Gleason Grading of Prostatic Adenocarcinoma

Larry Massie, MD
New Mexico VA Health Care System
UNM Department of Pathology

September 19, 2015

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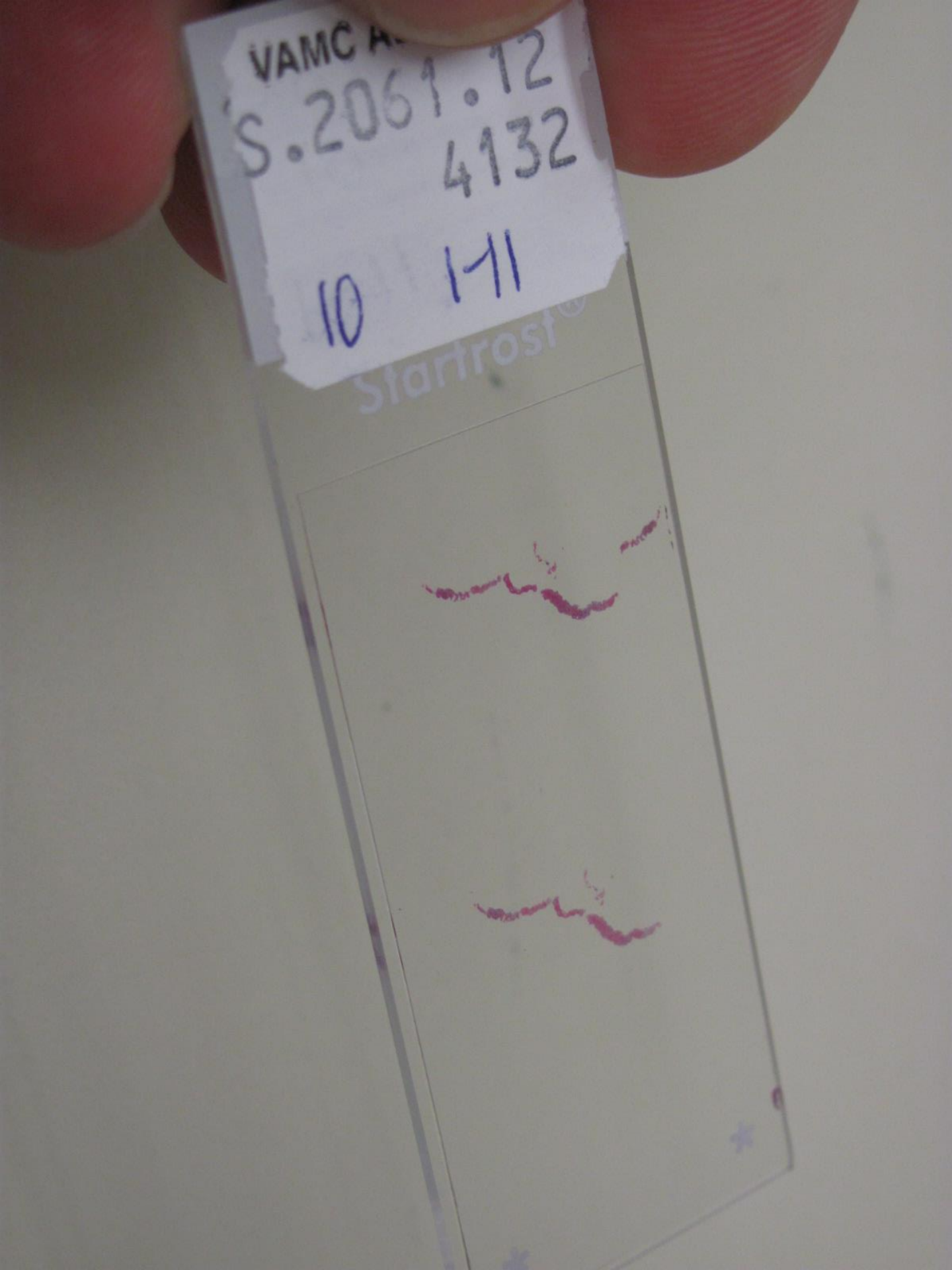
