



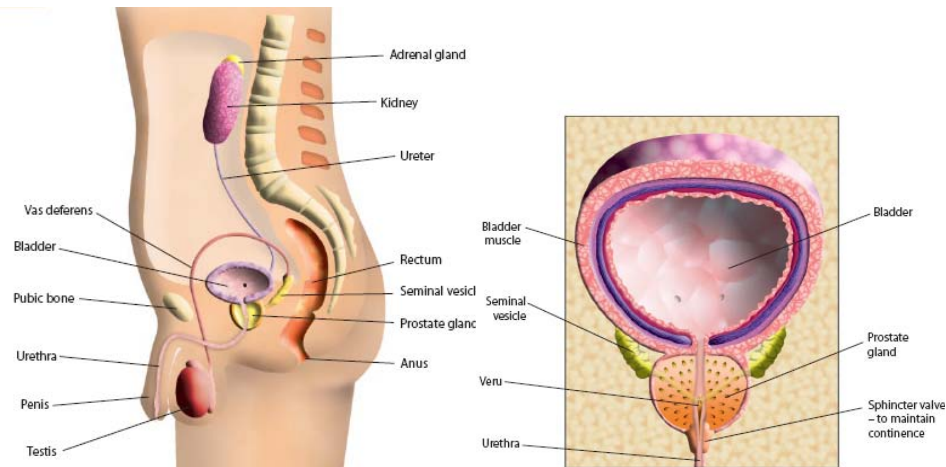
## A short intro to prostate cancer



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## Prostate anatomy



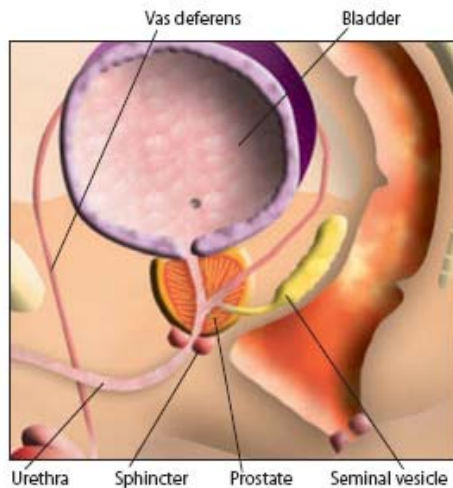
The prostate is a small gland, about the size of a walnut, which lies just below the bladder. The tube draining the bladder, called the urethra, passes through the centre of the gland, to the penis.



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## What does the prostate do?



The prostate gland is a part of the male reproductive system. It develops at puberty and continues to enlarge throughout life. The prostate acts rather like a junction box. It allows the tubes that transport sperm from each testicle and the tubes that drain from the seminal vesicles to meet and then empty their contents into the urethra. The seminal vesicles consist of two pouches that provide nutrients for the sperm and lie immediately behind the prostate. At the point of orgasm, sperm, seminal vesicle fluid and prostatic secretions enter the urethra and mix together, forming semen. This is then ejaculated out through the penis by rhythmic muscular contractions.

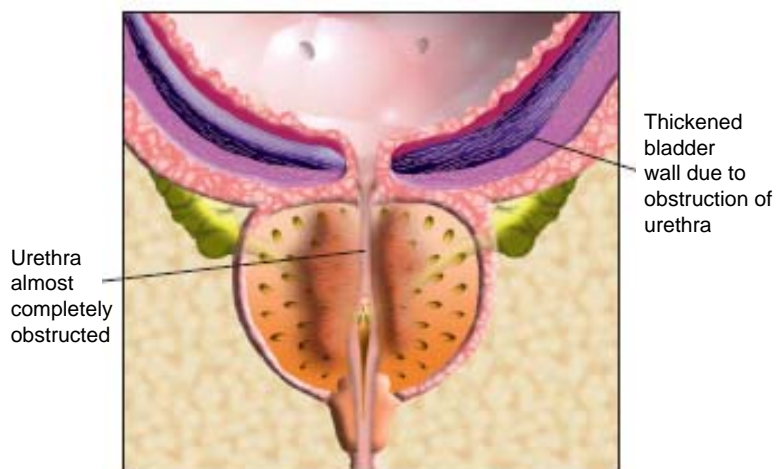


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## Benign Prostate Hyperplasia (BPH)

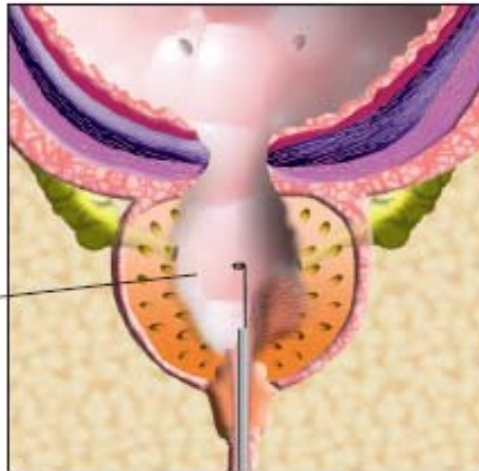
Very common. ~10M men in North America have it at any time



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## TURP – Trans Urethral Resection of the Prostate



...leaving a cavity that subsequently heals and re-lines itself over 4-6 weeks.

