

## Diagnostic Procedures

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Improvement on white-light standard cystoscopy, see Hexvix

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### Urinalysis / Cytology

Urine cultures often fail to detect malignancy, and cytologic studies can be of more help as a diagnostic tool. However, these tests are less than accurate, and due to a rather high rate of false negatives, cannot exclude the possibility of malignancy. The tests in use are less accurate in detecting low grade TCC, though a positive result would almost always indicate a malignancy.

See also urinemarkers for more information about the different types of tests used in bladder cancer diagnosis, such as NMP22, BTA, FISH and others.

### Glossary and abbreviations

### Cystoscopy

The cystoscope is inserted into the bladder through the urethra, and characteristics of the bladder are recorded photographically through a thin lighted tube, noting any abnormalities and where they are located. The procedure is considered by patients to be uncomfortable, but bearable. A flexible cystoscope is used for surveillance, while a rigid cystoscope must be used to remove (or biopsy) tissues. Cystoscopy is the most reliable tool used in diagnosing the presence of tumors.

Fluorescent (blue light) cystoscopy This technique is currently only available in Europe, see Hexvix , and is an improvement over standard, white light cystoscopy.

CT-Urography (aka: Virtual Cystoscopy) Computed Tomographic Virtual Cystoscopy for the Detection of Urinary Bladder Neoplasms - the newest tool, still in trials in Europe and the US, shows improvement over regular cystoscopes:

CT urography and virtual endoscopy images are generated from dedicated multislice helical CT data sets and various three-dimensional reconstruction techniques. These imaging techniques can provide external and endoscopic images of the urinary tract and also provide high spatial resolution images helping overcome some of the limitations of intravenous urography and ultrasound. PMID: 12684237 [PubMed - indexed for MEDLINE]

Aug: 2006 CT urography to evaluate macroscopic hematuria possibly due to bladder cancer obviates the need for intravenous urogram and ultrasound and can help determine whether cystoscopy is warranted, new research suggests. "Our results support the use of CT urography as a first-line screening tool for this high-risk group, the use of which will obviate the need for flexible cystoscopy in patients with a negative CT urography and allow those with an obvious tumor to be referred directly for rigid cystoscopy and resection," the authors conclude. "The remaining patients should be referred for flexible cystoscopy." BJU Int 2006;98:345-348.

### Bladder wash

A saline solution is administered through the cystoscope, and the bladder is vigorously irrigated, which loosens cells from the lining of the bladder.

### Biopsy

If abnormal tissue is found, the doctor will need to cut out a small piece and send it to pathology for a closer look. It is done through the cystoscope. After surgical removal through the scope, tissues are cauterized to lessen bleeding and hasten healing. Biopsy is the most reliable procedure for the diagnosing of CIS and/or TCC of the bladder.

### Bladder Mapping or Random Biopsy

This is when tissues are removed from several different places in the bladder to better determine extent of cancer or dysplasia (abnormal or pre cancerous cells) present.

### Ultrasound (US)

Ultrasonography uses sound waves for imaging, and though imaging is recorded on film similar to x-ray film, there is no radiation exposure. Ultrasonography has limitations in detail and specificity as compared to other imaging modalities.

Intravenous pyelography (IVP). An IVP involves an intravenous injection of contrast material which is then filtered out of the blood into the urine by the kidney. Plain x-rays taken during this process show the urinary tract. This test is especially helpful in visualizing the upper tract.

More info about what to expect from an IVP:

[http://www.radiologyinfo.org/content/ivp\\_radiology.htm](http://www.radiologyinfo.org/content/ivp_radiology.htm)

### Retrograde pyelography

Like the IVP, this test uses special dye to outline the lining of the bladder, ureters, and kidneys on x-rays. The difference is that in retrograde pyelography the dye is injected by catheterization of the ureters during a cystoscopic procedure. Other procedures may be conducted during the cysto in addition to the retrograde pyelogram.

