

Analysis of Patients Who Have Undergone Retroperitoneal Lymph Node Dissection and Metastasectomy after Chemotherapy for Advanced Nonseminomatous Germ Cell Tumors: A Retrospective Study.

Rakesh Kumar¹, Archana Sinha², Purushottam Kumar³

¹Assistant Professor, Department of Urology, AIIMS Patna, Bihar, India

²MD Medical Officer, Department of Microbiology, Sub Divisional Hospital, Bihar, India

³Assistant Professor, Department of Medicine, BMIMS, Pawapuri, Bihar, India

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Corresponding Author: Dr. Rakesh Kumar

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Abstract:

Background: Testicular tumors are rare, with germ cell tumors being a significant subset. Advances in treatment have improved survival rates, but determining the appropriate course of action for advanced nonseminomatous germ cell tumors (NSGCT) remains crucial. Post-chemotherapy retroperitoneal lymph node dissection (PC-RPLND) may lead to unnecessary chemotherapy. This study aims to link histological findings with necrosis indicators.

Methodology: This retrospective analysis involved reviewing pre- and post-chemo data, histologies, and tumor indicators from hospitals. 90 PC-RPLND and 20 metastasectomy patients were included. Statistical analysis, including univariate methods, assessed variables with SPSS software ($P < 0.05$). Receiver operating curves identified predictors.

Results: Among 90 PC-RPLND patients, 55.5% had Stage III NSGCT, commonly metastasizing to lungs and liver. PC-RPLND histology showed 45.83% necrosis, 9.7% viable tumor, and 44.44% teratoma-only histology. In 20 metastasectomy cases, RPLND and metastasectomy histology matched by 84.6%, and orchidectomy and metastasectomy matched by 69.2%. Nodal size change predicted necrosis with 100% specificity at 75% reduction.

Recommendation: This study on advanced-stage NSGCT provides insights into clinical management and histological complexities. Patients received standardized chemotherapy, and responses were evaluated through nodal size changes. Concordance between RPLND and metastasectomy histology enhances understanding.

Conclusion: This analysis of PC-RPLND and metastasectomy cases offers insights into advanced-stage NSGCT management. Meticulous data collection enables nuanced exploration, potentially improving future patient outcomes.

Keywords: Nonseminomatous germ cell tumors (NSGCT), Retroperitoneal lymph node dissection (RPLND), Metastasectomy, Chemotherapy response, Histological analysis

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Introduction

In men, testicular tumors are very rare, making up only 1.5% of all tumors in males. Most of these tumors, about 95%, are germ cell tumors, and among them, 40%–45% are NSGCT. Recent advances in treatment, patients with these tumors have a very good prognosis, with survival rates reaching nearly 90%. For those with advanced cancer (27% of cases), chemotherapy is the initial treatment. After assessing a patient's response to treatment through biochemical and radiological tests, further surgeries are planned. The examination of retroperitoneal lymph nodes after chemotherapy is crucial for determining the next steps in treatment.

According to current recommendations, patients should have more chemotherapy with live tumor cells in their lymph nodes, but this may lead to unnecessary complications for those with only dead tissue. Therefore, researchers are actively looking for signs of necrotic tissue in (PC-RPLND) specimens. Likewise, any remaining metastatic masses are surgically removed. In our study, we analyzed data from these surgeries to find links between their histological findings and potential indicators of necrosis [1].

Methodology

Study Design: This study was a retrospective descriptive analysis.

Study Setting: This study was conducted by reviewing the pre- and post-chemo radiographic sizes of the retroperitoneal lymph nodes, orchidectomy, RPLND, and metastasectomy histologies, and pre- and post-chemotherapy tumour indicators of AIIMS Patna in 2018-2023.

Participants: Patients with advanced-stage NSGCT who had PC-RPLND or metastasectomy were reviewed.

Inclusion and Exclusion Criteria:

Inclusion criteria involved patients meeting specific conditions, including receiving the recommended chemotherapy. Exclusion criteria excluded patients with non-germ cell tumor types, early-stage or localized NSGCT, and those lacking essential data for analysis.

Study Size: After fulfilling the inclusion criteria, 90 patients who underwent PC-RPLND and 20 patients underwent metastasectomy following cisplatin- or carboplatin-based chemotherapy.

Data Collection and Analysis: The size of the RPLND before and after chemotherapy, together with clinically and pathologic traits including the metastasectomy, orchidectomy, and RPLND

histology, as well as serum tumour markers, were used to gather data.

Bias: To minimize bias, the goal of the research was not disclosed to the participants or healthcare providers during data collection. Additionally, data analysts were blinded to the identity of the participants.

Statistical Analysis: This study used statistical analysis, including univariate method. A tumor's response was determined by dividing its maximum transverse nodal diameter before and after chemotherapy by its percentage. The statistical analyses were all conducted using SPSS software. The Student's t-test was used for nonparametric variables and the Chi-square test was used for categorical data, with a significance threshold of $P < 0.05$. Receiver operating curves were used to depict critical factors.

Ethical Considerations: The study was carried out in accordance with ethical guidelines, which included getting each participant's informed consent. The ethics committee examined and approved the study protocol.

