

# Oncosurgery

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# Definition

- Cancer – malignant growth

Locally nonregulated tissue growth

Autonomous

Always a result of DNA mutation

- Spot mutation
- Gene amplification
- Deletion (loss of DNA sequence)
- Chromosome rebuilding

# Epidemiology

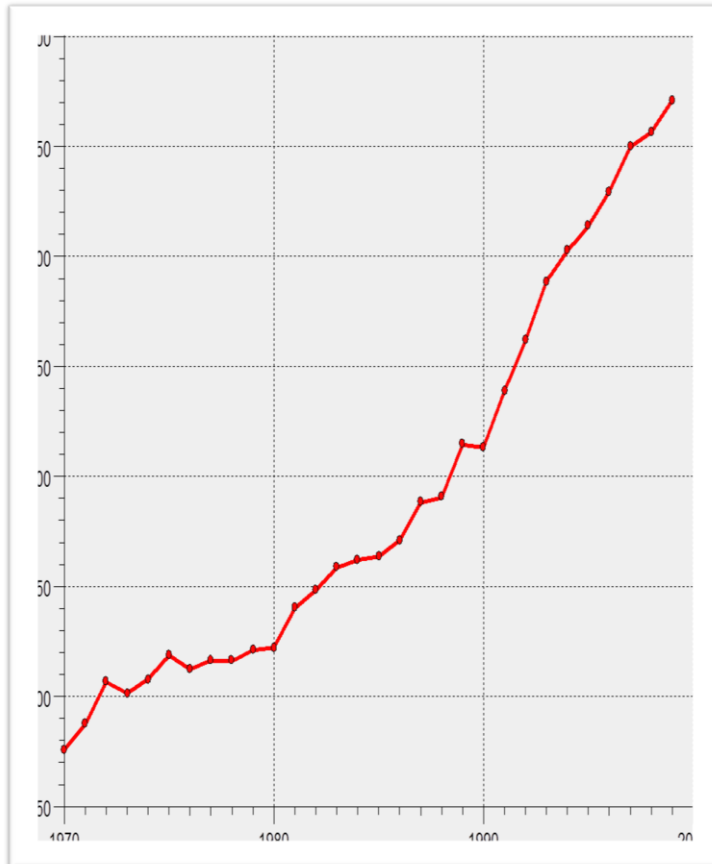
- Incidency – number of newly diagnosed cases per year (absolute x relative (per 100k))
- Prevalence - actual number of cases alive with a specific disease (in treatment + remission)
- Mortality – frequency of occurrence of death in a defined population
- Lethality - number of deaths / over number of sick with a specific disease (mortality:incidence; 5-year survival)

# Epidemiology

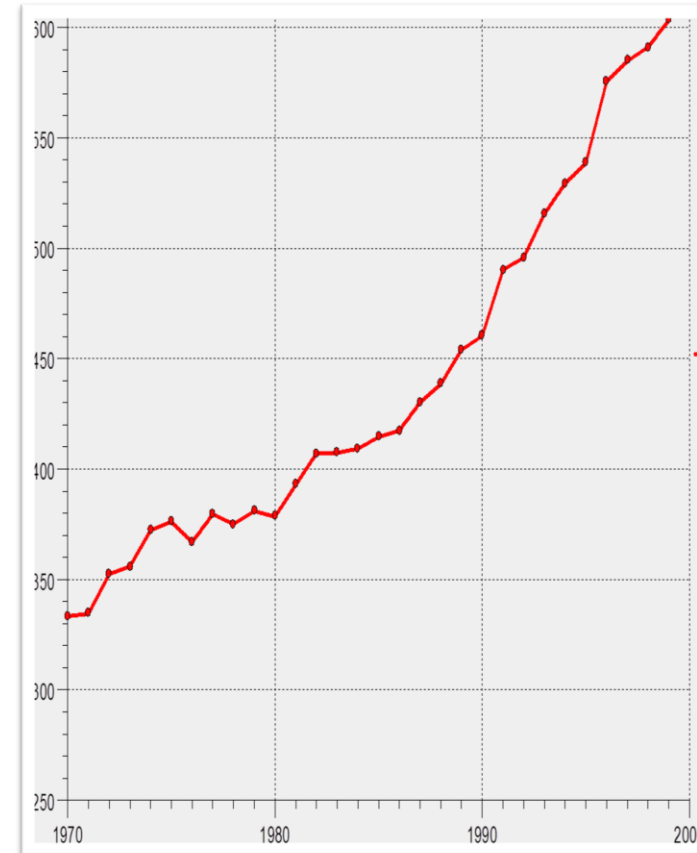
- Most frequent in male patients
  - Prostate cancer (40th)
  - Colorectal cancer (1st)
  - Malignant tumors of trachea, bronchi, lungs (9th)
- Most frequent in female patients
  - Breast cancer (30th)
  - Colorectal cancer (9th)
  - Cervical tumors (106th)
  - Malignant tumors of trachea, bronchi, lungs (25th)