### Computed tomography (CT)

The CT scan is commonly used as a diagnostic tool for staging and follow up. Often a contrast-medium is additionally injected into a vein to assist the visualization. A CT scan of the pelvis will provide information about whether the cancer may have spread to tissues next to the bladder, to nearby lymph nodes in the pelvis, or to distant organs such as the liver. The CT scan involves a special machine that rotates around the body taking x-ray pictures from many angles. A computer then combines their pictures into a very detailed cross-sectional image. CT scans are used only if spread beyond the bladder is suspected. Sometimes, a MRI scan is used instead of the CT scan.

### CTU (CT Urography)

A relatively new test still evolving and not yet readily available in the US, CT urography and virtual endoscopy images are generated from dedicated multislice helical CT data sets and various three-dimensional reconstruction techniques. These imaging techniques can provide external and endoscopic images of the urinary tract and also provide high spatial resolution images helping overcome some of the limitations of intravenous urography and ultrasound

### MRI

Magnetic resonance imaging-You may find that a doctor will be hesitant about ordering this test; it's still considered experimental for bladder cancer staging, it's more expensive than the CT and the insurance companies may not approve. This test is similar to CT scans, but uses powerful magnets and radio waves instead of x-rays to take detailed cross-sectional images. If spread beyond the bladder is suspected, MRI scans are sometimes used to detect cancer in tissues next to the bladder, in nearby lymph nodes, or in distant organs.

If you are wondering why a doctor will send you to X-Ray, then Ultrasound, then IVP, then CT, while saving what may debatably the best test for last, the MRI, it may be that the doctor had to prove to your insurance company that an MRI was warranted because the other tests were inconclusive. If money is no object, you probably wouldn't have too much trouble convincing your doctor to prescribe the MRI, or even the PET, as he would most likely be interested in the findings.

See also imaging studies

### MRU (MR Urography)

Magnetic Resonance Urography is a new technique that uses heavily weighted T2 fast spin-echo pulse sequence coronal MR images with a rapid acquisition - relaxation enhancement to generate a high intensity signal outlining the collecting system, ureters and bladder without contrast or ionizing radiation. The entire urinary tract can be visualized in patients with renal failure. It can detect renal cysts, carcinomas, ureteropelvic junction obstruction, diverticulum in the bladder and ejaculatory duct cyst.

### MR Lymphography

MR lymphography is a new and promising imaging modality in differentiating benign and metastatic lymph nodes, which gives information on both lymph node morphology and function.

### Bone Scan

Bone scans often give false negatives as well as false positives, but are still the best we have for detecting bone metastases, especially if one has been done at the beginning of treatment to be used as a base line for later scans.

## PET scans

Although a few studies have shown its potential usefulness as a diagnostic tool, PET scans are not yet readily available and there are not enough doctors who are trained to use, as well as interpret the findings for, PET scan use in bladder cancer imaging. Currently none of the diagnostic tools available can identify extent of invasion and distant metastases as well as the PET. Logistical problems remain to be overcome, as the dyes used concentrate in the urine and make visualization of the bladder difficult for those untrained in its use for detection of bladder cancer.

See also imaging studies.

## TUR

Transurethral resection is a minimally invasive surgical technique where tumors are removed through the urethra via a scope equipped with a special tool on the end for excision of tissue. Cauterization prevents excessive bleeding. A new resectoscope loop, Olympus prototype model A2186, has been evaluated by Herr and colleagues at MSKCC, which was found to provide a better tumor resection and helped facilitate histological evaluation of the tissue specimens.<sup>1</sup>

Electrosurgery uses an electric current to remove the cancer. The tumor and the area around it are burned away and then removed with a sharp tool.

Laser therapy uses a narrow beam of intense light to remove cancer cells. Laser surgery is often used to destroy small low grade tumors. This is done through a cystoscope.

