

CT STAGING OF THE UPPER URINARY TRACT UROTHELIAL TUMORS

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Summary. *CT diagnosis of the upper urinary tract transitional cell carcinomas (UUTCC) was evaluated. The aim of the study was to investigate which are the most reliable radiological signs for making difference between infiltrating and non infiltrating UUTCC.*

Thirty eight patients with the histologically confirmed UUTCC and preoperatively performed CT scan were evaluated. CT was diagnostically sensitive in 100% of cases. Primary tumor was correctly staged in 52.6% of cases and nodal disease was recognized in 55% of cases. The most important radiological sign was filling defect (present in 28-73.6%). Non infiltrating neoplasm was most frequently present when the filling defect was isolated radiological sign (53.8%). The most important signs for deep infiltrating neoplasms are: infiltration of the kidney, distortion of the contour and renal mass effect. CT is the best single method but still not sufficiently precise for the preoperative staging of UUTCC.

Key words: *Computer tomography, urothelial cancer, diagnosis*

Introduction

Upper urinary tract transitional cell carcinoma (UUTCC) is the most frequent neoplasms of the upper urothelium although these neoplasms are not so common in oncological pathology. They are especially frequent in the areas of Balkan endemic nephropathy, according to different data, four to ten times more than in non endemic areas (1-3). UUTCC are most frequently discovered by intravenous urography (IVU), retrograde pyelography (URP), urinary cytology and additionally by ureteroscopy and biopsy, as well as by CT of the renal pelvis (1). Due to increased incidence in the areas of Balkan Endemic Nephropathy, and because of the evolving concept of organ preservation even in cases with non absolute indications, it seems essential to determine the reliability of the imaging methods (4). The aim of the study is to evaluate the most frequently used radiological signs of UUTCC on CT in order to determine place of CT and it's usefulness in diagnosis and surgical treatment.

Materials and methods

Thirty eight patients with the diagnosis of UUTCC were evaluated. Out of them 26 were males and 12 females. The average age was 63.7 years with the range 57 to 78 years. Neoplasms of the renal pelvis were present in 23 cases and in 13 cases calyceal neoplasms. In two cases disease was multifocal. All patients were operated and the diagnosis was histologically confirmed. The operation was extrafascial nephrectomy and ureter-

ectomy with the lymph node biopsy in 36 patients and neoplasm and node biopsy in 2 patients without the operation because of the extensive disease. The material was collected during eight years 1996-2004 (UUTCC were more frequent but cases with both CT and lymph node biopsy were not). In all cases a routine diagnostic procedure with IVU and URP was performed. Native and contrast CT of the renal pelvis was done in all of them. In all the patients procedure started without contrast and after primary anatomic evaluation of the kidneys contrast medium was injected and arteriographic and parenchymatous capture of the contrast media was followed. There are several radiological signs that were evaluated: filling defect (occupation of the lumen by the tumor), infiltration of the renal parenchyma (local decrease in contrast enhancement of the renal parenchyma), renal mass effect (similar like in renal cell carcinomas), peripelvic (or periureteral) strand (increase in periureteral density), ipsilateral hydronephrosis, parenchymal distortion (lose of the reniform contour) and lymphadenopathy. The most important radiological signs are shown in Figure 1. CT was mainly performed with the 5 mm thick slices with a five generation CT or with the spiral CT device (Somatom H&Q and Somatom plus 4, Siemens). In all patients radiological signs were evaluated and its occurrence according to the tumor stage and grade. Patients were divided in two groups: non infiltrating (pT0-pT2) and infiltrating (pT2-pT4) (5). Statistical evaluation was performed with the Chi square test.