# Cancer incidence development in age groups according to WHO

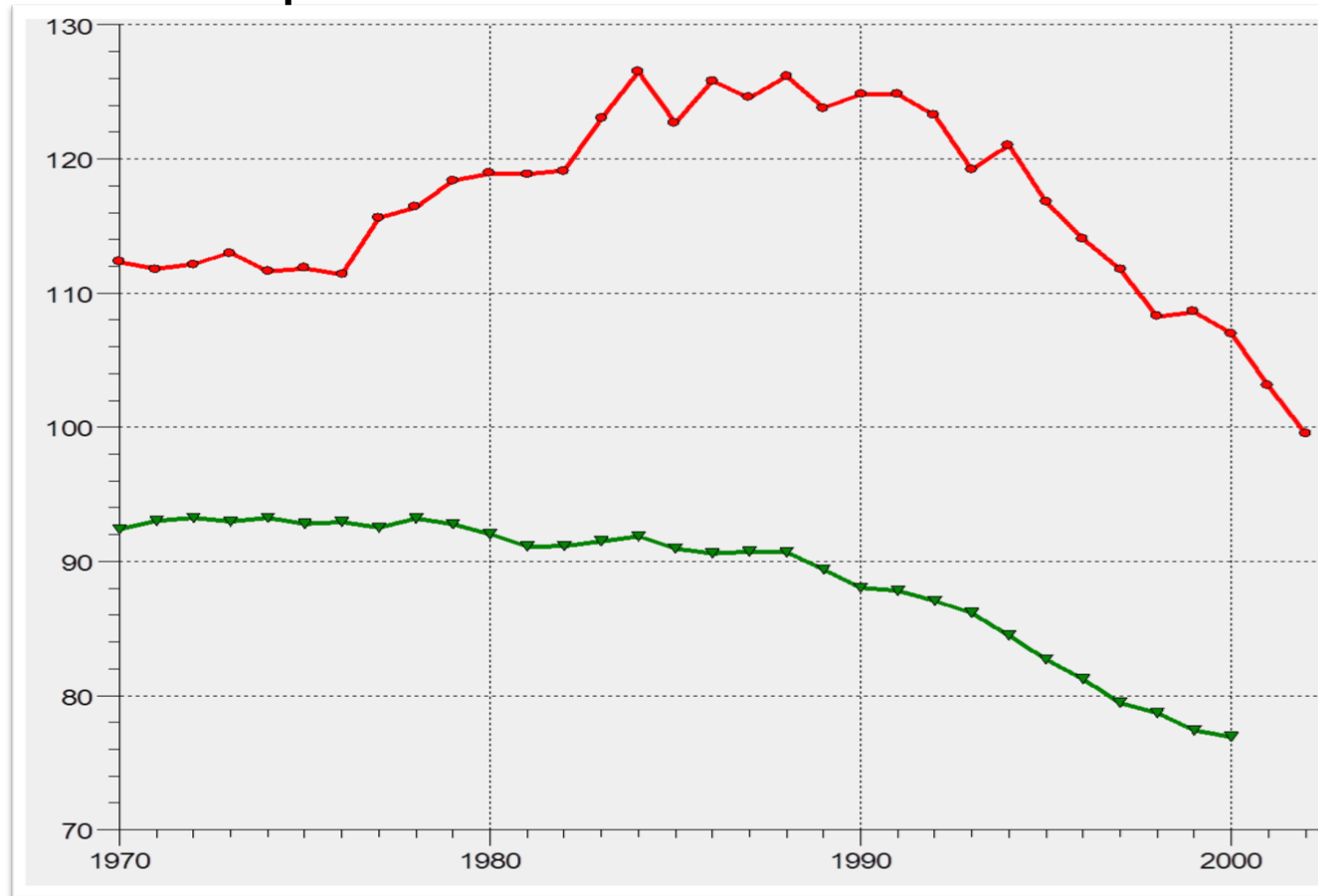
• women



• men



# Cancer mortality of people up to 64 years of age in ČR compared to EU



# Etiology - noninfluenceable factors

- Genetics - hereditary transfer of mutations (Wilms tumor, von Hippel-Lindau syndrome)
- (proto)oncogenes – high level expression in tumor cells, suppressing apoptosis