Cavity

Release 3-5 days, recovery ~14 days



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## 2007 estimated U.S. cancer cases\*



|                      |     | Men<br>766,860 | Women<br>678,060         |
|----------------------|-----|----------------|--------------------------|
| Prostate             | 29% |                | •26% Breast              |
| Lung & bronchus      | 15% |                | •15% Lung & bronchus     |
| Colon & rectum       | 10% |                | •11% Colon & rectum      |
| Urinary bladder      | 7%  |                | •6% Uterine corpus       |
| Non-Hodgkin lymphoma | 4%  |                | •4% Non-Hodgkin lymphoma |
| Melanoma of skin     | 4%  |                | •4% Melanoma of skin     |
| Kidney               | 4%  |                | •4% Thyroid              |
| Leukemia             | 3%  |                | •3% Ovary                |
| Oral cavity          | 3%  |                | •3% Kidney               |
| Pancreas             | 2%  |                | •3% Leukemia             |
| All Other Sites      | 19% |                | •21% All Other Sites     |

\*Excludes basal and squamous cell skin cancers and in situ carcinomas except urinary bladder.  
Source: American Cancer Society, 2007.



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## U.S. prostate cancer stats<sup>1</sup>

- 240,000 new prostate cancer cases
- Will double by 2025
- 30,000 deaths
- >90% long term disease free survival with early stage cancer
- **While local control still must improve, quality of life matters the most**

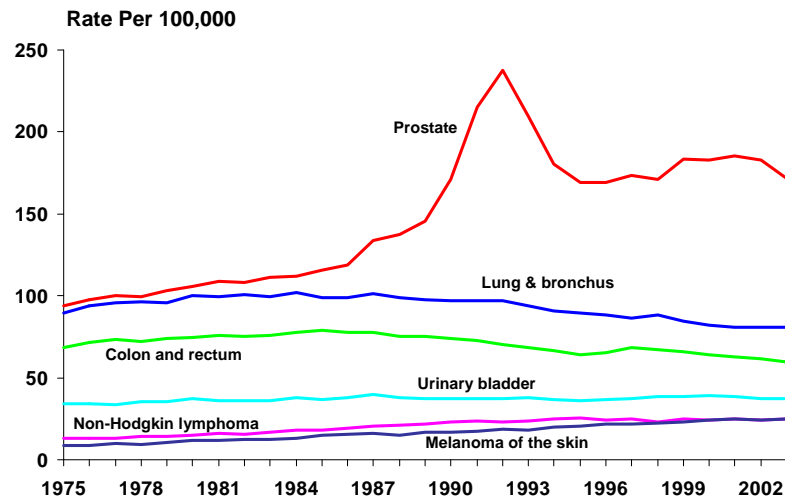
<sup>1</sup> Jemal et al. *Cancer statistics, 2007. CA Cancer J. Clin.* 57(1), 43–66 (2007).



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## Cancer Incidence Rates\* for Men, 1975-2003



\*Age-adjusted to the 2000 US standard population and adjusted for delays in reporting.

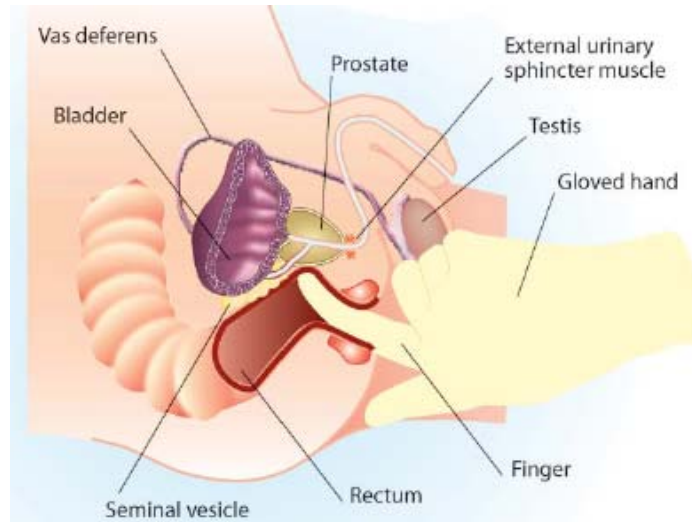
Source: Surveillance, Epidemiology, and End Results Program, 1975-2003, Division of Cancer Control and Population Sciences, National Cancer Institute, 2006.



