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Radiological and Clinically Relevant Lymphoceles After Retroperitoneal Lymph Node Dissection for Testicular Cancer: A Longitudinal Imaging Study

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Abstract

Purpose

Postoperative lymphoceles are recognized complications of retroperitoneal lymph node dissection (RPLND) for testicular germ cell tumours (TGCT). Previous studies have predominantly reported symptomatic or intervention-requiring lymphoceles, whereas the incidence, temporal evolution, clinical relevance of lymphoceles on postoperative imaging remain poorly defined. We evaluated radiologically detected and clinically relevant lymphoceles after post-chemotherapy RPLND (PC-RPLND) using routine serial imaging.

Methods

This retrospective single-centre cohort study included 86 consecutive patients who underwent PC-RPLND under a standardized perioperative management protocol. Postoperative imaging consisted of ultrasound at postoperative day 5–7 and 3–4 weeks, followed by computed tomography at 3 and 12 months. The primary endpoint was the incidence of any imaging-detected lymphocele during follow-up. Secondary endpoints included lymphocele prevalence at each imaging time point, symptomatic or intervention-requiring lymphoceles, postoperative complications, and exploratory factors associated with lymphocele formation.

Results

Of 86 included patients, 85 were evaluable for the primary endpoint. Overall, 46 patients (54.1%) had at least one imaging-detected lymphocele during follow-up. Lymphoceles were most frequently detected at discharge (36/84, 42.9%) and decreased over time to 32.8% (19/58) at 3–4 weeks, 31.5% (17/54) at 3 months, and 15.8% (9/57) at 12 months. Clinical follow-up was available for 65 patients. Symptomatic or intervention-requiring lymphoceles occurred in only 3 (4.6%) of 65 patients, while 36 (92.3%) of 39 imaging-positive patients with documented clinical follow-up remained asymptomatic. Exploratory analyses identified no significant associations between imaging-detected lymphocele formation and patient characteristics, tumour-related factors, surgical approach, or extent of lymphadenectomy.

Conclusions

Lymphoceles are frequently detected by routine serial imaging after PC-RPLND but rarely represent clinically relevant morbidity. Most imaging-detected postoperative lymphoceles remain asymptomatic, and their prevalence decreases substantially during follow-up over time. Radiologically detected lymphoceles should therefore be distinguished from symptomatic, intervention-requiring or clinically relevant lymphatic complications when interpreting surveillance imaging, counselling, and reporting postoperative outcomes after RPLND.

1. Introduction

Retroperitoneal lymph node dissection (RPLND) remains an integral component in the management of selected patients with testicular germ cell tumours (TGCT). It is performed in carefully selected patients with clinical stage I–II disease and for the resection of residual retroperitoneal masses following systemic chemotherapy. In patients with non-seminomatous germ cell tumours (NSGCT), post-chemotherapy residual masses may contain teratoma or viable malignancy despite normalized serum tumour markers, making surgical resection both diagnostically and therapeutically important (1, 2). Although contemporary RPLND provides excellent oncological outcomes in experienced centres, the procedure remains technically demanding, particularly after chemotherapy, because of treatment-related fibrosis and the close anatomical relationship to major vessels, ureters, autonomic nerves, and retroperitoneal lymphatic structures (2–4).

Disruption of retroperitoneal lymphatic channels is an inherent consequence of RPLND and may result in postoperative lymphatic complications, including chylous ascites, persistent lymphatic leakage, and lymphocele formation (3–7). While some lymphatic collections remain clinically silent, others may cause pain, infection, compression of adjacent structures, prolonged hospitalisation, or require percutaneous drainage or surgical intervention (3–5, 8, 9). Published rates of lymphocele formation after RPLND for TGCT range from .8% to 5.1% in larger surgical series, although direct comparison is limited by differences in patient selection, surgical approach, extent of dissection, definitions of lymphatic complications, imaging practices, and follow-up protocols (3, 4, 8–10).

