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Nephrectomy During Operative Management of Retroperitoneal Sarcoma

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Background: Complete resection of a retroperitoneal sarcoma often requires removal of adjacent organs. In this study we evaluated the role of nephrectomy during operation for retroperitoneal sarcoma.

Methods: Between July 1982 and July 1995, 75 of the 371 (20%) patients who underwent resection of retroperitoneal sarcoma at MSKCC underwent concommitant nephrectomy. Data concerning the reasons for nephrectomy, degree of sarcomatous renal involvement, and survival were retrospectively analyzed.

Results: Fifty-four patients (72%) underwent nephrectomy during the initial resection, and 21 (28%) during a resection of a recurrent or persistent tumor. The most common reason for nephrectomy was total encasement by sarcoma (n = 40; 53%), followed by dense adherence of the tumor to the kidney (n = 21; 28%), and the direct invasion of the kidney by tumor (n = 2; 3%). Pathology demonstrated an absence of kidney invasion in the majority of cases (55 of 75; 73%). Renal capsular invasion was present in 11 of 75 (15%), renal parenchymal invasion in 7 of 75 (9%), and renal vein invasion in 2 of 75 (3%) of cases. There were no significant differences in survival based on degree of sarcoma involvement of the kidney, tumor grade, or whether the resection was for primary or recurrent disease. The 53 patients who underwent a complete gross resection of all tumor had a significantly improved long-term survival compared to the 20 patients who did not (50% versus 20% DFS at 5 years, respectively; $p < 0.001$).

Conclusions: Decisions for concomitant nephrectomy during resection of retroperitoneal sarcoma should be based on whether this maneuver will provide a complete resection of all gross tumor, in which case the long-term disease-free survival of 50% is comparable to the reported 5-year survival of all patients with retroperitoneal sarcoma who are completely resected.

Key Words: Sarcoma—Kidney—Nephrectomy—Retroperitoneal.

Sarcomas arising from the retroperitoneum are rare tumors of varying histopathology, grade, and sites of origin and account for 10% to 15% of soft tissue sarcomas (1). From both historical series (2–4) and more recent reports from our institution (5,6) and elsewhere (7–11), the foundation of surgical treatment has been complete resection with a margin of tissue that appears grossly normal. Complete resection is reported in 50% to 78% of modern-day series, which may, in part, be also due to improvements in preoperative imaging such as CT and MRI. Improvements in perioperative care have led to a decrease in perioperative morbidity (5–11). The basis for unresectability is usually unrecognized intraabdominal metastatic disease or extensive invasion of major vascular structures. Retroperitoneal sarcomas that are incompletely resected, despite adjuvant systemic chemotherapy or radiation therapy, inexorably progress with local and systemic recurrence (1,8). Despite this, organs adjacent to a retroperitoneal sarcoma are commonly sacrificed in up to 68% of operations where complete resection is described. The organ most commonly resected is the kidney (32% to 46%), followed by the colon (25%), adrenal (18%), pancreas (15%), and spleen (10%) (5–10).

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In a 13-year period between July 1982 and July 1995, 371 patients underwent operation for the resection of a retroperitoneal (intraabdominal, nonvisceral) sarcoma at Memorial Sloan Kettering Cancer Center (MSKCC). Of these, 75 patients (20%) underwent a concomitant nephrectomy. It was the purpose of this study to describe the clinical situation in which nephrectomy was performed and to determine the prognosis for this subgroup of patients.

PATIENTS AND METHODS

Adult patients (more than 16 years old) admitted to MSKCC were prospectively entered on a data base between July 1982 and July 1995. During this period, 371 patients underwent operation for primary or recurrent retroperitoneal soft tissue sarcoma. All pathologic material was reviewed by a single referee pathologist, and a histologic diagnosis and tumor grade were assigned. Actuarial survival was calculated according to the method of Kaplan and Meier (12), and the log rank test was used to compare differences in survival distributions observed in subsets of patients (13). Survival was calculated from the time of initial operation at MSKCC.

