Malignancy after kidney transplantation: A radiological approach

Poster No.: C-373  
Congress: ECR 2009  
Type: Educational Exhibit  
Topic: Genitourinary  
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Keywords: Kidney transplantation, Multimodality, Tumoral lesions  
DOI: 10.1594/ecr2009/C-373

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Learning objectives

To review our experience with de novo malignancies that occurred early in the course of kidney transplants.

To review the spectrum of malignancies occurred after kidney transplantation.

To shows their typical and atypical radiological features, not commonly seen in not transplanted patients.

Background

Immunosuppressed renal transplant patients have a higher incidence of carcinoma than the general population. The aetiology of post transplant malignancy is unknown, it might probably be multifactorial.

Advancements in immunosuppressive therapy have significantly improved patient and graft survival following renal transplantation. This is paralleled by an increasing occurrence of post transplantation malignancy. The chronic use of immunosuppressive therapy to prevent acute rejection increases the long-term risk of cancer.

The overall incidence of de novo malignancies after kidney transplantation ranges 5.7% in our institution (similar to that reported in other studies), but may be higher as there is a steady increased in graft survival.

Cutaneous neoplasm and malignant lymphomas develop frequently. The occurrence is proportionate to the time and intensity of the immunosuppression.

There are several clinical series reporting an increased incidence of malignancies in kidney transplant recipients. Although a high percentage of de novo malignancies after transplantation are low-grade neoplasms, cancer has become an important cause of death (second cause of death after cardiovascular disease), especially in long-term surviving recipients.

Imaging findings OR Procedure details

The problem of de novo tumors developing after kidney transplantation is progressively growing, due to increased age of the transplanted population, the increased graft survival rate, and the long-term immunosuppressive therapy.

We reviewed retrospectively 30 patients (19 men and 11 women) with cancer diagnosed after renal transplantation. In our institution the incidence of cancer after renal transplantation is 5.7 %. 54 % developed cancer within the first 5 years after transplantation, and 46% did after 10 years or more.
Usually the indications for kidney grafts were end-stage renal disease. The median age of the patients at the moment of diagnosis of de novo tumors was 60 years (range 38 to 72). The median elapsed time from transplant to the diagnosis of a de novo malignancy was 52 months (range 0 to 210).

In our series (Graphic 1) on page 27 lymphoproliferative disease was the most frequent cancer (7), followed by renal cell carcinomas (6), lung cancer (4), and hepatic metastasis (2). Isolated cases of skin carcinoma, bladder carcinoma, breast carcinoma, prostatic cancer, menigioma, peritoneal carcinomatosis, colon carcinoma, desmoid tumor, cholangiocarcinoma, iliopsoas liposarcoma and melanomas were also seen.

Patients with Kaposi's sarcoma benefit from reduction or cessation of immunosuppression, but this entails a higher risk of graft loss.

Solid organ de novo malignancies are often more aggressive than those in normal population; the life expectancy of these recipients is low. Moreover, the most frequently occurring malignant tumors in the normal population, such as carcinoma of the colon, rectum, breast, and prostate, are not seen more frequently after renal transplantation.

**Lymphoproliferative disorder**

Post transplantation lymphoproliferative disorder is an abnormal proliferation of B lymphocytes found in solid-organ transplant recipients receiving immunosuppression treatment. A relationship with primary or reactivated Epstein-Barr virus has been established. In most patients, the disorder occurs within the first year after organ transplantation.

Lymphomas that occur in transplant recipients exhibit aggressive atypical features not commonly seen in lymphomas occurring in the general population. Post transplant lymphoproliferative disorder occurs approximately 1% of renal allograft recipients.

The histopathologic types of post transplantation lymphoproliferative disorder include hyperplastic infiltration by plasma cells, polymorphic, and monomorphic. Monomorphic post transplantation lymphoproliferative disorder has histologic features similar to primary lymphoma.