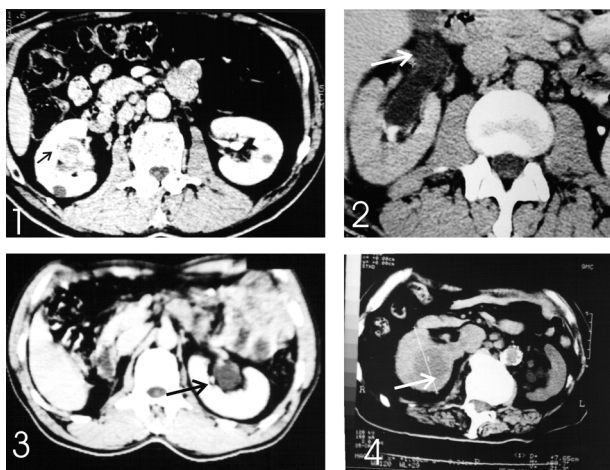


Fig. 4. The most important radiological signs for the staging of UUTCC. (1) infiltration of the renal parenchyma; (2) periureteral strand; (3) filling defect; (4) renal mass.

Results

In all patients the diagnosis of the UUTCC was confirmed. The primary tumor was detected by CT in 100% patients. IVU was successful in discovery in 22/38 (57.8%) and additional contribution of URP made a situation clear in next 9 cases- that means 30/38 (78.9%). In additional 8/38 cases (21%) CT made a contribution to the establishment of diagnosis. The pathologic stage of the neoplasms is shown in Table 1. The distribution of the tumor grades is shown in Figure 2. Although tumors with the intermediate malignancy grade were the most frequent, there was a significant number of positive lymph nodes. Both the low stage and the high stage neoplasms have equal distribution. The global incidence of radiological signs is shown in Figure 3. The filling defect is the most frequent sign of UUTCC (73.6%). Radiological signs in each stage of the neoplasm are shown in Table 2. The most important sign of the non deep infiltrating neoplasm is a "pure" filling defect in the renal pelvis (53.8%). Disturbance of the renal contour and renal mass are signs of the high stage neoplasms. Total pT staging for UUTCC was correctly performed in 20/38 (52.6%) of cases, nodal status was correctly staged in 21/38 (55%). The specificity was 16/20 (80%) and sensitivity 5/8 (62.5%) (Figure 4). Renal mass effect, infiltration of the renal parenchyma and distortion of the reniform contour are commonly associated with the high the high stage and grade UUTCC (Table 3).

Table 1. Patohistological findings in patients with UUTCC

pT Stage	N-	N+	Total
pT0	0	0	0
pT1	4	0	4
pT2	13	2	15
pT3	8	4	12
pT4	5	2	7
Total	30	8	38

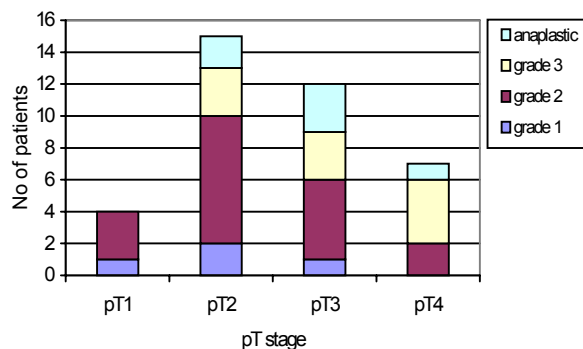


Fig. 2. Tumor grade in different stages
* In cases with the mixed histological characteristics (for example UUTCC grade 2 with the focal grade 3), more malignant potential was considered as a representative

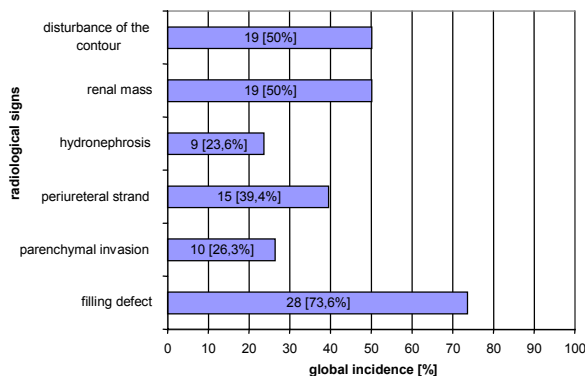


Fig. 3. Global incidence of radiological signs in patients with UUTCC

Table 2. Radiological signs of UUTCC according to the tumor stage

CT	pT0-pT2**	pT3-pT4
Filling defect	19 (67.8%)	9 (32.2%) *
Renal parenchymal invasion	2 (20.0%)	8 (80.0%) *
Periureteral strand	3 (20.0%)	12 (80.0%) *
Hydronephrosis	5 (55.5%)	4 (44.5%)
Renal mass effect	3 (15.8%)	16 (84.2%) *
Disturbance of the renal contour	4 (21.0%)	15 (78.9%) *