# Etiology – influenceable factors

- Influenceable factors
  - Nutrition (high fibre diet, antioxidants)
  - Hormonal growth stimulation
  - Irritation (chronic inflammation)
    - Smoking (↑ lungs, mouth, stomach, pancreas, urinary bladder cancer)
    - Infection (HBV+HCV, HPV, Helicobacter, EBV, HIV...)
  - Sexual behavior, workplace (tar, cancerogenic chemicals)
  - Physical factors – radiation



# Virus induced oncogenesis

- HPV – verruca vulgaris, ca of cervix
- EBV – lymphomas, nasopharyngeal ca
- Hepatitis B, C – hepatocelular ca
- HHV8 – Kaposi sarcoma
- HTLV - leukaemia

# Kaposi sarcoma



# Prevention

- Primary: HBV, HPV vaccination
- Secondary: screening, self examination -> early diagnosis
- Tertiary: keeping QoL, control of progression

[www.loono.cz](http://www.loono.cz)

# Screening

- Early detection of disease (asymptomatic)
- Quick, cheap testing with high specificity
- 3 screening schemes in Czech rep.
  - Colorectal cancer > 55y (haemoccult/2y; colonoscopy/10y)
  - Breast cancer >45y (mammography/2y)
  - Cervical cancer (cervical smear/1y)

# Examination

- Anamnesis
  - Familiarity (cancer occurrence, early onset)
  - Polymorbidity, other diseases with likely connection with suspected cancer or influencing the therapeutic plan)
  - Work/social (cancerogens in workplace)
  - Abuse (alcohol, smoking, drug use)
  - Epidemiological
  - Gynaecological

# Examination

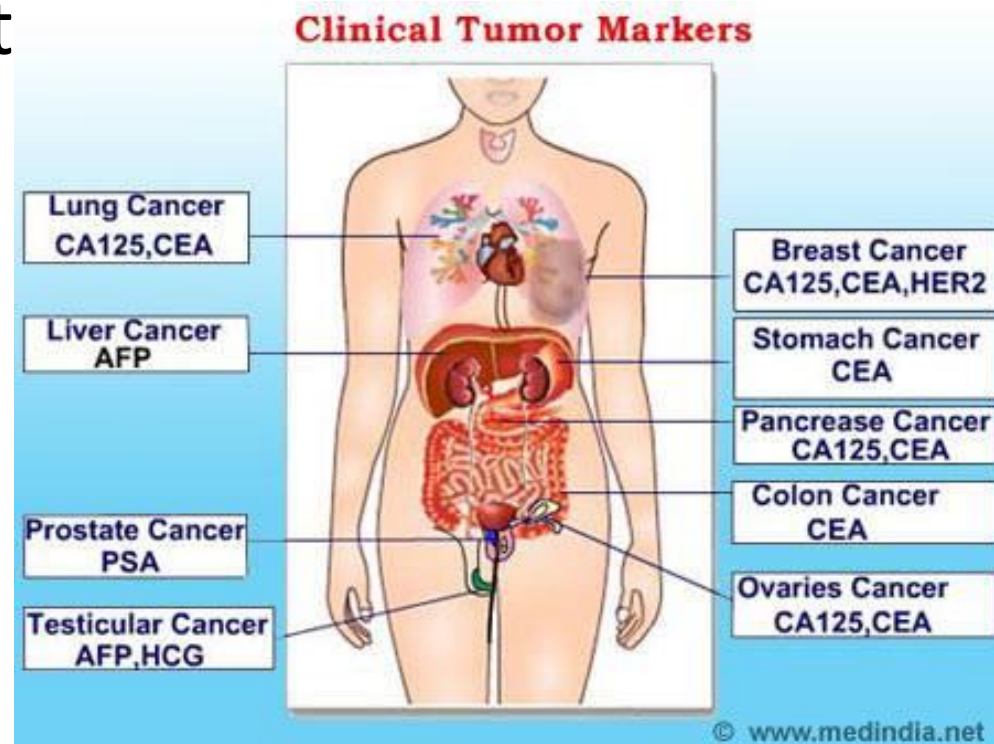
- Thorough physical examination
  - Local changes (tenderness, consistency/color change, naevi changes, blood in the stool/urine)
  - General changes (loss of weight >10% in 6 months, lack of appetite, intolerance of specific foods, fatigue, night sweating, fevers of unknown etiology, cough, depression....)
  - Per rectum!