Extranodal disease (81%) is more common than lymphadenopathy (22%) in patients with post transplantation lymphoproliferative disorder.

Extranodal disease is the hallmark of post transplantation lymphoproliferative disorder. The liver is the most frequent site of abdominal involving. Hepatic involvement may be diffusely infiltrative or consist of discrete lesions. Other extranodal locations from lymphoma are: soft tissues (Case 2) on page 28, gastrointestinal tract, genitourinary tract, nervous central system, lung, breast, and other.

CT findings are nonspecific and may include no enhancing or peripherally enhancing, low-attenuation masses. Those lesions were multiple, homogeneous, low-density areas on CT and hypoechoic on
sonography. Calcifications in the lymphoproliferative mass may represent tumor necrosis or sequelae after treatment.

**Renal tumors**

The incidence of urogenital tumors is higher. In any series the estimated rate of renal carcinoma in the general population is 0.12%. De novo malignancies of the native kidney account for 4.8% of all malignant tumors found in transplanted recipients, compared with 2.5% in the general population.

Unlike at other locations, it appears that immunosuppression does not increase the risk of developing malignant disease in the native kidney.

Compared with the general population, several reports suggest that the prevalence of renal cell carcinoma (RCC) is greater in patients receiving haemodialysis, and in the native kidney of renal transplant recipients than in the general population, and that acquired cystic kidney disease might be a risk factor in transplant patients.

Denton et al. who performed systematic nephrectomy of the ipsilateral native kidney at the time of renal transplantation, reported a 4.2% prevalence of renal cell carcinoma before transplantation.

The European bed guidelines for renal transplantation recommend a waiting time of < 2 years between successful treatment of low-stage RCC and transplantation, to minimize the risks of disease recurrence.

The diagnosis of native kidney malignancies in renal transplant recipients typically is incidental, because these tumors are small and asymptomatic. Occasionally the patients have macroscopic hematuria.

The semiology and the ultrasonographic techniques used to diagnose renal carcinoma are the same for all patients, regardless of whether they are kidney transplant recipient.

CT can be used in the confirmation and staging of malignancies of the renal parenchyma and urothelium. In the detection of renal malignancies *(Case 6), on page* CT scan semiology is similar for transplant recipients and members of the general population; however, acquired multicystic renal dysplasia decreases the diagnostic performance of CT.

Renal cell carcinoma is generally less aggressive in transplanted kidneys *(Case 7)* on page 29 than in native kidneys.

**Broncogenic carcinoma**

All patients, except one, with bronchogenic carcinoma *(Case 9)* on page 30 died of neoplastic disease at a median of 13 months after diagnosis. One patient had brain metastasis on CT.

**Hepatic metastasis**
Two patients with hepatic metastasis (Case 10) on page 31 died at a median of 9 months. In the extension diagnosis detected cecum and sigmoid colon carcinoma. Two cases had lymph node metastasis on CT and sonography

**Skin carcinoma**

The case of skin cancer is alive without tumor recurrence (Case 12) on page

Karposi's sarcoma is a rare malignancy of mixed vascular and fibroblastic origin that occurs with increased frequency in transplant recipients and other immunosuppressed individuals. Kaposi's sarcoma is of multicentric origin and occurs primarily in the skin, usually as multiple nodules or plaques. Lesions may also involve the internal organs, particularly the gastrointestinal tract, although virtually any organ may be involved.

**Colorectal carcinoma** (Case 13) on page 16

**Bladder carcinoma**

The case of bladder carcinoma is alive without evidence of recurrence (Case 14) on page 32.

