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Usefulness of narrow-band imaging in transurethral resection of bladder tumor: Early experience from a tertiary center in India

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Abstract

Background: The current standard for diagnosis and treatment of urinary bladder cancer is transurethral resection of bladder tumor (TURBT) using white light guidance. Narrow band imaging (NBI) has emerged as a promising method for identifying additional bladder lesions. Various studies have been published to evaluate its sensitivity in identifying new lesions and its impact on decreasing recurrences. In this study, we evaluated our early experience using NBI in TURBTs. **Aims and Objective:** The aim of the study is to determine the accuracy of NBI in identifying additional malignant lesions during TURBT. **Materials and Methods:** We retrospectively collected data for all patients who underwent either TURBT or repeat TURBT with white light and NBI from November 2016 to July 2017 at Cancer Institute (WIA). The number of additional lesions identified using NBI was evaluated along with its correlation with the final histopathology. **Results:** Forty patients were analysed of which 20 underwent TURBT and 20 underwent repeat TURBT. Of these, 36 patients had complete resection of tumour. Additional lesions were detected in 6 patients (14%) by NBI of which 2 (33%) were malignant histology. The additional lesions detected were carcinoma in situ and no patient was upstaged. **Conclusion:** The inclusion of NBI to conventional white light TURBT increases the sensitivity for identifying additional lesions. The limitation of NBI is high false positivity and its availability. Long term follow up studies with larger subset of patients are required to evaluate its role in decreasing recurrences and justification in routine clinical practice.

Key words: Narrow-band imaging, nonmuscle invasive bladder cancer, transurethral resection of bladder tumor

Introduction

Transurethral resection of bladder tumor (TURBT) using white light is the current standard of treatment for diagnosis and treatment of bladder cancer. All patients irrespective of the stage are subjected to TURBT. About 80% of patients have nonmuscle invasive bladder cancers (NMIBCs) at presentation.[1] The natural history of NMIBC is characterized by recurrences for which they undergo Re-TURBT along with a slight risk of progression. The risk of recurrence varies from 15% to 61% based on the number, size, and grade of the tumor along with the presence of concomitant carcinoma *in situ* (CIS).[2] Various strategies have been employed to reduce the risk of recurrence, including the use of intravesical chemotherapy or immunotherapy, repeating TURBT after 4–6 weeks and improving the detection rates of TURBT. Technologies such as fluorescent cystoscopy, confocal laser endomicroscopy, optical coherence tomography, and narrow-band imaging (NBI) have been studied to improve the sensitivity of tumor identification. NBI aids in the identification of abnormal areas by delineating the vascular pattern more clearly. Studies are ongoing to evaluate its impact on the management of bladder cancer. We retrospectively attempted to determine the accuracy of NBI when used in addition to white light.

Materials and Methods

This was a single-center retrospective analysis of all patients who underwent TURBT or Re-TURBT at our institute from November 2016 to July 2017. All patients suspected to have bladder cancer underwent a formal evaluation with contrast-enhanced computed tomography scan and 3-day urine cytology before undergoing TURBT. TURBT aimed at maximal tumor resection, including deep-muscle biopsies. Patients diagnosed to have NMIBC are further subjected to Re-TURBT at 4 weeks. All procedures were performed under general anesthesia unless contraindicated and were done by the same urologist, experienced in NBI technology. The patients underwent a white light cystoscopy followed by NBI cystoscopy in the same sitting. TURBT was performed for all lesions seen on the white light, and NBI resected lesions were evaluated separately.

Results

A total of 29 patients underwent TURBT or Re-TURBT at our institute during the given time interval. A total of 40 surgeries were done which included 20 TURBTs and 20 Re-TURBTs. The mean age was 61.4 years and male-to-female ratio was 2.2:1.