# Colorectal cancer



# Oncomarkers

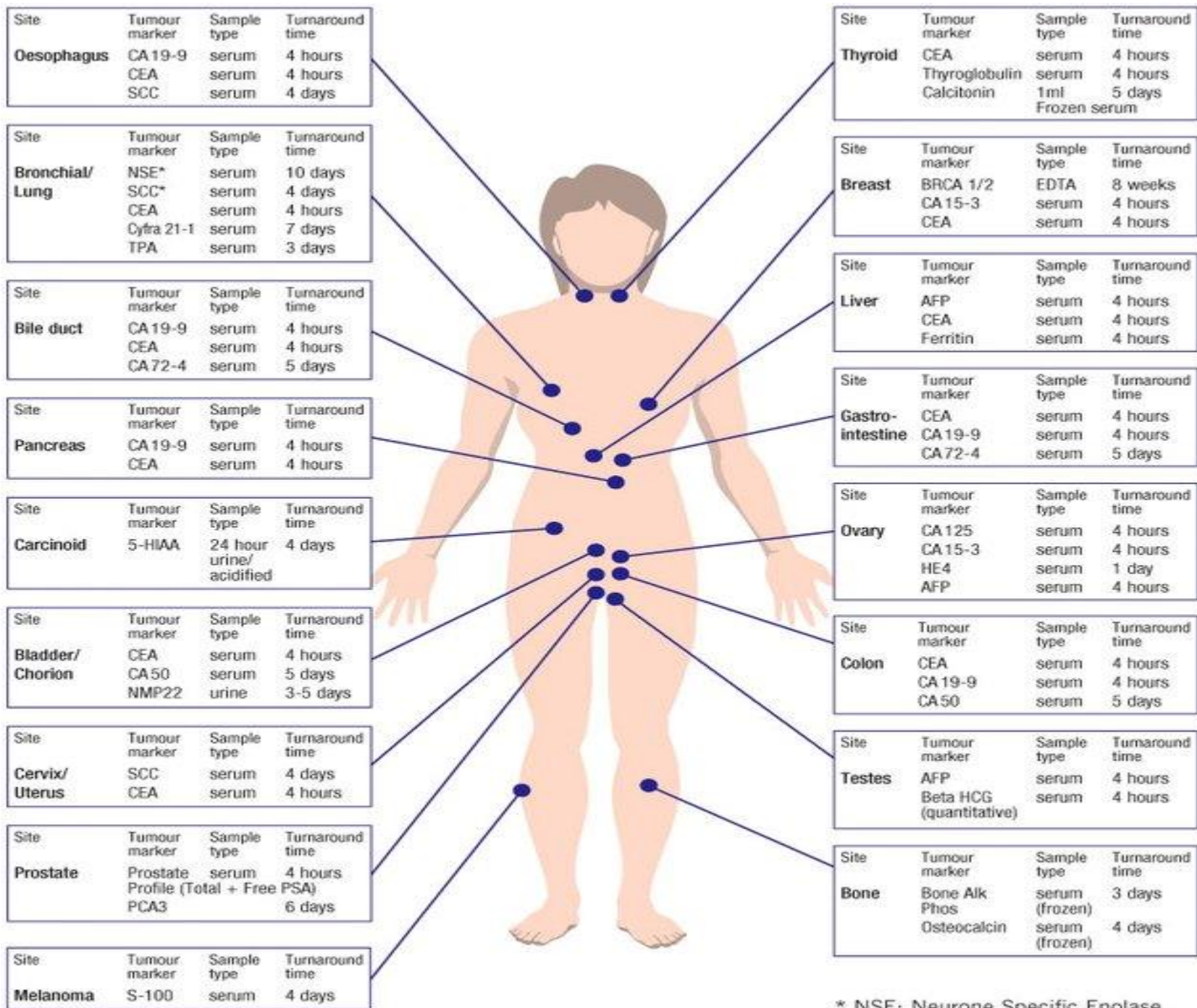
- Biomarkers found in bodily fluids or tissues
- ↑ levels can indicate cancer
- Screening (false positivity – Ca 125 endometriosis)
- Monitoring