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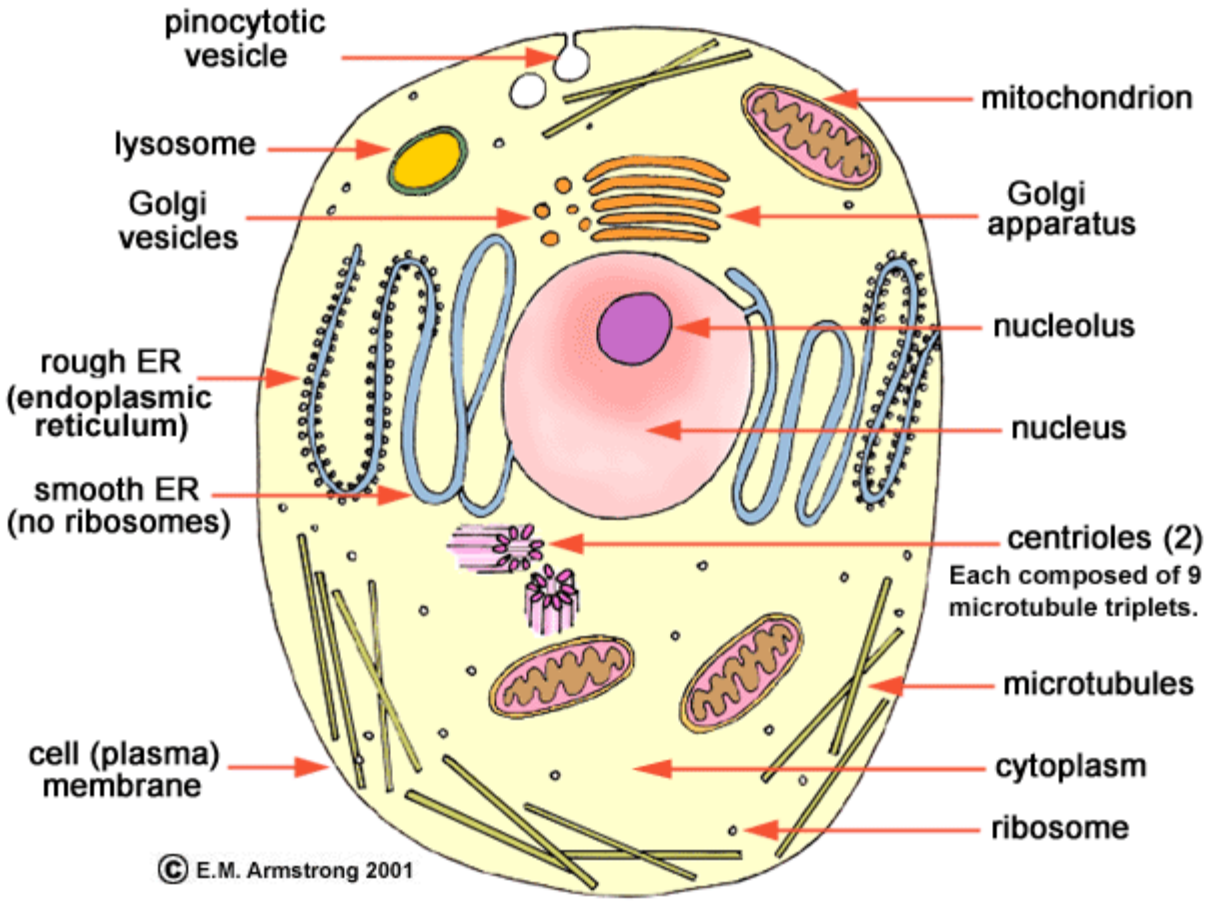
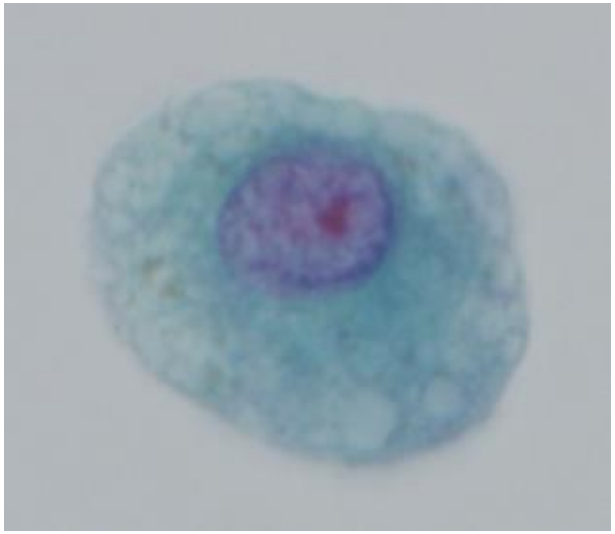
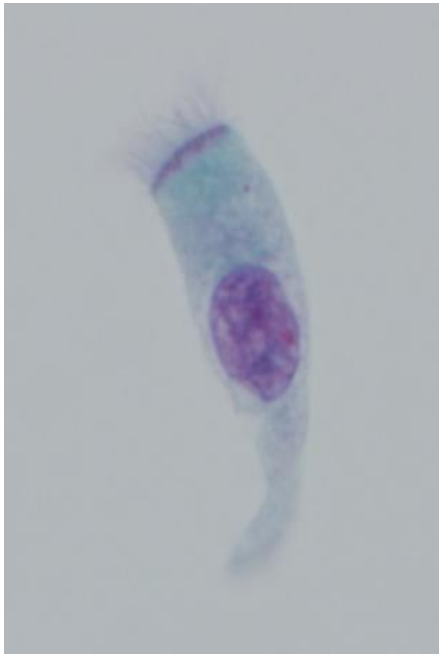
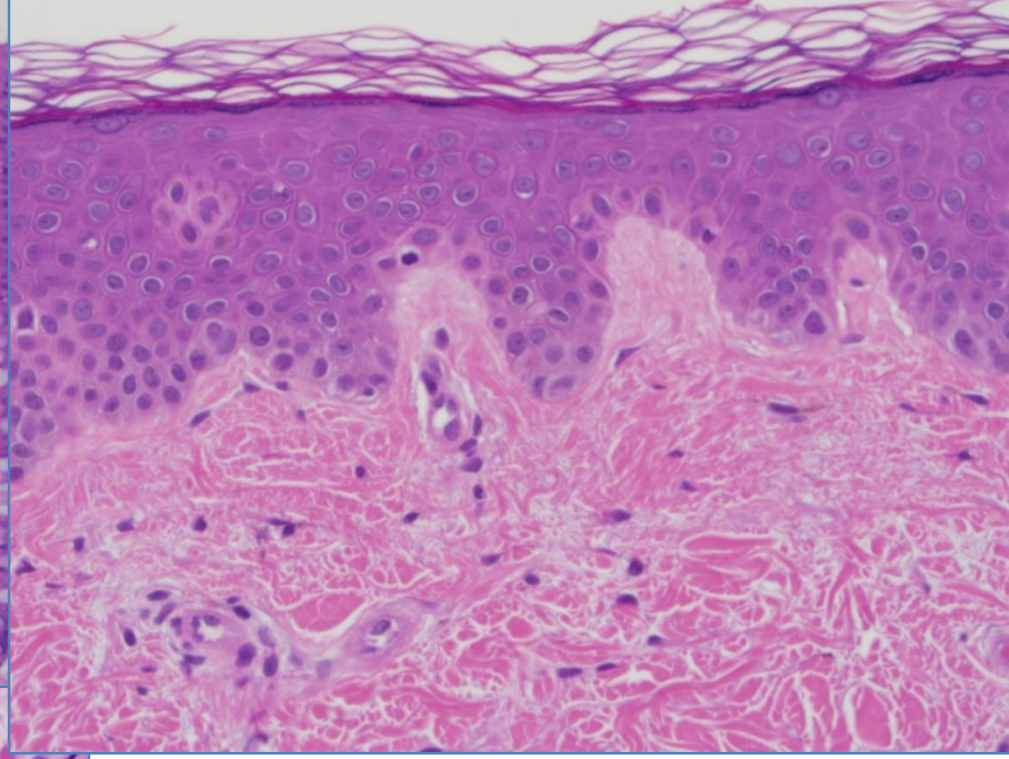
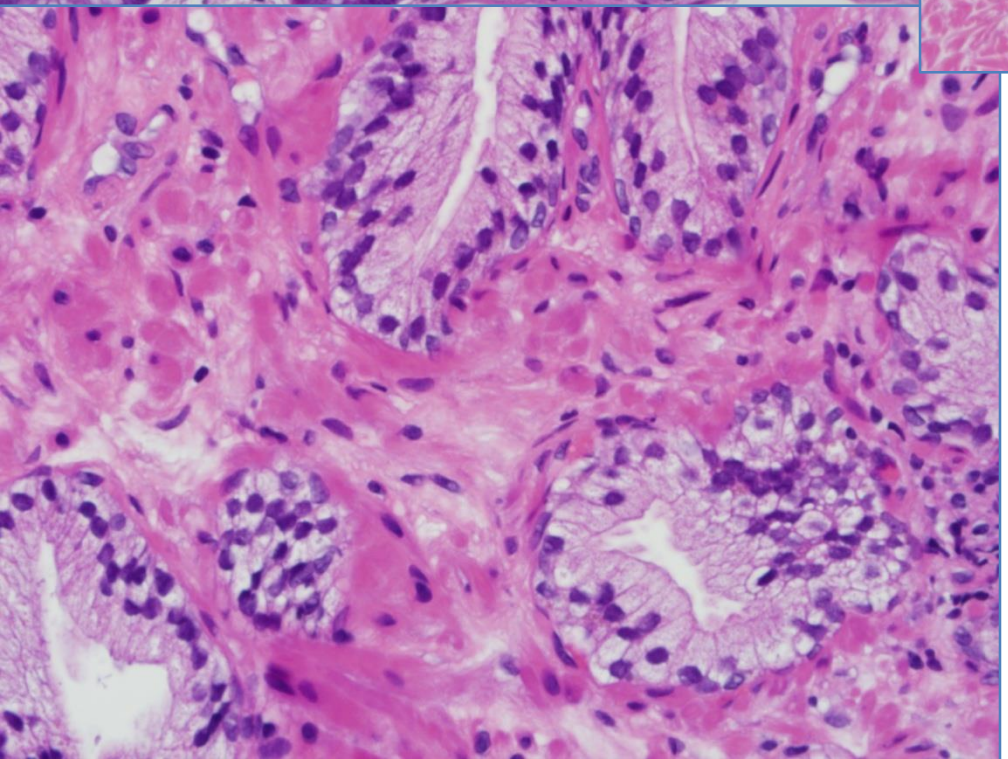

