Left Renal Vein Ligation and Preservation of Renal Function Through the Collateral Circulation after Retroperitoneal Tumor Resection

Abstract

Introduction: The retroperitoneum can present several pathologies that have a certain complexity and a poor prognosis due to their proximity to large vessels, the involvement of which complicates surgical approaches. Surgery is the therapeutic option associated with the longest survival. The objective of this study was to demonstrate that renal function can be preserved after ligation or resection of the left renal vein, without vascular reconstruction, if the collateral circulation remains functional. Case reports: We report two cases of patients with retroperitoneal tumors with local vascular invasion, the complete resection of which required division and ligation of the left renal vein. Postoperatively, both patients showed preserved renal function, because of collateral venous drainage, and vascular reconstruction was not necessary in either case. We also present a review of the literature on such cases. Conclusion: Division and ligation of the left renal vein proved to be safe in both of the patients undergoing retroperitoneal tumor resection, and reconstruction of the vein is not mandatory when the collateral circulation is preserved.

Key words: Renal Veins; Ligation; Retroperitoneal Neoplasms; Collateral Circulation.

Resumo

Introdução: O retroperitônio pode apresentar diversas patologias e possui certa complexidade e mau prognóstico em virtude do íntimo contato e envolvimento de grandes vasos nas abordagens cirúrgicas. A cirurgia é a opção terapêutica associada à sobrevida prolongada. O estudo tem por objetivo demonstrar que é possível a preservação da função renal, pelas colaterais, após a ligaatura ou resecção da veia renal esquerda sem reconstrução vascular. Relato dos casos: Dois casos de pacientes com tumores retroperitoneais com invasão vascular local onde, para sua completa resecção, fizeram-se necessárias a secção e a ligadura da veia renal esquerda. Evoluíram com preservação da função renal em razão da drenagem venosa pelas colaterais, não sendo necessária a reconstrução vascular. Além disso, foi realizada, para melhor discussão dos casos, revisão bibliográfica. Conclusão: A secção e ligadura da veia renal esquerda mostraram-se seguras nos dois pacientes tratados com resecção de tumores retroperitoneais, não sendo a sua reconstrução obrigatória quando preservadas as colaterais para drenagem venosa.

Palavras-chave: Veias Renais; Ligadura; Neoplasias Retroperitoneais; Circulação Colateral.
INTRODUCTION

The retroperitoneum can present several pathologies, including a variety of benign and malignant neoplasms that can be primary or metastatic. Malignant retroperitoneal tumors, which are four times more common than benign lesions in the region, account for 0.1-0.2% of all malignant tumors.

Because of the surgical complexity and the poor long-term prognosis, the involvement of large vessels has traditionally been considered a limiting factor for the resection of retroperitoneal tumors. However, advances in surgical techniques and perioperative care have made vascular resection an important therapeutic option for patients with retroperitoneal tumors. Radical resection of the affected venous segment continues to be the only treatment associated with prolonged survival.

In relation to retroperitoneal sarcomas, the perirenal portion of the vena cava is the vascular segment most often involved, either because the retroperitoneal sarcoma originates there or because it invades it directly, making resection necessary in order to obtain tumor-free margins. On the basis of the anatomical characteristic of the presence of collaterals, there is no consensus in the literature about the need for reconstruction of the left renal vein after resection of the juxtarenal vena cava. Some authors recommend reconstruction with the objective of preventing venous congestion of the kidney and the consequent deterioration of renal function, whereas others favor direct ligation without reconstruction, due to the practicality, shorter surgical time, and lower risk of bleeding of the latter.

The objective of this study was to demonstrate that, after the radiological study of the cases and confirmation of collateral circulation, it is possible to preserve left renal function after ligation or resection of the left renal vein without vascular reconstruction. To that end, we report two cases of retroperitoneal tumors in which, for their complete resection, division and ligation of the left renal vein were necessary. In addition, for further discussion on the topic, a review of the literature was conducted.