In the primary TURBT group, of the 20 events, 16 patients were newly suspected cases of bladder cancer, whereas four cases were under evaluation for suspected recurrence on follow-up. Urine cytology was positive in eight patients, three patients had dark staining cells, and two patients had inconclusive cytology. On cystoscopy with both NBI and white light, four patients were found to have no lesion in the bladder. This included the three patients on follow-up. In other 16 cases, transitional cell carcinoma was the predominant histology diagnosed in 15 cases, whereas one patient was diagnosed to have squamous-cell carcinoma. In the transitional cell carcinoma group, one patient had Ta lesion, 11 had T1 lesion, two had deep-muscle infiltration, and one patient had no deep muscle in the biopsy. Ten patients underwent an R0 resection. In three cases, additional lesions were identified by NBI. Of these 3, one was confirmed to be CIS in the patient who had been diagnosed high-grade T1 lesion on white light

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TURBT. In the second patient, no growth was seen on white light, and the additional lesion seen on NBI was stratified squamous epithelium. In the third patient, T1 low-grade tumor was diagnosed on white light, and the additional lesion on NBI was transitional epithelium.

In the Re-TURBT group, 12 patients had upfront TURBT done with combined white light and NBI, and eight patients had upfront TURBT done by white light only. Six of 20 (30%) patients were detected to have a recurrence. Of the 12 patients from the first group, one was diagnosed with an additional lesion on NBI. This patient had no visible lesion on white light; however, the lesion detected on NBI was histologically confirmed to be CIS. Two patients in the other group had additional lesions on NBI. In both the patients, no lesion was detected on white light, and the additional lesion seen on NBI was also transitional epithelium.

Overall, the accuracy of NBI was 90.4% with 14% additional lesion detection rate. Only 33% of additional lesions identified were histopathologically malignant.

Discussion

As per the GLOBOCAN databases held at IARC, bladder cancer is the 9th most common cancer worldwide with a strong male predilection.[3] In the Indian population, the incidence of bladder cancer is 2.8% in males and 0.6% in females. In the largest published Indian series of bladder cancer, the mean age was 60 years with a male-to-female ratio of 8.6:1.[4]

Histologically, transitional-cell carcinoma is the most common followed by squamous cell carcinoma. Based on the depth of infiltration, bladder cancer is usually divided into nonmuscleinvasive and muscle invasive cancers, which also decides the further management. In the Indian population, 74% of patients present with NMIBC.[4]

The current management of NMIBC centers around an adequate TURBT which should include deep muscle in the resected specimen. Re-TURBT has become an integral part of management protocol as there was a significant risk of residual tumor following the first resection and to reduce the understaging. Intravesical immunotherapy or chemotherapy is delivered based on the presence of risk factors such as CIS, grade of the disease, and multiplicity.

At present, most centers use white light for TURBT and Re-TURBT. NBI is a real-time optical image enhancement technique which uses unique narrow-bandwidth color filters at 415 nm and 540 nm wavelengths, such that it is specifically absorbed by hemoglobin. This enhances the visibility of capillaries, thereby identifying abnormal vascular patterns in malignant areas. This technology was introduced in gastrointestinal diseases of the esophagus, stomach, and colon for the identification of premalignant lesion from the benign disorder.[5] Bryan *et al*. published the first results of NBI technology in bladder cancer in 2008. In their series of 29 patients, they felt a subjective improvement in the visibility of malignant lesions with an increased rate of detection.[6] Since then, various studies have been conducted to evaluate its role in the diagnosis, treatment, and surveillance of NMIBCs.

Li *et al*. performed a meta-analysis of seven prospective studies comparing white light endoscopy and NBI for diagnosing bladder cancers. They concluded that an additional 17% of patients and 24% of tumors were detected using NBI. The false detection rate was higher with NBI, but it was not statistically significant.[7]

In the post-bacille calmette guerin vaccine settings also, NBI was found to have improved sensitivity as compared to white light cystoscopy.[8] In postintravesical chemotherapy patients, the low specificity leading to additional biopsies was a concern.[9]

The utility of NBI in TURBT and Re-TURBTs has been evaluated at various centers worldwide. Cauberg *et al*. prospectively conducted NBI TURBT over 40 patients and compared the firstrecurrence rate with retrospective cohort treated by conventional white light TUR. Their recurrence rate at 3-month follow-up was significantly reduced (30.5% vs. 15%). Only two patients had upstaging or upgrading of the tumor when evaluated by NBI.[10]

