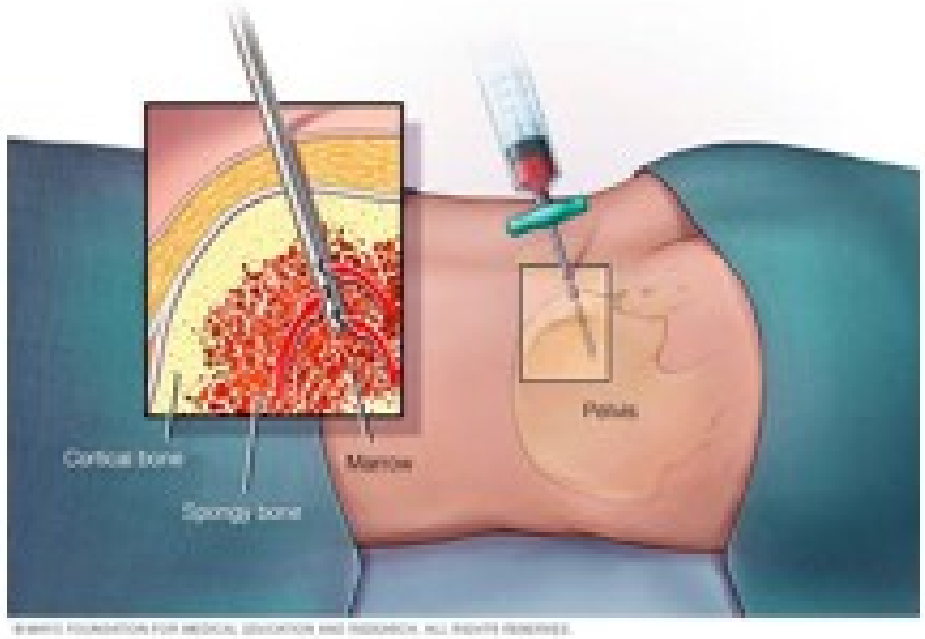
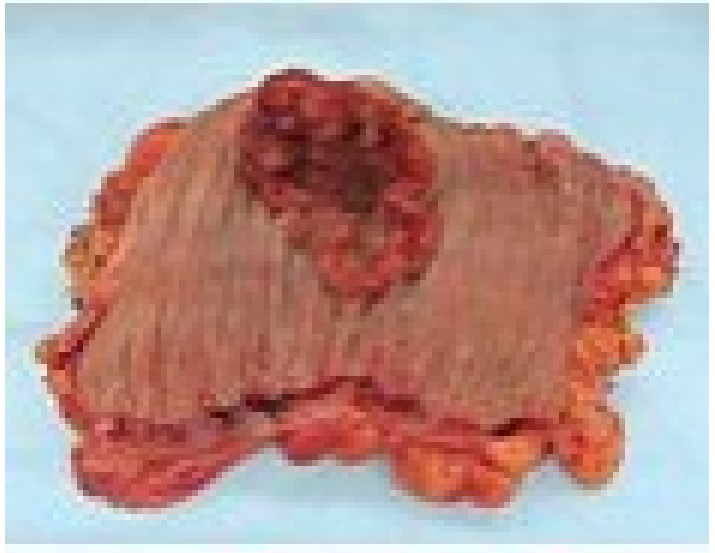
Medical Terminology for Cancer

Diagnosis - Biopsy

- this is the removal of a small section of the tumour, the sample will be analysed by a histopathologist in order to establish a precise diagnosis. Surgical procedure.
- This may be a needle biopsy, where a very fine needle is used to take a tiny sample of the tumour. Occasionally a surgeon may remove the whole tumour prior to diagnosis; a resection biopsy.