The 75 patients undergoing nephrectomy as part of the operative management of the retroperitoneal sarcoma provide the basis of this report. Operative records were reviewed to determine the reason for including nephrectomy in the procedure. Pathology reports were analyzed to determine the degree of involvement, if any, of the kidney by the sarcoma.

RESULTS

From July 1982 to July 1995, 75 of 371 (20.2%) patients underwent nephrectomy as part of the operative management for retroperitoneal sarcoma. There were 45 males and 30 females with a median age of 61 years (range 27 to 81 years). The most common histologic subtype was liposarcoma (54 of 75; 72%) followed by leiomyosarcoma (12 of 75; 16%), malignant fibrous histiocytoma (MFH) (6 of 75; 8%), and one case each of the following: angiosarcoma, fibrosarcoma, and mesenchymoma. There were 44 high-grade tumors (59%) and 31 low-grade tumors (41%). Fifty-four patients (75%) underwent nephrectomy as part of the resection of the primary tumor, 12 (16%) during operation for a first recurrence, 8 (11%) during operation for a second recurrence, and one during operation for a third recurrence (Table 1). Median tumor size was 23 cm (range 10 cm to 70 cm). At the time of operation, the surgeon reported complete gross tumor resection of all tumor in 53 patients (71%), incomplete gross resection in 20 patients (27%), and in two cases (3%), the degree of resection was not reported (see Table 1).

TABLE 1. *Clinicopathologic features of retroperitoneal sarcomas requiring nephrectomy*

			p value
Histologic grade	High: n = 44 (59%)	Low: n = 31 (41%)	<0.07
Operation	Primary n = 54 (75%)	Recurrent n = 21 (25%)	0.1
Resection	Complete n = 53 (71%)	Incomplete n = 20 (27%)	<0.002
Kidney involved	Uninvolved n = 55 (73%)	Involved n = 20 (27%)	0.83

At the time of operation, the surgeon described a sarcoma that completely encased the kidney, rendering it unrecognizable in 40 cases (53%), a sarcoma that was densely adherent to the kidney in 21 cases (28%), a sarcoma that was invading the kidney in 2 cases (3%), and a sarcoma that was adjacent to the kidney in one case (1%). No report of the relationship of the tumor to the kidney was available in 11 cases (14.7%) (Table 2). In one case where the tumor invaded the renal parenchyma, there was also ureteral invasion. In a second case where the kidney was uninvolved, periureteral soft tissue was invaded.

Of the 40 cases of sarcoma that completely encased the kidney, 31 of 40 (78%) of the removed kidneys were normal upon histological examination. In 6 of 40 cases (15%), the renal capsule was invaded by sarcoma, and in 3 of 40 cases (8%), the renal parenchyma was invaded by sarcoma.

Of the 21 cases (28%) of sarcoma felt by the surgeon to be densely adherent to the kidney, in 13 cases (62%) the kidney was normal, in 4 cases (19%) the renal capsule was invaded, in 2 cases (10%) the renal vein was invaded, and in 2 cases (10%), the renal parenchyma itself was invaded.

TABLE 2. *Retroperitoneal sarcoma and degree of kidney involvement*

Category	Normal	Capsule invaded	Kidney invasion	Renal vein invasion
Encased n = 40 (53%)	31	6	3	0
Adherent n = 21 (28%)	13	4	2	2
Invaded n = 2 (3%)	0	1	1	0
Adjacent n = 1 (1%)	1	0	0	0
N/A n = 11 (15%)	10	0	1	0
Totals (n = 75)	55 (73%)	11 (15%)	7 (9%)	2 (3%)

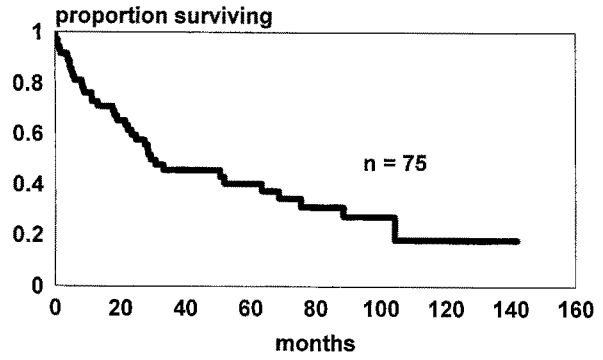

FIG. 1. Overall actuarial survival of 75 patients undergoing nephrectomy during resection of a retroperitoneal sarcoma.

