

## T2 T3a

1

. . .

: T2 T3a CT .

: 114 (T2, n=40), TNM T2 T3a (T2, n=38), (T3a, n=36) CT , 가

: (p<0.05), 가 3 cm , 가 (p<0.05), 가 (p>0.05).

: T3a T2 CT , T3a T3a .

85% - 90% 217

(1). TNM 가 T2 T3a 114 가

CT ) , 가 ( .

(2 - 5). 38 - 77 ( 55 ) , 80:34 . CT 9800 Quick (GE, Milwaukee, U.S.A.) Somatom plus S (Siemens, Erlangen, Germany) 60 Rayvist 300 mg (Schering, Berlin, Germany) 3 cc 120 cc

(overstaging) , (6, 7). 가 , T2 8 - 10 mm, 4 mm

T3a 가 가 (4, 7). T2 T3a CT CT 2

1996 12 2000 3

T2 T3a( ) T2 ( )

( ) .

2001 1 2 2001 5 27

(Gerota's fascia) ,

: T2 T3a  
 가 (perinephric strand) cm, 3.1 cm, 3.5 cm  
 가 , , (p < 0.05).  
 가 , 3 cm 24 (67%),  
 , 22 (58%) 9 (23%)  
 CT 가 가  
 가 ' 3 cm ' ' 3 cm ' ,  
 (upper pole) (lower pole)  
 pole) 3  
 3 cm  
 CT 15 (38%) 23 (64%)  
 가 가 (p = .022)  
 CT 가 22 (59%)  
 가 (p = .598). T2 T3a  
 CT 가 (p = .102) (Fig. 1).  
 가  
 19 (53%), 22 (61%) 16 (42%),  
 19 (50%) 가  
 5 (13%), 12 (30%) (p  
 < 0.05). T2 T3a  
 (p = .007) 가 (p = .033)  
 T3a (Fig. 1).  
 CT T2 T3a  
 Table 2  
 가 (78%), 가 가 (53%).  
 가 73% 가  
 가 53 % 가  
 가 67% 가 가 56  
 % 가  
 CT  
 Table 3  
 가 T2 T3a  
 가 60%  
 60% 50%  
 60%  
 1.8

**Table 1.** Comparison of CT Findings in Intact Capsule, Capsule Involvement, and Capsule Penetration Group

CT Findings	Intact Capsule (n = 40)	Capsule invasion (n = 38)	Capsule penetration (n = 36)
Margin			
Irregular	12 (30%)	20 (53%)	28 (78%)
Smooth	28 (70%)	18 (47%)	8 (22%)
Bulging > 3 cm			
Beyond renal contour	9 (23%)	22 (58%)	24 (67%)
Collateral Vessels	15 (38%)	22 (58%)	23 (64%)
Thickening of			
Gerota 's fascia	5 (13%)	16 (42%)	19 (53%)
Perinephric strand	12 (30%)	19 (50%)	22 (61%)

**Table 2.** Sensitivity, Specificity and Accuracy of Variable CT Findings in Differentiating T2 from T3a

CT findings	Sensitivity	Specificity	Accuracy
Irregular Margin	78%	59%	65%
Bulging > 3 cm			
beyond renal contour	67%	60%	62%
Collateral Vessels	64%	53%	56%
Thickening of			
Gerota 's fascia	53%	73%	67%
Perinephric strand	61%	60%	61%

**Table 3.** Sensitivity, Specificity and Accuracy of Variable CT Findings in Differentiating Capsule Penetration (T3a) from Capsule Invasion (T2)

CT findings	Sensitivity	Specificity	Accuracy
Irregular Margin	78%	47%	62%
Bulging > 3 cm beyond renal contour	67%	42%	54%
Collateral Vessels	64%	42%	53%
Thickening of Gerota 's fascia	53%	58%	55%
Perinephric strand	61%	50%	55%

가 (8 - 10).

, CT

가 , 가 가  
Johnson (2) CT  
91% , T2 T3a

**Fig. 1.** Comparison of CT scan findings renal cell carcinoma in intact capsule group (T2), capsule involvement group (T2), and capsule penetration group (T3a).

CT scan of renal cell carcinoma with intact capsule (T2). Although tumor (arrows) has grown out from renal contour, bulging beyond renal contour is less than 3 cm, tumor margin is smooth, and any of peritumoral collateral vessels, thickening of Gerota 's fascia, perinephric strand are not noted (**A**). In another intact capsule (T2) case, peritumoral collateral vessels (arrow), Gerota 's fascia thickening, and minimal perinephric strand (arrowhead) are noted, but the tumor has relatively smooth outer margin (**B**).

CT scan of renal cell carcinoma with capsular involvement (T2). Tumor has grown more than 3 cm beyond renal contour, and peritumoral collateral vessels (black arrows) and perinephric strands (white arrows) are noted. Tumor has smooth and regular margin (**C**).

CT scan of renal cell carcinoma with capsular penetration (T3a). Tumor has grown more than 3 cm beyond renal contour, and peritumoral collateral vessels (black arrows), perinephric strands (white arrows), and thickening of Gerota 's fascia (arrowheads) are noted. Compared with B, tumor margin is lobulated and irregular (**D**).