Importantly, most available studies have reported lymphoceles as postoperative complications rather than as systematically assessed radiological findings. Consequently, the literature predominantly reflects symptomatic or intervention-requiring lymphoceles, whereas asymptomatic postoperative collections detected only during routine imaging are likely underreported (3, 4, 8–10). This distinction is clinically relevant because postoperative ultrasound or cross-sectional imaging may identify lymphoceles that do not necessarily represent clinically meaningful morbidity. However, the incidence, natural history, and clinical relevance of radiologically detected lymphoceles after RPLND remain poorly defined. In particular, longitudinal imaging data describing their persistence, temporal evolution, and relationship to clinical symptoms are scarce. The natural history of postoperative lymphoceles after RPLND is also insufficiently characterized. While many lymphatic fluid collections are presumed to regress spontaneously, longitudinal imaging data describing their persistence, resolution, and relationship to symptoms are scarce. This uncertainty may complicate interpretation of postoperative imaging findings and postoperative counselling, particularly when asymptomatic lymphoceles are detected during routine follow-up.

At our institution, patients undergoing post-chemotherapy RPLND (PC-RPLND) are managed within a standardized perioperative pathway that includes a diet low in long-chain triglycerides (LCT), supplemented with medium-chain triglycerides (MCT) (11, 12). Because all patients received the same perioperative protocol, the present study was not designed to assess its preventive efficacy. Instead, we aimed to determine the incidence, temporal evolution, and clinical relevance of postoperative lymphoceles detected by serial imaging after PC-RPLND. We hypothesized that radiologically detected lymphoceles occur substantially more frequently than symptomatic or intervention-requiring lymphatic complications and that most remain asymptomatic, with their prevalence decreasing during follow-up.

2. Material and Methods

Study design and patient cohort

This retrospective single-centre cohort study included consecutive patients who underwent PC-RPLND for TGCT between January 2011 and December 2023 at the Medical University of Innsbruck. Patients were eligible if postoperative imaging and oncological follow-up was available for the assessment of lymphocele formation at our outpatient's department. Demographic, clinical, pathological, perioperative, and follow-up data were extracted from institutional electronic medical records, operative reports, pathology reports, and radiological records.

Perioperative management and surgical procedure

All patients were managed according to a standardized institutional perioperative pathway that included a strict low LCT diet supplemented with MCT, initiated two weeks before surgery and continued for approximately five weeks postoperatively. MCT contain fatty acids with a chain length of 8 or 10 carbon atoms and were administered as a palm and coconut derived oil (77% MCT) and margarine (83% MCT). Conventional dietary fats were gradually replaced by MCT fats, starting at approximately 20 g/day and increasing by 10 g/day to a target intake of 80 g/day within one week. The rationale for this protocol was to reduce intestinal lymphatic flow during the period of surgically disrupted retroperitoneal lymphatic drainage. As all patients received the same perioperative management and no untreated control group was available, the present study was not designed to evaluate the preventive efficacy of the dietary protocol.

PC-RPLND was performed either through an open or laparoscopic approach depending in tumour burden and distribution, previous treatment, anatomical considerations, anticipated vascular involvement, and surgeon preference. Patients with bulky residual disease encasing the inferior vena cava, aorta, renal vessels, or other major vascular structures were generally considered unsuitable for a laparoscopic approach because vascular control, resection, or reconstruction could be required. The extent of lymphadenectomy was classified as unilateral or bilateral according to the applied surgical template (13). Attention was paid to the identification and secure closure of retroperitoneal lymphatic channels using clips or vessel-sealing devices to minimize postoperative lymphatic leakage. Histopathological findings of the resected specimens were categorized as normal tissue, necrosis/fibrosis, teratoma, viable germ cell tumour, or other histology.

Imaging follow-up and study endpoints

Patients underwent standardized postoperative imaging consisting of ultrasound on postoperative day 5–7 and again at 3–4 weeks, followed by contrast-enhanced computed tomography (CT) at approximately 3 and 12 months after surgery as part of routine oncological follow-up. Imaging availability was recorded separately for each follow-up time point.

A lymphocele was defined as any postoperative non-complicated water-isodense or anechoic fluid collection identified within the retroperitoneal operative field on ultrasound or CT. The primary endpoint was the incidence of any imaging-detected lymphocele during follow-up. Secondary endpoints included the

prevalence of lymphoceles at individual follow-up time points, temporal changes in lymphocele occurrence, symptomatic or intervention-requiring lymphoceles, and postoperative complications.