pinocytotic vesicle
lysosome
Golgi vesicles
rough ER (endoplasmic reticulum)
smooth ER (no ribosomes)
cell (plasma) membrane
mitochondrion
Golgi apparatus
nucleolus
nucleus
centrioles (2)
Each composed of 9 microtubule triplets.
microtubules
cytoplasm
ribosome
© E.M. Armstrong 2001

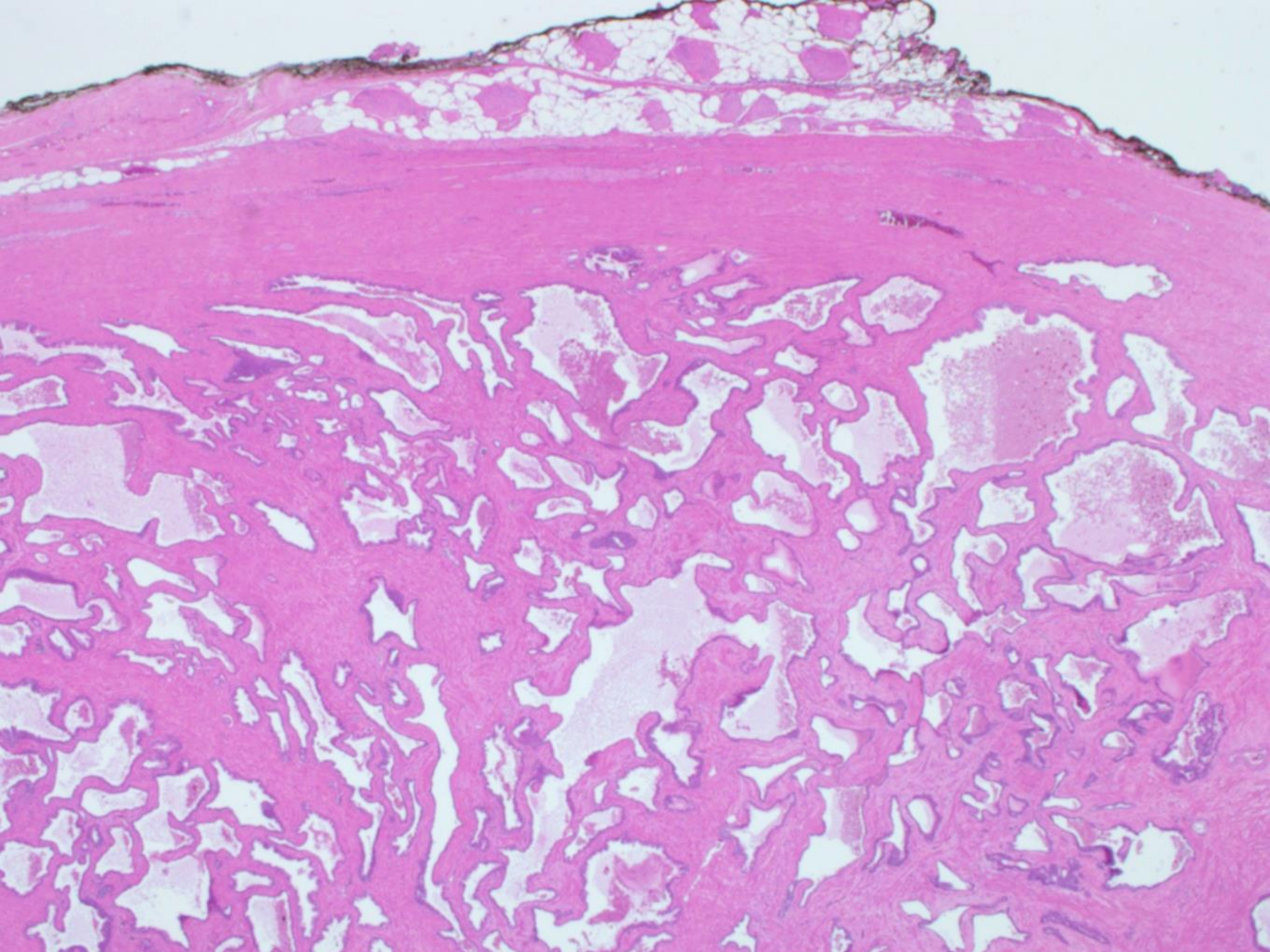


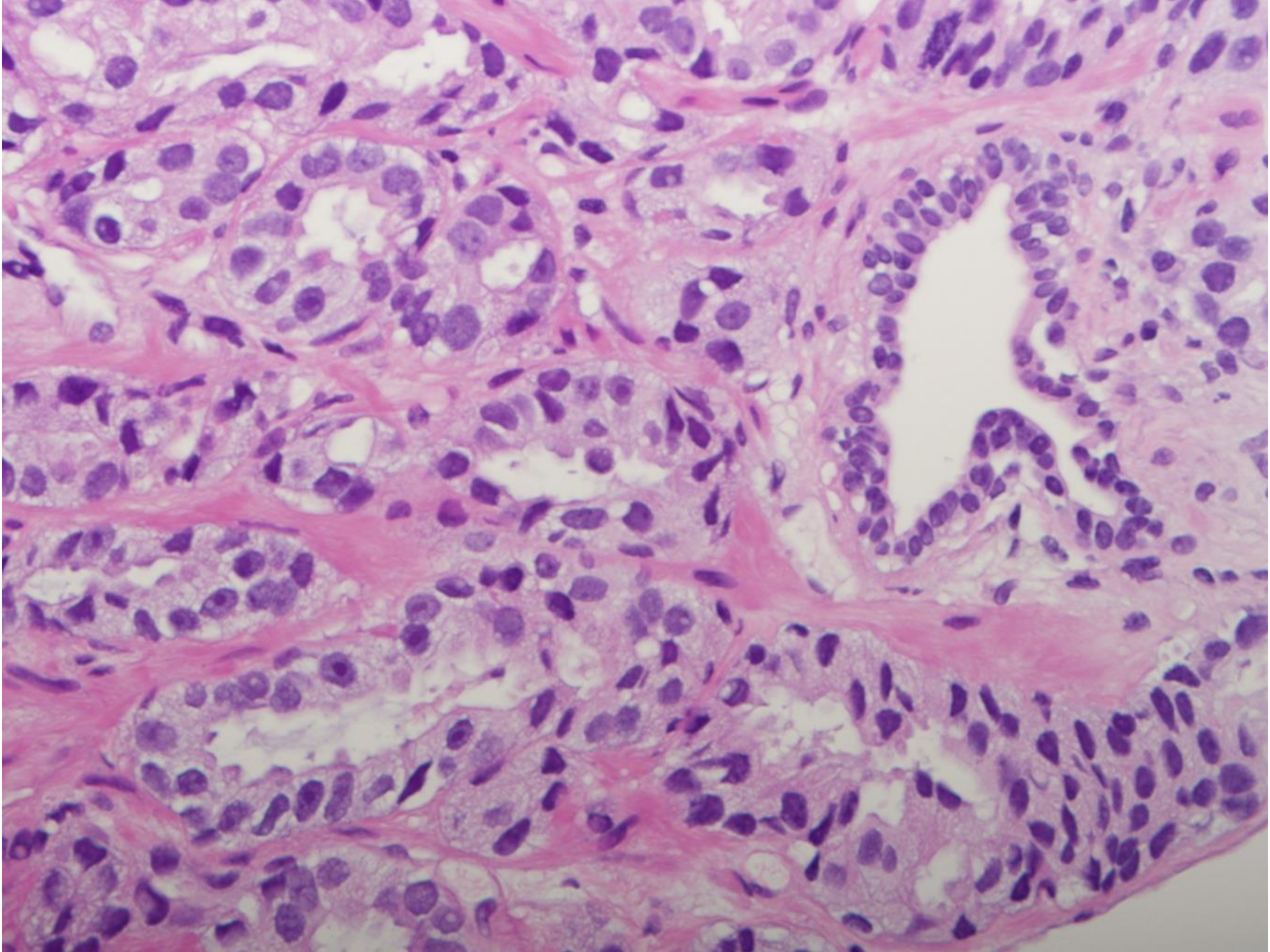


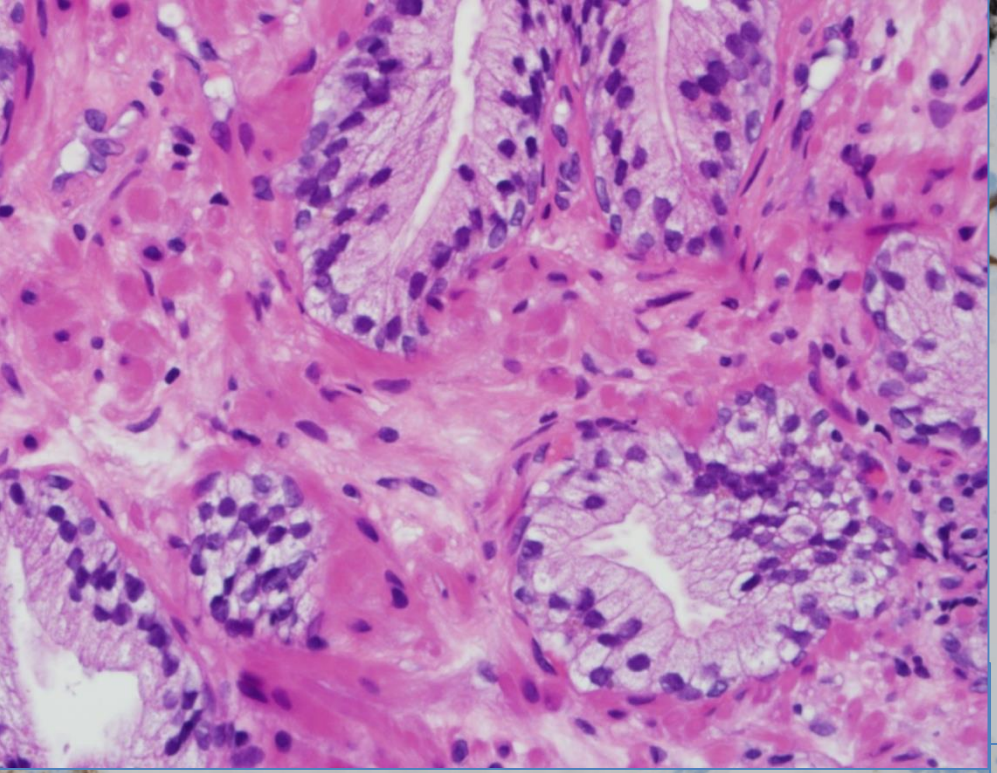
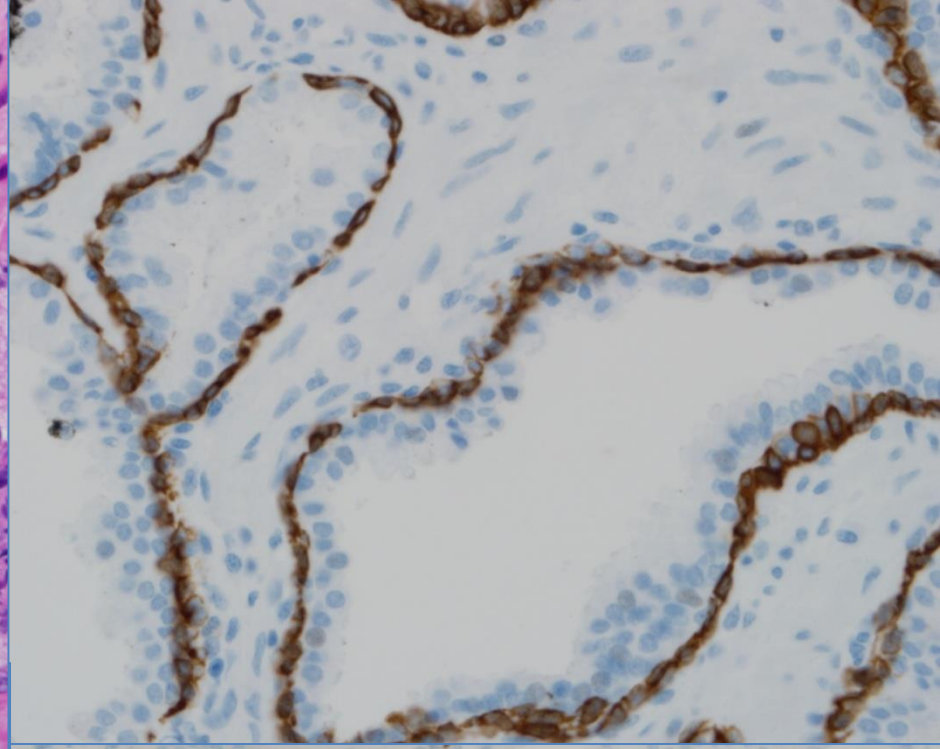
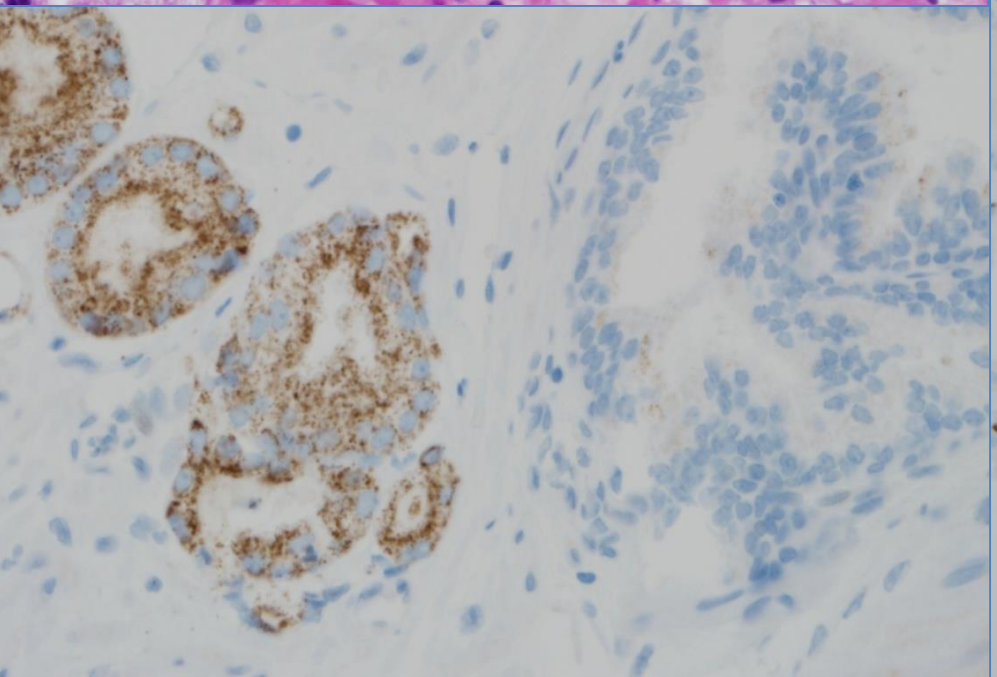
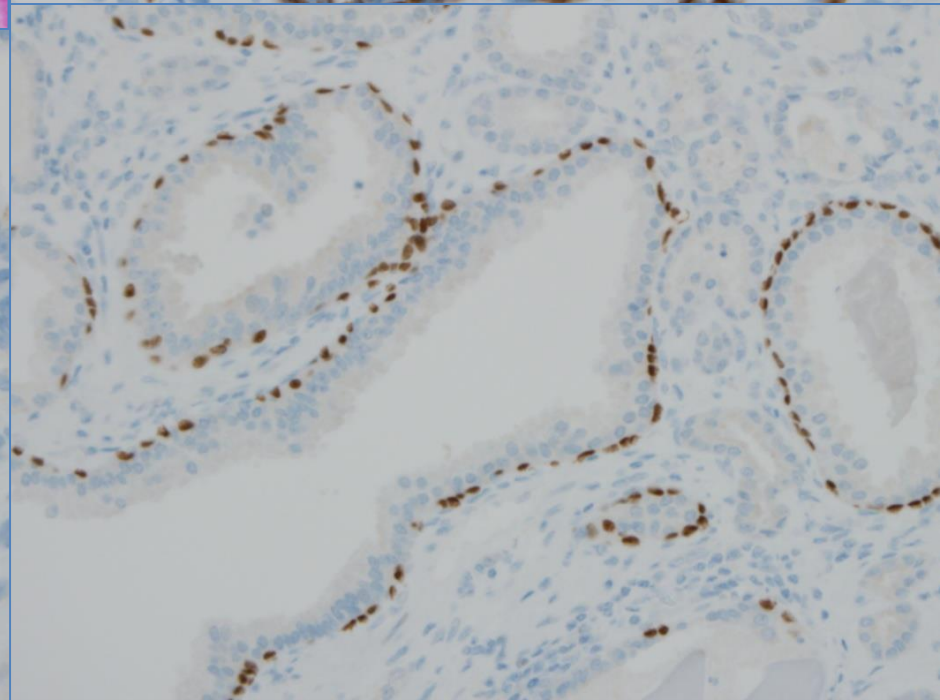




