC and high grade serous ovarian cancer, CA 125 elevation was recorded among PFTC but with variable sensitivity related to stage. Preoperative serum cancer antigen CA-125 levels were elevated in 61% of patients with PFTC, in contrast with patients with HGSOC where elevated CA 125 was found in 98% of patients (9). Earlier data also align: in a cohort of 33 patients, 57.6% showed elevated CA 125 pre surgery; higher levels and posttreatment descents were associated with relapse and response (32). In our study cohort of 72 patients with primary fallopian tube carcinoma, the mean preoperative CA-125 level was 763.5 ± 1259.26 U/L, and elevated values (>35 U/L) were observed in 50 patients (69%). This rate is higher than those reported in most previous series and may be explained by the predominance of advanced-stage disease in our population. These findings support the concept that CA-125 elevation in PFTC reflects tumor burden rather than serving as a sensitive marker for early-stage disease.

Although most published studies do not explicitly report the presence or absence of breast cancer in patients with tubal carcinoma, a possible association has been suggested. In a previously reported series, breast cancer was identified in 11 of 103 patients with invasive tubal carcinoma (11%). In our cohort, a personal history of breast cancer was observed in 6 patients (8.3%), while 66 patients (91.7%) had no prior diagnosis of breast malignancy (33).

Primary fallopian tube carcinoma is often considered to share biological behavior with epithelial ovarian cancer; however, several reports have suggested that PFTC may be diagnosed at earlier stages than ovarian cancer, likely due to earlier symptom development. In one such series, 72% of PFTC patients were diagnosed at FIGO stages I–II, with only 28% presenting with stage III disease and no cases of stage IV reported (9).

Several studies suggest that primary fallopian tube carcinoma (PFTC) may be diagnosed at earlier stages compared with epithelial ovarian cancer, other institutional series report a predominance of advanced-stage disease at presentation. In a large single-institution retrospective study of 101 cases, the proportion of FIGO stage I disease was relatively low, while stage III disease accounted for up to 38.6% of cases, with advanced stages (III–IV) representing an independent prognostic factor for both overall survival and disease-free survival. These findings indicate that late-stage diagnosis remains common in real-world clinical practice (34). In contrast to previously published reports describing a higher prevalence of early-stage disease, our cohort was predominantly characterized by advanced-stage presentation, indicating a more aggressive disease profile at the time of diagnosis. FIGO stage III and IV were identified in 45 and 4 patients, respectively, while early-stage disease (FIGO I–II) was observed in only 23 cases. Likewise, T stage III predominated in our series. This pattern closely mirrors the findings of single-institution studies reporting advanced-stage predominance and may be explained by differences in referral patterns and patient selection, as our institution

functions as a tertiary oncology center managing a higher proportion of advanced and complex cases. Additionally, nonspecific early symptoms and diagnostic delays may further contribute to late-stage presentation. Taken together, these data suggest that, despite reports of earlier-stage detection in selected series, PFTC frequently presents at an advanced stage in routine oncologic practice, reinforcing the ongoing challenges of early diagnosis and the need for increased clinical awareness.

In the present cohort, serous carcinoma accounted for 86.11% of all cases, a proportion that is consistent with previously published data, in which high-grade serous carcinoma accounts for approximately 75–90% of primary fallopian tube and tubo-ovarian malignancies (1,3,35). Large institutional series and population-based studies have consistently demonstrated the predominance of serous histology, supporting the current paradigm that most tumors historically classified as ovarian in origin arise from the distal fallopian tube (1,35). The high rate of poorly differentiated tumors further supports the aggressive biological behavior typically associated with this malignancy.

Non-serous histological subtypes were uncommon in our cohort, with endometrioid adenocarcinoma of the fallopian tube comprising 6.9% of cases — a finding consistent with published series in which non-serous variants collectively comprise approximately 8–12% of primary fallopian tube carcinomas. For example, Bao et al. reported serous adenocarcinoma in 91.1% of cases (implying ~8.9% non-serous) in a retrospective analysis (34). Rare entities such as carcinosarcoma and neuroendocrine carcinoma each represented 1.4% of cases, consistent with the literature, where these subtypes are reported to constitute less than 2–3% of fallopian tube malignancies and are typically described in small case series or isolated reports (35). Additionally, associated pathological features such as synchronous tumors (12.5%) and collision histology (6.9%) were identified.

In our cohort bilateral tubal involvement was found in 18.05% of cases. Gadducci et al. reported that both tubes were involved in 31.8% of 88 cases and concludes that the higher incidence of bilaterality in advanced disease might suggest that it is due to metastastic spread rather than simultaneous development of primary malignancies in both tubes (36). In the series reported by Alvarado-Cabrero et al., unilateral tubal involvement predominated (95%), with a slight right-sided predominance, while bilateral disease was uncommon, occurring in only 3% of cases (33).

