For Healthcare Professionals

CASE STUDY of NBI

(Specific Wavelength Light)

UROLOGY

Supervisor : **Fan Jinhai, MD**
Xi'an Jiaotong University Medical College Affiliated 1st Hospital, China

Qiao Ludong, MD
Capital University of Medical Science Affiliated Beijing Tongren Hospital, China

Christian Doehn, MD, PhD
Universitätsklinikum Schleswig-Holstein, Germany

Tomohiro Ueda, MD
Kyoto City Hospital, Japan

Satoru Ishikawa, MD
Hitachi General Hospital, Japan

Mike Wallace, MD
Rik Bryan, MD, PhD
University Hospitals Birmingham NHS Foundation Trust (The Queen Elizabeth Hospital), United Kingdom

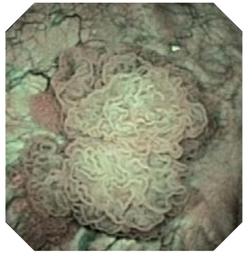
Vol.1

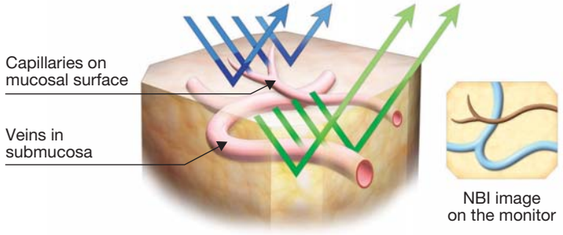
Narrow Band Imaging™

NBI is an optical image enhancement technology that enhances the visibility of vessels and other tissue on the mucosal surface. Narrowband illumination, which is strongly absorbed by hemoglobin and penetrates only the surface of tissues, is ideal for enhancing the contrast between the two. As a result, under narrowband illumination, capillaries on the mucosal surface are displayed in brown on the monitor, and veins in the submucosa are displayed in cyan.

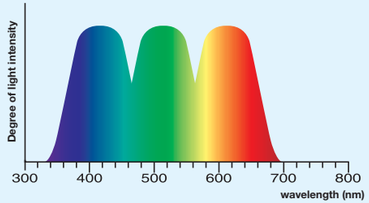
White Light Image

NBI Image

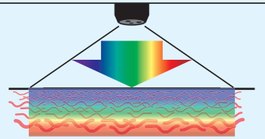




Conventional White Light

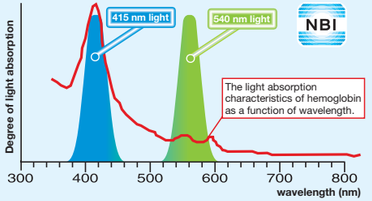


White light is composed of an equal mixture of RGB wavelengths.

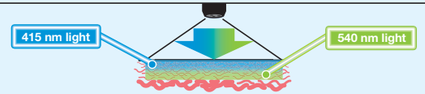


Short wavelengths have shallow penetration characteristics whereas long wavelengths penetrate deeper into the mucosa.

Narrow Band Imaging™ -NBI



The narrowband light is composed of two specific bands that are strongly absorbed by hemoglobin.



Short wavelengths penetrate only the superficial layers of the mucosa.
→Absorbed by capillary vessels in the surface layer of mucosa.

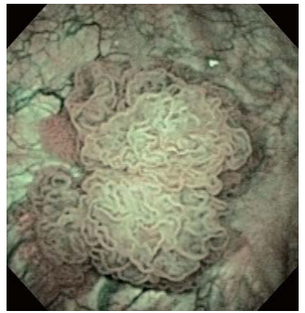
Longer wavelengths penetrate deeper compared to 415 nm light.
→Absorbed by blood vessels such as veins, which are located deeper than capillary vessels in the surface layer of the mucosa.

INDEX

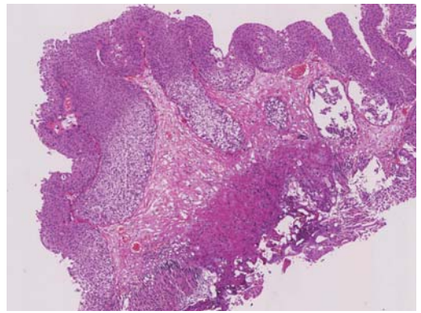
Case 1 age 85, male

White Light

NBI



Histology



Comments

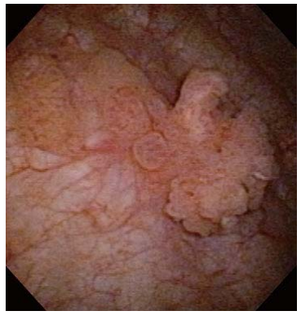
Utilizing NBI enables us to visualize the lesions three-dimensionally. The enhanced visualization provided by NBI revealed the boundaries of the tumor and the structure of blood vessels inside the tumor.