Histology – the study of tissues





Histologic Grading of Malignant Tumors

- Most classification schemes are based upon how closely the malignant cells mimic normal cells from which they are derived, variability in nuclear size, and mitotic rate (cell division)

- Most classification schemes utilize three tiers – Well, Moderate, and Poorly-differentiated

- More than 40 grading schemes were proposed for prostate cancer during the 20th century

- Currently Gleason grade (or score) is the single system in use throughout the US and World

Gleason Grading of Prostatic Adenocarcinoma

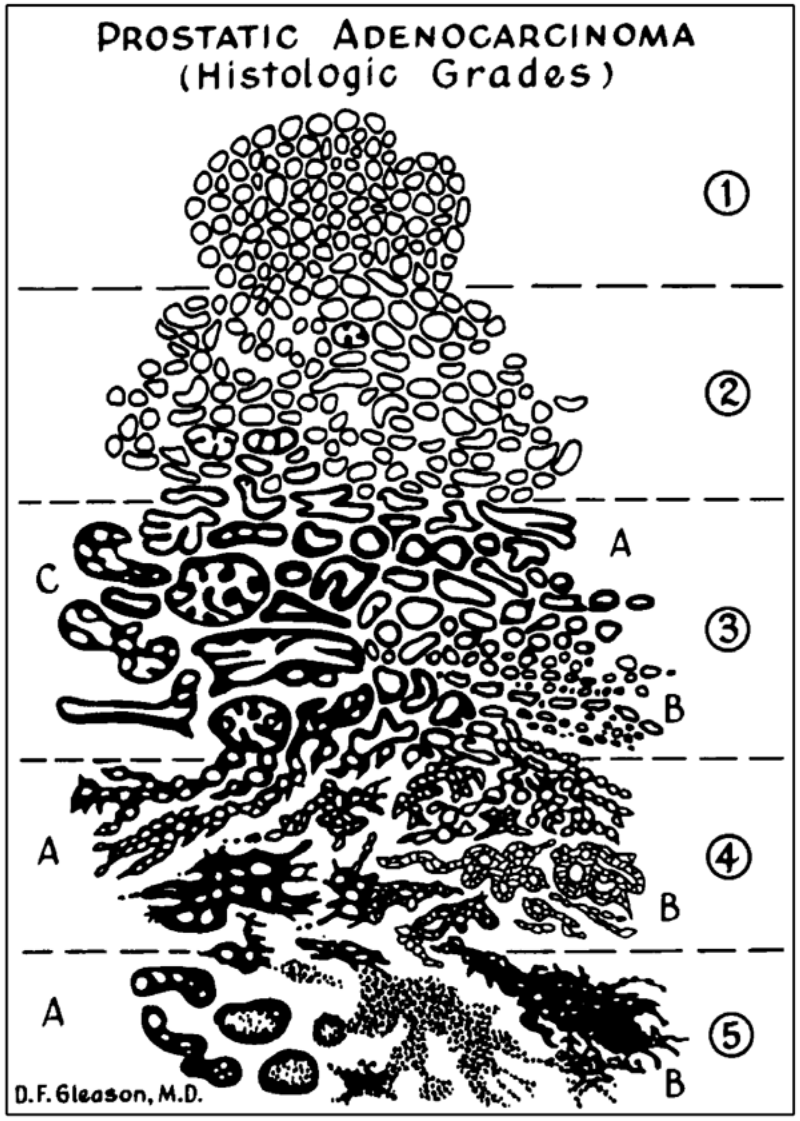
- Developed by Dr. Donald Gleason as part of the Veterans Administration Cooperative Urological Research Group (VACURG) established in Minnesota in 1960s.

- In 1962, Dr. Gleason, a junior pathologist at the Minneapolis VA Medical Center, was recruited by Dr. George Mellinger, Chief of Urology, to develop a standardized rating system for prostatic tumors to facilitate communication between the fourteen participating hospitals.

- Gleason arrived at a classification system that relied on architectural features that represented virtually every patient and correlated with disease progression and tumor burden.

- In 1966, the results on the first 270 patients were published in Cancer Chemotherapy Reports and subsequently more than 4,000 patients were enrolled until 1975.

- Slowly adopted until 1987 when a group of leading experts recommended that Gleason grading be adopted for all scientific publications.