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## Digital Rectal Examination (DRE)



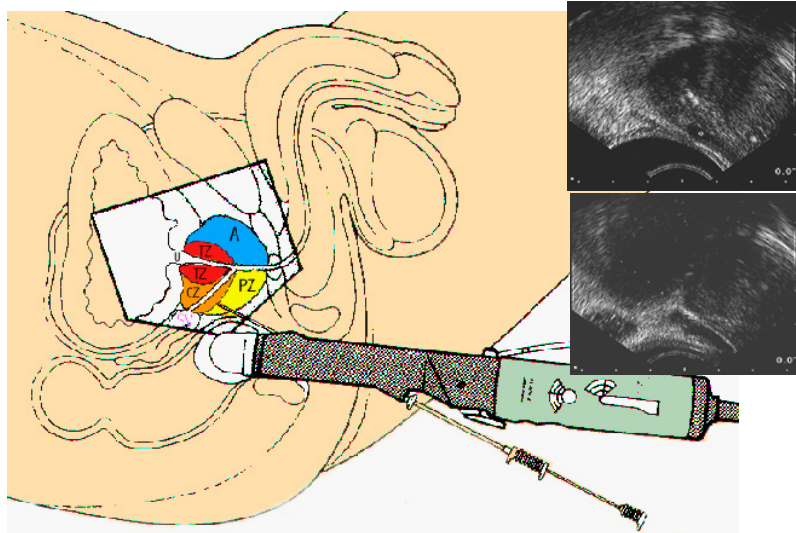
- Annual DRE is recommended over 50 years of age



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## Transrectal ultrasound biopsy



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## Technical issues in TRUS biopsy

### 1.5 M biopsies → 220,000 cancers???

- Low image quality for visual inspection
- Low predictive value of US
- Almost blind site selection (sextant, etc.)
- Patient motion
- Organ deformation due to probe pressure
- Free-hand execution

**Research toward improving on prostate biopsy**  
**Coming in separate lecture ☺**




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## Diagnosis and staging

**T1**




Seminal vesicle  
Rectum  
External urinary sphincter muscle

**T2**




| Stage |   |
|-------|---|
| 1     | Earliest stage, where the cancer is so small that it cannot be felt on rectal examination, but is discovered in a prostate biopsy or in prostate tissue that has been surgically removed to 'unblock' the flow of urine (as in a transurethral resection of the prostate – TURP). |
| 2     | The tumour can now be felt on rectal examination, but is still confined to the prostate gland and has not spread.   |
| 3     | The tumour has spread outside the gland and may have invaded the seminal vesicles.  |
| 4     | The tumour has spread to involve surrounding tissues such as the rectum, bladder or muscles of the pelvis.  |

**T3**



**T4**





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## PCa treatment options

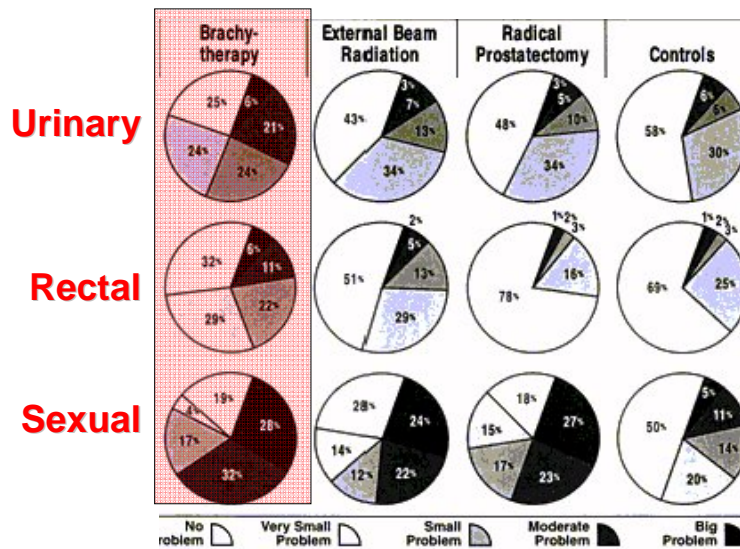
- No treatment (a.k.a. Active Surveillance)
- Prostate surgery: radical prostatectomy (RP)
- Localized therapies
  - External beam radiation therapy (EBRT)
  - Brachytherapy (BT)
  - Highly Focused Ultrasound (HIFU)
  - Cryosurgery
- Hormone therapy
- Chemotherapy



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## Treatment side effect stats<sup>1</sup>