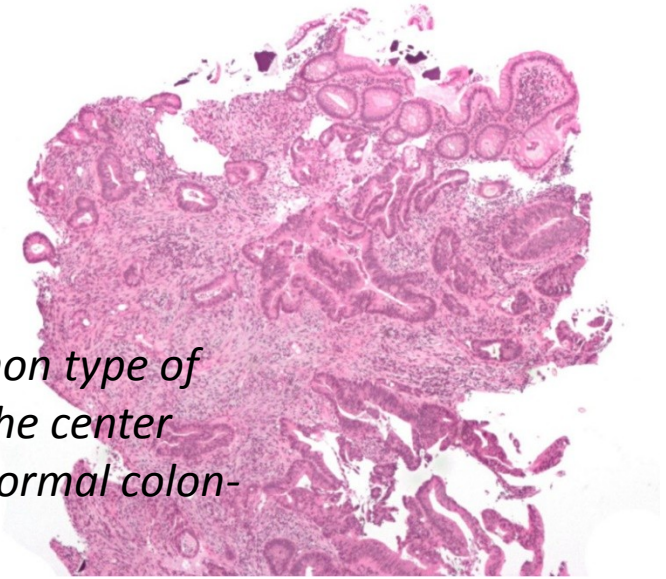


Histopathology



the study of cells relating to the disease. (Histology is the microscopic study of cells and tissues, Pathology is the study of the disease).

The histopathologist will determine a precise diagnosis by laboratory tests and microscopic examination of the cells



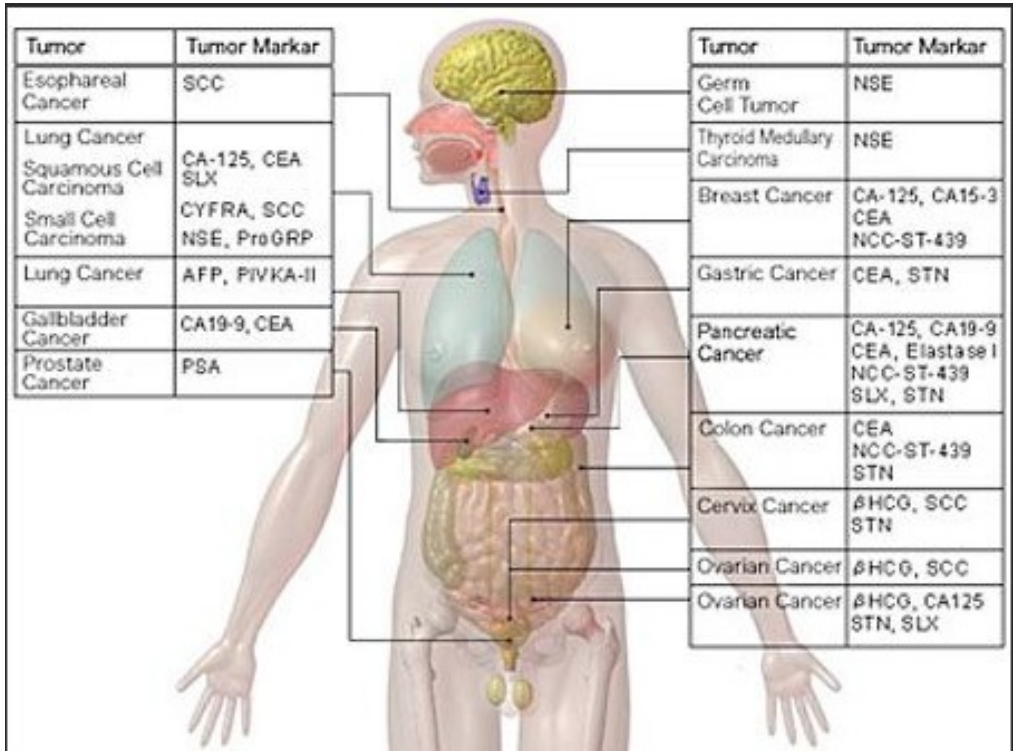
Micrograph of adenoma (the most common type of colorectal cancer). The cancerous cells are seen in the center and at the bottom right of the image (blue). Near normal colon-lining cells are seen at the top right of the image.

Differentiation

- is where normal cells go through physical changes in order to form the different specialised tissues of the body. Malignant cells may range from *well-differentiated* (closely resembling the tissue of origin) or *undifferentiated or anaplastic* (bearing little similarity to the tissue of origin). In general it is the undifferentiated or anaplastic histologies which are more aggressive