** According to Baron et al. (5) it is impossible to make a more precise difference

* Statistically significant difference

• In 10/19 (53.8%) low stage renal neoplasms only filling defect was visible

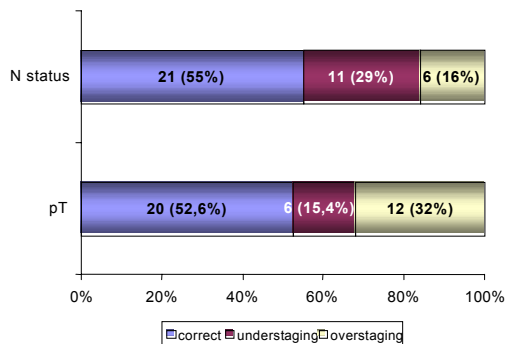


Fig. 4. pT and N staging of the UUTCC

Table 3. Radiological signs in dependence on tumor grade

CT	grade 1-2	grade 3-4
Filling defect	17/28 (60.0%)	11/28(40.0%)*
Renal parenchymal invasion	2/10 (20.0%)	8/10 (80.0%)*
Periureteral strand	5/15 (33.3%)	10/15(66.6%)
Hydronephrosis	3/9 (33.3%)	6/9 (66.6%)
Renal mass effect	4/19 (21.0%)	15/19(80.0%)*
Disturbance of the renal contour	2/19 (10.5%)	17/19(89.5%)*

* Statistically significant difference

Discussion

Our results confirmed that there is a limited role of CT in staging of UUTCC. This role can be evaluated from two points of view. The first is a contribution to the diagnosis, and the second one is a contribution to the staging of disease i.e. possibilities to exert an influence on the change of the treatment plan.

The detection rate was 100% in our series and it is slightly better than in the series previously reported. Other authors reported detection rate from 60-90% (6,7). A lower percent of the detection rate was recognized in the previous series mainly due to suboptimal CT scans. Early generation machines, inadequate contrast material, or too wide slices are frequently responsible (8). In our series CT was helpful in establishing diagnosis in 21% of cases. When the kidney affections are considered, in the majority of cases these are renal parenchymal and urothelial neoplasms. There is a great clinical difference between them. Renal parenchymal neoplasms are in almost 30% of cases without haematuria especially when they are small. Urothelial neoplasms have much more frequently expressed haematuria (80%) or even more, so detection is always performed with the special care (1). Long time used contrast diagnostic methods (IVU+URP) are still very sensitive in cases with urothelial neoplasms. IVU and URP have sensitivity in our series of 79% and in other series even more, up to 100% (6,9,10). There are also possibilities for the detection come from ureteroscopy and biopsy, as well as urinary cytology, with the one sided specimen of urine (11-14). The difference between routinely performed diagnostics and CT is not so great to prove routine CT diagnostics in every case. CT remains as a good method for nonconclusive cases or pure functioning kidneys.

The second problem is the preoperative staging. We found correct preoperative staging in 37% of low stage urothelial neoplasms and 68.4% for the high stage UUTCC. The most important radiological sign of the superficial UUTCC is the sole presence of the filling defect. There is a confirmed data that CT is unable to make a difference between pTa up to pT2 UUTCC (5). All of them are considered as "low stage", but therapeutically, there is a great difference between them. pTa and pT1 UUTCC are possible candidates for conservative treatment (endoscopy) or nephron sparing surgery, but pT2 neoplasms are never considered as convenient for the treatment of that kind. The tumor stage is in numerous investigations confirmed as an independent predictor of recurrence and result of conservative approach is not satisfactory (15-17). If the whole series is consid-

ered, pT2 stage is more frequent than lower stage UUTCC (15 compared to 4, out of 38 patients). It seems consequent to state that low stage neoplasm can't be diagnosed by CT, so it remains that nephron sparing surgery must be kept for cases with absolute indications for this type of treatment. Additional help may be expected from biopsy and significant concordance between the grade and the stage of the neoplasm but this is a still developing concept.