Clinical relevance of lymphoceles

Clinical records were reviewed to determine whether imaging-detected lymphoceles were associated with symptoms or required therapeutic intervention. Lymphoceles were classified as clinically relevant if they caused symptoms or required invasive treatment, including percutaneous drainage or surgical intervention. Incidentally detected lymphoceles without symptoms that were managed conservatively were classified as clinically silent.

Postoperative complications

Postoperative complications occurring within 30 days after surgery were graded according to the Clavien–Dindo classification. Major complications were defined as Clavien–Dindo grade III or higher.

Statistical analysis

Continuous variables are presented as median and interquartile range (IQR), whereas categorical variables are reported as absolute numbers and percentages. Exploratory univariable analyses were performed to compare patients with and without imaging-detected lymphoceles. Continuous variables were analysed using the Mann–Whitney U test, while categorical variables were compared using Fisher's exact test or the chi-square test, as appropriate.

All statistical tests were two-sided, and a p-value < .05 was considered statistically significant. Missing data were reported descriptively, and no imputation was performed. Because of the descriptive study design and the small number of clinically relevant lymphoceles, no multivariable regression analysis was performed.

Ethics

The study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee of the Medical University of Innsbruck (Approval No. 1246/2023). Owing to the retrospective study design, the requirement for written informed consent was waived in accordance with institutional regulations.

3. Results

Patient characteristics

A total of 86 patients who underwent PC-RPLND for TGCT under a standardized perioperative low and MCT supplemented diet protocol were included. Median age at surgery was 38 years (IQR 32–50), and median body mass index was 26.2 kg/m² (IQR 22.8–29.5). Median follow-up was 32.5 months (IQR 11.5–78.0). Most

patients had non-seminomatous germ cell tumour (NSGCT) (62/84, 73.8%), while 17/84 (20.2%) had mixed tumours and 5/84 (6.0%) had pure seminoma.

According to the clinical stage (Lugano classification), 11 (12.9%) of 85 patients had stage IA disease, 19 (22.4%) stage IIA, 13 (15.3%) stage IIB, 11 (12.9%) stage IIC, and 31 (36.5%) stage III disease. IGCCCG risk group was good in 52 (62.7%) patients, intermediate in 16 (19.3%), and poor in 15 (18.1%) patients. Median post-chemotherapy residual mass size was 1.5 cm (IQR 1.0–4.0), and the median number of chemotherapy cycles was 3 (IQR 3–4).

Surgery was performed laparoscopically in 61 (70.9%) patients and via an open approach in 25 (29.1%) patients. Bilateral lymphadenectomy was performed in 46 patients (53.5%), while 40 patients (46.5%) underwent unilateral lymphadenectomy. Median operative duration was 206 minutes (IQR 138–268), and median inpatient stay was 6 days (IQR 5–7). Histology of the lymphadenectomy specimen showed normal tissue in 29 patients (33.7%), necrosis/fibrosis in 27 (31.4%), mature teratoma in 19 (22.1%), viable tumour in 10 (11.6%), and neurinoma in one patient (1.2%). Postoperative complications within 30 days occurred in 13/85 patients (15.3%), including Clavien-Dindo grade ≥ III complications in 5/86 patients (5.8%). Baseline and perioperative characteristics are summarized in Table 1.

Imaging follow-up and incidence of lymphoceles

Of the 86 included patients, 85 were evaluable for the primary endpoint of any postoperative imaging-detected lymphocele. Availability of imaging varied across follow-up time points. Ultrasound at hospital discharge was available in 84 patients, ultrasound at 3–4 weeks in 58 patients, CT at 3 months in 54 patients, and CT at 12 months in 57 patients. Accordingly, 29 patients were not evaluable for 12-month imaging.

Overall, postoperative imaging detected at least one lymphocele in 46 of 85 evaluable patients, corresponding to an incidence of 54.1%. Detection was most frequent in the early postoperative period. At discharge, lymphoceles were identified in 36 of 84 patients (42.9%). At the 3–4-week ultrasound, lymphoceles were present in 19 of 58 patients (32.8%). At 3-month CT, lymphoceles were detected in 17 of 54 patients (31.5%). At 12-month CT, persistent lymphoceles were present in 9 of 57 patients (15.8%).