In the two cases where the surgeon felt that the kidney was invaded by sarcoma, the renal parenchyma was invaded in one case and the renal capsule was invaded in the other. In a single case, the surgeon described the kidney as adjacent to the tumor and removed a histologically normal kidney. In the 11 cases (15%) where the reason for nephrectomy was not described in the operative report, the kidney was normal in 10 cases and invaded in one case.

Taken together, 55 kidneys not invaded by sarcoma were removed (73%), 11 kidneys were removed in which sarcoma had invaded the renal capsule (15%), 7 kidneys were removed in which the renal parenchyma was invaded (9%), and 2 kidneys were removed in which the renal vein was invaded (3%) (see Table 2).

After a median follow-up time of 18 months (range 1 week to 11 years), 30 patients (40%) are dead of disease, 9 patients (12%) are alive with disease, 27 patients (36%) are alive without evidence of disease, 7 (9%) patients are dead of other causes, and 2 patients are lost to follow up. The 5-year disease-free survival for all 75 patients was

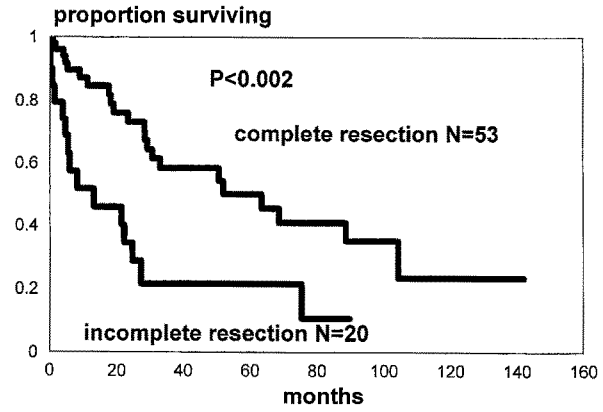

FIG. 3. Actuarial survival distribution comparing patients undergoing a complete resection (n = 53) and those undergoing an incomplete resection (n = 20).

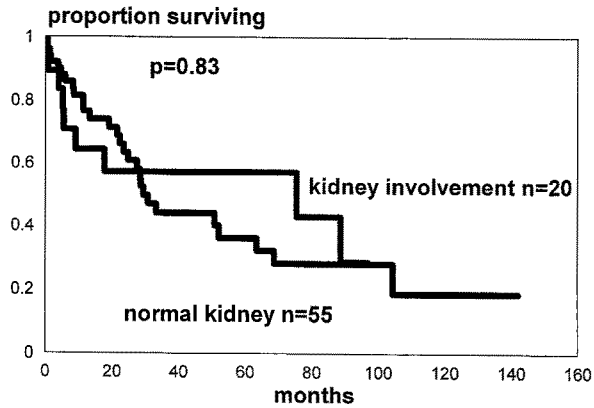

FIG. 2. Actuarial survival distributions in patients found to have a normal kidney (n = 55) and patients with some degree of kidney involvement (n = 20).

40% and overall survival was 50% (Fig. 1). There was no significant difference in survival between the 55 patients found to have a normal kidney and the 20 patients with some degree kidney invasion (capsule, parenchyma, renal vein) (36% vs. 57% disease-free survival at 5 years, $p = 0.83$) (Fig. 2). The 53 patients undergoing a nephrectomy during a complete gross resection of all tumor experienced significantly improved 5-year disease-free survival of 50% compared to 20% for the 20 patients who had an nephrectomy in association with an incomplete resection ($p < 0.002$) (Fig. 3). Patients undergoing nephrectomy during the resection of a low-grade sarcoma versus high grade sarcoma (54% vs. 31% disease-free survival, $p < 0.07$) (Fig. 4) or primary resection versus resection of a recurrent sarcoma (48% vs. 0% disease-free survival) $p = 0.1$ approached, but did not achieve, a statistically different 5-year disease-free survival.