High grade neoplasms have infiltrative nature, so some radiological signs are more visible in high grade neoplasms both in our as well as in other series (18). Although indirect sensitivity of CT regarding the tumor grade is present, the fact still remains that in majority of cases these patients are not suitable for the anything else except radical operation because of the advanced tumor stage. We are able to meet intermediate grade high stage UUTCC in clinical praxis, but low stage high grade UUTCC are really exceptional that also diminishes clinical utility of CT.

The most important radiological sign of high stage UUTCC is the renal mass effect and can be confused with renal parenchymal neoplasms. Infiltration of the renal parenchyma renal mass effect and disturbance of the renal contour was present in around 80% of deep infiltrating neoplasms. We have to keep in mind that there are two important signs of parenchymal tumor alteration of the renal contour and renal mass (18). When the infiltration is present without them diagnostic direction is to the urothelial neoplasm, if not, additional diagnostic tools are needed. Depth of infiltration is less important for surgery than for survival. High stage (pT4) neoplasms were rarely enough difficult to give up from the surgery only in 1 case.

Hydronephrosis was not important for surgery, but the periureteral strand was more frequently present in high stage UUTCC.

Malignant lymphadenopathy has always been hard to recognize because of macroscopically invisible malignant deposits in the lymph nodes. They are detected as individual enlargement, or bulky lymph nodes in mass, both of them with unsatisfactory sensitivity (in our series 55%). There are respectable reports that encourage routine local lymphadenectomy as a therapeutic method when a surgery is performed. It is especially successful when the lymph nodes are minimally involved in the disease (19-22). It seems reasonable to conclude that lymphadenectomy must be a routine part of the operation both in cases with a minimal for of disease or without it. If disease is minimal there is a therapeutic benefit of lymphadenectomy and systemic therapy. If there is no nodal disease necessity for systemic chemotherapy can be excluded with the great security. Lymphadenectomy of the huge metastatic nodes makes no therapeutic benefits (21, 22).

Conclusion

CT of the urothelial neoplasms is the best single method for the staging of UUTCC. It can be success-

fully used in the preoperative evaluation of a non functioning kidney, making a difference between unclear filling defects (uric acid stone, papillary necrosis etc. versus UUTCC), differentiating between UUTCC and parenchymal neoplasms as well as evaluation of the retroperitoneal lymph nodes. CT of the UUTCC is not

advocated as a primary guide, but it is very useful combined with other methods of preoperative evaluation (ureteroscopic biopsy, tumor grade etc.), in planning cases for the nephron sparing surgery without absolute indications for this kind of treatment.

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ODREDJIVANJE STADIJUMA TUMORA GORNJEG UROTELIJUMA KOMPJUTERIZOVANOM TOMOGRAFIJOM

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Kratka sadržaj: Proučavana je dijagnoza tumora gornjeg urotelijuma pomoću kompjuterizovane tomografije (CT). Zadatak istraživanja bio je da analizira najznačajnije radiološke znake pomoću kojih se može učiniti diferencijacija infiltrativnih od ne-infiltrativnih tumora gornjeg urotelijuma.

Analizirano je 38 bolesnika sa histološki dokazanim tumorom gornjeg urotelijuma kod kojih je preoperativno učinjen CT. CT je otkrio oboljenje u 100% slučajeva. Primarni tumor je korektno procenjen u 52,6% a status limfnih žlezda u 55% bolesnika. Najznačajniji pojedinačni znak neinfiltrativnih tumora bio je prisustvo defekata u punjenju koje postoji kao samostalno kod 53,6% bolesnika. Najznačajniji znaci duboko infiltrativnih tumora su infiltracija bubrega, poremećaj konture bubrega i bubrežna masa. CT nije metoda od presudnog značaja za dijagnozu i lečenje tumora gornjeg urotelijuma.

Ključne reči: Kompjuterizovana tomografija, tumor urotelijuma, dijagnoza