The Diagnostic Accuracy of NBI Assisted Digital Flexible Ureteroscopy in Upper Tract Urothelial Carcinomas

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Abstract

Introduction and Objectives. Digital flexible ureteroscopy (FURS) became an important diagnostic and follow-up procedure in upper urinary tract urothelial carcinoma (UTUC). Even so, many characteristics that can suggest nature of a lesion still represent a difficult challenge. The endpoint of the trial was to determine the diagnostic accuracy of NBI assisted digital flexible ureteroscopy versus standard FURS (WL) in upper tract urothelial carcinomas.

Materials and Methods. White light (WL) and NBI-assisted digital FURS were performed in 65 patients, admitted for suspicion of UTUC. The inclusion criteria consisted of unilateral hematuria during cystoscopy, abnormal urinary cytology and pyelocaliceal system filling defects according to CT results. Patients with invasive UUT according to CT results were excluded.

The investigation protocol included abdominal ultrasound, cytology, contrast CT scan and cystoscopy. The endoscopic examination use digital white light flexible ureteroscopy, followed by the NBI assessment of the renal collecting system urothelium.

Results. A total of 78 UTUC lesions (23 pTa, 37 pT1 and 18 CIS) were confirmed by pathology in 65 patients. pTa, pT1 and CIS tumors detection rates were determined for WL combined with NBI mode by comparison to the WL evaluation overall UTUC 78 lesions (100%) versus 67 lesions (85.9%); pTa 23 lesions (100%) versus 17 lesions (73.9%); pT1 37 lesions (100%) versus 35 lesions (94.5%) and CIS 18 lesions (100%) versus 15 lesions (83.3%). Detection rate was improved in WL combined with NBI mode when compared with standard FURS (100% versus 84.4%). A total of 11 (14.1%) UTUC tumors (6 pTa, 2 pT1 and 3 CIS) were solely observed in NBI. Targeted biopsies' specificity Rate of false-positive results 10.3% vs. 17.8% (WL vs. WL+NBI).

Conclusions. NBI was an important tool regarding detection because it is providing a significant diagnostic improvement during digital flexible ureteroscopy.

Key-words: digital flexible ureteroscopy, urothelial cancer, narrow-band imaging, white light.

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Introduction and Objectives

Upper urinary tract urothelial carcinomas (UTUC) represent 5-10% of total urothelial tumors. The risk factors for this type of neoplasia are mainly smoking and aromatic amines. Hereditary diseases, exemplified by hereditary non-polyposis colorectal cancer, increase the risk of UTUC.

Diagnostic methods start from a clinical suspicion often represented by macroscopic hematuria, but also the presence of detectable susceptible lesions by imaging techniques (ultrasonography) performed for other disorders. Investigations will be completed in this case, according to the recommendations of the European Urology Association, with: urographic CT examination (MRI urography in case of contraindications of CT), cystoscopy and urinary cytology (grade A recommendation).[1-4]

The endpoint of the trial was to determine the diagnostic accuracy of NBI assisted digital flexible ureteroscopy versus standard FURS (WL) in upper tract urothelial carcinomas.

Materials and Methods

A prospective analysis involving a total of 65 patients admitted for suspicion of upper tract urothelial carcinomas was performed in Urology Clinic of Saint John Clinical Emergency Hospital, between March 2014 - March 2018. The investigation protocol included abdominal ultrasound, urinary cytology, contrast CT scan and cystoscopy. The endoscopic examination was performed with digital white light FURS followed by the NBI FURS of the renal collecting system urothelium.

All suspicious areas of the urothelium were biopsied using the grasping forceps, separately for WL and NBI findings. The biopsy specimens were registered in two categories: found in both WL and NBI examination vs. observed solely in WL. The lesions were excised according to the same pathological map. All the biopsy specimens were analyzed by the pathologist.

Results

Regarding the pathological analysis of the biopsy specimens, in 27% of cases the obtained biopsy fragments were too small to provide a reliable pathological diagnosis, while benign lesions were diagnosed in 4.6% of cases. Consequently, a dependable outcome was outlined gathering a total of 78 UTUC lesions (23 pTa, 37 pT1 and 18 CIS) confirmed by pathology results in all 65 patients who finally constituted the study group of the trial. As far as the actual diagnostic accuracy achieved during WL/NBI ureteroscopy was concerned, substantial progresses were underlined while introducing the NBI supplementary findings. On a tumors related basis, significantly higher overall upper tract, pTa, pT1, CIS tumors detection rates were determined for WL combined with NBI ureteroscopy by comparison to the WL evaluation: overall UTUC 78 lesions (100%) versus 67 lesions (85.9%); pTa 23 lesions (100%) versus 17 lesions (73.9%); pT1 37 lesions (100%) versus 35 lesions (94.5%) and CIS 18 lesions (100%) versus 15 lesions (83.3%). Detection rate was improved in WL combined with NBI mode when compared with standard FURS (100% versus 84.4%). A total of 11 (14.1%) UTUC tumors (6 pTa, 2 pT1 and 3 CIS) were solely observed in NBI. Targeted biopsies’ specificity Rate of false-positive results 10.3% vs. 17.8% (WL vs. WL+NBI).