# Oncomarkers

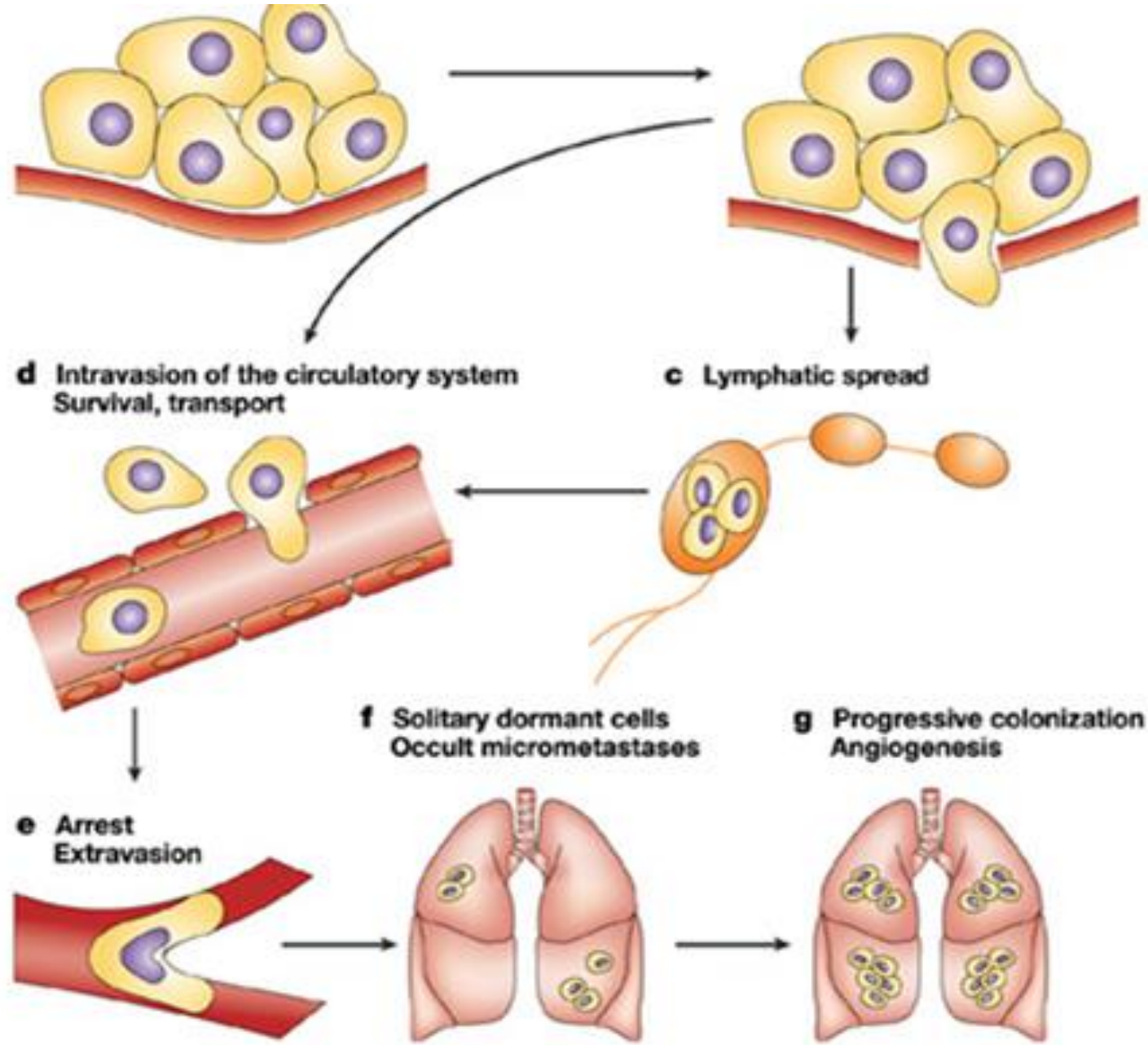
- AFP
- Ca 15-3
- Ca 19-9
- Ca 125
- CEA
- CYFRA
- hCG
- PSA
- Hepatocelular carcinoma
- Breast cancer
- GIT cancer
- Ovarian, endometrian cancer, GIT
- GIT, cervix, lung, ovarian, breast cancer
- Carcinomas, sarcomas
- Choriocarcinoma
- Prostate cancer



