Urology Pathology Services

Prostate

Background

In the United States there are approximately 190,000 estimated new cases of prostate cancer and approximately 33,000 estimated deaths from prostate cancer per year. The median age of diagnosis is 66 years and the median age of death is 80 years. The lifetime risk in the general population for developing prostate cancer is 12%. More than 95% of prostate cancers are adenocarcinomas (cancers that begin in glandular cells). Other rare types of prostate cancer include sarcomas, small cell carcinomas and transitional cell carcinomas. Compared to many other cancers, prostate cancers usually grow slowly. Most men with prostate cancer are 65 years or older and many die of some other cause before the prostate cancer causes any symptoms. However, some prostate cancers do grow rapidly impacting survival and quality of life.

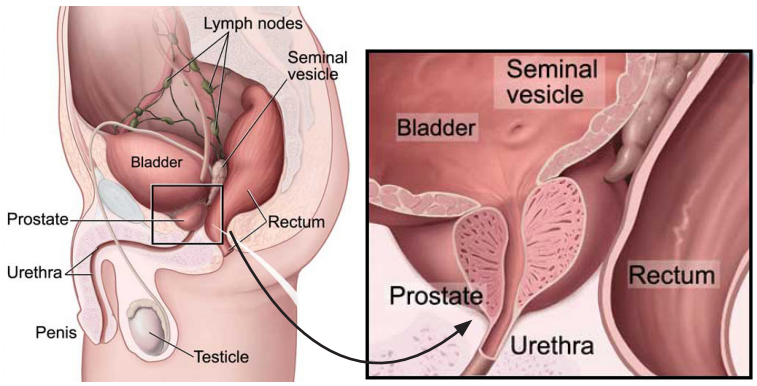


Figure 1: Prostate gland anatomy

The following test is available to assist in the diagnosis and/or staging of prostate cancer:

Immunohistochemical Stain: PIN4

PIN4 consists of a cocktail of three antibodies, including: AMACR (P504S), p63, and a high molecular weight cytokeratin (HMWK, antibody clone 34ßE12). It is a triple stain that is useful in distinguishing prostatic adenocarcinoma (variable AMACR/P504S red cytoplasmic staining with a lack of basal cell p63+HMWK brown staining) from benign conditions (with preserved basal cell brown staining of p63+HMWK and a general lack of red cytoplasmic staining of AMACR/ P504S).

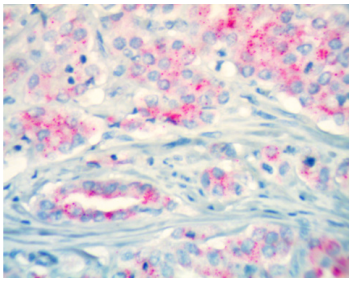


Figure 2. PIN4 cocktail positive

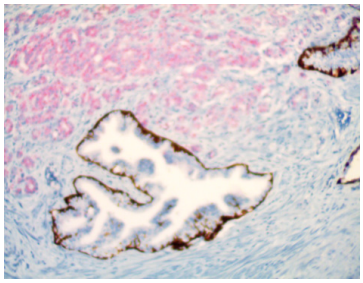


Figure 3. PIN4 cocktail negative

Bladder

Background

In the United States there are approximately 81,000 estimated new cases of bladder cancer and approximately 18,000 estimated deaths from bladder cancer per year. The median age of diagnosis is 73 years and the median age of death is 79 years. The lifetime risk in the general population for developing bladder cancer is 2.4%.