*Images and comments by **Satoru Ishikawa, MD***

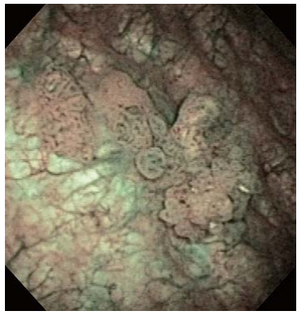
Case 2 age 65, male

Papillary Peduncular Tumor

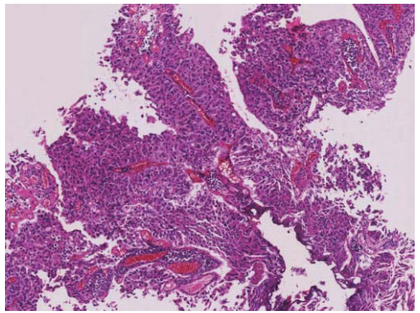
White Light



NBI



Histology



Comments

Utilizing NBI enables us to visualize the lesions three-dimensionally. The enhanced visualization provided by NBI revealed the boundaries of the tumor and the structure of blood vessels inside the tumor.

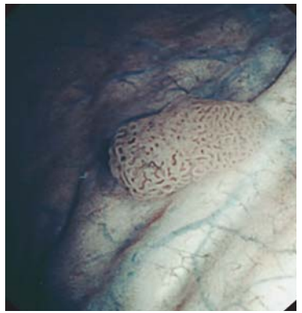
*Images and comments by **Satoru Ishikawa, MD***

Case 3 age 83 , male

Papillary Peduncular Tumor

White Light

NBI



Comments

It is important to note that on switching to NBI there is an overall reduction in the illumination of the bladder due to the narrowing of the bandwidth of light. The operator therefore needs to keep the distal end of the cystoscope closer to the bladder mucosa; the area viewed will be smaller and the time taken to inspect the whole bladder will thus be longer. This highlights the importance of thorough cystoscopic training and allowing an appropriate amount of time to carry out the procedure properly.

*Images and comments by **Mike Wallace, MD / Rik Bryan, MD, PhD***

Case 4 age 81, male

Papillary Peduncular Tumor

White Light

NBI

Comments

This patient had a total of five tumors, one of which was not identified by WLI due to the thick trabeculations. The improved contrast with NBI enabled this fifth tumor to be clearly seen.

Images and comments by ***Mike Wallace, MD / Rik Bryan, MD, PhD***

Case 5 age 81, female

Papillary Peduncular Tumor

White Light

NBI

Comments

Two tumors were identified with WLI. However, a third tumor at this site (bottom left) was only clearly visualized with NBI.

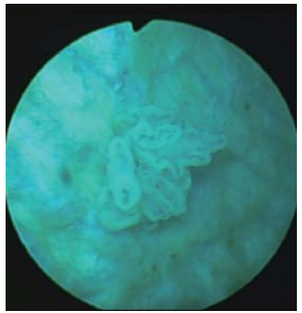
Images and comments by ***Mike Wallace, MD / Rik Bryan, MD, PhD***

Case 6 age 69, male

Papillary Peduncular Tumor

White Light

NBI



Comments

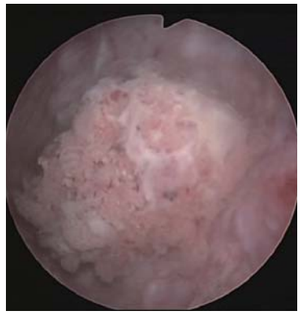
Urothelial cancer right bladder wall, pTaG1

*Images and comments by **Christian Doehn, MD, PhD***

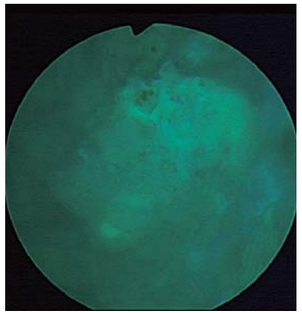
Case 7 age 69, male

Papillary Peduncular Tumor

White Light



NBI



Comments

Urothelial cancer left bladder wall, pTaG2

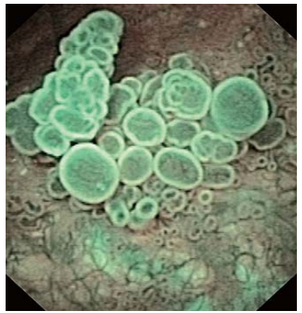
*Images and comments by **Christian Doehn, MD, PhD***