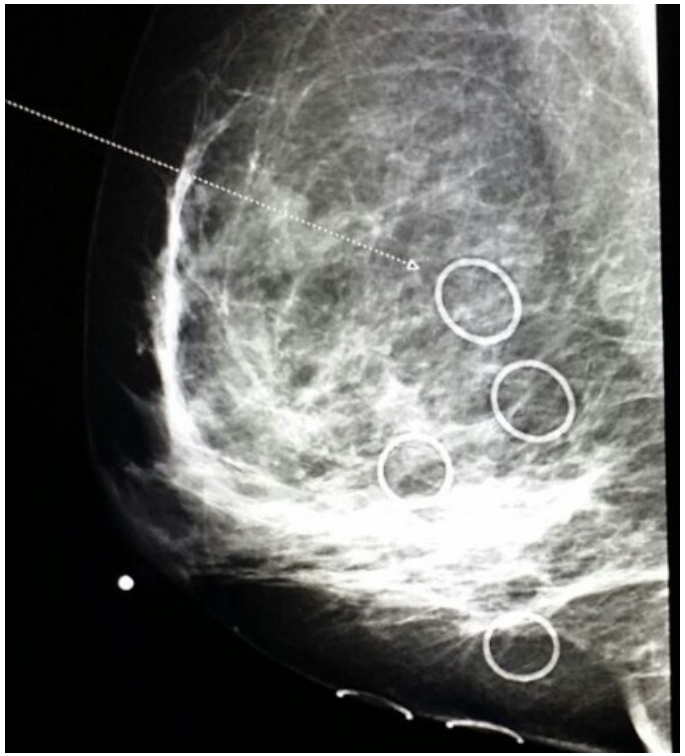
Tumour Markers

- A substance in the body that may indicate the presence of cancer.
- Markers may be secreted by the tumour itself or produced by the body in response to the cancer.
- Tumour markers may aid diagnosis or give an indicator of how treatment is progressing.
- These markers are usually specific to certain types of cancer.
- For example neuron-specific enolase (NSE) is associated with a number of types of cancers, in particular neuroblastoma. Also alphafetoprotein (AFP) levels are often abnormally high in patients with Germ cell tumours.



	SCC/NSE Cyfra 21-1		Calcitonin Thyroglobulin
Liver	AFP	**Esophagus**	SCC
Bladder	CEA Cyfra 21-1 TPA	**Breast**	CEA CA 15-3 MCA Estrogen receptors Progesterone receptors
Colon, rectum	CEA CEA 19-9 CA 50	**Stomach**	CEA CA 72-4 CA 50
Prostate	PSA PAP	**Pancreas**	CA 19-9 Elastase
Testis	β-hCG AFP	**Ovary**	CEA CA 125

Medical Imaging



- **X-ray** Examination of X-ray films may indicate the site and extent of the tumour and aid in the detection of metastatic spread.
- **CT** Computed tomography (CT or CAT scan) makes a cross-sectional x-ray picture of a "slice" of the body. The machine rotates around the patient taking x-rays from different angles, the images are then processed by a computer.
- **MRI** Magnetic resonance imaging. This is used to determine if the biochemical activity of a tissue responds normally to magnetic forces, tumours may give an abnormal signal.
- **Ultrasound** The use of sound waves to image the underlying structures of the body. Ultrasonic waves are reflected differently depending on the type of tissue they pass through, aiding the detection of abnormal tissues…Endoultrasound
- **PET**(CT, MRI)

Staging and Prognosis

Benign

- Not spreading, usually a more mild disease.

Malignant

- Cancerous, where the tumour grows uncontrollably and may spread.

In-situ / Invasive

Localised

- A tumour restricted to a single site. Circular. Stenotic(bowel obstriction, joundice)

Metastases

- Where the tumour has spread to other parts of the body beyond the **primary** site.
- Metastatic sites (secondaries) my be regional or distant from the original tumour.

Staging

- Staging is where the disease is categorised as to how far it has spread. The precise staging system used will depend on the type of cancer the patient has. In general low stage patients are those with localised tumours that are easily resectable, whilst high stage patients are those with widespread metastases. The treatment given may largely depend upon which stage the patient is at diagnosis.

Prognosis

- is the expected outcome of a disease and it's treatment, this may be influenced by a variety of factors such as stage, age, site etc. depending on the particular type of cancer. For example, in general a patient with localised disease may have a more favourable prognosis compared to a patient with widespread disease which may be less favourable.

Prognosis

Remission

is where the symptoms of cancer are no longer present.

There is no longer any evidence of the disease using the available investigations.

Relapse

This is when the disease reoccurs after a period in remission.

Refractory

This is where the cancer is resistant to treatment, patient may nevergo into remission,

possibly with stable or progressive disease.

Restaging

This is where the patient is staged again after a period of treatment to access the response to therapy.

Follow-up

When treatment is complete the periodic visits to the physician are needed to monitor the patient

and ensure there has been no recurrence of the disease.