Out of 72 primary fallopian tube carcinomas, five cases demonstrated distinct histological patterns. These included one mixed serous–mucinous carcinoma, one dedifferentiated carcinoma with high-grade serous and poorly differentiated components, and three papillary serous carcinomas associated with discrete clear cell carcinoma areas. Collision tumors of the fallopian tube remain exceedingly rare in the literature, with reported frequencies largely limited to anecdotal cases (37).

Complete cytoreduction was achieved in 75% of patients, representing a key determinant of oncologic outcomes in tubo-ovarian malignancies. Extensive surgical procedures, including bowel resections and peritonectomies, were required in a substantial proportion of cases, underscoring the aggressive surgical effort often necessary to obtain adequate tumor clearance. This finding further supports the central role of radical surgery performed in specialized centers. Optimally cytoreduced patients with PFTC followed by paclitaxel-based chemotherapy regimen were found to be more likely to obtain excellent survival (22).

A multicenter study including 64 patients with primary fallopian tube carcinoma demonstrated that the extent of residual disease after surgery is a key prognostic factor, with significantly longer time to progression (86 vs. 23 months, $p < 0.001$) and improved overall survival observed in optimally debulked patients (38). Although our retrospective cohort of 72 patients did not identify complete cytoreduction as an independent predictor of survival, this finding should be interpreted within the broader clinical context. Primary fallopian tube carcinoma is frequently diagnosed at advanced stages, where survival outcomes are influenced by multiple interrelated factors such as tumor biology, disease burden, and response to systemic therapy. Consequently, the prognostic impact of residual disease may be less apparent when adjusted for these variables in multivariate models. Importantly, our results do not contradict the established surgical paradigm but rather emphasize the multifactorial nature of survival in this rare malignancy, where optimal cytoreduction remains a central therapeutic objective.

In contrast to the study that included 101 patients and identified pelvic lymphadenectomy as an independent prognostic factor for both overall survival and disease-free survival (34), our analysis conducted on a cohort of 72 patients did not demonstrate a significant association between lymph node status and survival outcomes. Specifically, lymph node involvement (positive versus negative) was not predictive of survival ($p = 0.96$), suggesting that, within our study population, nodal status alone did not independently influence prognosis.

Systemic treatment in our cohort aligned with current standards, with most patients receiving

platinum-based chemotherapy in either the neoadjuvant or adjuvant setting, reflecting the chemosensitivity of high-grade serous tumors. The high use of neoadjuvant therapy corresponds to the predominance of advanced-stage disease, while the near-universal use of adjuvant platinum is consistent with standard management of tubo-ovarian malignancies. Incomplete chemotherapy data in a subset of patients likely reflect the retrospective nature of the study.

BRCA testing was performed in a limited subset of patients due to cost constraints; nevertheless, the integration of molecular profiling into clinical practice is expected to expand, given its therapeutic implications, particularly in the era of PARP inhibitors. Only 20 patients (27.7%) underwent BRCA testing, reflecting the limited availability and reimbursement of genetic testing during most of the study period. Consequently, BRCA status could not be incorporated into the prognostic analyses and the molecular characterization of the cohort remains incomplete. This limitation should be considered when interpreting our findings, particularly in the context of current personalized treatment strategies. HRD testing was not routinely available during most of the study period and therefore could not be evaluated in the present cohort. Current ESGO/ESMO guidelines recommend HRD assessment in addition to BRCA testing because HRD status guides the indication for maintenance treatment with PARP inhibitors (20). Since our cohort spans 2014–2025, HRD testing was progressively introduced only during the later years and was unavailable for the majority of patients.

Maintenance therapy with PARP inhibitors (olaparib, niraparib or rucaparib) and bevacizumab was not systematically analyzed because these agents became progressively available during the later years of the study period and were not routinely administered throughout the entire cohort. Consequently, maintenance treatment could not be evaluated as a prognostic variable.

The study conducted by Horng HC et al. on a cohort of 58 patients with primary fallopian tube carcinoma demonstrated that FIGO stage was significantly associated with survival in univariate analysis but did not retain independent prognostic value in the multivariate model, where optimal cytoreduction emerged as the strongest predictor of recurrence and mortality (39). A similar pattern was observed in our study, in which FIGO stage (I–II vs. III–IV) was significant in univariate analysis ($p = 0.02$) but only approached statistical significance after adjustment for other variables ($p = 0.06$). This consistency across studies suggests that while disease stage remains a fundamental prognostic factor, its impact on survival may be partially mediated by surgical outcomes, particularly the achievement of optimal cytoreduction.