Clinical relevance and temporal evolution

Despite frequent radiological detection, clinically relevant lymphoceles were uncommon. Clinical follow-up data regarding lymphocele-related symptoms or intervention were available for 65 patients. Symptomatic lymphoceles or those requiring interventions occurred in 3 of the 65 clinically evaluable patients (4.6%).

Among patients with both an imaging-detected lymphocele and available clinical status, 36 of 39 patients (92.3%) remained asymptomatic. Only 3 of 39 patients (7.7%) developed symptoms attributable to the lymphocele or required therapeutic intervention. Thus, most imaging-detected lymphoceles were clinically silent.

The prevalence of detectable lymphoceles decreased progressively during follow-up, from 42.9% at discharge to 32.8% at 3–4 weeks, 31.5% at 3 months, and 15.8% at 12 months. These findings indicate that

serial postoperative imaging detects a substantial number of lymphoceles after lymphadenectomy for testicular cancer, but that most collections remain asymptomatic and decrease over time.

Exploratory analysis of factors associated with imaging-detected lymphocele

Exploratory univariable analyses did not identify a statistically significant predictor of imaging-detected lymphocele formation. Patients with and without lymphocele did not differ significantly with regard to age (median 35 vs. 39 years; p = .394), BMI (25.1 vs. 26.9 kg/m²; p = .200), tumour size (2.2 vs. 2.9 cm; p = .199), post-chemotherapy residual mass size (2.0 vs. 1.2 cm; p = .256), number of chemotherapy cycles (median 3 vs. 3; p = .185), operative duration (183 vs. 236 minutes; p = .304), or inpatient stay (6 vs. 5 days; p = .910) (Table 2).

Similarly, lymphocele occurrence was not significantly associated with surgical approach. Lymphoceles were detected in 31/46 patients (67.4%) in the laparoscopic group and in 15/46 patients (32.6%) in the open group, compared with 29/39 (74.4%) and 10/39 (25.6%) among patients without lymphocele, respectively (p = .633). Extent of dissection was also not associated with lymphocele formation, with nearly identical distributions of bilateral and unilateral lymphadenectomy in patients with and without lymphocele (p = 1.000).

Clinical stage showed a non-significant trend toward different distribution between patients with and without lymphocele (p = .093), but no statistically significant association was observed. Given the descriptive design and the small number of symptomatic or intervention-requiring events, no meaningful risk-factor analysis for clinically relevant lymphoceles could be performed.

4. Discussion

In this study, we systematically evaluated postoperative lymphocele formation using serial imaging after PC-RPLND for TGCT. The principal finding was that lymphoceles were substantially more common when routine imaging surveillance was considered than suggested by previous complication-based series. More than half of all evaluable patients (54.1%) developed at least one imaging-detected lymphocele, whereas clinically relevant lymphoceles remained uncommon, occurring in only 3 of 65 clinically evaluable patients (4.6%). Among patients with an imaging-confirmed lymphocele and available clinical information, 36 of 39 (92.3%) remained asymptomatic. Furthermore, the prevalence of detectable lymphoceles declined progressively during follow-up, with persistent lymphoceles identified in only 15.8% of patients undergoing imaging at 12 months.

Published reports of lymphatic complications after RPLND for testicular cancer are summarised in Table 3. The overall incidence of imaging-detected lymphoceles in our cohort was considerably higher than the rates reported in previous RPLND series. However, this apparent discrepancy most likely reflects differences in outcome assessment rather than greater surgical morbidity. Previous studies generally reported lymphoceles only when they became symptomatic or required intervention, with rates of clinically relevant lymphoceles typically ranging from approximately 1% to 5% following contemporary RPLND (3, 4, 8, 9, 13, 14). In a contemporary PC-RPLND cohort, symptomatic lymphoceles occurred in four patients, corresponding to approximately 2% of the total population (3). Despite the substantially higher radiological detection rate in

our cohort, the incidence of symptomatic or intervention-requiring lymphoceles remained within this reported range.

By systematically reviewing routine postoperative ultrasound and CT examinations, our study additionally identified small and clinically silent lymphatic collections that would not have been captured in complication-based series. Thus, previous studies primarily describe the incidence of clinically relevant lymphoceles rather than the total radiological prevalence of postoperative lymphatic collections. This distinction should be considered when comparing lymphocele rates between surgical cohorts.