: T2 T3a  
 CT MR  
 (11 - 13). Masuda 82%, T3a 78%  
 (14) CT 82%, 82%, ( 86%, T3a 가 .  
 97%, 95%), ( 80%, 98%, T3a 가 .  
 96%) T2 T3a  
 T3a , 5 Masuda (14) 80% Masuda (14)  
 77%, 91% T1 가  
 가 , T1 T3b  
 (2). T2 T3a 가  
 가 가 CT T2 T3a CT  
 가 , , T3a  
 가 , T2 CT  
 가 (T2) 가 (T3a)  
 T2 T3a 가  
 가 , 가  
 (15, 16). CT T2 T3a  
 가 , (7) 9 5  
 T3a .  
 3 cm , , ,  
 가 가 CT  
 가 T2  
 . Johnson (2) CT 가  
 T2 가  
 T3a T2  
 Gleb (8) 가  
 Birnbaum  
 (17) 가 가  
 가  
 T3a  
 (7) I ,

1. Boring CC, Squires TS, Tong T. Cancer statistics, 1993. *CA Cancer J Clin* 1993; 43:7-26
2. Johnson CD, Dunnick NR, Cohan RH, Illescas FF. Renal adenocarcinoma: CT staging of 100 tumors. *AJR Am J Roentgenol* 1987;148: 59-63
3. Cronan JJ, Zeman RK, Rosenfield AT. Comparison of computed tomography, ultrasound and angiography in staging renal cell carcinoma. *J Urol* 1982; 127:712-714
4. , , , , CT 1986; 22:879-884
5. Zeman RK, Cronan JJ, Rosenfield AT, et al. Renal cell carcinoma: dynamic thin section CT assesment of vascular invasion and tumor vascularity. *Radiology* 1988; 167:393-396
6. Fein AB, Lee JKT, Balfe DM, Heiken JP. Diagnosis and staging of renal cell carcinoma: A comparison of MR imaging and CT. *AJR Am J Roentgenol* 1987; 148:749-753
7. , , , , , CT 1993; 29:800-804
8. Gleb AB, Shibuya RB, Wiss LM, Medeiros LJ. Stage I renal cell carcinoma: a clinicopathologic study of 82 cases. *Am J Surg Pathol* 1993; 17:275-286
9. McNicholas DW, Segura JW, Deweerd JH. Renal cell carcinoma: long term survival and late recurrence. *J Urol* 1981; 126:17-20
10. Bell ET. A classification of renal tumors with observations on the frequency of the various types. *J Urol* 1938; 39:238-240
11. Semelka RC, Shoenut JP, Magro CM, Kroecker MA, MacMahon R, Greenberg HM. Renal cancer staging: comparison of contrast-enhanced CT and gadolinium-enhanced fat-suppressed spin-echo

- and gradient-echo MR imaging. *J Mag Reson Imaging* 1993;3:597-602
12. Choyke PL. Detection and staging of renal cancer. *Mag Reson Imaging. Clin North Am* 1997;5:29-47
  13. Pretorius ES, Siegelman ES, Ramchandani P, Cangiano T, Banner MP. Renal neoplasms amenable to partial nephrectomy: MR imaging. *Radiology* 1999; 212:28-34
  14. Masuda F, Kurauchi H, Imanaka K, Kawahara M, Nakajo H, Machida T. Accuracy of computed tomography in the staging of renal cell carcinoma. *Jpn J Urol* 1989; 80:192-196
  15. Levine E. *Malignant renal parenchymal tumors in adults*. In pollack HM. *Clinical Urography*. Philadelphia: WB Saunders, 1990:1216-1291
  16. Weyman PJ, McClennan BL, Stanley RJ, Levitt RG, Sagel SS. Comparison of computed tomography and angiography in the evaluation of renal cell carcinoma. *Radiology* 1980;137:417-424
  17. Birnbaum BA, Bosniak MA, Krinsky BA, Cheng D, Waisman J, Ambrosino MM. Renal cell carcinoma: correlation of CT findings with nuclear morphologic grading in 100 tumors. *Abdom Imaging* 1994;19:262-266

## Usefulness of CT Scan in Differentiation of T2 from T3a in Renal Cell Carcinoma<sup>1</sup>

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**Purpose:** To assess the usefulness of CT scanning in the differentiation of stage T3a from T2 in renal cell carcinoma.

**Materials and Methods:** Among patients with pathologically proven renal cell carcinoma, 114 at stages T2 and T3a were divided into three groups, as follows: intact capsule (T2) n=40, capsular involvement (T2) n=38, and capsular penetration (T3a) n=36. By referring to contrast-enhanced CT scans, we retrospectively compared the groups in terms of tumor margin, the frequency with which a tumor bulged more than 3 cm beyond the renal contour, the presence or absence of peritumoral collateral vessels, thickening of Gerota's fascia, and perinephric strands.

**Results:** An irregular margin was more common in the capsular penetration group than in the other two groups ( $p < 0.05$ ). With regard to frequency of tumor bulging, the presence of peritumoral collateral vessels, thickening of Gerota's fascia, and perinephric strands, these characteristics were more frequently noted in the capsular penetration group (T3a) and capsular involvement group (T2) ( $p < 0.05$ ) than in the intact capsule group. The difference between the capsular penetration group (T3a) and the capsular involvement group (T2) was not significant, however ( $p > 0.05$ ).

**Conclusion:** In determining the tumor stage of renal cell carcinoma, CT is not helpful in differentiating between a tumor with capsular penetration (T3a) and one with capsular invasion (T2), though differentiation of the T3a stage from the T2 stage, without capsular invasion, is reliable. When a tumor has an irregular margin, however, the possibility that it is at stage T3a should be considered.

**Index words :** Kidney, CT

Kidney neoplasm, staging

Kidney neoplasm, diagnosis

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