

# Resection and simultaneous reconstruction of the infrarenal aorta and inferior vena cava – case report

Oleg Valentynovych Vasilyev<sup>1</sup>, Anton Anatoliyovych Burlaka<sup>2</sup>, Volodymyr Ivanovych Dorozhynskiy<sup>1</sup>, Olena Oleksandrivna Kolesnik<sup>1,2</sup>

<sup>1</sup>HPB Department of National Cancer Institute, Kyiv, Ukraine

<sup>2</sup>Abdominal Department of National Cancer Institute, Kyiv, Ukraine

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## ABSTRACT:

**Background:** The combined removal of the retroperitoneal sarcoma with vascular resection and one-stage reconstruction not so far considered as an optimal tactic. However, simultaneous aortal and vena cava resections with subsequent reconstruction due to oncologic reason are almost not covered in research literature.

**Methods:** Surgical approach in retroperitoneal sarcoma treatment was used, which includes simultaneous resection and reconstruction of the infrarenal segment of aorta and inferior vena cava.

**Results:** The total vascular reconstruction time was 40 minutes and 15 minutes out of total time was arterial ischemia. The postoperative period was complicated by the right urethral fistula and the limited fluid concentration in the surgical area. Complications eliminated by endoscopic stent placement in the damaged right ureter and drainage of a liquid under the ultrasound control. On day 25th of the post-operative period patient discharged from the hospital.

**Conclusions:** We believe that such a tactic can be safe and effective in case of meticulous patients selection and the multidisciplinary and multi-team approaches application.

## KEYWORDS:

simultaneous venous and arterial resection, reconstruction, retroperitoneal sarcoma

## INTRODUCTION

Retroperitoneal sarcomas make up to 1% of all oncologic diagnosis [1]. The main method of such patients treatment is surgery which brings satisfactory results only when R0-resection has place [1, 2]. Such tumors are in most cases resistant to chemo and radiation therapy, rarely metastatic, and mortality is 77% due to local relapses [3]. Vascular invasion of magistral vessels is diagnosed in 7–26% of cases [4, 5]. Nowadays the combined removal of the retroperitoneal sarcoma with vascular resection and one-stage reconstruction considered an optimal tactic [5]. However, simultaneous arterial and venous resections with subsequent reconstruction due to oncologic reason are almost non-existent in research literature. The purpose of the study is to present a clinical case of combined removal of a retroperitoneal sarcoma, resection and simultaneous reconstruction of the intra-renal part of aorta and inferior vena cava (IVC).