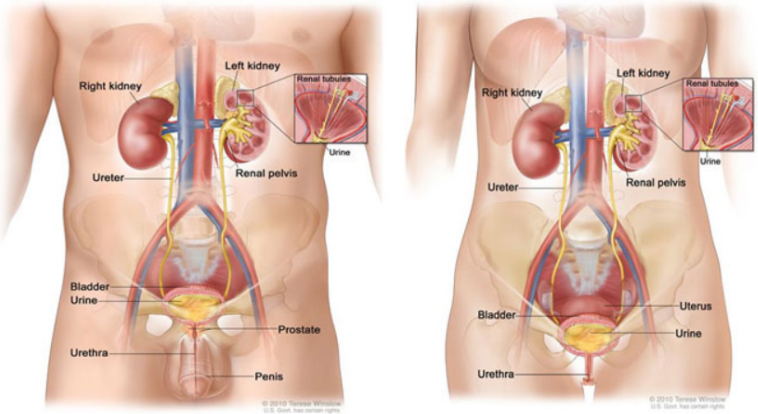


Figure 4: Bladder anatomy

Bladder cancer begins in the epithelial cells lining the inside of the bladder. There are three types of bladder cancer: (1) transitional cell carcinoma, which begins in the innermost layer of the bladder and accounts for most bladder cancers in the United States; (2) squamous cell carcinoma, which forms in the thin, flat squamous cells that line the bladder and is rare in the United States; (3) and adenocarcinoma, which begins in glandular cells and is also rare in the United States. Cancer that begins in the transitional cells may spread through the lining of the bladder and invade the muscle wall of the bladder or spread to nearby organs and lymph nodes; this is called invasive bladder cancer. Risk factors for bladder cancer include: smoking, aging (bladder cancer is rarely found in people under 40 years of age), being a Caucasian male, exposure to certain chemicals, previous cancer treatments (cyclophosphamide), chronic bladder inflammation (repeated UTIs, catheterization, or schistosomiasis infection), and a previous history of bladder cancer.

The following tests are available to assist in the diagnosis and/or staging of bladder cancer:

Immunohistochemical Stain: Smoothelin

Smoothelin is a smooth muscle-specific, contractile protein expressed only by fully differentiated smooth muscle cells, and not by proliferative or noncontractile smooth muscle cells or myofibroblasts. Detection of smoothelin in sections of formalin-fixed, paraffin embedded tissue sections using an immunohistochemistry (IHC) test method is indicated as an aid to the characterization of terminally-differentiated smooth muscle cells and grading of bladder carcinoma.

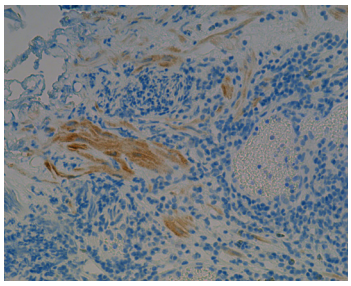


Figure 5: Smoothelin IHC positive

Urine Cytology

Urine cytology is performed in patients with symptoms that suggest malignancy such as hematuria, or for screening patients with occupational hazards that increase the risk of bladder cancer. It is also used to monitor patients for recurrence of previous malignancy. Urine cytology can detect high grade urothelial cell carcinomas, as well as low grade urothelial lesions. It may also detect bacterial, fungal, parasitic, and viral infections.

Urine samples are collected into sterile containers, concentrated by centrifugation, fixed using ThinPrep® PreservCyt® solution, placed onto a slide using monolayer technology, stained with a modified Papaniculou stain and examined microscopically by a cytotechnologist to identify any abnormal cells. After initial evaluation by a cytotechnologist, each case is reviewed and reported by a pathologist. When diagnostically indicated, clinicians can order UroVysion® testing [a fluorescence *in situ* hybridization (FISH) test method], for further evaluation when diagnostically indicated.

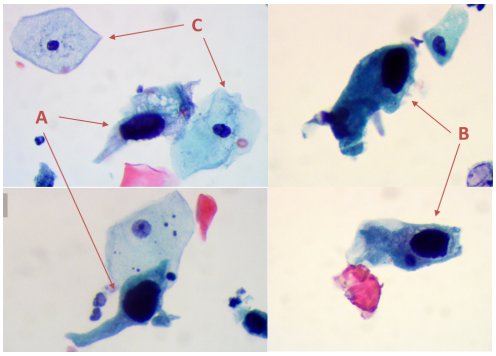


Figure 6: Urothelial Carcinoma in 88 y/o male, voided urine cytology (ThinPrep® slide at 400x magnification) Single atypical urothelial cells **(A)** show high nuclear-cytoplasmic ratios, densely hyperchromatic chromatin, and irregular nuclear borders. The cytoplasm of these cells begins to form a tadpole shape. Single atypical urothelial cells **(B)** show high nuclear-cytoplasmic ratios, densely hyperchromatic chromatin, and irregular nuclear borders. In contrast, single benign urothelial cells **(C)** display normal round nuclei with normal nuclear-cytoplasmic ratios and evenly distributed chromatin.

