Tumour Structure and Nomenclature

Paul Edwards

Department of Pathology and Cancer Research UK Cambridge Institute, University of Cambridge
Core idea of cancer

Normal Cell → Slightly Abnormal → More Abnormal → Malignant → Metastasis

mutations
1. Malignancy and Metastasis

the central problem of cancer research, both clinically and intellectually
1. Malignancy and Metastasis

The central problem of cancer research, both clinically and intellectually

*Metastasis* is when a cancer forms additional tumours ‘secondaries’ elsewhere in the body. A metastasis is also a secondary tumour, plural metastases

*Malignancy* definition: the *ability* to form metastases (it doesn’t have to have metastasized yet)
Metastasis
Malignancy

malignant tumour (melanoma)
Malignancy

Benign tumour (mole)  
*NOT capable* of metastasis

malignant tumour (melanoma)  
*capable* of metastasis
Malignancy can be identified down the microscope.

benign

malignant
Benign smooth muscle tumour of uterus (common)
Malignant smooth muscle tumour of uterus (v. rare)
Malignant smooth muscle tumour (very rare) 'invasive' tumour cells spread.
Malignancy can be identified down the microscope

benign

invasion = local ‘metastasis’? (Heresy?)
Nomenclature

not entirely consistent but roughly speaking:

**Benign tumours:**
tissue name + - oma  e.g.
lipoma = benign fat tumour
Leiomyoma = benign smooth muscle tumour
Papilloma = wart,
adenoma = benign glandular lump, including glandular polyp

**Malignant tumours from mesenchyme**
-[name of tissue] sarcomas E.g
- osteosarcoma (malignant bone tumour),
- leiomyosarcoma (malignant smooth muscle)

**Malignant tumours from epithelium**
[name of tissue] carcinoma
e.g. breast carcinoma
may include adeno- or squamous, e.g. oesophageal adenocarcinoma; squamous carcinoma of oesophagus

**Some Exceptions to the above rules:**
malignant melanoma
Neuroblastoma, medulloblastoma (both malignant)
Leukaemias are liquid, mainly in blood. Lymphomas are related proliferations of lymphocytes as solid masses mainly in lymph nodes.
Cause of illness and death

Loss of function

e.g. failure of normal bone marrow in leukaemia

(see also spleen)

Liver overwhelmed by metastatic colon cancer

etc etc
Benign versus malignant:
benign tumours can kill

e.g. meningioma, pituitary adenomas
Incidence

**Benign tumours:**
very common all tissues
Leiomyoma of uterus, lipoma, wart, mole ....

**Malignant tumours from mesenchyme**
generally rare but often rapidly lethal
-E.g osteosarcoma (malignant bone tumour),

**Malignant tumours from epithelium**
Common - most important cancers
e.g. breast carcinoma,
colorectal
lung,
ovary
prostate
Liver (low in West, high elsewhere, HBV + aflatoxin)
Cervix (HPV)
Nasopharyngeal (chinese, EBV))  

\[\text{main virus-associated cancers}\]
The 20 Most Common Cancers

New Cases, UK, 2011

Half of all cases
Core idea of cancer

some of these intermediates can be seen

mutations
Cancer develops in multiple stages
Colon cancer precursor: benign adenoma or polyp
Colon/rectum cancer: malignant
Colon carcinoma: malignant

Invasion

Cancer

Normal epithelium

Invasion

Muscle
colon carcinoma – following slides zoom in on ‘invasion’
Vogelstein model of colon cancer - a classic example of stages in cancer development
Cervical Cancer: Second Classic multistep example

Illustrates:

- multiple stages
- Benign to malignant transition

- Metaplasia
- Virus infection
- screening
Cervix and cervical Cancer

- Uterus
- Vagina
- Squamous epithelium
- Columnar epithelium
- Virus infection (HPV)
Cervix at low power

uterus, glandular

vagina, squamous
Cervix at low power

glandular

squamous
Very dysplastic but still benign cervix epithelium ‘CINIII’

uterus, glandular

vagina, squamous
Very dysplastic but still benign cervix epithelium ‘CINIII’

normal glandular

squamous metaplasia
+ severe dysplasia

‘CINIII’

normal squamous
Very dysplastic but still benign cervix epithelium ‘CINIII’

normal glandular

squamous metaplasia
+
severe dysplasia (note mitoses circled)

‘CINIII’

normal squamous
Malignant - Carcinoma
Presentation and screening
e.g. Colon/rectum cancer: pain, bleeding, strictures...
Best example of screening

Cervical Cancer
Screening: cervix is ideal

uterus

pre-invasive

vagina
Precursor - detect by screening
Screening: cervix is ideal

pre-invasive

vagina

Scrape sample
Cervical smears

- normal

abnormal:
large pleomorphic nuclei
Miscell

Hereditary predisposition - polyposis (vs HNPCC)

Benign Teratoma
hereditary predisposition

Gene changes / mutations

Normal Cell

Slightly Abnormal

More Abnormal

Malignant