Case 8 age 68, male

Papillary Peduncular Tumor

White Light

NBI



Comments

Papillary urothelial neoplasm of low malignant potential, pTa

*Images and comments by **Fan Jinhai, MD***

Case 9 age 64, male

Papillary Peduncular Tumor

White Light

NBI

Comments

Papillary urothelial neoplasm of low malignant potential, pT1

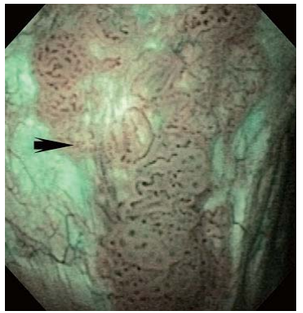
*Images and comments by **Qiao Ludong, MD***

Case 10 age 85, male

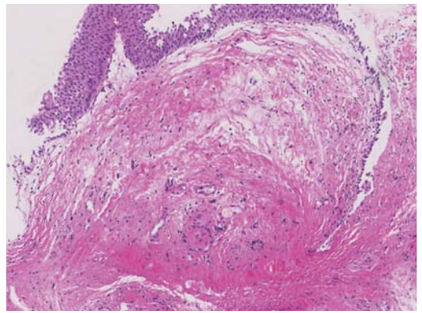
Papillary Sessile Tumor

White Light

NBI



Histology



Comments

Vessel structure of papillary sessile tumor is clearly observed with NBI, and the tumor lesion is enhanced. A segment (indicated by the arrow) was biopsied using cold cup forceps.

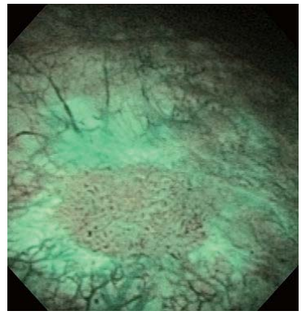
*Images and comments by **Satoru Ishikawa, MD***

Case 11 age 65, male

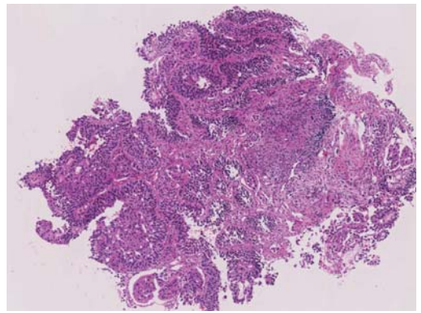
Papillary Sessile Tumor

White Light

NBI



Histology



Comments

The margin of a recurrent papillary sessile tumor at the scar of former TURBT is clearly observed by NBI.

*Images and comments by **Satoru Ishikawa, MD***

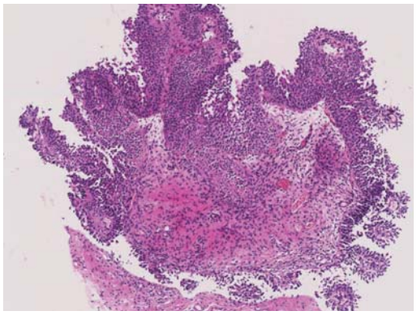
Case 12 age 71, male

Papillary Sessile Tumor

White Light

NBI

Histology



Comments

Vessel structure of papillary sessile tumor is observed clearly by NBI.

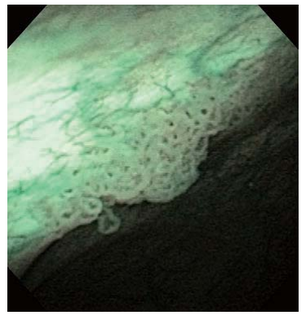
*Images and comments by **Satoru Ishikawa, MD***

Case 13 age 71, male

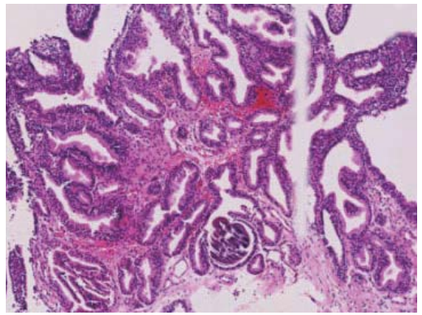
Papillary Sessile Tumor

White Light

NBI



Histology



Comments

Small papillary sessile tumors which might be overlooked by WLI observation, was easily differentiated from normal tissue using NBI as an abnormal lesion.