Although previously published data have reported 5-year survival rates ranging from 64% in stage I to 17% in stage IV disease (40), direct comparison with our cohort is limited by the shorter duration of follow-up. The mean follow-up of 35.74 months in our study does not provide sufficient maturity to reliably estimate 5-year overall survival, particularly given the progressive censoring observed beyond this interval. As a result, any calculation of 5-year survival would be statistically unstable and potentially misleading.

Nevertheless, the Kaplan–Meier curve demonstrates encouraging early survival outcomes (*Fig. 3*). The estimated one-year survival rate of 81% indicates favorable short-term disease control (*Table 2*), likely attributable to aggressive cytoreductive surgery and platinum-based chemotherapy. Furthermore, the survival curve suggests the presence of patients with prolonged follow-up extending beyond five years, supporting the existence of a subgroup of long-term survivors despite the predominance of advanced-stage disease. These findings highlight meaningful early therapeutic benefit while underscoring the need for longer follow-up to accurately define long-term survival patterns.

Early survival in tubo-ovarian malignancies largely depends on optimal cytoreduction and multimodal therapy. The high rate of complete or near-complete resection in our cohort may explain the favorable one-year survival; however, variable follow-up duration requires cautious interpretation of long-term outcomes. The small proportion of missing follow-up data (5.6%) is unlikely to have substantially influenced survival estimates. The association between neo-

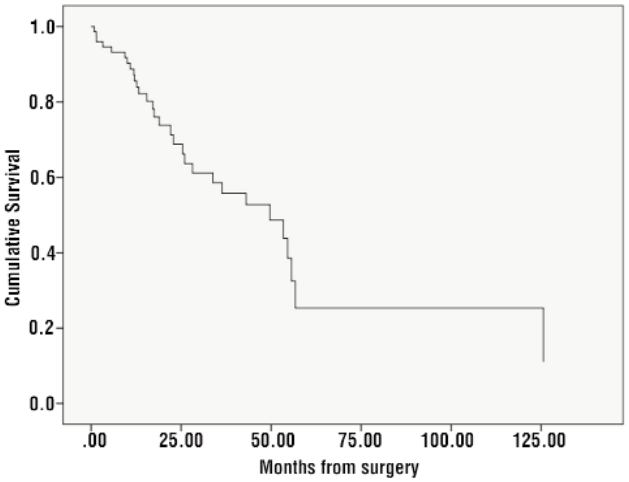

Figure 3. Overall survival

adjuvant chemotherapy and poorer survival likely reflects the more advanced disease burden among patients selected for this treatment rather than a negative therapeutic effect.

Limitations

Several limitations warrant consideration. First, the retrospective single-center design may limit the external validity of our findings. Second, the relatively small sample size may have reduced the statistical power to detect additional prognostic factors. Furthermore, treatment strategies evolved during the study period, potentially introducing heterogeneity. Only overall survival was available for the entire cohort. Disease-free survival, progression-free survival and recurrence patterns could not be reliably assessed because recurrence data were incomplete in this retrospective database. Finally, the predominance of advanced-stage disease may partly reflect the referral pattern of a tertiary oncology center.

Missing data were present for several variables, reflecting the retrospective design of the study conducted over a prolonged 12-year period. These gaps primarily resulted from incomplete historical records, variations in documentation practices, and treatment delivered partially outside our institution. Nevertheless, the overall dataset remained sufficiently robust to support meaningful clinical and survival analyses.

The strengths of this study include a relatively large single-center cohort of 72 patients, despite the rarity of primary fallopian tube carcinoma. Taken together, our findings contribute to the growing body of real-world evidence suggesting that PFTC frequently presents at an advanced stage and requires complex multimodal management. Continued efforts toward earlier recognition and improved diagnostic pathways remain essential to optimize patient outcomes.

Conclusions

In this single-center retrospective cohort, most tubal cancers were high-grade serous carcinomas treated with primary cytoreductive surgery followed by platinum-based chemotherapy. The rising number of surgically managed cases likely reflects improved recognition of tubal origin and refined pathological classification rather than a true increase in incidence, emphasizing the need for standardized surgical and pathological assessment.

Most patients presented with advanced disease, predominantly FIGO stage III (especially IIIB–IIIC), while early-stage cases were less frequent, underscoring the challenge of early detection and the aggressive nature of the disease. Our 12-year experience supports complete cytoreduction combined with platinum-based chemotherapy as the optimal approach; genetic testing should be routinely considered, and larger prospective multicenter studies are warranted to further refine management strategies.

Conflicts of Interest

The authors declare that they have no conflicts of interest

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Informed Consent Statement

This study was conducted following the ethical principles of the latest version of the Declaration of Helsinki. Patient confidentiality was ensured.

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