Treatment

Curative treatment

treatment to destroy the cancer.

Palliative treatment

treatment which relieves the symptoms and pain.

Surgery

Complete resection (R0)

this is where all of the tumour has been totally removed during surgery,as opposed to an incomplete resection.

The surgical specimen may be examined by a pathologist to determine if it is likely to have removed all of the primary tumour.

If there is any tumour left after surgery this may be macroscopic (visible to the eye) or microscopic,in either case radiotherapy may be needed to kill the remaining tumour cells.

R1microscopic positive margins

R2macroscopic positive margins

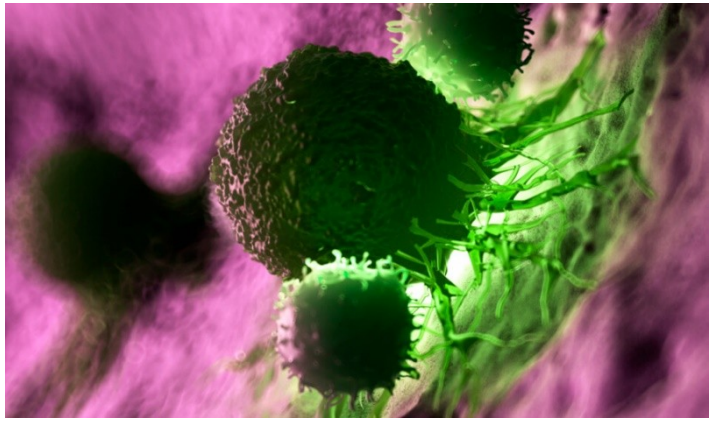
Radiotherapy

- **External radiotherapy** - radioactivity from a source outside the body.
- **Internal radiotherapy** - placing radioactive source within the body in or near to the tumour to kill the cancer cells (Brachytherapy).
- **Fractions** - the radiotherapy dose is divided into a number of smaller doses to reduce the risk of side effects. There is normally one fraction per day.
- **Hyperfractionated radiotherapy** - more than one fraction is given per day.
- **Radiotherapy field** - the area towards which the radiotherapy was directed.
- **Total Body Irradiation** (TBI) - radiation to the whole body e.g. to destroy all malignant cells prior to bone marrow transplant (BMT).

Chemotherapy

- Since the 1960's the development and use of drugs has dramatically improved the prognosis for many types of cancer.
- Chemo- means chemicals, for most types of cancer chemotherapy will consist of a number of different drugs, this is known as combination chemotherapy.
- Chemotherapy may be given in a variety of ways;
    - Intravenously (IV) -into a vein is the most common,
    - Intramuscularly (IM) -injection into a muscle,
    - Orally -by mouth,
    - Subcutaneously (SC) -injection under the skin,
    - Intralesionally (IL) -directly into a cancerous area,
    - Intrathecally (IT)-into the fluid around the spine,
    - Topically -medication will be applied onto the skin. **Cytotoxic** - cytotoxic drugs kill or damage cells. The normal cells of the body grow and die in a controlled way, but cancer cells keep growing and multiplying. Chemotherapy destroys cancer cells by stopping them from growing or multiplying at one or more points during the life cycle of the cell.
- **Central line** - a thin plastic line into a vein in the chest used for the delivery of chemotherapy e.g. HICKMAN® catheter.
- **Drug resistance** is where tumour cells become resistant to chemotherapy. Some tumour cells will be chemo-sensitive and are killed by anticancer drugs; the cells that remain are likely to be more resistant. Thus by selection it is the most resistant cells survive and divide, they may be resistant to a particular drug, a class of drugs, or all drugs.

New approaches - Gene therapy / Immunotherapy



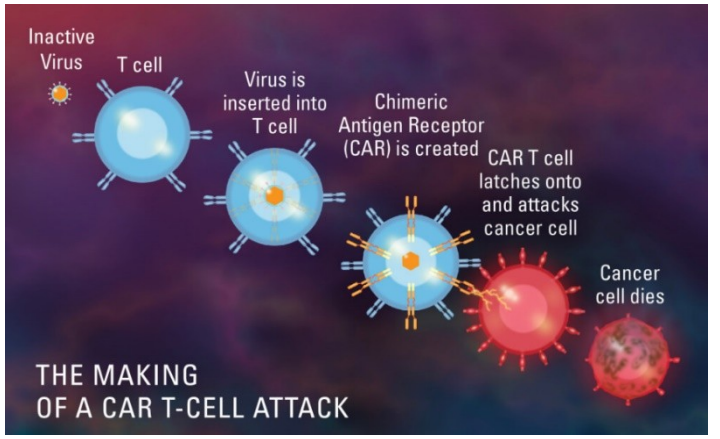
In the future patients might be immunised against their own cancers by injecting them with their

own tumour cells after they have been genetically modified.