\* NSE: Neurone Specific Enolase  
 SCC: Squamous Cell Carcinoma

# Tumor characteristics

- Metastasizing – forming new focuses in distant body parts (>3 generalisation)
- Invasion – primary tumor cells -> submucosis  
-> vessels
- Extravasation
- Angiogenesis – vessel growth stimulation



**d** Intravasation of the circulatory system  
Survival, transport

**c** Lymphatic spread

**f** Solitary dormant cells  
Occult micrometastases

**g** Progressive colonization  
Angiogenesis

**e** Arrest  
Extravasation

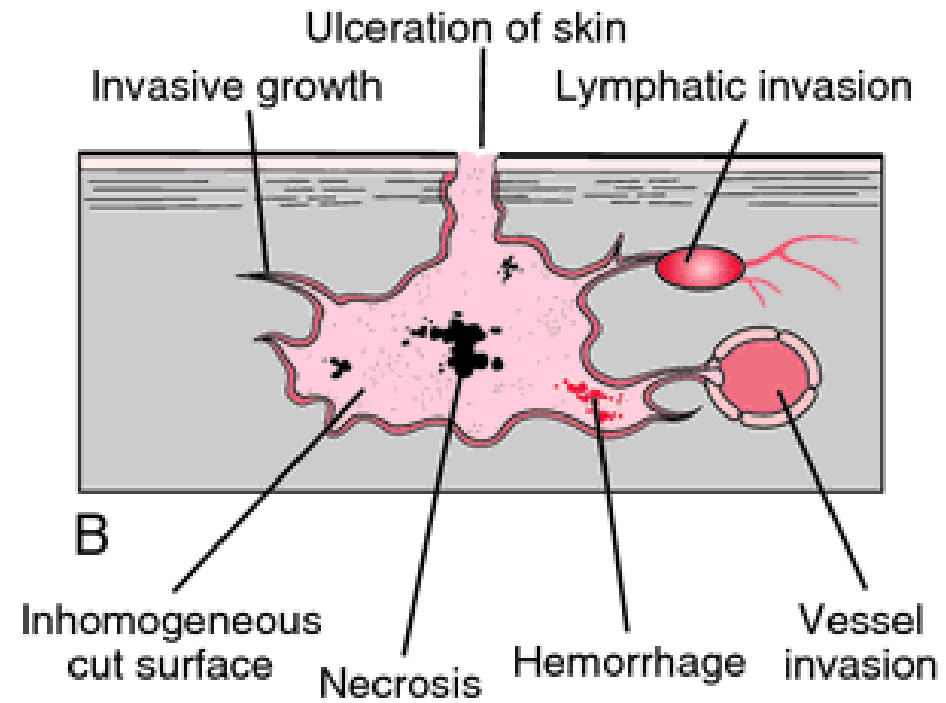
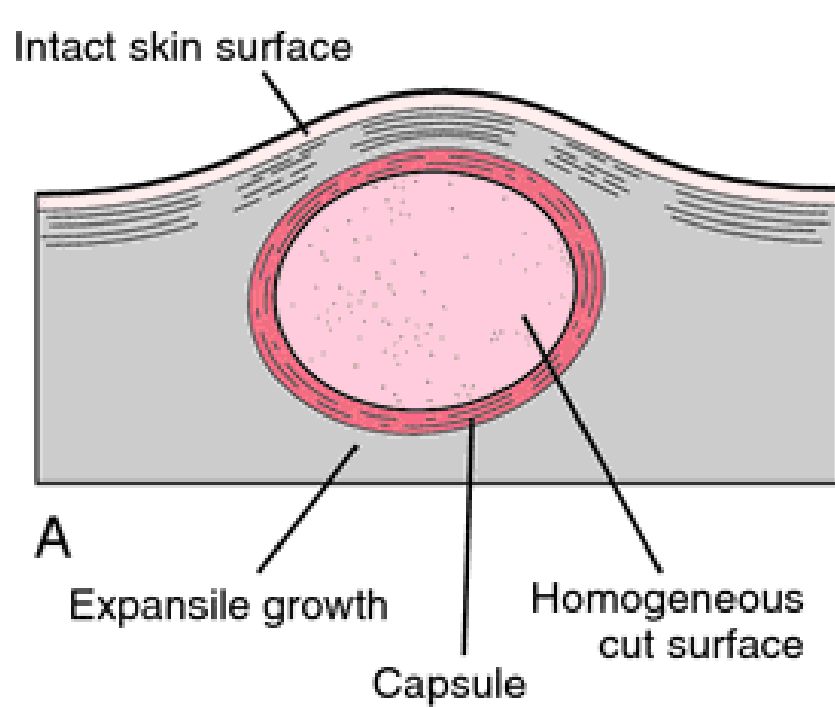
# Tumor division