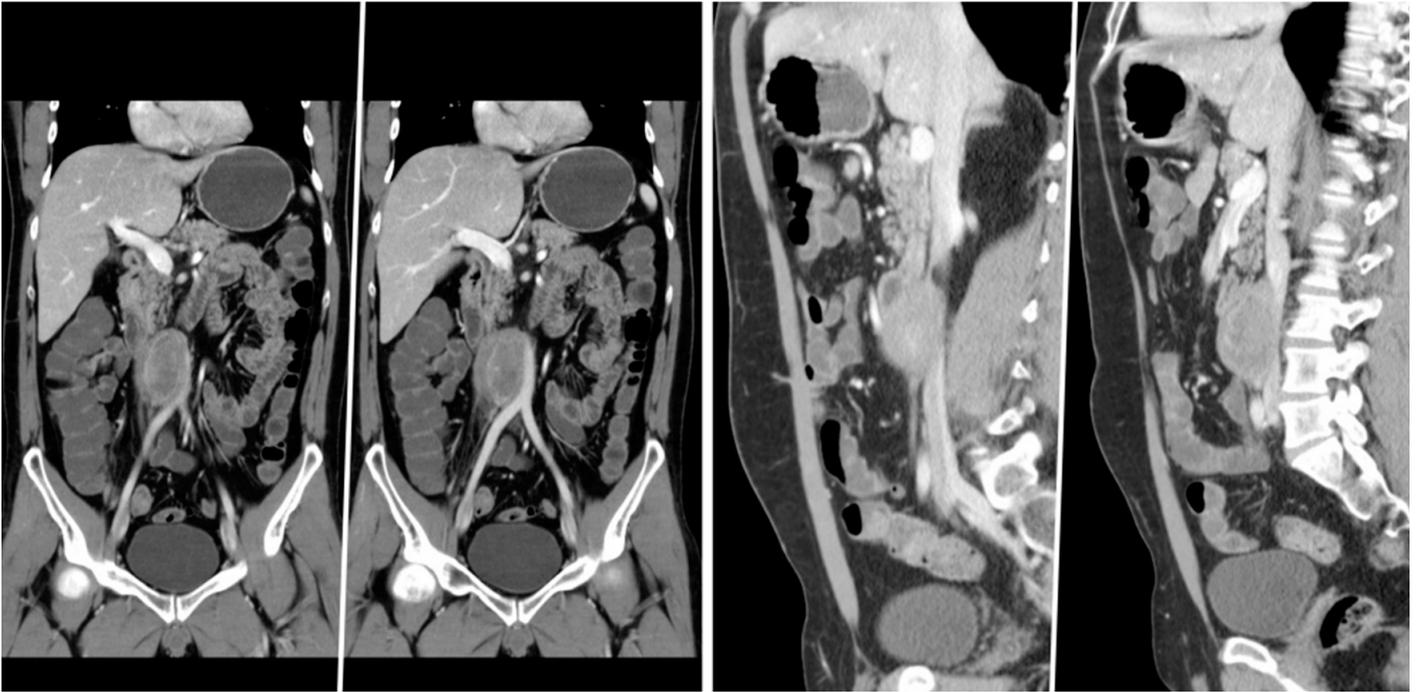
## CASE REPORT

Patient, 27 years of age, with a malignant tumor of the retroperitoneum, chronic pain syndrome. According to the results of a computer tomography (CT) signs of tumor invasion of the infrarenal segment over the bifurcation and the confluence of common iliac veins the anterior aortal circumference and 2/3 of IVC circumference were found. Also, an adherence of tumor tissue to the lower horizontal section of the duodenum and completely doubled right ureter were detected (Fig. 1.). Taking into account the young age and the prospect of a significant improvement expectancy and quality of life, a multidisciplinary team consisting of a chemotherapist, radiation therapist, surgeons and oncologist confirmed surgical treatment.

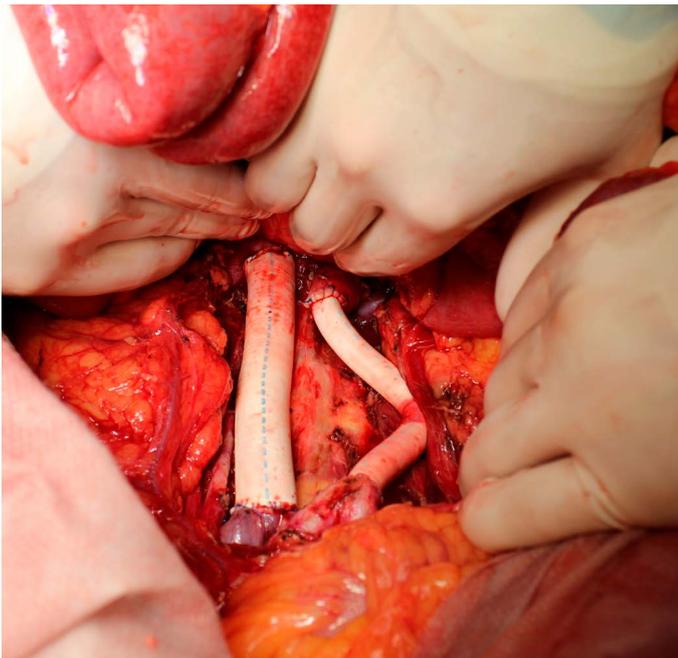
At the period of operation planning, the high-quality CT of the abdomen and pelvis with further reconstructions was performed. We've been focused on the diameter and length of the infrarenal aorta and IVC. Also tumor invasion, vascular variative anatomy, morphology, and principles of future PTFE prosthesis fixations were measured and planned on this stage. Surgical position on the back was chosen. Surgical access – lower-middle laparotomy with an additional incision to the left with the dissection of the left rectus abdominis muscle. Through the revision immobile tumor fixed to the back wall of the abdominal cavity, a significant invasion of the infra-renal part of aorta, IVC, the wall of duodenum, completely doubled right ureter observed. The right part of colon and the root of mesentery of the small intestine were mobilized by using the Cattell-Braasch maneuver; the Koher's maneuver performed that supplies the adequate access to the retroperitoneal space in particular the infrarenal part of aorta and IVC. The tumor has been mobilized from the right ureter and the lower horizontal part of the duodenum. The tumor invasion of mentioned above structures has not been confirmed.

„Proximal” and „distal” control of the infrarenal segment of aorta and IVC over the bifurcation and confluence of common iliac veins was received. In order to reduce the time of ischemia of the lower extremities and intraoperative blood loss the resection of the infrarenal part of aorta above the bifurcation followed by linear alloprosthetics using a Polytetrafluoroethylene (PTFE) prosthesis were done during the first operative stage. The length of the prosthesis is selected from excess (3–4 cm) in order to ensure safe manipulation of the tumor. Prosthesis of the aorta is positioned to the left of the spine (Fig. 2.).

The tumor final mobilization done in complex with infrarenal segment of IVC, the latter is crossed below the renal vein and above



**Fig. 1.** Results of the SCT reconstruction with highlighting the retroperitoneal tumor and surrounding anatomical structures ratio.



**Fig. 2.** Surgical field captured on the stage of the vascular reconstruction finishing.

the confluence of iliac veins. The linear alloprosthetic PTFE graft performed (Fig. 2.). The total vascular reconstruction time was 40 minutes, 15 minutes out of total time was arterial ischemia.