DISCUSSION

It has been well established that the most important factor determining long-term survival in retroperitoneal sarcoma is the complete gross resection of all tumor (1–11). Factors associated with unresectability include major vascular invasion (inferior vena cava, aorta), evidence of peritoneal or visceral metastases, extensive involvement of the root of the small intestinal mesentery, and spinal cord involvement. In as many as 68% of cases where complete resection is performed, an adjacent organ is also resected. In previous reports, the kidney is the most commonly sacrificed organ (32% to 46%) followed by colon (25%), adrenal (18%), pancreas (15%), and spleen (10%) (5,8–10).

In reports of retroperitoneal sarcoma that discuss ad-

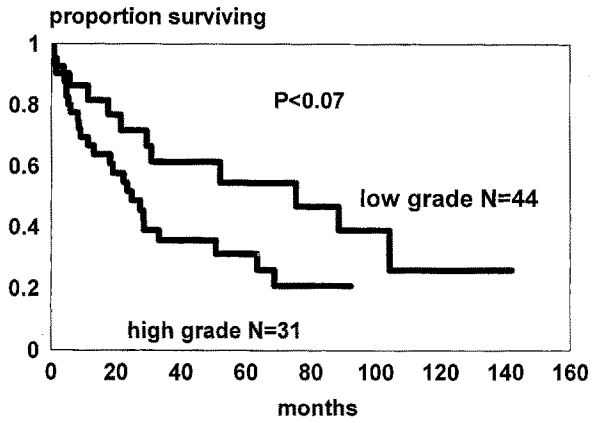

FIG. 4. Actuarial survival distributions comparing patients undergoing research of high-grade sarcoma (n = 31) and those undergoing a resection of low-grade sarcoma (n = 44).

jacent organ resection in general and nephrectomy in particular, the precise reason for the nephrectomy and the degree pathological involvement of the kidney has not been described (5,8–10). In addition, no description is provided as to whether the nephrectomy was done in the setting of a complete resection of all gross tumor, and what, if any, impact nephrectomy had on eventual outcome.

The MSKCC experience with operation for retroperitoneal sarcoma suggests a somewhat lower rate of nephrectomy (20%) than previously reported in the literature. The analysis of nephrectomies performed in this setting describes a large retroperitoneal tumor (median size 23 cm), which 50% of the time completely encased the kidney, leaving the surgeon little choice but to remove it en bloc with the intent of achieving a complete resection. Our experience suggests that direct renal involvement occurs in only 27% of cases (capsule, parenchyma, or renal vein) and is generally not the deciding factor as to whether concommitant nephrectomy should be done. In this subset of patients with retroperitoneal sarcoma, there was no significant difference in survival whether the kidney was normal or involved in some way by sarcoma, whether the sarcoma resected was high grade or low grade, or whether the resection was for primary or for recurrent sarcoma. However, when nephrectomy was performed as part of a complete resection, long-term survival was significantly enhanced.

Our data, despite the potential limitations of a retrospective study, provide insight into the role of nephrectomy in the treatment of retroperitoneal sarcoma. When the kidney is completely encased, its sacrifice, assuming a functional contralateral kidney, is indicated in an attempt to achieve a complete resection. Sarcoma involving the kidney is uncommon, is usually associated with renal capsular involvement, and in and of itself is not an adverse prognostic factor as long as complete resection can be performed. In patients with large retroperitoneal sarcomas, the need for nephrectomy should be anticipated with a preoperative assessment of renal function and appropriate informed consent. Should the surgeon encounter renal encasement or adherence in association with other operative findings mitigating against complete resection, no discernible benefit is expected by the partial resection of the sarcoma and nephrectomy.

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