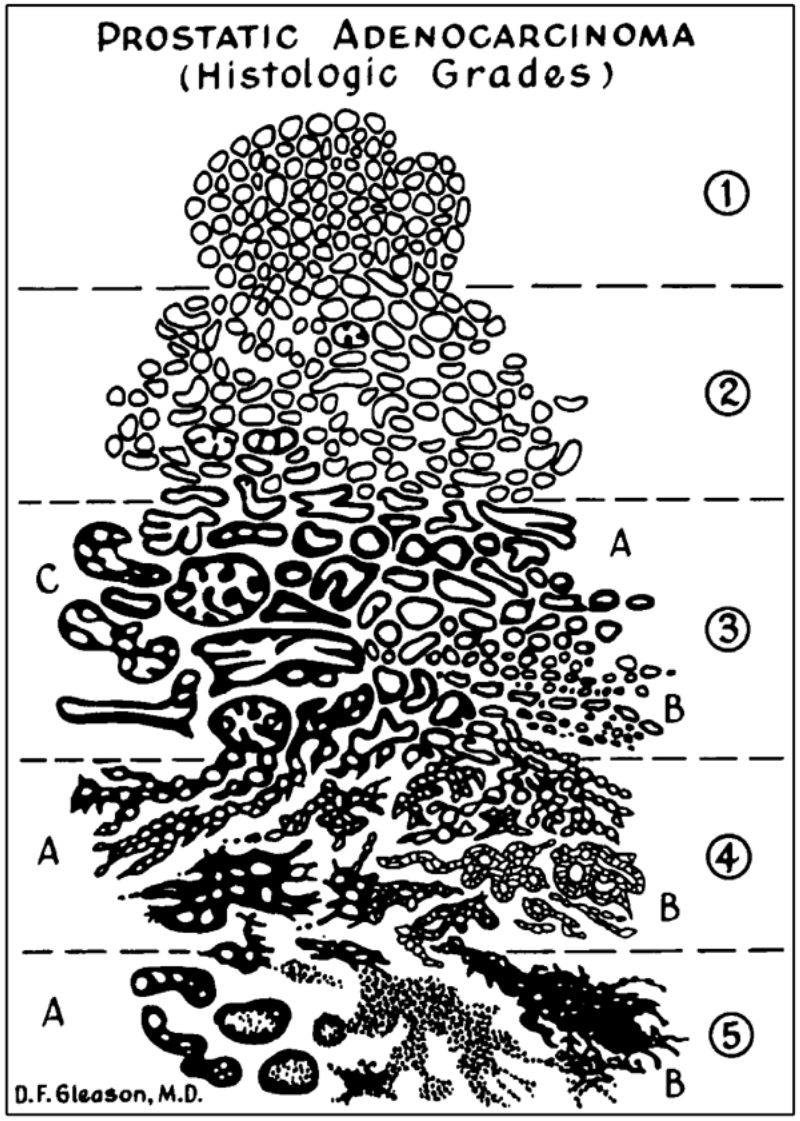
Gleason Score is the combined grades of the predominant histologic pattern and the second most prominent pattern.

If there is no secondary pattern, the histologic grade is doubled, i.e. (3+3) = 6.

Up to 50% of tumors have more than two grades depending on specimen.

Tertiary Gleason grades are reported for radical prostatectomy specimens, if a higher grade than the predominant and second most predominant pattern is present, even if the tertiary pattern occupies < 5% of the tumor.

For needle cores, Gleason scores should be assigned to each specimen container, or each positive intact core in the container.



For needle cores with two patterns, but the secondary pattern represents less than 5% of the tumor, the following rules apply.

If the secondary pattern is lower grade than the primary pattern, the primary grade is doubled, i.e. 96% Gleason 4 and 4% Gleason 3 would be Gleason 4 + 4 = 8

If the secondary pattern is higher grade than the primary pattern, the primary grade and worst grade are reported, i.e. 97% Gleason 3 and 3% Gleason 4 would be Gleason 3 + 4 = 7

Lower Gleason Scores correlate with better outcomes, higher Gleason Scores represent more aggressive tumors.

Reproducibility of Gleason Scores

Intra-observer variability – studies have shown an exact match in up to 78% of cases and within one grade difference in up to 87% . Gleason himself noted exact reproducibility on 50% of prostate biopsies and +/-1 grade in 85% of cases

Inter-observer variability

- One study showed exact agreement in up to 81% of cases and within one grade difference in up to 86%
- Another study only showed complete agreement in 66% of cases. Concordance increased to 80% when considering <7 versus 7 or more.

From Bostwick, D.G., & Cheng, L (2008). Urologic Surgical Pathology (second edition). Mosby Elsevier

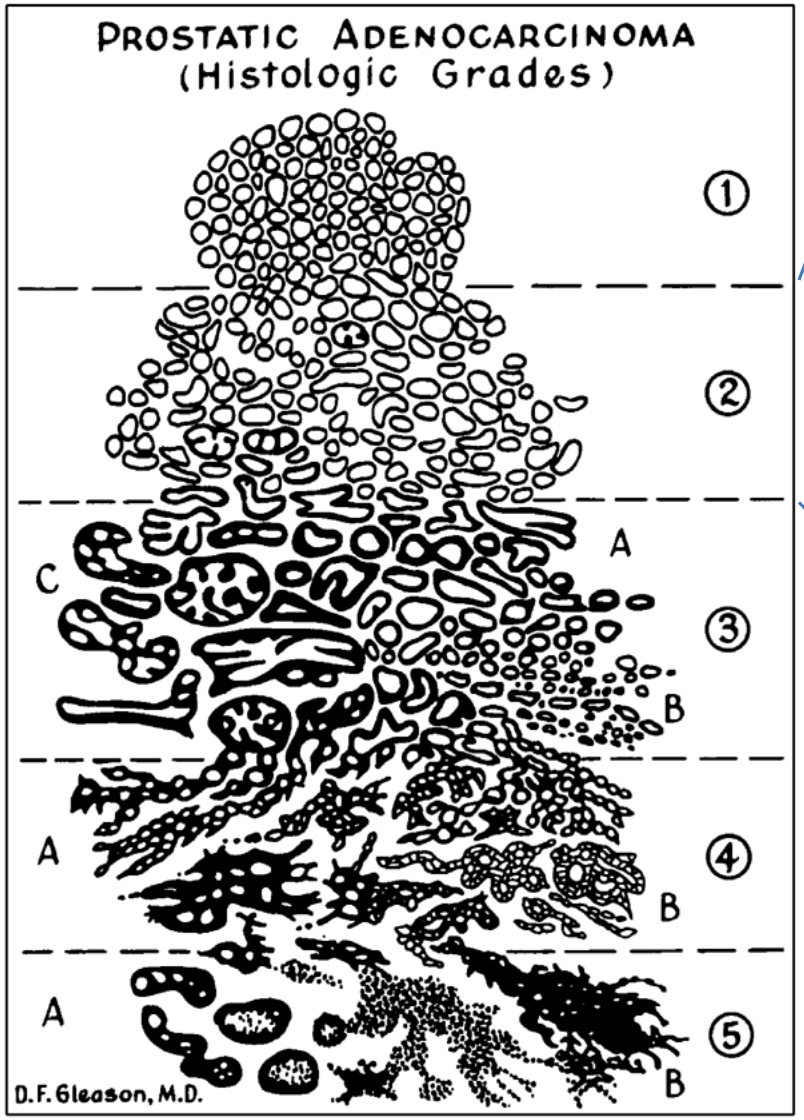
Concordance of needle biopsy and radical prostatectomy

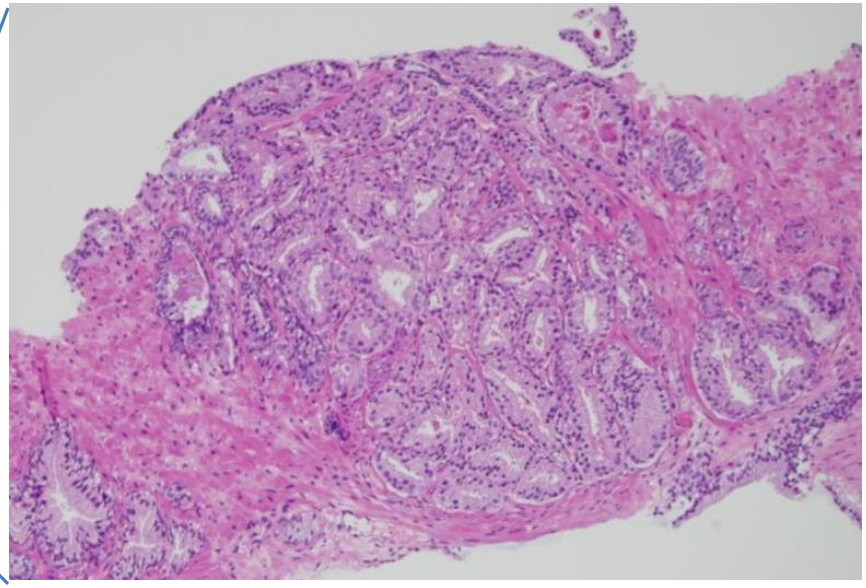
- Needle cores underestimate the tumor grade in 33-45% of cases and overestimates the grade in 4-32% of cases
- Errors due to tissue sampling error, tumor heterogeneity, and under-grading of needle biopsies
- Despite this error, Gleason grading of all prostate biopsies is recommended because useful predictive information is obtained, even for those with small amounts of tumor – similar to Gleason's original recommendation.

