

Report series:

General cancer information



ECRIC report series:

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Cancer is a general term for more than 100 diseases. All these are characterised by some central similarities which can be used to define cancer.

- Cancer is a neoplasm (tumour) which is also known as a new growth
- Cancer results from uncontrolled cell growth
- This growth is caused by a mutation within the genes of the cell
- This genetic mutation can be caused by exposure to carcinogens (these are substances which increase the risk of cancer in humans or animals)
- Once the mutation has started the tumour will continue to grow even if the carcinogen is removed

The oldest known description of cancer is found in an Egyptian papyrus or writing written between 3000-1500 BC. It contains details of conditions that are consistent with modern descriptions of cancer. The Edwin Smith Papyrus, describes 8 cases of tumours of the breast. It remarked that there was no treatment for this condition and recommended cauterisation as a palliative measure. In Greece in about 400 BC Hippocrates, the "Father of Medicine", is credited with being the first to recognise differences between benign and malignant tumours. The oldest available specimen of a cancer was found in the remains of skull of a female who lived during the Bronze Age (1900-1600 BC). The tumour in the female skull was suggestive of head and neck cancer.

Cancers are normally named after the cell or organ where they began, such as, breast cancer and lung cancer. Some tumours are not cancerous (benign) and may not need treatment, but malignant tumours (cancers) can spread. The cancer cells may spread through the body via the blood system or the lymphatic system. This is known as metastasis. Metastatic cells are found in a different organ from the primary cancer but are not formed from the organ, for example, a breast cancer cell found in the liver will resemble breast tissue instead of liver tissue.

Cancer is quite common, during our lifetimes, one in three of us will be diagnosed with cancer, and however cancer is more rare in children and young people.

Cancers can be classified in a number of ways

Histopathological

This is classifying tumours based on their tissue of origin.

Carcinomas

Most cancers (approx 80-90 %) are carcinomas. These start in the epithelial cells that line internal and external body surfaces. The commonest carcinomas are lung cancer, breast cancer and bowel cancer.

Sarcomas

Sarcomas begin in connective tissues of the body, such as muscle, bone, cartilage and fat.

Leukaemias

The leukaemias are cancers of the blood cells that grow in the bone marrow, which are found in the bloodstream.

Lymphomas

Lymphomas develop in the lymph nodes and tissues of the immune system.

Adenomas

Adenomas are tumours (often benign) that begin in glandular tissue, such as the pituitary gland or thyroid.

Blastomas

Childhood cancers often form in the embryonic tissues which are left. Tumours formed here are often named after the blastocytes, for example neuroblastoma, nephroblastoma.

Primary of unknown origin

This is where the tissue or origin cannot be determined.

Locational

This refers to the actual site of the tumour. This is very important for symptoms, spread, treatment and sometimes prognosis. For example, treatment of carcinoma of the retina will be different to that of a melanoma.

Biological

This includes descriptions of the tumour behaviour such as the degree of differentiation, lymphocytic reaction, hormone receptor status (some tumours need hormones to survive, i.e. breast so they may be treated by hormone therapy) and the degree of infiltration therefore showing the likeliness of spread.

Descriptive

This is where the tumour is described by how they look.

Fungating

Tumour invades the epithelial surface.

Nodular

Tumour is hard and fibrous.


Fixed or mobile

Attached to other structures. Helps indicate possible spread.

Grade & stage

Tumours can be categorised by their stage and grade.

Grade is described on a scale of 1-4

Grade	% undifferentiated cells	Best
1	<25	
2	>25 <50	
3	>50% <75%	
4	>75%	

Staging

Staging is a way to describe the characteristics of a cancer; it is a measure of the size and extent of the tumour at diagnosis. By staging this allows decisions to be made on the management and treatments for the patient. It allows comparisons of similar cases and can also be used in clinical trials for evaluation.

The main staging tool is the TNM (tumour-nodes-metastasis), this was developed by the Union Internationale Contre Le Cancer (UICC) and the American Joint Committee on Cancer (AJCC). TNM is used internationally and within the UK is the basis for data collection for the national cancer dataset.