The gene-modified tumour cells may encourage the patients own immune system to destroy the cancer cells.

Tumour necrosis factor (TNF) and interleukin-2 (IL-2) are substances associated with the immune

system which encourage anititumour activity.



An illustration of white blood cells attacking a cancer cell.

Dukes´classification

- Dukes' classification, first proposed by Dr Cuthbert E. Dukes in 1932, identifies the stages as:
- A - Tumour confined to the intestinal wall
- B - Tumour invading through the intestinal wall
- C - With lymph node(s) involvement
- D - With distant metastasis

Grading

Grading is based on the histologic assessment of tumor cells according to their state of differentiation. Differentiation in the microscopic appearance of tumor cells determines the grade. Tumor cells are grouped into 4 types based on how they resemble and differ from healthy cells. Well-differentiated tumors (low grade) generally have a **better prognosis** than poorly differentiated tumors (high grade)

G1	Well-differentiated—close similarity to original tissue (low grade)
G2	Somewhat differentiated malignant tissue (intermediate grade)
G3	Poorly differentiated malignant tissue (high grade)
G4	Undifferentiated malignant tissue—the original tissue that gave rise to the tumor can be determined only by immunohistochemical evaluation or not at all (high grade)
G9	Cannot gauge level of differentiation (undetermined grade)

Note: Grading describes the grade of the histologic change of tumor tissue versus the neighboring healthy tissue.

Staging of a tumor

- Staging of a tumor can be determined by its size and the extent to which it has spread throughout the body. Tumor staging is performed with different laboratory tests such as radiography, ultrasonography, computed tomography scanning, etc. Solid tumors are usually classified with the TNM system. This system has been administered by the **UICC**> (Union Internationale Contre le Cancer) since the 1950s, and it is regularly updated.
- The letters T, N, and M stand for separate categories: **t**umor (size and extent of the primary tumor), **n**ode (involvement of neighboring lymph nodes), and status of **m**etastases, respectively.

TNM Classification

- The most common current staging system is the TNM(for tumors/nodes/metastases) system, though many doctors still use the older Dukes system. The system assigns a number:
- T - The degree of invasion of the intestinal wall
  - T0 - no evidence of tumor
  - Tis- cancer in situ (tumor present, but no invasion)
  - T1 - invasion through submucosa into lamina propria (basement membrane invaded)
  - T2 - invasion into the muscularis propria (i.e. proper muscle of the bowel wall)
  - T3 - invasion through the subserosa
  - T4 - invasion of surrounding structures (e.g. bladder) or with tumour cells on the free external surface of the bowel
- N - the degree of lymphatics node involvement
  - N0 - no lymph nodes involved
  - N1 - one to three nodes involved
  - N2 - four or more nodes involved
- M - the degree of metastasis
  - M0 - no metastasis
  - M1 - metastasis present

Staging of a tumor

T: primary tumor	Tx: primary tumor cannot be measured T0: absence of primary tumor T1–T4: assignment of various stages according to the specific type of tumor, taking into account different criteria such as size (diameter), invasive depth, and infiltration of neighboring tissue and organs
N: involvement of lymph nodes	Nx: involvement of neighboring lymph nodes cannot be assessed N0: no involvement of neighboring lymph nodes N1–3: number and localization of involved lymph nodes developing cancer
M: distant metastases	Mx: distant metastases cannot be assessed M0: no metastases M1: distant metastases observed

Note: Staging describes the totality of all indicated examinations that are necessary to determine malignant tumor spread. Observations are described by TNM classification and are assigned to a specific stage.

The TNM system is further divided into the following 5 stages

Stage 0	There is marked growth of abnormal cells, which have not spread to neighboring tissue but have the potential to develop into a tumor (also termed carcinoma in situ)
Stage I, stage II, and stage III	Assignment of various stages occurs according to the specific type of tumor, taking into account different criteria such as size (diameter), invasive depth, and infiltration of neighboring tissue
Stage IV	Metastasis to different organs