Results

Table 1: Study on PC-RPLND and Metastasectomy in NSGCT Patients

Aspect	Findings/Statistics
Total Patients (PC-RPLND)	90 patients
Total Patients (Metastasectomy)	20 patients
Study Period	2018-2023
Type of Tumors	Advanced-stage NSGCT
Chemotherapy Regimen	Bleomycin, Etoposide, Cisplatin-based
Patients with Stage III Disease	Approximately 55.5%
Most Common Metastatic Sites	Lungs, Liver
Histological Analysis (PC-RPLND)	- 45.83% necrosis - 9.7% viable tumor - 44.44% teratoma-only
Concordance (RPLND vs. Metastasectomy)	84.6%
Concordance (Orchidectomy vs. Metastasectomy)	69.2%
Significant Predictor (Necrosis)	Percentage change in nodal size (75% reduction predicted necrosis with 100% specificity)

This study involved a total of 90 patients who underwent PC-RPLND, along with an additional 20 patients who had metastasectomy procedures. The research focused on patients diagnosed with advanced-stage (NSGCT). The study collected a wide range of data, including prechemotherapy tumor markers, orchidectomy history, histological findings from RPLND and metastasectomy, and detailed measurements of retroperitoneal lymph nodes before and after chemotherapy.

All patients received a standardized treatment protocol, which consisted of 3-4 cycles of chemotherapy using bleomycin, etoposide, and cisplatin-based drugs.

The institute's policy dictated RPLND for patients with residual nodes measuring ≥ 1 cm in size after their tumor markers had normalized, while those with elevated tumor markers received salvage chemotherapy.

Applying the percentage change in nodule size between pre- and post-chemotherapy, the study evaluated treatment response. Using the Student's t-test and the Chi-square test, with a significance level of $P < 0.05$, intricate statistical analyses were carried out with SPSS software version 17.0. We assessed important factors using receiver operating curves.

Among the 90 patients who underwent PC-RPLND, the analysis revealed various clinical

nuances. Notably, a few patients had unique cases, such as one who had orchidectomy at a different facility with unavailable slides for review, and another with an extragonadal or burnt-out primary. Additionally, some patients had undergone prechemotherapy imaging at other centers, resulting in missing nodal size data. Approximately 55.5% of patients had Stage III disease, with the most common metastatic sites being the lungs and liver.

Further examination of this group uncovered various surgical interventions, including postsalvage chemotherapy surgical resection, desperation RPLND, and surgery for para-aortic region recurrence. The histopathological analysis of PC-RPLND specimens showed 45.83% necrosis, 9.7% viable tumor tissue with or without teratoma, and 44.44% teratoma-only histology.

Moving on to the 20 patients who underwent metastasectomy, the study found an 84.6% match between the histology of RPLND and metastasectomy specimens, as well as a 69.2% match between orchidectomy and metastasectomy specimens.

Discussion

This study focused on advanced-stage NSGCT and comprised 90 PC-RPLND and 20 metastasectomy patients. It gathered a lot of information, such as nodal measurements, histology, history of orchidectomy, and prechemo tumour indicators. Everybody had the same kind of chemotherapy. Nodal size changes were used to measure treatment response and were statistically analysed.

Testicular cancer is mostly prevalent in men in the age of 20-40 years. Our study focused on patients with (NSGCT), including those with cryptorchidism [2, 3]. Of our patients, nearly 55% had NSGCT with distant metastasis, with 47.5% falling into the poor-risk IGCCCG category, differing from the original criteria due to our center's referral nature [4]. Around 59.7% had prior orchidectomy elsewhere. Standard treatment involved 3-4 chemotherapy cycles, followed by assessing biochemical and radiological responses. Guidelines recommended RPLND for residual retroperitoneal nodes ≥ 1 cm and metastasectomy for other residual sites, based on histological evaluations from retrospective series [5].

Literature indicates resected RPLND specimens often contain necrosis, teratoma, and viable malignancy in 40%, 45%, and 15% of cases [6]. Our series noted a 9.5% viable tumor rate in RPLND histology, increasing to 50% after salvage chemotherapy. Studies aimed to predict RPLND histology using preoperative parameters like teratoma presence, postchemotherapy nodal size,

IGCCCG risk, markers, and tumor size reduction [7].

Moving beyond RPLND, our study extended to the cases of 20 patients who underwent metastasectomy. When a thorough histological analysis was conducted on this sample, it was discovered that the histology of the RPLND and the metastasectomy tissues agreed in 84.6% of cases. Moreover, 69.2% of orchidectomy and metastasectomy specimens showed concordance, according to the study offering a more comprehensive understanding of the clinical profiles of these patients [8,9].

Conclusion

Our comprehensive analysis, encompassing a substantial cohort of testicular cancer patients undergoing PC-RPLND and metastasectomy, provides valuable insights into the clinical management and histological complexities of advanced-stage NSGCT. The meticulous data collection, statistical analyses, and nuanced exploration of various patient subgroups contribute to our understanding of the intricate facets of these cancer cases. This improved understanding ultimately aids in the enhancement of patient care and outcomes, with the potential to refine treatment strategies and improve patient prognoses in the future.

Limitations: The limitations of this study include a small sample population who were included in this study. The findings of this study cannot be generalized for a larger sample population. Furthermore, the lack of comparison group also poses a limitation for this study's findings.

Recommendation: This study on advanced-stage NSGCT provides insights into clinical management and histological complexities. Patients received standardized chemotherapy, and responses were evaluated through nodal size changes. Concordance between RPLND and metastasectomy histology enhances understanding.

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List of Abbreviations:

1. NSGCT - Nonseminomatous germ cell tumors
2. PC-RPLND - Post-chemotherapy retroperitoneal lymph node dissection
3. SPSS - Statistical Package for the Social Sciences
4. IGCCCG - International Germ Cell Cancer Collaborative Group

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