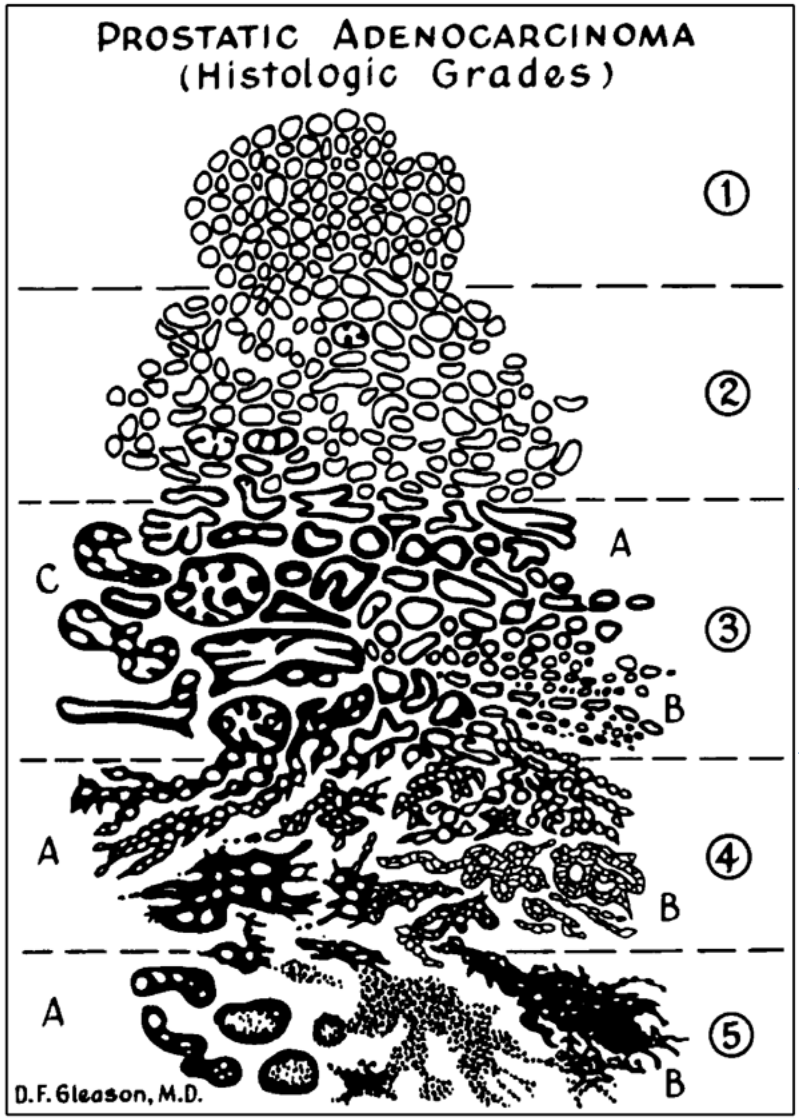
Common problems with grading

- Grading becomes more difficult with small cancer volumes, low-grade tumors, small cribriform proliferations, and 'borderline' cases
- For general pathologists – there is a tendency for undergrading

From Bostwick, D.G., & Cheng, L (2008). Urologic Surgical Pathology (second edition). Mosby Elsevier


PROSTATIC ADENOCARCINOMA
(Histologic Grades)
①
②
C
A
③
B
A
④
B
A
⑤
B
D.F. Gleason, M.D.




PROSTATIC ADENOCARCINOMA
(Histologic Grades)
①
②
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④
B
A
⑤
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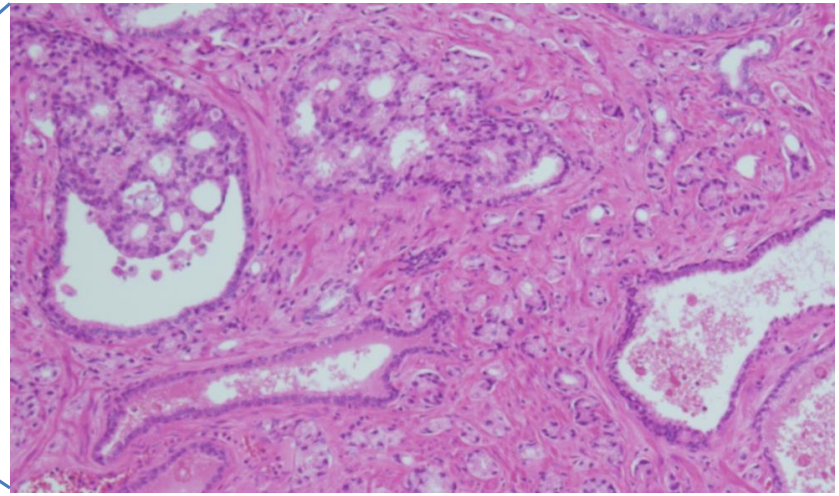