UroVysion® Bladder Cancer Test

The UroVysion® Bladder Cancer Test is designed to detect aneuploidy for chromosomes 3, 7, 17, and loss of the 9p21 locus—chromosomal abnormalities that commonly occur with bladder cancer—by fluorescence *in situ* hybridization (FISH) in urine from patients suspected of having bladder cancer.

In situ hybridization is a technique that allows the visualization of specific nucleic acid sequences within a cellular preparation. With UroVysion®, cells recovered from urine pellets are fixed on slides. The DNA within the cells is denatured to its single-stranded form and allowed to hybridize with the UroVysion® probes. The UroVysion® probes are a 4-color, 4-probe mixture of Chromosome Enumeration Probe (CEP) 3 SpectrumRed, CEP 7 SpectrumGreen, CEP 17 SpectrumAqua, and Locus Specific Identifier (LSI) 9p21 SpectrumGold. Following hybridization, the unbound probe is removed by a series of washes, and the cell nuclei are counterstained with DAPI (4,6 diamidino-2-phenylindole), a DNA-specific stain that fluoresces blue. When hybridized and microscopically examined, these probes allow specific enumeration of chromosomes 3, 7, 9, and 17.

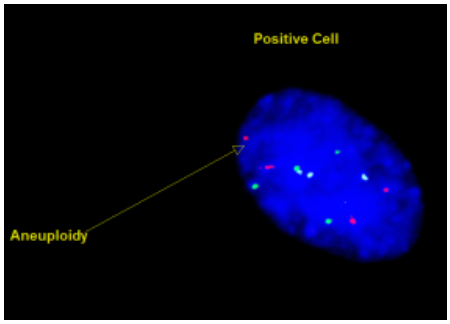


Figure 7: UroVysion® positive with aneuploidy detected

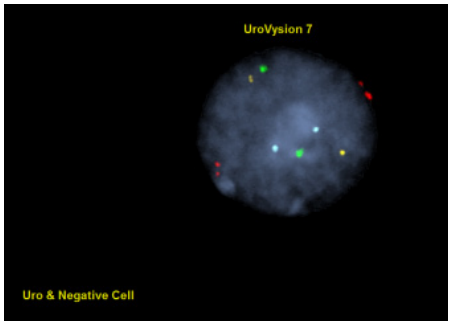
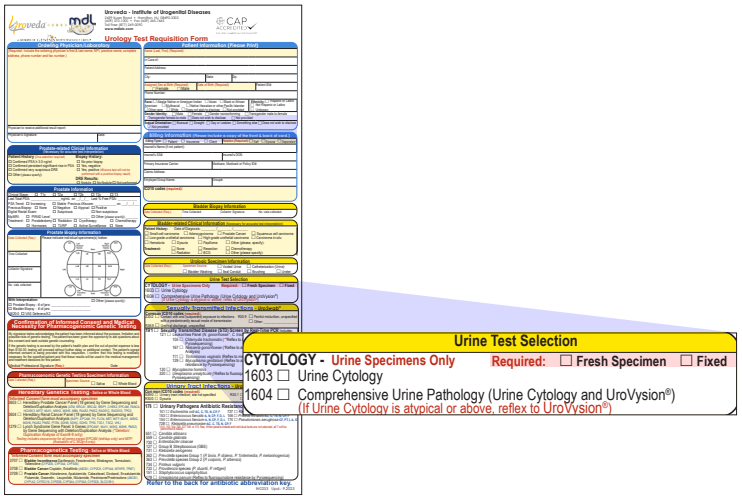


Figure 8: UroVysion® negative

Medical Diagnostic Laboratories (MDL) offers the following urine cytology tests:



References

1. SEER Cancer Stat Facts: Prostate Cancer. National Cancer Institute. Bethesda, MD, Accessed February 9, 2021 at https://seer.cancer.gov/statfacts/html/prost.html
2. SEER Cancer Stat Facts: Bladder Cancer. National Cancer Institute. Bethesda, MD, Accessed February 9, 2021 at https://seer.cancer.gov/statfacts/html/urinb.html