In another randomized trial from Italy, Naselli *et al*. compared 1-year outcomes of NBI transurethral resection with white light TUR in 142 patients. The recurrence rate at 3 months and 1 year was significantly lower in the NBI group; however, they performed Re-TURBT in only 26% of patients. In addition, the false-positive rate was 28% as compared to 21% in the standard white light group.[11]

In a retrospective analysis by Jecu *et al*., NBI TUR had improved overall detection rates and significantly improved rates for CIS (89.7% vs. 50%) and pTa (98.7 vs. 82.9%) lesions.[12]

Kobatake *et al*. from Japan published a retrospective data for a cohort of 57 patients treated with NBI TURBT and compared with 78 patients treated with WL-TURBT. They concluded that NBI had higher sensitivity and reduced the 1-year recurrence rate. However, they also noted a higher false-positivity rate which reduced with increasing experience of the surgeon. Furthermore, they also highlighted the technical limitation of NBI during active inflammation of bladder or bleeding.[13]

NBI has also been combined with various other energy sources in TURBT. Stanescu *et al*. have reported from a prospective study the 2-year outcomes of patients treated with NBI TURBT with bipolar plasma vaporization. The recurrence rate was substantially reduced (11.5% vs. 25.8%) owing to higher detection rates by NBI.[14] In another randomized study from China, NBI was combined with holmium laser and found to have significantly reduced recurrence rates at 1 year.[15]

Kang *et al*., in their meta-analysis, reported a significantly improved detection rate for NBI TURBT, which thereby reduced recurrence rates at 3 months, 1 year, and 2 years.[16] The most recent multicenter randomized trial conducted by Naito *et al*. reported their 1-year results for NBI TURBT. Recurrence rates at 1 year were significantly reduced for low-risk group defined by pTa, Grade 1, <3 cm, and no CIS. The rates were similar for intermediate- and high-risk group. They also noted an increased operative time for the NBI group.[17]

The literature from the Indian subcontinent is scarce. In one published prospective randomized trials, 17% of patients

revealed additional lesions on NBI; however, only seven of these were biopsied and four were confirmed to be malignant.[18]

We have presented our initial experience with NBI at a tertiary institute from India. The study shows an improved lesion detection rate, however, *in lieu* of high false-positive rate. The study cohort is small, and the population is mixed; however, we want to emphasize that various lesions, including normal transitional epithelium, can also mimic malignancy on NBI leading to unnecessary biopsies. In addition, NMIBC requires long follow-ups and repeated cystoscopic evaluation adding to the burden. This could be a major impediment to a resource-limited country like ours. We plan to prospectively follow the patients to evaluate the impact on recurrence rates.

NBI ushers a new era of technological advancement with improved detection rates; however, it is fraught with limited availability, high false-positivity, learning curve, limited benefit, and the paucity of the literature. It requires further scrutiny by long-term follow-up studies before being introduced into routine clinical practice.

Conclusion

The inclusion of NBI to conventional white light TURBT increases the sensitivity for identifying additional lesions. The limitation of NBI is high false-positivity and its availability. Long-term follow-up studies with a larger subset of patients are required to evaluate its role in decreasing recurrences and justification in routine clinical practice.

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Conflicts of interest

There are no conflicts of interest.

