# Renal Sinus Invasion in Renal Cell Carcinoma

## *RENAL HÜCRELİ KARSİNOMDA RENAL SİNÜS İNVAZYONU*

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**Summary**

**Aim:** Renal sinus contains numerous veins and lymphatics, invasion into this compartment may permit dissemination of a tumor otherwise regarded as renal limited. In this study we examined renal sinus invasion to determine its possible prognostic importance in renal cell carcinomas (RCC).

**Material and Methods:** Thirty-five patients who underwent radical nephrectomy were reviewed. Relations of renal sinus involvement with grade, stage, tumor type, capsular invasion, microvascular invasion, renal vein invasion, tumor size, lymph node metastasis and distant metastasis are evaluated.

**Results:** Of 35 patients 16 invaded the renal sinus: 11 of 21 clear cell RCC, 3 of 11 papillary RCC, and 2 of 3 chromophobe RCC. No relation was found between tumor type and renal sinus invasion. A strong relationship was found between renal sinus invasion and grade, stage, capsular invasion, microvascular invasion, renal vein invasion, tumor size, lymph node metastasis, distant metastasis.

**Conclusion:** Renal sinus involvement was useful for predicting extra-renal involvement of RCC and could identify the prognosis of patient. Our findings suggest that renal sinus involvement should be examined in all patients with RCC.

**Key Words:** Renal cell carcinoma, Renal sinus invasion

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**Özet**

**Amaç:** Renal sinüs çok sayıda ven ve lenfatikler içerir, bu kompartman içine invazyon olması, böbrek sınırlı olarak kabul edilen tümörün yayılmasına olanak verebilmektedir. Bu çalışmada renal hücreli karsinomlarda, muhtemel prognostik önemini anlamak için renal sinüs invazyonunu inceledik.

**Materyal ve Method:** Radikal nefrektomi yapılan 35 hasta incelendi. Renal sinüs tutulumu ile grade, evre, tümör tipi, kapsüler invazyon, mikrovasküler invazyon, renal ven invazyonu, tümör boyutu, lenf nodu metastazı ve uzak metastaz arasındaki ilişki incelendi.

**Bulgular:** 35 hastanın 16'sının renal sinüsü invaze ettiği izlendi: 21 şeffaf hücreli renal hücreli karsinomun 11'i, 11 papiller renal hücreli karsinomun 3'ü, ve 3 kromofob renal hücreli karsinomun ikisi. Tümör tipi ile renal sinüs invazyonu arasında ilişki bulunamadı. Renal sinüs invazyonu ve grade, evre, kapsüler invazyon, mikrovasküler invazyon, renal ven invazyonu, tümör boyutu, lenf nodu metastazı ve uzak metastaz arasında kuvvetli ilişki bulundu.

**Sonuç:** Renal sinüs tutulumu renal hücreli karsinomun ekstra renal tutulumunu belirlemek için yararlıdır ve hastanın prognozunu belirleyebilir. Bizim bulgularımız tüm renal hücreli karsinomu olan hastalarda renal sinüs tutulumunun incelenmesi gerektiğini düşündürmüştür.

**Anahtar Kelimeler:** Renal hücreli karsinoma, Renal sinüs invazyonu

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The renal sinus consists of the concavity on the medial aspect of the kidney that contains the majority of the pelvicalyceal system and the surrounding fatty, fibrous and areolar tissues (1,2). Its medial border is the hilar plane, which extends from the most medial points on the upper and lower poles of the kidney. While the sinus lies within the confines of the kidney, it lies outside the renal parenchyma. The renal sinus is an important region, which contains lymphatics and numerous vessels (Fig 1).

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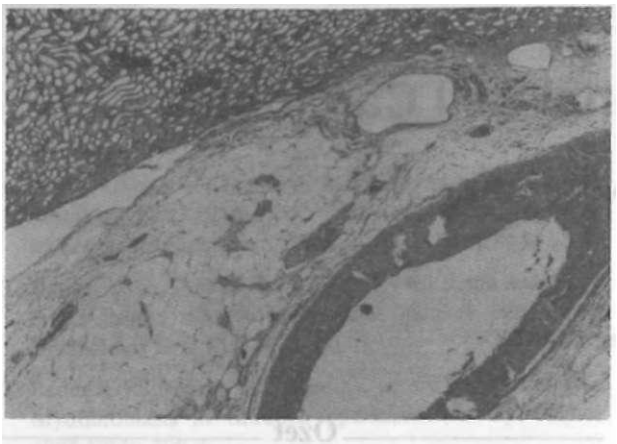

**Figure 1.** The renal sinus is the region within the kidney and contains the major branches of the renal artery and vein. There is no fibrous capsule between cortical tissue and the renal sinus.

There is a fine structure renal capsule between the renal cortex and the vascular structures of the perinephric fat. Whereas there is no capsule between the renal sinus and the columns of Bertin (2,3)- The absence of a capsule between the renal sinus and renal cortex of the columns of Bertin could enable a renal cell carcinoma to infiltrate to this vascular rich interstitial space more easily than to the perinephric fat. In practice sinus invasive tumors without perinephric fat invasion were regarded as renal limited and low stage. As a matter of fact they have already acquired metastatic capability. This finding could explain why some low stage tumors progress in few months or years (4-6).

In the present study we have examined renal sinus invasion in 35 renal cell carcinomas to determine its incidence and possible prognostic importance.

## Material and Methods

From January 1995 to March 2000 a total of 40 patient underwent nephrectomy for renal cell carcinoma. Only 35 patient who had radical nephrectomy specimen with generous renal sinus sampling were included in this study. The histological grading of the tumor was done according to the nuclear grading method of Fuhrman et al (7). Tumor classification and pathological staging procedures were done according to T N M classification of the UICC (8,9). A11 pathological slides were retrospectively reviewed for the presence or absence of renal sinus invasion, microvascular and renal vein invasion. The existence of renal sinus invasion was defined as invasion of sinus structures, fat and vascular structures. Simple protrusion of encapsulated tumor into the sinus or the presence of tumor in the pelvicalyceal lumen without infiltration of its wall, were not considered to represent sinus invasion. Microvascular invasion was considered present when tumor was seen in a vessel, that is at least one or more endothelial cells or the tunica media of the vessel were recognised to surround a neoplastic cell group.

Statistical significance of observed differences was assessed by the chi-square test or Fischer's exact test. The criterion for statistical significance was $p<0.05$.

## Results

Mean age at diagnosis was 54.1 ±14.7 years (range 15-80 years). There were 26 men (74.3%) and 9 women (25.7%). 21 patients had clear cell carcinoma, 11 cases had papillary renal carcinoma, and 3 cases had chromophobe renal cell carcinoma. Of 35 patients 9 patients had lymph node metastasis while only 6 patient had distant metastasis during follow-up period. There was a large variation in tumor diameter from 2cm to 15cm. A11 cases were evaluated for renal sinus invasion. Only 16 cases found to invade the renal sinus. Renal sinus invasion increased with increasing tumor size (pO.OOl). The longest diameter of tumors in sinus invasive carcinomas were approximately 8.4 ± 3.1cm, whereas it was 3.8 ± 2.4 cm in non invasive tumors. Microscopically all sinus-invasive carcinomas infiltrated the renal sinus fat and surrounded large vascular structures (Fig 2,3). Tumor cells also directly extended into the lumen of thin-walled sinus veins in 8 of 16 cases. Only 2 of 6 carcinomas invading the lumen of sinus veins also had main renal vein involvement. In 11 of 16 cases only focal invasion through the renal sinus was observed. Statistically no relation was found between tumor type and renal sinus invasion whereas renal sinus invasion was most common in clear cell renal cell carcinoma. Compared with clear cell renal cell carcinomas that did not invade the renal sinus, sinus invasive carcinomas were larger, frequently showed renal capsule invasion and renal vein, mi-

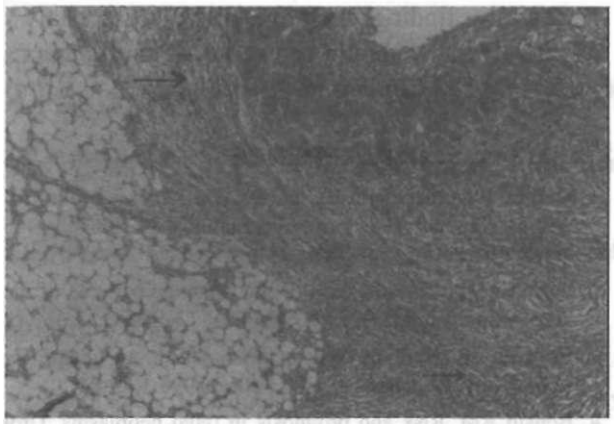

**Figure 2.** Tumor cells diffusely infiltrated the adipose tissue in sinus and these cells infiltrated the wall of the large vessel in the renal sinus.

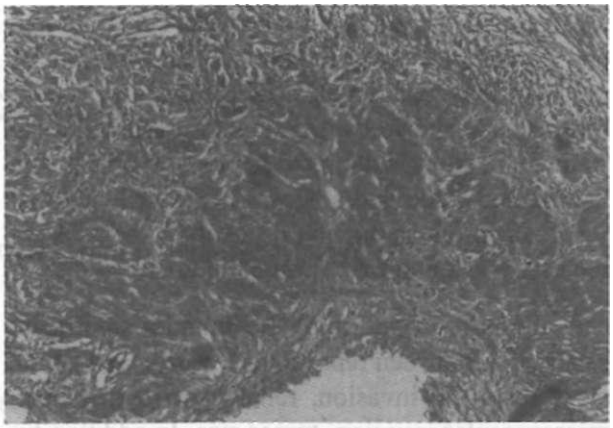

**Figure 3.** Small islands of tumor cells were scattered throughout the wall of large artery.

crovascular invasion. As well they showed higher grades than carcinomas without sinus invasion. The correlation between the presence or absence of microscopic sinus invasion and other prognostic variables were shown in Table 1. As shown in table 1 a strong relationship between renal sinus invasion and grade, stage, capsular invasion, microvascular invasion, renal vein invasion, lymph node metastasis, distant metastasis were found.

## Discussion

Renal cell carcinoma is well recognised as a malignancy with an unpredictable course. In many cases staging and grading are absolutely unreliable predictors in the evaluation after presumed curative radical nephrectomy. Patients with similar grade and staged tumors present a completely different outcome. Whereas stage, grade and other histologic parameters are important in renal cell carcinoma as prognostic factors. Tumors confined to the kidney obviously have a better prognosis (4-6,10). Pathological tumor stage reflecting the anatomical extent of the tumor was reported to be the most important variable determining survival. Also tumor grade was correlated with clinical outcome (4-6).

Although there is no doubt that these histological parameters certainly provide independent prognostic information, the outcome after surgery remains uncertain and attempts to find better prognostic criteria have not been successful or are still under investigation.

**Table 1.** Relationship between renal sinus invasion and prognostic variables

| | N | RS (-) | RS (+) | P value |
|---|---|---|---|---|
| Grade 1 | 9 | 9 | 0 | |
| Grade 2 | | | 2 | PO.001 |
| Grade 3 | | 4 | 5 | |
| Grade 4 | 9 | 0 | 9 | |
| Stage T1 | 8 | 8 | 0 | |
| Mage 1/ | 12 | | 2 | PO.001 |
| Stage T3 | 9 | 1 | 8 | |
| Stage T4 | 6 | 0 | | |
| Capsule invasion (-) | 15 | 15 | 0 | P<0.001 |
| Capsule invasion (+) | 20 | | 16 | |
| Perinephric Fat inv (-) | 23 | 18 | 5 | PO.001 |
| Perinephric Fat inv (+) | 12 | 1 | 11 | |
| Renal vein invasion (-) | 29 | 19 | 10 | P<0.01 |
| Renal vein invasion (+) | | 0 | 6 | |
| Microvascular inv (-) | 10 | 10 | 0 | PO.01 |
| Microvascular inv (+) | 25 | 10 | 15 | |
| Clear RCC | 21 | 10 | 11 | |
| Papillary RCC | 11 | 8 | 3 | p>0.05 |
| Chromophobe RCC | | 1 | 2 | |
| LN Metastasis (-) | 26 | 18 | 8 | PO.01 |
| LN Metastasis (+) | 9 | 1 | 8 | |
| Distant metastasis (-) | 29 | 19 | 10 | P<0.01 |
| Distant metastasis (+) | 6 | 0 | 6 | |

In nephroblastoma invasion of renal sinus is the most important site of extension and when present it is associated with a higher incidence of relapse (3,11,12). The prognostic importance of mi-

croscopic invasion through the renal sinus in renal cell carcinomas was studied only in two reports (13,14). They found that those cases with renal sinus invasion showed larger tumors, exhibited more frequent renal capsule, renal vein involvement, and had higher grade and stages. They concluded that renal sinus invasion could identify the risk of metastasis even in renal limited tumors.

Similarly in our study we found a significant association between renal sinus invasion and grade, stage, capsular invasion, renal vein involvement, microvascular invasion, tumor size. In addition tumors with renal sinus invasion were tend to show higher incidence of lymph node and distant metastasis. In practice in renal cell carcinomas, a renal sinus invasion criterion is not used in T N M staging system (8,9). But it is very important to sample renal sinus in paediatric renal neoplasms in order to discriminate stage I tumors from stage II tumors. With its rich vascularity renal sinus is an important region for tumor cells to leave the kidney. If renal sinus invasion criterion is not used in staging system of renal cell carcinomas, sinus invasive tumors could be regarded as low-stage and renal limited. In several previous studies, it has been reported that patients with stage I renal cell carcinoma had showed 17 to 35 percent metastasis in 5 years after nephrectomy (4,5). The possible reason of metastasis in these cases with stage I renal cell carcinomas could be explained by the possible renal sinus invasion. Recently it has been recommended by participants of the recent UICC/AJCC workshop on renal cell carcinoma to sample renal sinus generously in radical nephrectomies (8,14).

We concluded that renal sinus invasion is useful for predicting extra-renal involvement of renal cell carcinoma and could identify the prognosis of patient. Our findings therefore suggest that renal sinus involvement should be examined in all patients with renal cell carcinoma.

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