**Miscellaneous**

Include: cholangiocarcinoma
, prostatic carcinoma
, desmoid's tumor (Case 17) on page 33, retroperitoneal liposarcoma
malignant melanoma, meningioma, breast carcinoma, and peritoneal carcinomatosis (Case 19) on page 34
Case 2 48 years old man with chest pain. Kidney transplant 4 years ago. Sonography confirmed a hypoechogenic septae irregular mass within the rib. Biopsy guided by sonography was performed. Lymphoma was the pathological analysis.
**Fig.**: Case 6. Bilateral renal cell carcinoma in the native's kidney. CT scans demonstrate bilaterally lesion enhancing, hyperattenuation tumor
Fig.: Case 7. Large mass in the kidney graft. The transplantectomy was performed
Fig.: Case 9. Large mass in the lingula. Bronchoscopy was performed. Squamosus carcinoma
Fig.: Case 10. Ultrasonography shows multiples, hypoechoics lesions of liver. Punction was performed guided by ultrasound. Adenocarcinoma
**Fig.:** Case 12 Skin carcinoma (Kaposi’s sarcoma) in a 51-year-old man. CT scan shows a large tumor (open arrows) in the anterior abdominal wall. The tumor involves the skin and subcutaneous fat. A small air bubble suggestive of an ulcer (solid arrow) is also noted.
**Fig.:** Case 13. Neoplasm of ascending colon. Noted the enlarged lymph nodes with suggested local infiltration it's confirmed at surgery
**Fig.:** Case 14. Ultrasound and not enhanced axial CT (creatinin elevated). Pelvis and proximal urether dilated. Bladder stones and soft tissue injury in ureteral meatus. Cistoscopy reveals transicional carcinoma
Fig.: Case 17. Desmoid’s tumor of rectus abdominal anterior
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Fig.
Fig.: Case 19. Multiple peritoneal implants after transplantectomy

Additional images for this section:
Fig. 1: Case 13. Neoplasm of ascending colon. Noted the enlarged lymph nodes with suggested local infiltration it's confirmed at surgery
**Fig. 2:** Case 16b. Prostatic carcinoma. MR images show locoregional affectation, and multiple vertebral metastasis
Fig. 3: Case 8a. Posteroanterior radiographs show opacity in right upper lobule. The patient has hemoptysis
**Fig. 4:** Case 5b. Renal cell carcinoma in the native right kidney. CT scans demonstrate an enhancing, hyperattenuation tumor, a finding that is consistent with renal cell carcinoma.
Fig. 5: Case 4a. Wife of 59 years ago 5 years transplanted kidney treated with cyclosporine. Mammograms or routine. Left craniocaudal mammogram shows an asymmetric density in the aspect intern of breast. Magnified view of the right breast demonstrated a poorly defined lesion without calcifications. Left mediolateral oblique mammogram with metallic guide into the lesion
Fig. 6: Case 3b. MR confirms the mass located in the genu of the corpus callosum and white matter adjacent tissue hypointense in T1WI with intense contrast enhancement in a butterfly pattern.
Fig. 7: Case 1b. Axial CT scan shows a large mass hypodense and enhancement heterogeneous
Fig. 8: Case 16a. Prostatic carcinoma. CT findings
Fig. 9: Case 16c. Prostatic carcinoma. Contrast ultrasound shows multiples liver metastasis
Fig. 10: Case 18b. Retroperitoneal liposarcoma. Sagittal CT reconstructions
**Fig. 11:** Case 11b. Metastatic liver infiltration. Axial CT enhanced. Portal phase
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Fig. 18: Case 17. Desmoid's tumor of rectus abdominal anterior
Fig. 19: Case 19. Multiple peritoneal implants after transplantectomy
Conclusion

Although de novo malignancies occur more frequently many years after kidney transplantation, our experience demonstrates that they can occur early during the post transplant follow-up. This conclusion did not differ from previously reported series.

Radiologists should be aware of the higher incidence of malignancies in immunocompromised patients after renal transplantation and their special radiologic appearances due to their more aggressive behaviour.

Follow-up of renal transplant patients must include screening tests directed at tumor detection. Imaging studies and other tests in this patient group should be interpreted by physicians who are familiar with transplant related peculiarities.

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References