The distinction between radiological and clinically relevant lymphoceles also has important implications for clinical practice. Although postoperative imaging frequently demonstrated lymphatic collections, only a small minority of patients developed symptoms or required intervention. Moreover, the prevalence of detectable lymphoceles decreased from 42.9% at discharge ultrasound to 32.8% at 3–4 weeks, 31.5% at 3 months, and 15.8% at 12 months. Although different patients contributed imaging data at individual time points, this overall pattern suggests that most postoperative lymphoceles represent transient collections that regress or resolve spontaneously (10, 15). Consequently, incidental asymptomatic lymphoceles detected during oncological surveillance should generally be managed conservatively unless accompanied by infection, progressive enlargement, compression of adjacent structures, functional impairment, or relevant symptoms.

Our findings also have implications for future studies evaluating morbidity after RPLND. Combining all imaging-detected lymphoceles with symptomatic lymphatic complications into a single endpoint may substantially overestimate clinically meaningful morbidity. Future studies should therefore distinguish between any imaging-detected lymphocele, symptomatic lymphocele, and intervention-requiring lymphocele. Standardized reporting of imaging modality, assessment time point, lymphocele size, associated symptoms, and subsequent treatment would facilitate more meaningful comparisons between surgical series.

Whether the surgical approach influences lymphocele formation remains uncertain. Open RPLND has traditionally been associated with considerable perioperative morbidity, whereas minimally invasive approaches have demonstrated favourable perioperative outcomes in appropriately selected patients (4, 8, 9, 13, 16–19). More than 70% of procedures in our cohort were performed laparoscopically, yet imaging-detected lymphoceles remained common. This observation suggests that lymphocele formation may primarily reflect disruption of retroperitoneal lymphatic channels during nodal dissection rather than the surgical access itself. However, the surgical approach was selected according to tumour burden, anatomy, anticipated vascular involvement, and surgeon preference. The present study therefore cannot determine whether open and laparoscopic approaches differ in their risk of lymphocele formation. Comparative studies using standardized imaging protocols and adjustment for surgical complexity are required.

Exploratory analyses did not identify significant predictors of imaging-detected lymphocele formation (4, 8, 9, 13). Patient characteristics, tumour-related variables, residual mass size, number of chemotherapy cycles, operative factors, surgical approach, and extent of lymphadenectomy were not significantly associated with lymphocele occurrence (Table 2). These findings should be interpreted cautiously because the present study was primarily descriptive, imaging follow-up was incomplete at some time points, and only three clinically

relevant lymphoceles occurred. The study was therefore insufficiently powered to identify independent predictors of symptomatic or intervention-requiring lymphatic complications.

All patients were managed according to a standardized perioperative low LCT diet supplemented with MCT. Dietary fat restriction and MCT supplementation are intended to reduce intestinal lymphatic flow and chyle production and are commonly used in the prevention or treatment of chylous leakage (5–7, 11, 12). However, because all patients received the same dietary protocol and no untreated control group was available, the present study was not designed to evaluate its preventive efficacy. Our findings therefore describe the incidence and clinical course of postoperative lymphoceles under standardized perioperative management but do not demonstrate that the dietary intervention reduced lymphocele formation or clinically relevant lymphatic complications.

Several limitations should be acknowledged. The retrospective single-centre design introduces the potential for selection and information bias. Imaging was not available for all patients at every scheduled follow-up visit, particularly during later follow-up, and different imaging modalities were used, potentially influencing lymphocele detection rates. Documentation of clinical symptoms was incomplete in a small proportion of patients. In addition, the low number of clinically relevant events limited risk-factor analyses, and the absence of a control group precluded conclusions regarding the perioperative dietary protocol. Nevertheless, this study provides one of the first longitudinal analyses of systematically assessed postoperative lymphoceles after PC-RPLND and demonstrates that radiological lymphoceles are considerably more common than clinically relevant lymphatic complications.