This was a descriptive observational study in which the patients were selected on the basis of the clinical and radiological data collected through direct searches of the medical records at the José Alencar Gomes da Silva National Cancer Institute. The study was approved by the local research ethics committee (CAAE Protocol no. 79253717.6.0000.5274) and was exempted from the requirement to obtain written informed consent.

CASE REPORTS

Case 1: A 56-year-old female patient presented with a one-year history of pain in the upper abdomen and back. Magnetic resonance imaging (MRI) showed a retroperitoneal formation, measuring 4.2 × 2.5 cm, in close contact with the uncinate process and affecting the inferior vena cava (Figure 1).

Endoscopic ultrasound showed a nodular lesion, measuring 5 × 3 cm, adjacent to the posterior portion of the head of the pancreas and inferior vena cava, encompassing the left renal vein. Ultrasound-guided punch biopsy was performed, and the immunohistochemistry report showed leiomyosarcoma.

Due to the possibility of vascular invasion and probability of resection or vascular reconstruction, we opted for a preoperative study with contrast-enhanced imaging, which showed evidence of collateral circulation originating from the left renal vein. The surgical planning was based on the results of that study.

During the surgical procedure, a sarcomatous lesion was seen in the juxtarenal portion of the inferior vena cava, affecting the left renal ostium. On the left side, after the collateral circulation had been identified, the left renal vein was divided and the lesion was resected, together with the affected segment of the vena cava. The resected inferior vena cava was reconstructed with a Dacron prosthesis, and the left renal vein was ligated.

The patient had a satisfactory evolution and was discharged without complications in the postoperative period. In the outpatient follow-up, complementary
exams were performed to assess renal function. Urinalysis showed no proteinuria. Computed tomography angiography (CTA) revealed drainage of the left renal vein through the gonadal and left adrenal veins, the nephrogram showing preserved bilateral renal blood supply, with timely parenchymal and excretory phases, and renal scintigraphy showing approximately 44% and 56% of the accumulated total in the right and left kidneys, respectively (Figure 2).

Case 2: A 37-year-old female patient presented with a two-week history of abdominal pain in the right flank, accompanied by dysuria. She reported no alcoholism, smoking, comorbidities, or previous surgical procedures. The initial approach included antibiotic therapy and ultrasound investigation of the urinary tract, which revealed a mass in the right adrenal topography.

To investigate further, we acquired a computed tomography (CT) scan of the abdomen and pelvis. The CT scan showed that the mass measured 12.8 × 11.4 × 6.9 cm and was in proximity to the right adrenal gland, medially displacing the right renal artery and partially involving the inferior vena cava (Figure 3).

A surgical approach was chosen. During the surgical procedure, a tumor, measuring approximately 20 cm was seen on the right adrenal surface, in close contact with the right renal hilum, inferior vena cava, superior mesenteric artery, celiac trunk, duodenum, and hepatic hilum, adhering to the left renal vein. To achieve better access to the lesion, it was necessary to ligate and section the vein, after left renal venous drainage through the gonadal and adrenal veins had been confirmed. The tumor was then resected, without reconstruction of the left renal vein.

The patient had a satisfactory evolution and was discharged without complications in the postoperative period. In the outpatient follow-up, complementary exams were performed to assess renal function. The urinalysis results were normal, without proteinuria. The CTA and renal scintigraphy showed good bilateral renal perfusion (Figure 4).

**DISCUSSION**

The retroperitoneum represents a surgically challenging anatomic space, because it contains multiple vital structures, making the resection of tumors located in its topography technically complex procedures.
Retroperitoneal tumors usually present in advanced stages and are often in close contact with or invading adjacent organs and structures, sometimes requiring vascular resection to obtain adequate tumor-free margins. For retroperitoneal sarcomas in particular, the vena cava is the vascular structure most often affected, either because the lesion originates there or invades directly, typically involving the perirenal region, which often implies resection of the renal veins. Similarly to what occurs in relation to the infrarenal vena cava, in which there is no consensus on the need for reconstruction, some authors advocate direct ligation of the left renal vein, whereas others advocate its routine reconstruction.