Discussions

In the past years, digital flexible ureteroscopy (FURS) became a diagnostic procedure in UTUC management, performed often in white light (WL).[5] Unfortunately, there are substantial limitations when the main goal is to find small papillary tumors or carcinoma in situ (CIS).
The latter category is recognized as difficult to identify, because it may just involve small flat areas of the urothelium solely differentiated by a redness aspect related to the increased vasculature in the submucosa. Therefore the identification of the characteristics that may suggest the nature of a lesion and obtaining biopsy specimens for a reliable pathological exam trying to eliminate any potential differential diagnoses is still a difficult challenge.

One of the most important drawbacks during UTUC diagnostic by means of conservative approach is represented by the often-poor quality of the specimens obtained by performing grasping forceps biopsies during FURS. More precisely, according to literature reports, as well as to the present study, such specimens are too small and usually don’t include muscular fibers, thus leaving doubts with regard to tumor staging evaluation. In our study, in 27% of cases it was noted that biopsy specimens were too small to provide a reliable pathological result.

These results are similar with literature data supported by Traxer O. et al study which reported same type of limitation in 26% of cases.

Narrow-band imaging (NBI) was introduced as a technological advancement that promise to provide more accuracy in observation of the upper tract mucosa, giving targeted biopsies a better chance to pathological confirmation in the same time.

There are some major issues impair the diagnostic accuracy in upper tract urothelial carcinoma, this is why the imagery is often insufficient to discover small lesions of the pyelocaliceal mucosa in which case the endoscopic examination becomes imperative.

WL examination can’t offer sometimes reliability in case of flat (CIS) or small lesions.

The literature data shows that optical image technology brings useful specification to detect malignant changes in the urinary tract mucosa. Our study results are similar with literature data.

Referring to the subject of newly diagnosed urothelial carcinoma upon first clinical suspicion, the proportion of cases with non-invasive pTa or CIS tumors missed during the WL examination of the upper tract mucosa and only identified in NBI remains important. Iordache V. et al. in a study presented in 2018 had a rate of 6.5% tumor detection solely in NBI mode; in the same manner, Hao YC et al. had similar results. In our study a total of 11 (14.1%) tumors were solely observed in NBI mode.

On a tumors related basis, clinical evidence exists according to the available data that a substantial category of UTUC lesions are identified in NBI mode alone (14.2%). The present study substantiated a similar perspective in light of the 14.1% rate of supplementary pT1, CIS and pTa tumors being solely found while applying NBI vision.

NBI offer additional diagnostic information in cases of urothelial non-invasive cancer without additional costs.

NBI-FURS continue to bring enough evidence that shows actual differences in detection rates when compared to the WL examination UUT.

Progresses of FURS with NBI technology integrated makes UUT malignancies an interest area for study.

Anyway, figures that exist among the published reports and an evidence-based parallel with the present study may be considered useful in the future.

**Conclusions**

Taking into consideration all the aspects mentioned above we can say in conclusion that NBI was an important tool regarding detection because it is providing a significant diagnostic improvement during digital flexible ureteroscopy.

<table>
<thead>
<tr>
<th>Tumors detection rates</th>
<th>WL and NBI–FURS</th>
<th>WL–FURS</th>
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<tbody>
<tr>
<td>Overall UTUC</td>
<td>78</td>
<td>67 (86.5%)</td>
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<tr>
<td>pTa tumors</td>
<td>23</td>
<td>17 (86.7%)</td>
</tr>
<tr>
<td>pT1 tumors</td>
<td>37</td>
<td>35 (95.2%)</td>
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<tr>
<td>CIS lesions</td>
<td>18</td>
<td>15 (95.2%)</td>
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<td>Targeted biopsies specificity</td>
<td></td>
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<tr>
<td>Rate of false-positive results</td>
<td>17.8%</td>
<td>10.3%</td>
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</table>

Table 1 – UTUC related detection rates
References