5. Conclusion

Routine postoperative imaging demonstrates that lymphoceles are a common radiological finding after PC-RPLND for TGCT, affecting more than half of patients. In contrast, clinically relevant lymphoceles remain uncommon (< 5%), and more than 90% of radiologically detected lymphoceles remain asymptomatic and decrease spontaneously over time. These findings indicate that radiologically detected lymphoceles should not be equated with clinically relevant postoperative morbidity. Distinguishing imaging-detected lymphoceles from symptomatic lymphatic complications may improve postoperative counselling, interpretation of surveillance imaging, and future reporting of surgical outcomes after RPLND.

Declarations

Author Contribution

SL and HW contributed to conceptualization, methodology, investigation, data curation, formal analysis, visualization, and writing of the original draft. CM contributed to investigation, data curation, and manuscript review and editing. UP and AH contributed to the development and implementation of the dietary protocol, investigation, and manuscript review and editing. FA and LG contributed to radiological assessment, investigation, validation, and manuscript review and editing. GK and RPe contributed to patient treatment, investigation, resources, and manuscript review and editing. IR contributed to methodology, validation, and

manuscript review and editing. RPi contributed to conceptualization, methodology, supervision, project administration, and manuscript review and editing. All authors read and approved the final manuscript.

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Tables

Table 1
Baseline and perioperative characteristics

Parameter	Results
	N = 86
Age at surgery, years, median (IQR)	38 (32–50)
BMI, kg/m², median (IQR)	26.2 (22.8–29.5)
Post-chemotherapy residual mass, cm, median (IQR)	1.5 (1.0–4.0)
Chemotherapy cycles, median (IQR)	3 (3–4)
Operation duration, min, median (IQR)	206 (138–268)
Inpatient stay, days, median (IQR)	6 (5–7)
Follow-up, months, median (IQR)	32.5 (11.5–78.0)
Histology	
NSGCT	62/84 (73.8%)
Mixed tumour	17/84 (20.2%)
Pure seminoma	5/84 (6.0%)
Pathological tumour stage	
pT1	41/76 (53.9%)
pT2	29/76 (38.2%)
pT3	5/76 (6.6%)
pTis	1/76 (1.3%)
Clinical stage (Lugano)	
IA	11/85 (12.9%)
IIA	19/85 (22.4%)
IIB	13/85 (15.3%)
IIC	11/85 (12.9%)
III	31/85 (36.5%)
IGCCCG risk group	
Good	52/83 (62.7%)
Intermediate	16/83 (19.3%)
Poor	15/83 (18.1%)

Parameter	Results
	N = 86
Surgical technique	
Laparoscopic	61/86 (70.9%)
Open	25/86 (29.1%)
RPLND template	
Bilateral	46/86 (53.5%)
Unilateral	40/86 (46.5%)
PC-RPLND histology	
Necrosis/fibrosis	27/86 (31.4%)
Teratoma	19/86 (22.1%)
Viable tumour	10/86 (11.6%)
Neurinoma	1/86 (1.2%)
Postoperative complications within 30 days	13/85 (15.3%)
Clavien-Dindo ≥ III	5/86 (5.8%)
Lymphocele outcomes	
Any imaging-detected lymphocele	46/85 (54.1%)
Lymphocele at discharge ultrasound (day 5–7 postoperatively)	36/84 (42.9%)
Lymphocele at 3–4-week ultrasound	19/58 (32.8%)
Lymphocele at 3-month CT	17/54 (31.5%)
Lymphocele at 12-month CT	9/57 (15.8%)
Clinical relevance	
Asymptomatic among imaging-positive patients with clinical status	36/39 (92.3%)
Symptomatic/intervention-requiring among imaging-positive patients with clinical status	3/39 (7.7%)
Symptomatic/intervention-requiring in clinically evaluable cohort	3/65 (4.6%)

Table 2
Exploratory analysis of factors associated with imaging-detected lymphocele