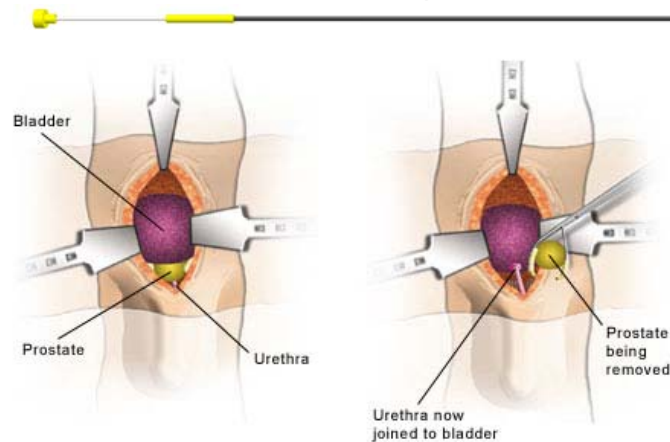


<sup>1</sup> Wei et al., J Clin Oncol, 2002 Jan 15;20(2):557-66.

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## Radical prostatectomy – retropubic



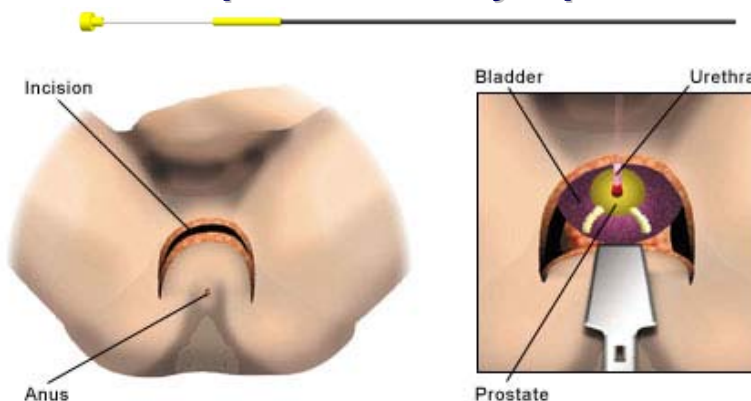
This is the commonest approach for open (i.e. non-keyhole) prostatectomy and involves an incision in the lower part of the abdomen, typically from just below the umbilicus (belly button) to just above the penis. The advantages of this route are that the lymph nodes can be removed if they need to be and that this is a surgical approach familiar to all urologists. The disadvantages of this approach are: the relatively awkward operative access to the prostate, which is partly hidden by the pubic bone; bleeding (which requires blood transfusion in about two-thirds of patients); and post-operative discomfort from the wound.



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## Radical prostatectomy – perineal



This is less commonly performed than retropubic prostatectomy, because of the lack of familiarity of this route to most urologists. It is done through an incision between the anus and the scrotum (the perineum). Its advantages are less bleeding and better access to the prostate, which is located just beneath the perineum. Its disadvantages are the inability to remove the lymph nodes (if necessary), its lack of suitability for large prostates (because of confined space) and the greater risk of rectal problems during and after surgery.

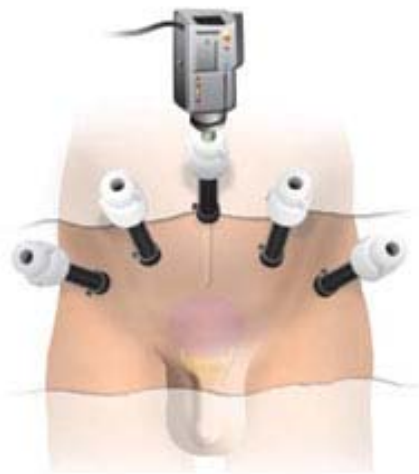


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## Radical prostatectomy – laparoscopic



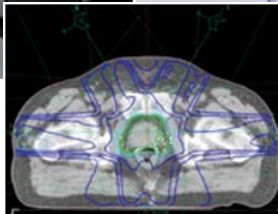
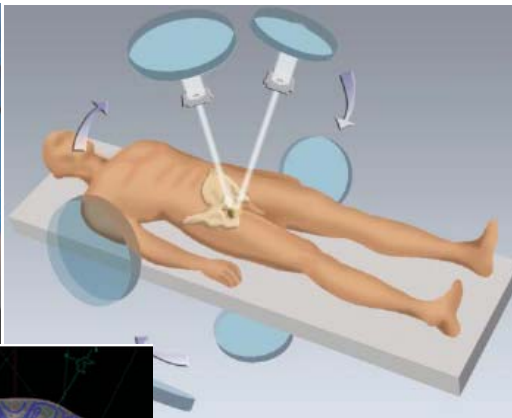
This approach has attracted great interest since 2000 and is becoming increasingly popular with surgeons, and requested by patients, and points the way for this type of operation in the future. This technique combines the advantages of retropubic prostatectomy with better vision for the surgeon and reduced blood loss, hospitalisation, catheterisation time and recovery. It is done through five 1cm incisions in the abdomen. The only disadvantage of this approach is that it takes longer to perform and is technically more demanding.



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## External beam radiation therapy



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