*Images and comments by **Satoru Ishikawa, MD***

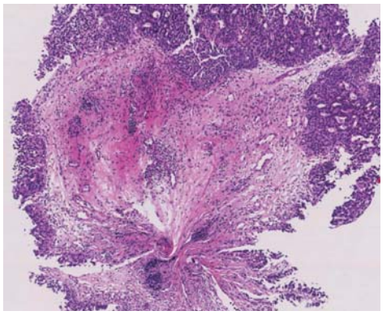
Case 14 age 82, male

Papillary Sessile Tumor

White Light

NBI

Histology



Comments

Flat papillary sessile tumors which are traditionally very hard to see using WLI was identified as a mucosal change using NBI.

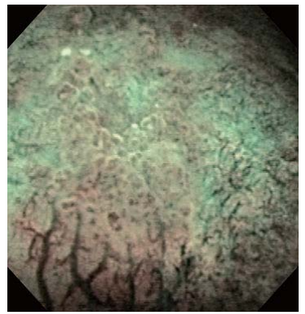
*Images and comments by **Satoru Ishikawa, MD***

Case 15 age 81, male

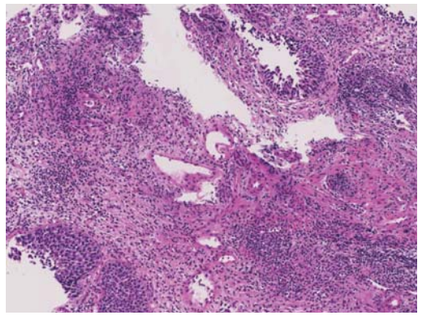
Papillary Sessile Tumor

White Light

NBI



Histology



Comments

Subtle papillary lesion is clearly observed by NBI.

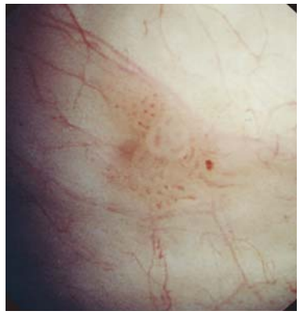
*Images and comments by **Satoru Ishikawa, MD***

Case 16

age 68, male

Papillary Sessile Tumor

White Light



NBI

Comments

In this patient, the increased contrast between the pale urothelium and the vascular cores of the papillary fronds is demonstrated by NBI.

*Images and comments by **Mike Wallace, MD / Rik Bryan, MD, PhD***

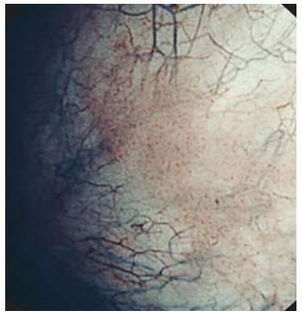
Case 17

age 75, male

Papillary Sessile Tumor

White Light

NBI



Comments

An area of micro-papillary tumor was completely missed by WLI, but became clearly visible with NBI, with the vascular cores of the papillary structure showing a characteristic "speckled" appearance.

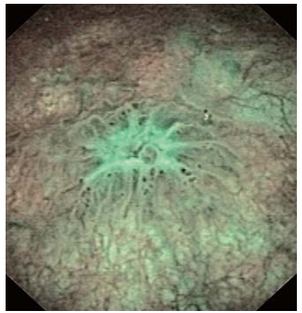
*Images and comments by **Mike Wallace, MD / Rik Bryan, MD, PhD***

Case 18 age 68, male

Papillary Sessile Tumor

White Light

NBI



Comments

Papillary urothelial neoplasm of low malignant potential, pTa

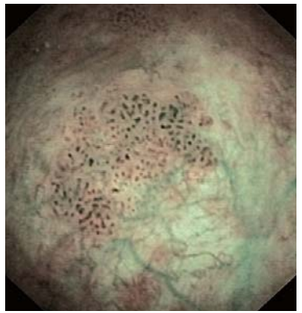
*Images and comments by **Fan Jinhai, MD***

Case 19 age 70, male

Papillary Sessile Tumor

White Light

NBI



Comments

Non-invasive papillary urothelial neoplasia, low grade, pT1

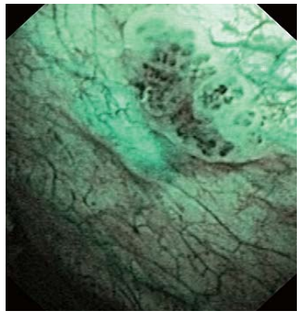
*Images and comments by **Qiao Ludong, MD***

