Renal tumor with tumoral thrombus
extension into inferior cava vein
and right atrium

We present the case of a patient with a left renal tumor with invasion of the renal and inferior cava veins and cephalad extension to right atrium. Under hypothermic circulatory arrest with cardiopulmonary bypass, left nephrectomy and adrenalectomy with thrombectomy was performed.

Imaging Findings:

A 61 year old male patient came to our Urology department already diagnosed of left renal tumor with invasion of the renal and inferior cava veins and cranial extension to right atrium. He suffered from progressive dyspnoea and lower limbs oedema. Pre-surgical studies discovered atrial fibrillation and pulmonary hypertension.

A contrast-enhanced thoracoabdominal CT was performed (Fig 1,2). A mass in the lower pole of the left kidney was confirmed. CT demonstrated a large tumoral thrombus inside the renal vein with cephalad extension into the right atrium. Venous collateral circulation developed through azygos-hemiazygos veins and lumbar plexus.

A varicocele had appeared due to left gonadal vein dilatation.

Under general anaesthesia and hypothermic (15°C) circulatory arrest with cardiopulmonary bypass of 20 minutes, left nephrectomy and adrenalectomy with thrombectomy was performed with right atrial and inferior vena cava incision. Postoperative course was unremarkable.

Postsurgical CT performed 6 months later showed no anomalies. Dilatation of azygos, hemiazygos and left gonadal veins were not found.

Discussion:

Renal cell tumor or hypernephroma is the most frequent tumor arising in the kidneys [1] and constitutes 2% of all tumors, with a male/female ratio of 3:1 and a rising incidence [2]. 30-50% of cases are diagnosed accidentally [3,4], while most frequent signs and symptoms are hematuria and flank pain [3].

CT features of hypernephroma are widely known [1-3]. In non-enhanced images renal contour may be distorted, calcifications are present in 30% and fatty areas are very seldom detected. In corticomedullary phase hypernephroma is hypervascular, but it appears as a hypodense lesion in nephrographic phase. Tumors smaller
than 3 cm are homogeneous, but greater are heterogeneous due to necrosis or haemorrhage, like the case we report. A renal mass with enhancement greater than 10-12 HU is considered suspicious for malignancy. This item aids in the differential diagnosis between malignant renal mass and dense cyst.

Preoperative imaging exams should answer these four questions [2,3]: a) is it a benign or malignant mass? b) Where is it located and what is its size? c) Is there visceral or nodal extension? d) Does venous involvement exist?

Venous involvement is frequently detected [1,2,4], but it does not worsen prognosis [5]. At the moment of diagnosis, venous involvement is detected in up to 25% of cases, while inferior vena cava is affected in 4-10%. Among the latter, 10-20% reaches suprahepatic level up to right atrium of even right ventricle [6,7]. Tumoral venous thrombosis does not worsen prognosis and patients with no metastasic disease get a long-term survival after surgical excision [8,9].

In our institution a modified classification for tumoral thrombus is used [10] based on Neves et Zinke [11] and TNM [12]. Tumoral thrombi are classified in three groups:

- T3-B1: Thrombus does not reach hepatic veins level.
- T3-B2: Thrombus is at hepatic veins level.
- T3-C: Thrombus extends above hepatic veins level.

Based on this classification most suitable surgical approach is selected. In B1 patients nephrectomy and thrombectomy are performed, while cardiopulmonary bypass, arrested circulation and profound hypothermia is selected in B2 and C patients [10,13-17].

**Differential Diagnosis List:** Renal tumor with invasion of cava vein and right atrium

**Final Diagnosis:** Renal tumor with invasion of cava vein and right atrium

**References:**

Figure 1

Description: T: trombus inside right atrium. Origin:

Description: T: trombus inside inferior vena cava Origin:
Description: T: trombus inside left renal vein and inferior vena cava Origin:

Description: Yellow arrowheads: left renal tumor Origin:
Description: Yellow arrows: dilatation of azygos and hemiazygos veins
Origin:

Description: V: left gonadal vein, dilated due to left renal vein trombosis
Origin:
Description: White arrow: left varicocele Origin:
Figure 2

a

**Description:** Coronal view. T: tumoral thrombus inside right atrium

**Origin:**

b

**Description:** Coronal view. T: tumoral thrombus inside inferior vena cava. Yellow arrowheads: tumor in the left kidney

**Origin:**
Description: Coronal view. T: tumoral thrombus inside left renal vein, with dilatation of left gonadal vein (V) Origin:

d Description: Coronal view. White arrow: left varicocele, due to obstructed left renal vein Origin:
Description: Coronal view. Yellow arrow: collateral venous circulation through azygos vein

Origin:

Description: Sagittal view. T: tumoral thrombus inside right atrium, retrohepatic and infrahepatic inferior vena cava

Origin: