

# **Peroperative Staging of Renal Carcinoma**

## *A methodologic comparison*

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### ABSTRACT

Angiography, computed tomography and ultrasonography were compared with respect to staging of renal carcinoma in 41 patients with 46 renal tumours. Angiography and ultrasonography gave correct staging in 52 % and 48 %, respectively, while correct staging was achieved with computed tomography in 80 % of the tumours.

### INTRODUCTION

Staging is one of the fundamental guidelines for the management and prognostic evaluation of neoplasms, including renal cancer. Critical factors for accurate clinical staging of renal carcinoma are extension through the renal capsule with invasion of perinephric fat, invasion of Gerota's fascia or adjacent organs, thrombotic tumour extension into the renal vein or inferior vena cava, involvement of regional lymph nodes and general dissemination.

Urography and angiography currently are basic procedures in the diagnosis of renal carcinoma. Assessment of perirenal tumour extension and of local metastasization with these methods often is uncertain, however (6). On the other hand, selective injection of a large dose of contrast medium into the renal artery (2), possibly supplemented with cavography (9) gives high diagnostic reliability with respect to extension of tumour to the renal vein or inferior vena cava.

In recent years the noninvasive techniques of computed tomography (1,6,7,12, 15) and ultrasonography (3,4) have also been used in the diagnosis of renal tumours. The present report concerns the possibilities for correct preoperative (clinical) staging of renal carcinoma by means of renal angiography (RA), computed tomography (CT) and ultrasonography (US). In a series of patients, the findings at these examinations were compared with observations made by the surgeon and/or pathologist.

## MATERIAL AND METHODS

The series comprised 41 patients with renal carcinoma investigated in the period December 1977 - June 1982. There were 28 men and 13 women, with mean age 60.2 (range 34-73) years. Five of the patients had bilateral carcinoma. The total of investigated kidneys thus was 46, involving the right kidney in 28 cases and the left in 18. In 38 patients extrafascial nephrectomy or, when there was bilateral disease, kidney resection was performed. The other three patients died soon after diagnosis and were studied *post mortem*.

For staging of the tumours we used a modification of the classification proposed by Robson et al. (11), as shown in Table 1. The study was restricted to clarification of the intraabdominal extent of tumour, and disseminated or distant metastases were disregarded in the present connection.

Table 1. Staging classification of renal adenocarcinoma according to Robson et al. (11)

Stage	Tumour
I	within kidney capsule
II	invading perinephric fat (confined to Gerota's capsule)
III a	involving renal vein or inferior vena cava
III b	involving regional lymph nodes
III a + b	involving renal vein or vena cava <u>and</u> regional lymph nodes
IV	invading adjacent organ(s)

RA and CT were performed in all cases, and 35 tumours were also studied with US.

RA was performed with conventional technique, injecting contrast medium into the aorta and selectively into the renal arteries. Evaluation of the renal vein was facilitated by injection of 30-50 ml Angiografin (306 mg I/ml) selectively into the renal artery. On any suspicion of tumour thrombus in the renal vein, cavography was performed with standard technique.

For CT a Delta 50 FS scanner (Ohio Nuclear) was used, with exposure time 18 s, slice thickness 13 mm and beam width 5 mm. CT scanning was performed over the kidneys before and after intravenous injection of contrast medium (Conray<sup>R</sup> meglumine, 282 mg I/ml).

US over the kidneys was performed in the first 2 years with a Sono Diagnost

B 50 (Philips) grey-scale apparatus, and after 1979 we used an ATL Mark III dynamic sector-scan apparatus with a 3.0 MHz transducer.

## RESULTS

In Table 2 the pathologic and angiographic stagings are compared. Stage I tumours were correctly evaluated with RA in most patients, while more advanced tumours often were understaged. RA correctly staged the tumour in altogether 52 % of the cases, with understaging in 41 % and overstaging in 7 %

Table 2. Angiographic staging of renal tumours compared with pathology staging

Operation/autopsy		Renal angiography					
group	n	I	II	IIIa	IIIb	IIIa+b	IVa
I	22	19	1	1			1
II	5	4	1				
IIIa	3	2	1				
IIIb	4	4					
IIIa+b	2			2			
IVa	10	1	1	4			4
Total	46	30	4	7			5
Understaging	19/46 (41 %)						
Overstaging	3/46 ( 7 %)						
Correct staging	24/46 (52 %)						

With US the tumour staging was correct in only 48 % of cases (Table 3), mainly in stage I. There was 9 % overstaging and 43 % understaging. Difficulties in demonstrating local tumour involvement were encountered at US mainly when there was extension of tumour in dorsal direction.

CT (Table 4) gave correct staging in 80 % of the tumours, but understaging in 11 % and overstaging in 9 %. CT thus was superior to the other procedures in providing information not only of the extent of tumour within the kidney, but also concerning its relations to the perinephric fat and adjacent organs. Moreover, CT was better than the other methods in detection of nodal metastases.

In the course of this study we received a strong impression that CT in many cases can obviate the need for angiography in the preoperative diagnosis and staging of solid renal tumours.

Table 3. Ultrasonographic staging of renal tumours compared with pathology staging

Operation/autopsy		Ultrasonography						
group	n	0	I	II	IIIa	IIIb	IIIa+b	IVa
I	17	2	14	1				
II	4		1	1				2
IIIa	2		1	1				
IIIb	4		3			1		
IIIa+b	2	1		1				
IVa	6		2	2		1		1
Total	35	3	21	6		2		3
Understaging	15/35 (43 %)							
Overstaging	5/35 ( 9 %)							
Correct staging	17/35 (48 %)							

Table 4. Computed tomography staging of renal tumours compared with pathology staging

Operation/autopsy		Computed tomography						
group	n	0	I	II	IIIa	IIIb	IIIa+b	IVa
I	22	1	18	2		1		
II	5		1	3				1
IIIa	3			2	1			
IIIb	4		1			3		
IIIa+b	2						2	
IVa	10							10
Total	46	1	20	7	1	4	2	11
Understaging	5/46 (11 %)							
Overstaging	4/46 ( 9 %)							
Correct staging	11/46 (80 %)							

## DISCUSSION

The results of this study showed CT to be the most reliable method for staging of renal carcinoma with respect both to perirenal extension of the tumour and to presence of local metastases. Understaging was recorded in 41 % of the tumours at RA and in 43 % at US. The inadequacy of angiography and ultrasonography for staging of these renal tumours accords with previous experience (5, 6,10). For evaluation of tumour growth to the liver, real-time US is valuable, and movements of surrounding tissues in relation to the tumour can be assessed, especially on deep expiration and inspiration.

CT overstaged the tumour in four cases (9 %). The reason was that these tumours lay against adjacent structures and could not be clearly separated from them at CT. Enhanced diagnostic accuracy with CT in such cases may be expected from the more modern equipment that permits rapid serial imaging after a bolus injection of contrast medium, thinner slices and higher spatial resolution.

Tumour thrombi in the renal vein and vena cava can be detected both with CT (3,4,7,14) and with US (3,4). In the present series venous thrombi were found in only five cases, but subsequent experience has confirmed these diagnostic possibilities. Venography, however, is often valuable if tumour thrombus in the caval vein is visualized by US or CT, to define the cranial limit of the thrombus preoperatively (8,13).

Computed tomography thus permits more accurate staging of renal carcinoma than do renal angiography and ultrasonography as regards both perirenal extension of tumour growth and presence of local metastases. With computed tomography, however, there is a tendency to overstaging. Ultrasonography can be useful especially for judging the relation of the tumour to the liver when the tumour is located in the upper part of the right kidney.

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