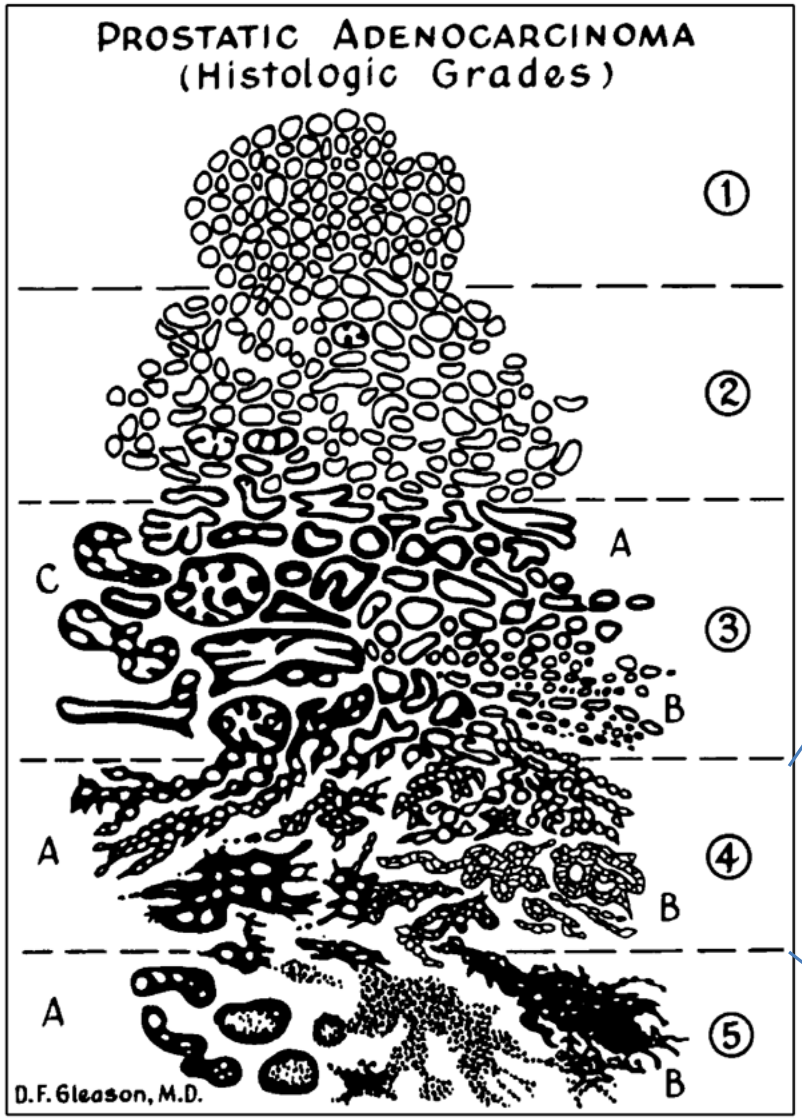
PROSTATIC ADENOCARCINOMA
(Histologic Grades)
①
②
C
A
③
B
A
④
B
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⑤
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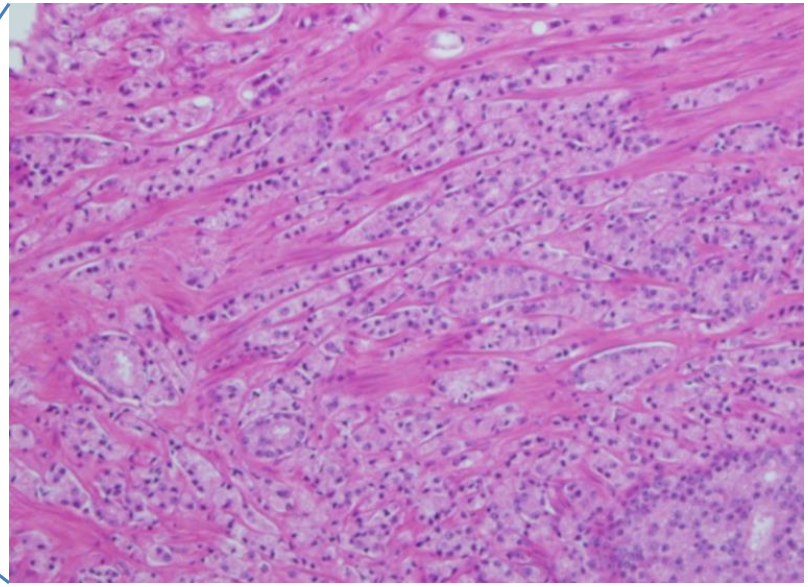
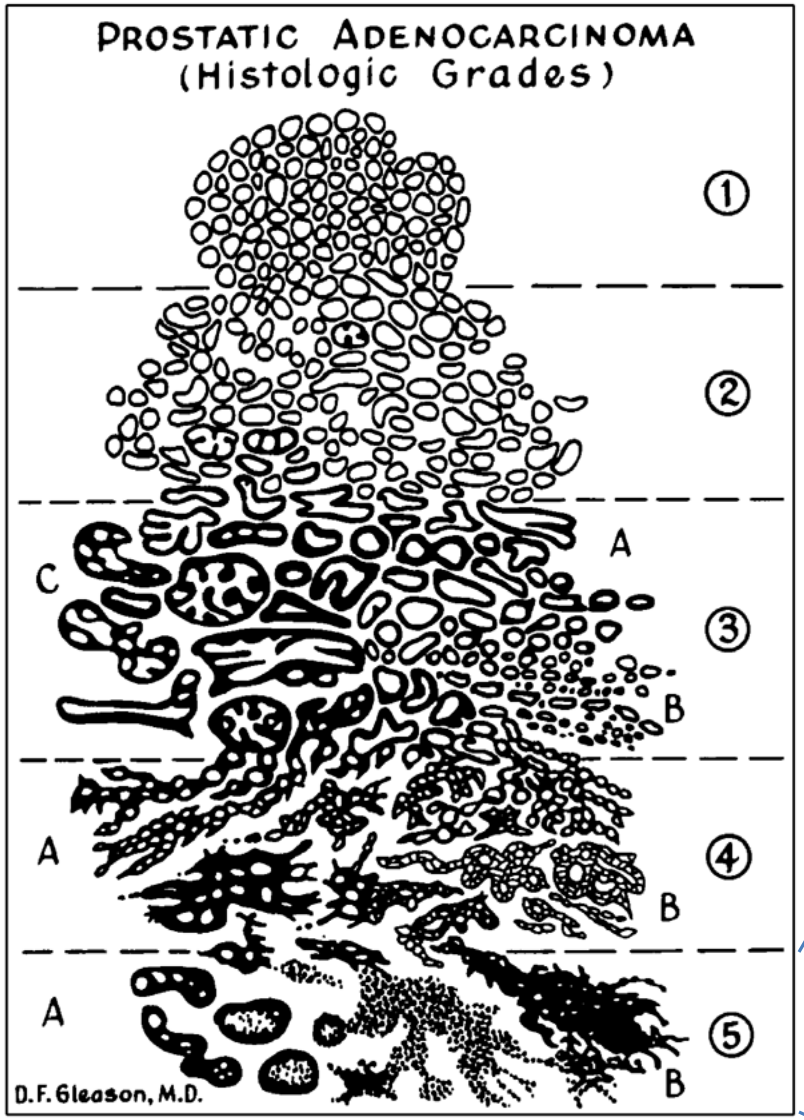
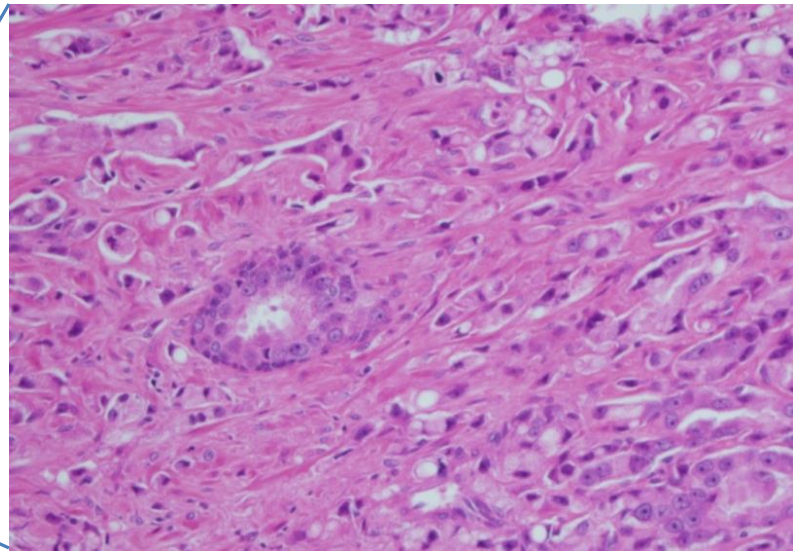
D.F. Gleason, M.D.




PROSTATIC ADENOCARCINOMA
(Histologic Grades)
①
②
③
④
⑤
A
B
C
A
B
A
B
D.F. Gleason, M.D.



Donald Floyd Gleason was born in Spencer, Iowa, and grew up in Litchfield, Minn., where his father, Fred, ran a hardware store and his mother, Ethel, was a teacher.

Dr. Gleason earned his undergraduate, medical and Ph.D. degrees from the University of Minnesota. After an internship at the University of Maryland, Baltimore, as a lieutenant in the Army Medical Corps, he trained as a pathologist at the Minneapolis VA hospital. He became the hospital's chief of anatomic pathology and laboratories and retired in 1986.

November 20, 1920 – December 28, 2008