Case 20 age 65, male

Papillary Sessile Tumor

White Light

NBI



Comments

Non-invasive papillary urothelial neoplasia, low grade, pTa

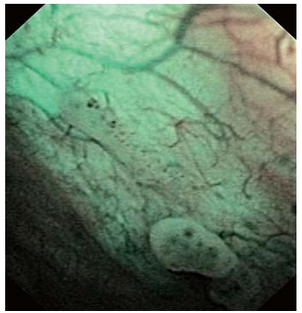
*Images and comments by **Fan Jinhai, MD***

Case 21 age 65, male

Papillary Sessile Tumor

White Light

NBI



Comments

Non-invasive papillary urothelial neoplasia, low grade, pTa

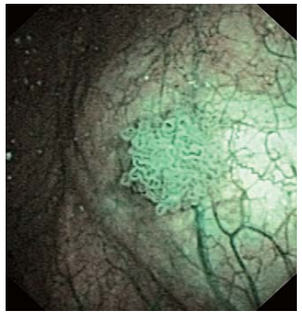
*Images and comments by **Fan Jinhai, MD***

Case 22 age 65, male

Papillary Sessile Tumor

White Light

NBI



Comments

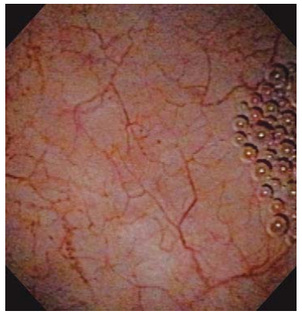
Non-invasive papillary urothelial neoplasia, low grade, pTa

*Images and comments by **Fan Jinhai, MD***

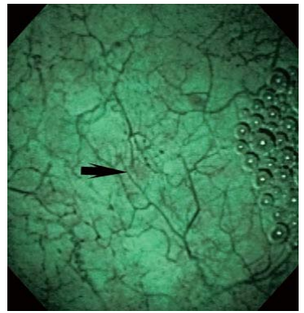
Case 23 age 82, male

Flat Lesion

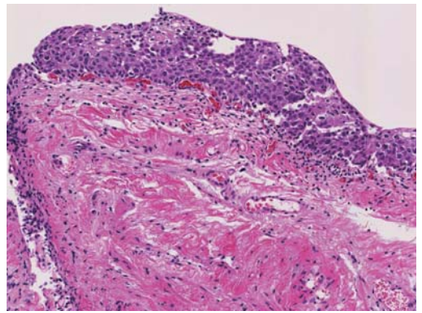
White Light



NBI



Histology



Comments

This patient has a papillo-nodular tumor on the left lateral wall. A flat lesion at the dome of the bladder is found using NBI and was diagnosed as CIS.

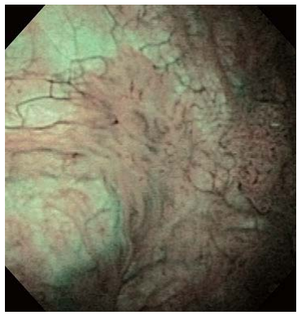
*Images and comments by **Satoru Ishikawa, MD***

Case 24 age 65, male

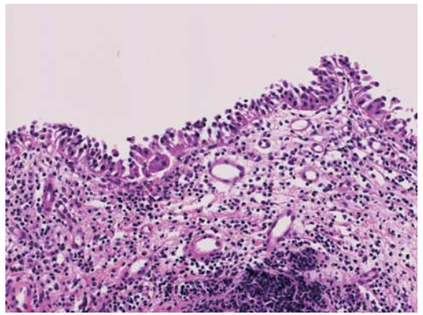
Flat Lesion

White Light

NBI



Histology



Comments

A mucosal change on the right lateral wall adjoining papillary tumors. An atypical cell is confirmed pathologically.