Variable		**Lymphocele (n = 46)**	**No lymphocele (n = 39)**	***p* value**
Age (yrs, median)		35	39	.394
BMI (median)		25.1	26.9	.200
Tumour size in cm (median)		2.2	2.9	.199
Post-chemotherapy residual mass in cm (median)		2.0	1.2	.256
Chemotherapy cycles (median)		3	3	.185
Operation duration, minutes (median)		183	236	.304
Inpatient stay, days (median)		6	5	.910
Surgical approach	laparoscopic	31/46 (67.4%)	29/39 (74.4%)	.633
	open	15/46 (32.6%)	10/39 (25.6%)	
Extent of dissection	bilateral	25/46 (54.3%)	21/39 (53.8%)	1.000
	unilateral	21/46 (45.7%)	18/39 (46.2%)	
Lugano clinical stage	I	5/46 (10.9%)	6/38 (15.8%)	.093
	IIA	12/46 (26.1%)	7/38 (18.4%)	
	IIB	3/46 (6.5%)	10/38 (26.3%)	
	IIC	8/46 (17.4%)	3/38 (7.9%)	
	III	18/46 (39.1%)	12/38 (31.6%)	

Table 3

Reported lymphatic complications following retroperitoneal lymph node dissection for testicular cancer.L-RPLND = laparoscopic retroperitoneal lymph node dissection; MCT = medium-chain triglyceride; NA = not applicable; NR = not reported; NSGCT = nonseminomatous germ cell tumour; pc-RPLND = post-chemotherapy retroperitoneal lymph node dissection; RPLND = retroperitoneal lymph node dissection; TC = testicular cancer.

Study	Year	Setting / cohort	n	Lymphocele rate (n, %)	Symptomatic lymphocele (n, %)	Chylous ascites (n, %)
Stephenson et al.	2004	Role of RPLND in TC management	NR	NR	NR	NR
Heidenreich et al.	2009	Post-chemotherapy RPLND in advanced TC; radical vs modified template resection	NR	NR	NR	NR
Kenney and Tuerk	2008	Review of complications of L-RPLND in TC	NR	NR	NR	NR
Messing et al.	1986	Lymphocele after RPLND for stage II TC	1	1/1	1/1	NR
Janetschek et al.	1999	L-RPLND after chemotherapy for stage IIB NSGCT	24	NR	NR	5/24 (20.8%)
Cresswell et al.	2008	L-RPLND with adjuvant chemotherapy for pathological stage II NSGCT	87	1/87 (1.1%)	1/87 (1.1%)	NR
Gardner et al.	2011	L-RPLND for low-stage TC	59	3/59 (5.1%)	1/59 (1.7%)	2/59 (3.4%)
Steiner et al.	2013	Post-chemotherapy L-RPLND for low-volume stage II NSGCT	100	1/100 (1.0%)	1/100 (1.0%)	1/100 (1.0%)
Ruf et al.	2020	Contemporary RPLND cohort; major complications after post-	200 total; 146 pc-RPLND	4/200 (2.0%)	4/200 (2.0%)	NR

Study	Year	Setting / cohort	n	Lymphocele rate (n, %)	Symptomatic lymphocele (n, %)	Chylous ascites (n, %)
		chemotherapy RPLND				
Leibovitch et al.	2002	Diagnosis and management of postoperative chylous ascites	NR	NA	NA	NR
Browse et al.	1992	Aetiology and treatment of chylous ascites	NR	NA	NA	NR
Weniger et al.	2016	Treatment options for chylous ascites after major abdominal surgery	NR	NA	NA	NR
Shah and Limketkai	2021	Use of medium-chain triglycerides in clinical disorders	NR	NA	NA	NA
Heidenreich et al.	2003	Primary nerve-sparing RPLND for clinical stage I NSGCT	239	2/239 (.8%) retroperitoneal lymphoceles	NR	NR
Pearce et al.	2017	Primary robotic RPLND for low-stage NSGCT	47	NR	NR	NR
Present cohort	2026	RPLND for TC under standardized perioperative low-fat/MCT protocol with serial postoperative imaging	86	46/85 (54.1%)	3/39 (7.7%) among imaging-positive patients with clinical status; 3/65 (4.6%) in clinically evaluable cohort	Not systematically assessed