TNM is the anatomical extent of the tumour

- T – extent of the primary tumour
- N – absence or presence and extent of regional lymph node involvement
- M – absence or presence of tumour at a site distant to the primary (spread)

These letters then have a number assigned depending on the severity (0-4) 0 being the best prognosis and 4 being the worst.

In addition to TNM there are some specialized staging systems including FIGO for female gynaecological cancer, Dukes for colorectal and Jackson for penile cancer.

Cancer Treatment

There are a number of ways to treat cancer. The treatments decided upon must be representative of the stage of the disease and the individual patient.

Surgery

Surgery is used not only to treat cancer but also for diagnosis and staging. It can be used in the form of diagnostic samples (biopsies) or local treatment (removal of all or part of a tumour). Surgery can control the primary tumour; in the past couple of decades surgery has become more conservative. In the early 1900s breast surgery usually involved total mastectomy whereas now a local excision followed by radiotherapy works just as effectively.

Radiotherapy

Radiotherapy involves high-energy radiation which is usually used locally as either teletherapy or brachytherapy.

Teletherapy is also known as external beam radiotherapy. With this the radiation is created by a linear accelerator and applied from an external source to the area of body where the tumour is present. This radiation will sometimes cause local damage as well as affecting the tumour. Some side effects are hair loss, erythema and mucositis.

Brachytherapy involves the placement of small radioactive sources placed in a natural body cavity. This means that the radioactive dose can be administered to the tumour without affecting too much of the healthy tissue. An example of where this would be used is for prostate cancer.

Chemotherapy

Chemotherapy is the use of drugs to fight the disease. The drugs have a cytotoxic effect on the cells (kills them). The drugs work by stopping the cell cycle. As with radiotherapy, chemotherapy does not only target tumour cells, healthy cells are also affected, therefore giving side effects. Chemotherapy is used at various stages of cancer. It is used to treat solid tumours affecting organs such as the breast or bowel, as well as blood cancers such as leukaemia. It may be given at one or more of the following stages:

- Before surgery (neo-adjuvant therapy) - this will shrink a tumour so that it is easier to remove from the body by surgery. This is normally used for large tumours or those that are strongly attached to surrounding tissue.
- After surgery (adjuvant therapy) - this is to make sure that any cancerous cells left in the body after removal of a tumour by surgery are killed. This reduces the chances of recurrence.

In advanced cancer to remove cells that have spread through the body, or to slow the progress of the disease.

Immunotherapy

This is based on the body's natural defence system, which protects us against a variety of diseases. These treatments therefore encourage the body to fight the cancer. An example of these would be the treatment of bladder cancer where BCG is administered directly into the bladder via a catheter. Another treatment is the treatment of kidney cancer with interleukin 2 or interferon. Interferons belong to a group of proteins known as cytokines. They are produced naturally by white blood cells in the body (or in the laboratory) in response to infection, inflammation, or stimulation. Another important biological therapy involves antibodies against cancer cells or cancer-associated targets. Monoclonal antibodies are artificial antibodies against a particular target, the antigen, and can be produced in the laboratory. As a treatment for cancer, monoclonal antibodies can be injected into patients to search for the cancer cells, therefore, potentially leading to disturbance of cancer cell activities or to enhance the immune response against the cancer.

Hormone therapy

Hormone systems are important in some types of cancer; for example, oestrogen encourages some types of breast cancer to grow faster. By changing the body's hormone system in the right way, doctors can halt the growth of some cancers and even kill some. Hormone therapy was first discovered in 1896 when a Glaswegian surgeon, George Beatson, discovered that inoperable breast cancer responded to and regressed after an oophorectomy (removal of the ovaries). This was the first indication that the hormone system was involved in cancer growth. In 1969, the synthetic oestrogen-blocker tamoxifen was first used to treat breast cancer. Tamoxifen is now widely used in the treatment of breast cancer.

Gene Therapy

Cancer is caused by a mutation in the genes of the cell. Researchers have been trying to find a gene therapy technique to correct the DNA directly. Gene therapy is in its infancy. There are a number of concerns over the safety of modifying an individual's DNA. So far, no successful gene-based treatment has been approved for routine use on cancer patients, however, a large amount of research is being carried out in this area.