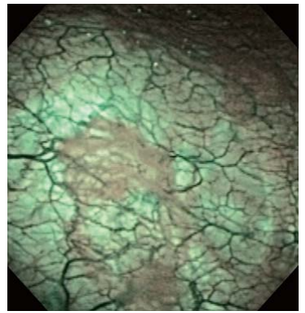
*Images and comments by **Satoru Ishikawa, MD***

Case 25 age 74, male

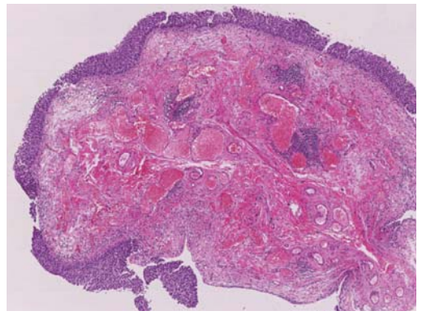
Flat Lesion

White Light

NBI



Histology



Comments

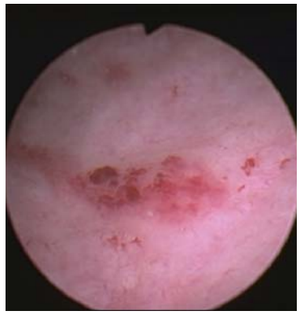
A flat lesion on the right lateral wall adjoining a tumor enhanced by NBI.

*Images and comments by **Satoru Ishikawa, MD***

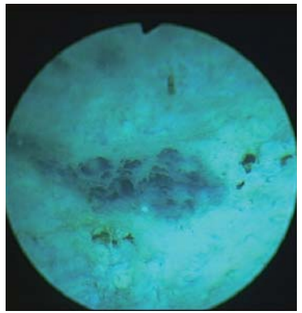
Case 26 age 75, female

Inflammation/Metaplasia/Hyperplasia

White Light



NBI



Comments

Squamous metaplasia of vesical mucosa

*Images and comments by **Christian Doehn, MD, PhD***

Case 27 age 66, female

Inflammation/Metaplasia/Hyperplasia

White Light

NBI

Comments

Hyperplasia

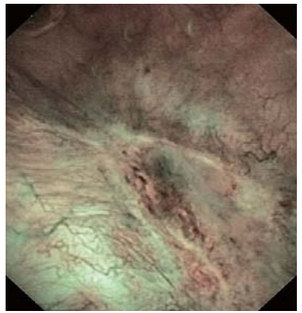
*Images and comments by **Qiao Ludong, MD***

Case 28 age 66, female

Inflammation/Metaplasia/Hyperplasia

White Light

NBI



Comments

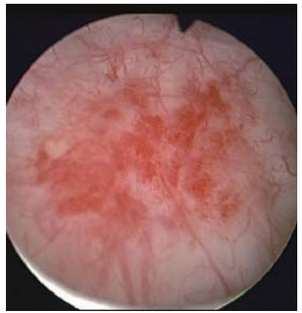
Hyperplasia

*Images and comments by **Qiao Ludong, MD***

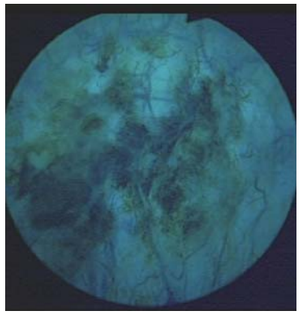
Case 29 age 94, female

Inflammation/Metaplasia/Hyperplasia

White Light



NBI



Comments

Inflammation of vesical mucosa

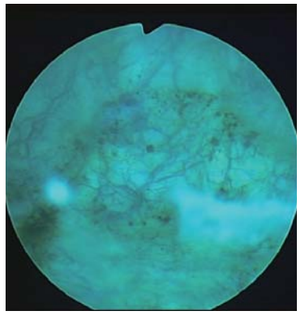
*Images and comments by **Christian Doehn, MD, PhD***

Case 30 age 75, female

Inflammation/Metaplasia/Hyperplasia

White Light

NBI



Comments

Chronic inflammation of vesical mucosa

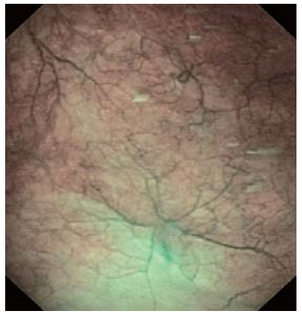
*Images and comments by **Christian Doehn, MD, PhD***