Urethral wash cytopathology-what does a positive result portend? This procedure is used to monitor male bladder cancer patients after they've had radical surgery. See also: [metatcc.asp#uwc](http://metatcc.asp#uwc)

Pathology tests see also: Review Pathology: why it is critical: [padova1.asp#path](http://padova1.asp#path)

Often a bladder cancer patient will be told that tissues have not had extensive pathology testing; this may be because the tumor was obviously superficial and the cells well differentiated. Laser or cauterization techniques may rule out path tests as small tumors and tissues are destroyed during removal, thus a doctor may be relying on his experience. The common approach to superficial tumors is TUR followed by continued (quarterly or bi-annual) surveillance. The research shows that this is almost always a safe approach, since with the large majority of these cases true (biological) progression is rare, occurring less than 5% of the time; thus, in the case of superficial papillary tumors with well differentiated cells, extensive pathology testing as well as aggressive treatment is reserved for multiple recurrences or presence of other risk factors (see also [Superficial Bladder Cancer](#))<sup>2</sup>.

In the case of carcinoma in situ, multiple tumors and multiple tumors of mixed cellular origin, or at any evidence of subepithelial invasion (stage T1), resected bladder tumors should always be submitted for pathological testing in order to determine the pT (post surgical stage) category.

A tumour is staged as pTx if there is insufficient or inadequate material available to the pathologist for a proper assessment of invasion. Since it is frequently not possible to determine whether or not invasion has occurred, a pTx tumour may be entirely superficial and non invasive. The text of the pathology report should state clearly whether or not invasion has been identified in the material examined. It is generally not possible to differentiate between superficial and deep detrusor muscle in biopsy samples, and a cystectomy specimen is necessary before a pathologist can reliably subdivide muscle invasive tumours into pT2 or pT3 categories.<sup>3</sup>

There are many new biomarkers being studied, which can give an indication not only of potential aggressiveness but of probable response to treatment. However, these markers are neither in common use, nor yet an exact science. Bladder cancer patients are very eager for biomarkers to be better understood, and so help us find our best path in the confusing world of cancer treatments. Although great headway is being made in the field of biomarker studies, at this point in time pathological assessment of stage and grade is still the best index of prognosis in common use.

When getting a second opinion, it may be wise to seek a second opinion of your pathology. In a recent study of more than 6,000 patients by Johns Hopkins researchers found that one or two out of every 100 people who come to larger medical centers for treatment following a biopsy arrive with a diagnosis that's "totally wrong." The results suggest that second opinion pathology exams not only prevent errors, but also save lives and money.

Please refer to an article at Steve Dunn's CancerGuide for an article on biopsy and pathology techniques by Ed Uthman M.D; The Biopsy Report: A Patients Guide

For an in-depth description of what assessments should be included in pathology reports following TUR and radical cystectomy, please refer to a very good article Cancer Management; Genitourinary Tumor Group, from the BC Cancer Agency.

#### References

1. Evaluation of new resectoscope loop for transurethral resection of bladder tumors. Herr HW; Reuter VE

Department of Surgery, Memorial Sloan-Kettering Cancer Center, New York, New York, USA.

J Urol 1998 Jun;159(6):2067-8 PMID: 9598520 UI: 98258467

2. Superficial bladder cancer: Progression and recurrence. Heney, N.M., Ahmed, S., Flanagan, M.J., et al J Urol 1983; 130:1083-1086 As reviewed by Drs. Emmanuel Schenkman, M.D. and Donald L. Lamm, M.D.; <http://www.duj.com/Article/Schenkman.html>

#### Superficial Bladder Cancer Therapy

3. Transitional Cell Carcinoma of the Bladder: Back to Basics

[http://www.uronews.com/archive.dir/vol1\\_4.htm](http://www.uronews.com/archive.dir/vol1_4.htm)

Dr. Ken Grigor MD, FRCPath Senior Lecturer and Consultant Pathologist, Edinburgh University and Western General Hospital, Edinburgh. Chairman of the Scottish Urological Oncology Group. Special Feature; Urology News Online Vol.1/4.