Intraoperative and 3 days after antithrombotic therapy included unfractionated heparin (5000 international units (IU) per kg body weight intravenously) under the control of international normalised ratio. Low molecular weight heparin was used on the day 4 of the postoperative period (8000 IU twice per day, subcutaneously).

The patient was hemodynamically stable during surgery and all recovery period. The postoperative period was complicated by the right urethral fistula and the delimited fluid concentration in

the surgical area. Complications eliminated by endoscopic stent placement in the damaged right ureter and drainage of a delimited liquid cluster under the ultrasound control. On day 25th of the post-operative period patient discharged from the hospital (Fig. 3.).

7,5 months after the moment of surgery intervention positron emission tomography (PET-CT) performed and no progression or relapse observed; aortic IVC prostheses are transmitted (Fig. 4.).

According to the ultrasound examination in 6,5 months after the surgery, veins of the lower extremities and IVC in prosthetic segment are transmitted, show satisfactory blood flow rates. Direct and indirect signs of blood flow in aorta and arteries of lower extremities are within normal range (Fig. 3.).

**Discussion.** Reconstruction of vessels using artificial prosthesis is a standard approach for the most oncopathologies, including those with retroperitoneal sarcomas [3]. References analysis shows that most of the retroperitoneal tumors have vascular invasion or spread to adjacent vital organs [4, 5]. The only method that significantly improves the long-term results is R0-resection of the tumor [6].

The scenario of surgical treatment with the reconstruction of both major vessels in the abdominal cavity considered as a non-standard. According to the literature data, we found that current study is 4th world-wide. In 2006, Schwarzbach et al. published results of 25 cases of retroperitoneal tumors removal with simultaneous reconstruction of magistral blood vessels.

The study involved 64% of venous vessel resections, including IVCs, and the only one case of one-stage aorta and IVC resection [7]. Two more successful case reports presented in 2008 and 2011, respectively [9, 10]. Schneider and colleagues performed osteosarcoma removal in 57-year-old patient using artificial implants.

Javier and colleagues conducted a similar operation for a 23-year-old patient with metastatic paratectic rhabdomyosarcoma, using



Fig. 3. The SCT-reconstruction data after 3 months since aorta and IVC prosthetics done.

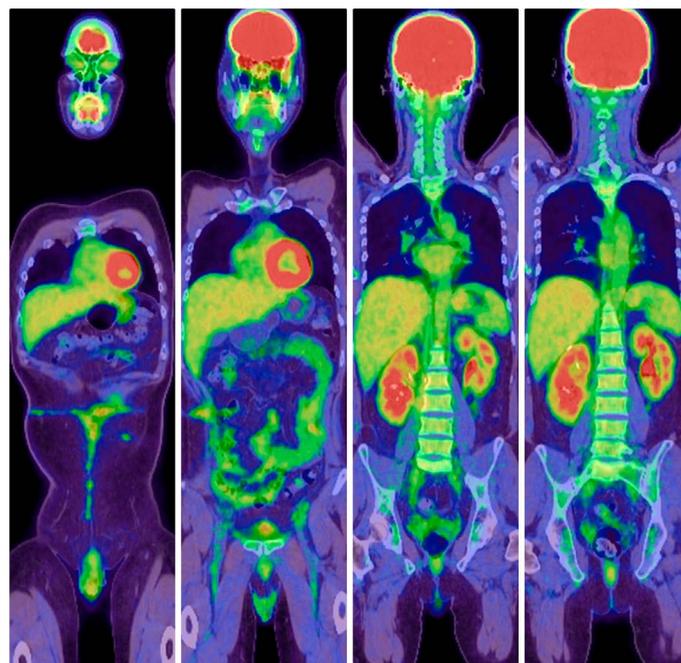


Fig. 4. Long-term results of surgical treatment. PET-CT in 4,5 months after the surgical intervention.

for vascular reconstruction an implant from the pericardium of the bull [8]. The feasibility of the IVC reconstruction was debatable, since it is known that some patients have tolerance ligation of it [10].

However, in case of a sudden occurrence of IVC-syndrome in postoperative period, accompanied by severe edema and venous hypertension in lower extremities (36–70% of cases), which subsequently leads to severe negative consequences [10].

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## CONCLUSIONS

We have successfully used a non-standard approach in malignant retroperitoneal tumor treatment, which includes simultaneous resection and reconstruction of the infrarenal segment of aorta and IVC in order to achieve the R0-resection. We believe that such a tactic can be safe and effective in case of meticulous patients selection and the multidisciplinary and multi-team approaches application.

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Corresponding author: Burlaka Anton, Abdominal department of NCI, Ukraine, Kyiv, Lomonosova 33/43, 03022; Phone: +380678002748; <http://unci.org.ua/en/>; E-mail: [nir.burlaka@gmail.com](mailto:nir.burlaka@gmail.com)

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