A study evaluating 47 patients submitted to inferior vena cava resection for tumor excision reported reimplantation of the right and left renal vein in 19 cases. Another study involving 41 patients submitted to caval resection for the treatment of a tumor reported left renal vein ligation in eight cases. In the first case described here, the tumor originated in the perirenal segment of the vena cava. The affected segment of the vena cava was resected, as was the orifice of the left renal vein. Because of the absence of collaterals, we opted to reconstruct the vena cava. Collateral circulation to the gonadal and adrenal veins having been confirmed, we chose ligation, rather than reconstruction, of the left renal vein.

The second case described here involved a patient with a retroperitoneal mass within the retrocaval space in the topography of the insertion of the renal veins, resulting in pronounced anterior displacement of the vessels. During the surgical dissection, there was significant difficulty in mobilizing the tumor mass, due to its proximity to the posterior face of the vena cava and left renal vein. We chose division and ligation of the juxtacaval as a strategy to obtain adequate surgical exposure, allowing the complete mobilization and freeing of the tumor from the abdominal wall posteriorly, as well as from the vena cava and left renal vein anteriorly.

Left renal vein division has been used by vascular surgeons as a strategy for the best exposure of the juxtarenal aorta during the surgical treatment of aneurysms or aortic occlusive disease. Although there have been few studies describing this procedure for better access and exposure in the context of the treatment of retroperitoneal tumors, the strategy proved to be valid and safe in the patient under study here, allowing a surgical approach with better exposure and lower risk of bleeding, a result similar to that obtained when this strategy is used in the approach to the pathologies of the juxtarenal aorta. A study published in 1997 in the Sao Paulo Medical Journal evaluated a total of 342 living donor nephrectomies for transplants. 331 left nephrectomies and 31 right nephrectomies. The left renal vein was found to have two tributaries (the adrenal and gonadal veins) in 100% of the cases and one or more lumbar veins in 65%. The presence of these tributaries makes it possible to ligate the renal vein without reconstruction, because they can provide the necessary venous drainage. However, some reports suggest that failure to reconstruct the left renal vein can result in deterioration of renal function, elevated creatinine levels and decreased filtration rate having been observed. These changes were not observed uniformly in all studies involving the treatment of abdominal aneurysms. In a study involving 56 cases of division and ligation of the left renal vein in the treatment of aortic pathologies, the mean preoperative creatinine level was 1.1 mg/dL (range, 0.7-2.4 mg/dL), similar to that found at hospital discharge 1.1 mg/dL (range, 0.6-2.1 mg/dL). In the long-term follow-up, only two of the patients in that study showed alterations in renal function, which were attributed to hypertensive nephrosclerosis and not to the ligation of the renal vein per se. In a study evaluating 261 patients with aortic aneurysms submitted to surgical treatment, 45 patients who underwent division and ligation of the left renal vein were compared with 212 patients who did not. On the first and seventh postoperative days, as well as in the subsequent weekly evaluations, the creatinine levels were comparable between the two groups. These data suggest that ligation of the left renal vein is safe from the point of view of renal function, the observed changes having little or no clinical impact.

In studies involving the treatment of juxtarenal abdominal aortic aneurysm, in which arterial clamping was necessary, there was a period of renal ischemia and, in some cases, renal artery reimplantation. In contrast, in the cases presented here, no arterial intervention was performed and there was therefore no period of renal ischemia. That suggests that, regarding renal function, the procedure increases the safety of treating retroperitoneal tumors without the use of aortic or renal artery clamping. In a study involving 41 patients submitted to resection of a retroperitoneal tumor and of the vena cava, eight patients also underwent ligation and division of the left renal vein, together with right nephrectomy; in those eight patients, no alteration of renal function was observed, providing evidence of the safety of that procedure.

CONCLUSION

In conclusion, division and ligation of the left renal vein proved to be safe in both of the patients undergoing
The Renal Vein and Retroperitoneal Tumors

Retroperitoneal tumor resection. Reconstruction of the left renal vein is not mandatory when the collateral circulation is preserved.

**DECLARATION OF CONFLICTS OF INTEREST**

Nothing to declare.

**REFERENCES**


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