Reoperative Retroperitoneal Surgery
Etiology and Clinical Outcome

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KEYWORDS

• Reoperative retroperitoneal lymph node dissection • Redo retroperitoneal lymph node dissection • Retroperitoneal lymph node dissection • Residual retroperitoneal mass • Testicular cancer

KEY POINTS

- Retroperitoneal recurrences following retroperitoneal lymph node dissection (RPLND) should be viewed as either surgical/technical failures or inappropriate modifications to the original RPLND template.
- Retroperitoneal recurrences in the setting of post-RPLND nonseminomatous germ cell tumors (GCTs) are most commonly found in the para-aortic and periaortic region, owing to the difficulty of dissection within the region of the left renal hilum.
- The most common histology of a retroperitoneal recurrence following RPLND is a teratoma, followed by viable GCT and necrosis/fibrosis.
- Complete resection of all malignant tissue is required, as teratoma is chemoresistant and may undergo malignant transformation, and viable GCT, especially in the postchemotherapy, setting may be chemoresistant.
- In the hands of experienced surgeons at tertiary care centers, reoperative retroperitoneal surgery is associated with long-term survival in a significant proportion of patients, with an acceptable degree of morbidity.

INTRODUCTION

Improvements in the management of germ cell tumors (GCTs), most notably the introduction of highly effective cisplatin-based chemotherapy, has resulted in dramatically improved rates of overall survival, now exceeding 95% for all patients who receive a diagnosis of testicular cancer and 80% for those with metastatic disease.[1] The multimodal approach to the management of GCT with the integration of surgery, chemotherapy, and radiation serves as a model for the successful management of cancer and provides hope for dramatic improvements in the management and prognosis of other malignancies in the future.

Although the advent of effective chemotherapy provides an adjunct to technically challenging surgery, retroperitoneal lymph node dissection (RPLND) remains an essential component of the treatment algorithm for nonseminomatous germ cell tumors (NSGCT)[2,3] and serves as both a therapeutic and a diagnostic and staging procedure (see the article by Masterson and colleagues elsewhere in this issue for further exploration of this topic).

Whether done in the primary or postchemotherapy setting (PC-RPLND), it is apparent that complete resection of all metastatic retroperitoneal disease is the key variable related to long-term relapse-free survival.[4,5] Unfortunately, some

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patients will relapse in the retroperitoneum or harbor unresected disease after RPLND, and salvage chemotherapy will rarely adequately compensate for an inadequate initial RPLND, as these late recurrences tend to be chemoresistant malignancies or have chemoresistant teratomatous elements.[6,7] Despite the technical challenges, appropriately selected patients can be effectively managed with reoperative retroperitoneal surgery with an acceptable morbidity rate when performed by experienced surgeons at tertiary care centers.[4,8,9]

This review describes the patterns of metastasis of testicular tumors; incidence, distribution, and histologic findings of retroperitoneal recurrences; indications for reoperative retroperitoneal surgery; and postoperative morbidity/complications and clinical outcomes of patients with GCTs with retroperitoneal recurrences following RPLND.

TESTICULAR TUMORS AND PATTERNS OF METASTASIS

The successful management of testicular GCTs has been facilitated by a predictable pattern of metastatic spread of disease, primarily to the lymph nodes of the retroperitoneum and subsequently to the lung and posterior mediastinum.[10–12] This process holds true for all histologic subtypes of GCTs, with the notable exception of choriocarcinoma, which has a higher reported incidence of hematogenous distribution.[13] The embryologic origin of the testis in the retroperitoneum and, therefore, lymphatic drainage pattern informs the most common location of metastatic disease; tumors of the right testis are first drained by the interaortocaval area, followed by the precaval and preaortic lymph nodes, whereas tumors of the left testis are first drained by the para-aortic and preaortic lymph nodes, followed by the interaortocaval nodes.[11] Right testis tumors are more commonly associated with contralateral spread, and bulky retroperitoneal disease and lymphatic obstruction can result in more caudal deposition of metastatic disease in the retroperitoneum.[14]

Given the predictable patterns of metastatic spread of testicular cancer, RPLND has a well-established role in the management of NSGCT for several reasons. First, because the retroperitoneum is often the first and only site of metastatic disease, patients can be cured with RPLND as long as the initial surgery is thorough enough to removal all sites of gross or micrometastatic disease.[15] Second, although radiologic imaging continues to improve, clinical staging still underestimates the disease burden in the retroperitoneum, with a reported 20% to 30% incidence of pathologic stage II disease (positive retroperitoneal nodes) despite radiographic suggestion of clinical stage I disease.[16] Third, the uncontrolled retroperitoneum represents a significantly adverse prognostic factor, as untreated retroperitoneal metastases are usually fatal.[7,15,17,18] The management of advanced-stage NSGCT involves the integration of chemotherapy and surgery, and even in the post-chemotherapy setting for clinical stage IIA/IIB NSGCT, RPLND reveals a 6% to 8% incidence of viable malignancy and a 31% to 44% incidence of chemoresistant teratoma.[19] Finally, the retroperitoneum is the predominant site of relapse of seminomatous and nonseminomatous GCT for viable malignant tissue, teratoma, or teratoma with malignant transformation.[20,21]

INCIDENCE, DISTRIBUTION, AND HISTOLOGIC FINDINGS OF RETROPERITONEAL RECURRENCES

Tumor recurrence within the retroperitoneum following RPLND is a relatively rare event, with a reported incidence of approximately 1% to 3%, but incidence of as high as 8.2% has been reported (**Table 1**). However, there is reason to believe that residual disease within the retroperitoneum following RPLND may be an underreported phenomenon. The use of effective postoperative cisplatin-based chemotherapy, especially in chemo-naïve patients, may eliminate occult micrometastatic disease that was not resected during initial RPLND.[2,30] In addition, some centers will not perform routine postoperative imaging, and the lack of publications with long-term follow-up likely results in an underreporting of retroperitoneal recurrences.[2,31]

Except in rare cases, a retroperitoneal recurrence following RPLND should be regarded as a technical failure, which may be due to a variety of factors including inappropriate modifications to the original retroperitoneal dissection template or lack of expertise in performing the challenging initial dissection.[2,9,16]

This proposal is supported by the findings of increased retroperitoneal recurrence with left-sided primary testicular tumors, which are associated with a more complex left renal hilar dissection,[4,9,28] and the finding that incomplete lumbar ligation, a prerequisite for clearing the posterior lymphatics behind the great vessels, is a common finding at the time of reoperative retroperitoneal surgery.[9]

RPLND has had a well-established role in the management of NSGCT since 1948, but the surgical template, techniques, and decision to implement this strategy has evolved over the past several decades.[2,14,32] The initial description of