Case 31 age 73, male

Inflammation/Metaplasia/Hyperplasia

White Light

NBI



Comments

Chronic inflammation

*Images and comments by **Qiao Ludong, MD***

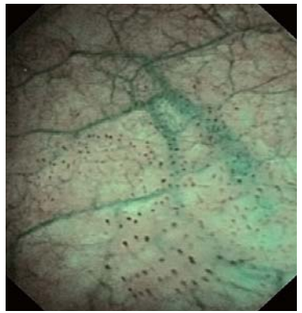
Case 32

age 73, male

Inflammation/Metaplasia/Hyperplasia

White Light

NBI



Comments

Chronic inflammation

*Images and comments by **Qiao Ludong, MD***

Case 33

age 73, male

Inflammation/Metaplasia/Hyperplasia

White Light

NBI

Comments

Chronic inflammation

*Images and comments by **Qiao Ludong, MD***

Case 34 age 73, male

Inflammation/Metaplasia/Hyperplasia

White Light

NBI

Comments

Chronic inflammation

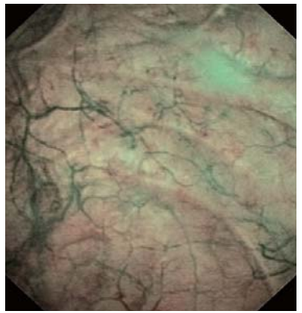
*Images and comments by **Qiao Ludong, MD***

Case 35 age 72, female

Inflammation/Metaplasia/Hyperplasia

White Light

NBI



Comments

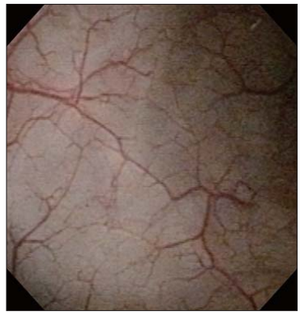
Chronic inflammation

*Images and comments by **Qiao Ludong, MD***

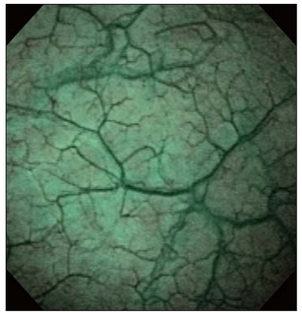
Case 36 age 33, female

Interstitial Cystitis

White Light



NBI



Comments

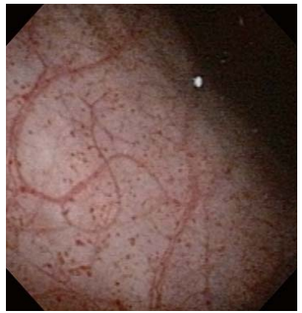
Hypervascularity identified by conventional cystoscopy with white light (left) and NBI cystoscopy (right) in non-ulcer type of interstitial cystitis (IC) before hydrodistention (Int J Urol15:1039-1043, 2008)

*Images and comments by **Tomohiro Ueda, MD, PhD***

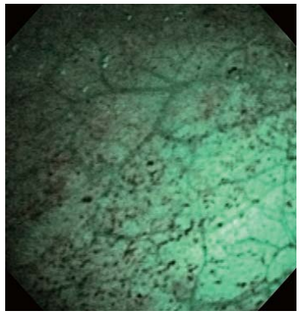
Case 37 age 33, female

Interstitial Cystitis

White Light



NBI



Comments

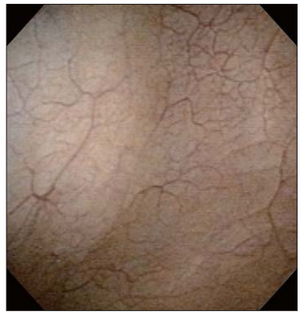
Glomerulation, petechial hemorrhages in non-ulcer type of IC after hydrodistention (Int J Urol15:1039-1043, 2008)

*Images and coments by **Tomohiro Ueda, MD, PhD***

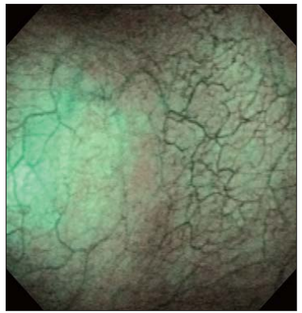
Case 38 age 45, female

Interstitial Cystitis

White Light



NBI



Comments

Hypervascular (reddish) areas were coincided with exhibiting glomerulation and/or petechial bleeding following bladder hydrodistention in non-ulcer type of interstitial cystitis (IC)

*Images and comments by **Tomohiro Ueda, MD, PhD***

Case 39 age 70, female

Interstitial Cystitis

White Light

NBI

Comments

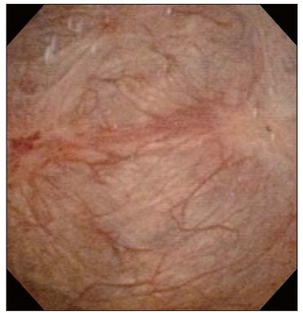
Hunner's ulcer with hemorrhages of IC / Bladder pain syndrome during bladder emptying

