

Retroperitoneal tumor invasion of the inferior vena cava. A single-centre experience in tumor thrombectomy

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Abstract. *Background and aim:* Radical surgical treatment improves survival in patients suffering from retroperitoneal tumors with co-existing inferior vena cava thrombus. The extraction excision can be performed through many techniques such as liver mobilization which is performed in liver transplantation procedures. *Methods:* During 2000-2007, 11 patients with retroperitoneal tumors and inferior vena cava thrombus were surgically treated in our department. Classification of the thrombus was defined as suggested by Neves and Zinke. All patients were categorized as level I or level II. In all cases a transabdominal approach, liver mobilization and extraction of the thrombus by milking down or Fogarty catheter were used. *Results:* No peri-operative mortality was observed. One case of pulmonary embolisation was conservatively treated. One patient presented recurrence 6 months after the procedure. *Conclusions:* The use of liver transplantation techniques in the surgical management of retroperitoneal tumors with inferior vena cava thrombus, is a safe procedure that improves the survival of these patients. (www.actabiomedica.it)

Key words: retroperitoneal tumors, renal cell carcinoma, thrombosis of the inferior vena cava, tumor thrombectomy

Background and aim

Retroperitoneal tumors always represent a surgical challenge, mainly due to their size and close anatomic relationship with vital organs or large vessels. Renal cell carcinomas (RCC) are the majority of these tumors, and they are associated with thrombus extending to the inferior vena cava (IVC) in up to 10% of cases (1, 2). In the past, conservative treatment offered poor results and short survival. Nowadays, radical surgical excision of the tumor in association with tumor vena caval thrombectomy offers better results, due to the ongoing experience and improvement of the peri-operative management (3-6). However, removal of the tumor thrombus from the vena cava still represents a major surgical challenge. A single-center

experience from retroperitoneal tumors and co-existing thrombus in IVC is presented.

Methods

Records from 11 patients, 8 males and 3 females (mean age 47 years -range 20-65 years), who presented retroperitoneal tumors and IVC thrombosis from 2000 to 2007, were retrospectively analyzed. Eight patients had RCC, 2 patients leiomyosarcoma with one patient having a retro- vena cava leiomyosarcoma and 1 patient adrenocortical carcinoma. Only four patients had vena cava-related symptoms; one of them presented with bilateral leg edema, two presented flank pain, and one had severe hypertension that was resis-



Figure 1. MRA showing a tumor of the right kidney and a thrombus extension to the IVC at the retrohepatic level

tant to therapy. The preoperative imaging included CT scan and MR angiography (Fig. 1). No metastases were found (lymph nodes, perinephric fat or distant). All patients were classified as levels I or II according to the rule of Neves and Zincke (5, 7). In one patient, an extension of the thrombus into the left renal vein was demonstrated.

Surgical technique

A radical resection of the tumor and successful thrombectomy was performed in all patients. The incision was approximately made two fingerbreadths below the right costal margin extending laterally to the mid axillary line to the right and as far as needed to the left. The liver was rotated to the left by dividing the ligaments and the retrohepatic segment of the inferior vena cava was subsequently exposed. A Pringle maneuver was used in one patient (11%) in order to control the porta hepatis. Although this manipulation may be of great benefit, it is not routinely used since it is often associated with hemodynamic problems. Piggy-back exposure of the liver in which the inferior vena cava remains in situ and the liver is mobilized off the vessels was used in four patients. This technique offers the opportunity to milk down the tumor thrombus in order to place a vascular clamp above the involved segment of the inferior ve-



Figure 2. Intraoperative figure, showing the milking of thrombus through a venotomy of the IVC in a renal cell carcinoma

na cava. Removal of the thrombus was achieved through milking or Fogarty catheter (Fig. 2). In one patient, resection of the invaded part of the vena cava was performed followed by an interposition of a 10 mm ringed PTFE graft.

All patients perioperatively received a wide-spectrum antibiotic.

Results

No perioperative death was observed. A pulmonary embolism occurred in one case, 12 hours after the initial operation. The patient was conservatively treated and recovered well. One patient died 2 years following the procedure and one patient presented recurrence of the disease 6 months after the procedure. He was treated with post-operative radiotherapy.

Discussion

The presence of IVC thrombosis in cases of retroperitoneal tumors is not uncommon. The reported incidence is ranged between 4% to 10% (1-4). Berg et al. first reported nephrectomy and cavotomy as a new type of procedure. These tumors usually enlarge silently, until the eventual compression of the surrounding

organs produces symptoms (7). Recently, most reports suggest the superiority of aggressive surgical treatment over alternative methods. The surgical technique depends on the level of thrombus extension. The classification of Neves and Zincke for the IVC thrombus was a useful tool for surgical planning. Level I thrombus extending <2 cm above the renal vein in the IVC, level II retro-hepatic thrombus and below the hepatic veins, level III extending above the hepatic veins including supra diaphragmatic involvement and level IV thrombus in the right atrium (5). Radical resection of the tumor and the thrombus offers a 5-year survival in up to 65% in levels I and II (1-4, 8-10). In level IV the procedure may require cardiopulmonary bypass.

Application of liver transplantation principles allows to approach upper retroperitoneal tumors through an upper abdominal incision with adequate exposure. The gradual rotation of the liver to the left facilitates the exposure of the retroperitoneal inferior vena cava and offers a direct approach to the tumor and the vein thrombus. No major complications or mortality during the post-operative period despite the severity of the procedure were observed. In other series the reported mortality range was 2,7-13%. Major causes of death are bleeding, pulmonary embolism, myocardial infarction, sepsis and complications from cardiopulmonary bypass procedures which could be used in patients of levels III and IV (11).

Piggy-back liver mobilization was performed in 4 of our patients facilitating the thrombectomy, because cavotomy should be cranially extended to remove any adherent tumor thrombus. This procedure is usually used in patients with thrombus of level III and IV.

In all patients, proximal and distal occlusion of the inferior vena cava was necessary and the level of clamping depended on the level of tumor propagation. In patients with level I thrombus, total occlusion of the IVC rarely affects the systemic circulation. However, total occlusion of the suprarenal IVC may cause hypotension secondary to a decreased venous return (12, 13).

Wellons et al (14) suggested the use of IVC filter during the operation in order to avoid pulmonary embolization. He suggested the use of IVC filters, in order to prevent the incidence of pulmonary embolism during the procedure. We did not use IVC filter pro-

tection in our patients, because all IVC thrombi were extending to the level of the porta hepatic. All patients received low molecular weight heparin, starting 12 hours before the operation in an anti-trendeleburg position. Only one patient (11%) presented pulmonary embolization during the procedure which was successfully treated with anticoagulant therapy.

Over the years, many techniques have been developed aiming for the safe resection of retroperitoneal tumors such as renal cell carcinoma (15, 16). The improvement of these techniques has been achieved by "borrowing" principles from other fields of surgery such as liver surgery and vascular surgery in order to deal with tumors involving the IVC (17-19).

The absence of metastases positively affects the survival and the quality of life. Many authors report that all patients with or without distant metastases should be considered for surgery with an aggressive approach (9).

Conclusions

In conclusion, tumor thrombectomy of the IVC, following a detailed planning is a safe procedure with minimal mortality and morbidity.

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