Figures

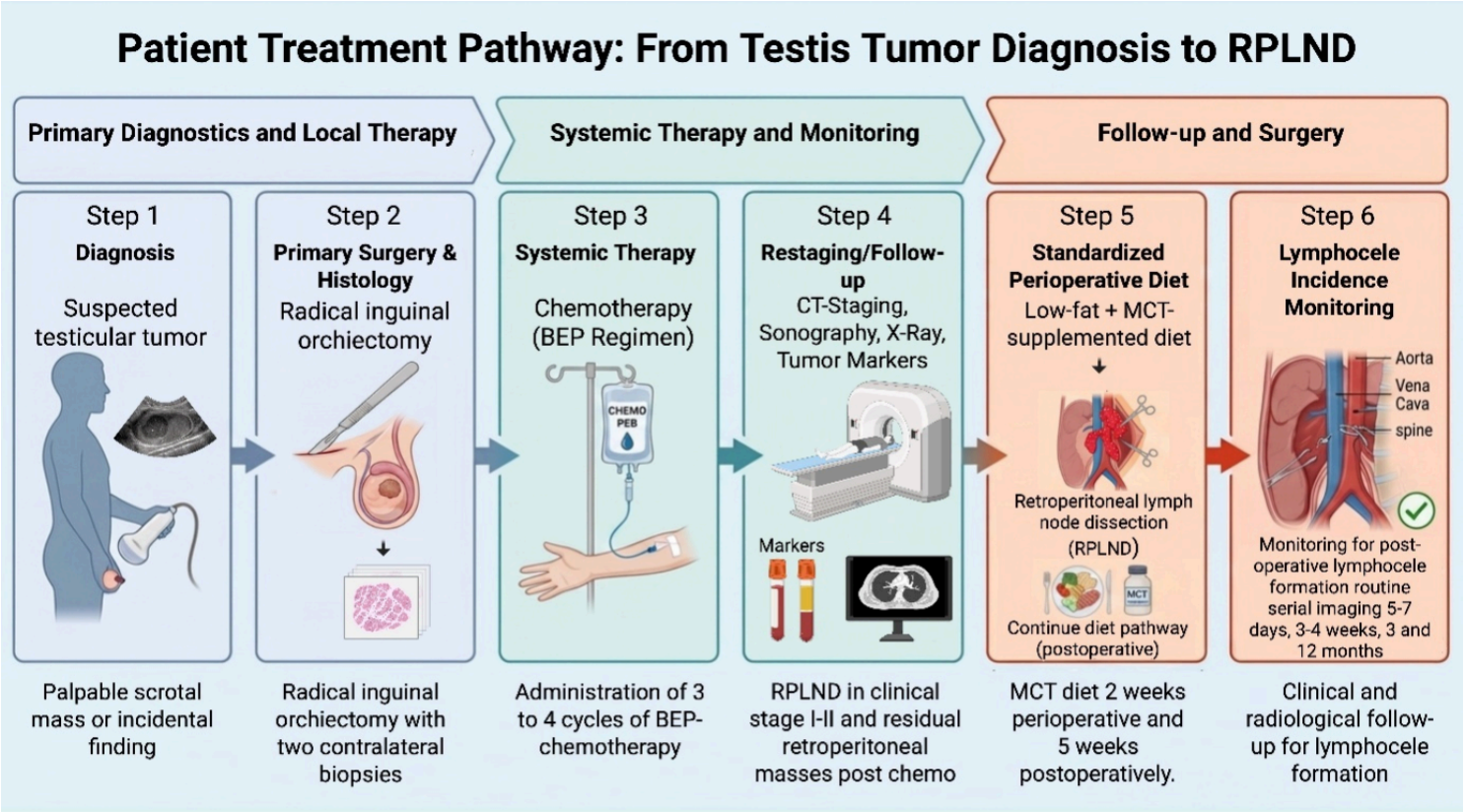


Figure 1

Standardized clinical pathway from testicular tumor diagnosis to retroperitoneal lymph node dissection (RPLND) with integrated dietary intervention. The flowchart delineates the three primary clinical phases for patients presenting with suspected testicular cancer. Step1 and step 2 includes initial diagnostics, radical inguinal orchiectomy, and subsequent histological differentiation between pure seminoma, mixed tumors and NSGCT. Step 3 and 4 outlines the systemic treatment protocol, specifically chemotherapy (BEP regimen) for indicated NSGCT/seminoma patients, followed by clinical restaging using cross-sectional imaging and serum tumor markers. Step 5 and 6 focuses on the surgical management of residual retroperitoneal masses via RPLND. This surgical phase incorporates a standardized perioperative dietary pathway, consisting of a low-fat diet supplemented with medium-chain triglycerides (MCT). Created in BioRender. Wafa, H. (2026)