*Images and comments by **Tomohiro Ueda, MD, PhD***

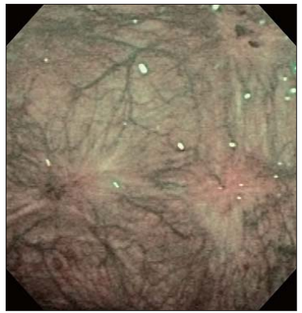
Case 40 age 70, female

Interstitial Cystitis

White Light



NBI



Comments

Hunner's ulcer of IC / Bladder pain syndrome

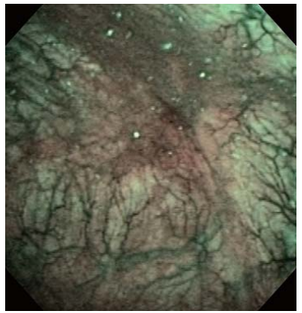
*Images and comments by **Tomohiro Ueda, MD, PhD***

Case 41 age 66, female

Interstitial Cystitis

White Light

NBI



Comments

Hunner's ulcer of IC / Bladder pain syndrome : an ulcerative mucosa recognized by conventional cystoscopy was clearly demarcated as a brownish area of the bladder wall with NBI cystoscopy

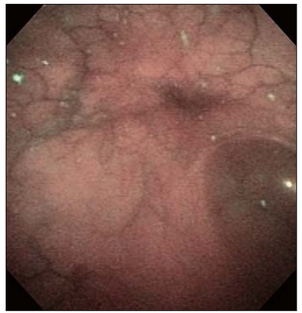
*Images and comments by **Tomohiro Ueda, MD, PhD***

Case 42 age 45, female

Interstitial Cystitis

White Light

NBI



Comments

Hunner's ulcer of IC / Bladder pain syndrome

*Images and comments by **Tomohiro Ueda, MD, PhD***

Case 43 age 63, female

Interstitial Cystitis

White Light

NBI

Comments

Hunner's ulcer with fibrosis in bladder dome of IC / Bladder pain syndrome

*Images and comments by **Tomohiro Ueda, MD, PhD***

Case 44 age 63, female

Interstitial Cystitis

White Light

NBI

Comments

Hunner's ulcer with fibrosis of IC / Bladder pain syndrome

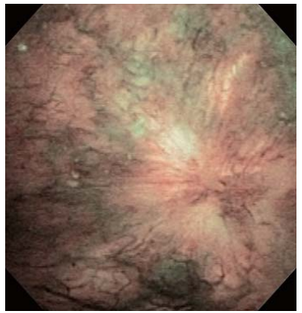
*Images and comments by **Tomohiro Ueda, MD, PhD***

Case 45 age 68, female

Interstitial Cystitis

White Light

NBI



Comments

Hunner's ulcer of IC / Bladder pain syndrome

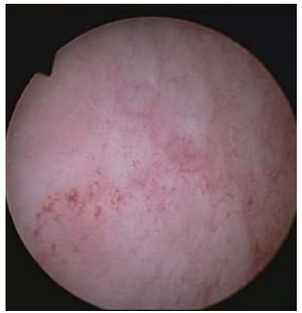
*Images and comments by **Tomohiro Ueda, MD, PhD***

Case 46

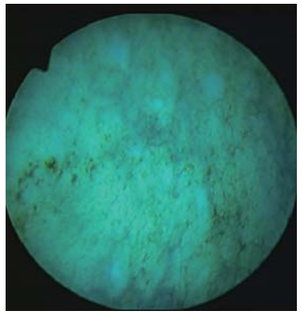
age 55, male

Normal Mucosa

White Light



NBI



Comments

Normal mucosa of an ileal neobladder

Images and comments by ***Christian Doehn, MD, PhD***

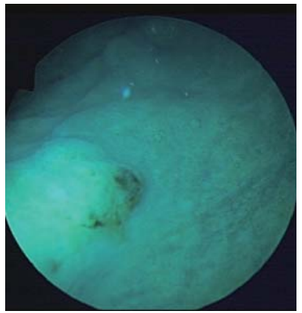
Case 47

age 55, male

Normal Mucosa

White Light

NBI



Comments

Mucosa of an ileal neobladder with lymph follicles and eosinophilic granulocytes

Images and comments by ***Christian Doehn, MD, PhD***

Published by OLYMPUS MEDICAL SYSTEMS CORP.

Printed in Japan R620UE-0310