References

1. Babjuk M, Oosterlinck W, Sylvester R, Kaasinen E, Böhle A, Palou-Redorta J, *et al.* EAU guidelines on non-muscle-invasive urothelial carcinoma of the bladder. Eur Urol 2008;54:303-14.
2. Sylvester RJ, van der Meijden AP, Oosterlinck W, Witjes JA, Bouffioux C, Denis L, *et al.* Predicting recurrence and progression in individual patients with stage ta T1 bladder cancer using EORTC risk tables: A combined analysis of 2596 patients from seven EORTC trials. Eur Urol 2006;49:466-5.
3. Ferlay J, Soerjomataram I, Dikshit R, Eser S, Mathers C, Rebelo M, *et al.* Cancer incidence and mortality worldwide: Sources, methods and major patterns in GLOBOCAN 2012. Int J Cancer 2015;136:E359-86.
4. Gupta P, Jain M, Kapoor R, Muruganandham K, Srivastava A, Mandhani A. Impact of age and gender on the clinicopathological characteristics of bladder cancer. Indian J Urol 2009;25:207-10.
5. Dekker E, van den Broek FJ, Reitsma JB, Hardwick JC, Offerhaus GJ, van Deventer SJ, *et al.* Narrow-band imaging compared with conventional colonoscopy for the detection of dysplasia in patients with longstanding ulcerative colitis. Endoscopy 2007;39:216-21.
6. Bryan RT, Billingham LJ, Wallace DM. Narrow-band imaging flexible cystoscopy in the detection of recurrent urothelial cancer of the bladder. BJU Int 2008;101:702-5.
7. Li K, Lin T, Fan X, Duan Y, Huang J. Diagnosis of narrow-band imaging in non-muscle-invasive bladder cancer: A systematic review and meta-analysis. Int J Urol 2013;20:602-9.
8. Herr HW. Narrow-band imaging cystoscopy to evaluate the response to Bacille Calmette-Guérin therapy: Preliminary results. BJU Int 2010;105:314-6.
9. Song PH, Cho S, Ko YH. Decision based on narrow band imaging cystoscopy without a referential normal standard rather increases unnecessary biopsy in detection of recurrent bladder urothelial carcinoma early after intravesical instillation. Cancer Res Treat 2016;48:273-80.
10. Cauberg EC, Kloen S, Visser M, de la Rosette JJ, Babjuk M, Soukup V, *et al.* Narrow band imaging cystoscopy improves the detection of non-muscle-invasive bladder cancer. Urology 2010;76:658-63.
11. Naselli A, Introini C, Timossi L, Spina B, Fontana V, Pezzi R, *et al.* A randomized prospective trial to assess the impact of transurethral resection in narrow band imaging modality on non-muscle-invasive bladder cancer recurrence. Eur Urol 2012;61:908-13.
12. Jecu M, Geavlete B, Mulțescu R, Stănescu F, Moldoveanu C, Adou L, *et al.* NBI cystoscopy in routine urological practice – From better vision to improve therapeutic management. J Med Life 2014;7:282-6.
13. Kobatake K, Mita K, Ohara S, Kato M. Advantage of transurethral resection with narrow band imaging for non-muscle invasive bladder cancer. Oncol Lett 2015;10:1097-102.
14. Stănescu F, Geavlete B, Georgescu D, Jecu M, Moldoveanu C, Adou L, *et al.* NBI - plasma vaporization hybrid approach in bladder cancer endoscopic management. J Med Life 2014;7:155-9.
15. Ma T, Wang W, Jiang Z, Shao G, Guo L, Li J, *et al.* Narrow band imaging-assisted holmium laser resection reduced the recurrence rate of non-muscle invasive bladder cancer: A prospective, randomized controlled study. Zhonghua Yi Xue Za Zhi 2015;95:3032-5.
16. Kang W, Cui Z, Chen Q, Zhang D, Zhang H, Jin X. Narrow band imaging-assisted transurethral resection reduces the recurrence risk of non-muscle invasive bladder cancer: A systematic review and meta-analysis. Oncotarget 2017;8:23880-90.
17. Naito S, Algaba F, Babjuk M, Bryan RT, Sun YH, Valiquette L, *et al.* The Clinical Research Office of the Endourological Society (CROES) Multicentre Randomised Trial of Narrow Band Imaging-Assisted Transurethral Resection of Bladder Tumour (TURBT) versus conventional white light imaging-assisted TURBT in primary non-muscle-invasive bladder cancer patients: Trial protocol and 1-year results. Eur Urol 2016;70:506-15.
18. Dogra PN, Desai P, Singh P. Narrow band imaging cystoscopy in non-muscle invasive bladder cancer – A prospective randomized comparison to the standard white light cystoscopy. J Urol 2016;195:137.