- Pseudotumors
  - Hypertrophy
  - Hyperplasty
  - Cyst
  - Inflammatory pseudotumor (Schloffer)
  - Hamartoma – tissue not involved in the organ structure
  - Choristia – cell cumulation in abnormal places

# Tumor division – biological activity

- Benign tumors – limited, slow growth, do not form mts, capsulated, well differentiated x meningioma
- Semimalignant tumors - basalioma
- Malignant tumors – quick, destructive growth, low differentiation, no borders, form mts
- Carcinoids – potentially malignant, rare, serotonin production -> flush

# Tumor division – biological activity

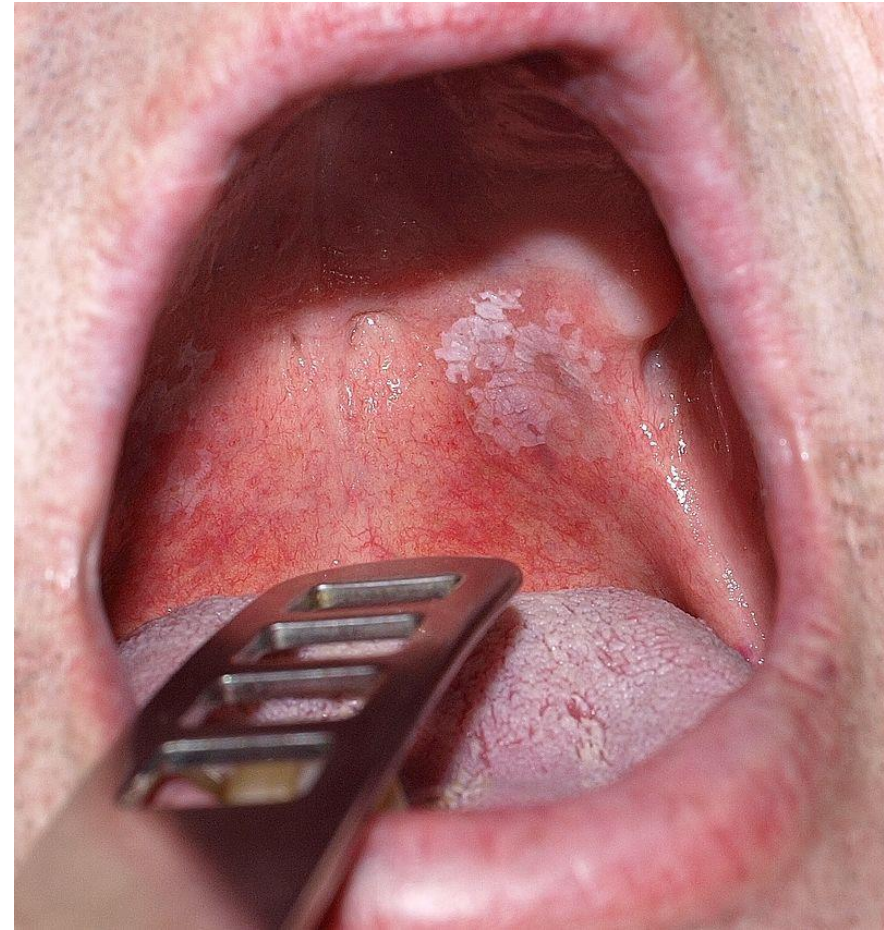


# Precanceroses

- State preceding malignancy
- Fastened cell proliferation -> higher risk of genetic mutation
- Metaplasia (Barret's oesophagus, leukoplakia, intestinal metaplasia of stomach lining)
- Inflammation (inflammatory hyperplastic polyps in ulcerative colitis, HPV infection)
- Hyperplasty in hormone-dependant organs (endometrium, prostate)



# Precanceroses

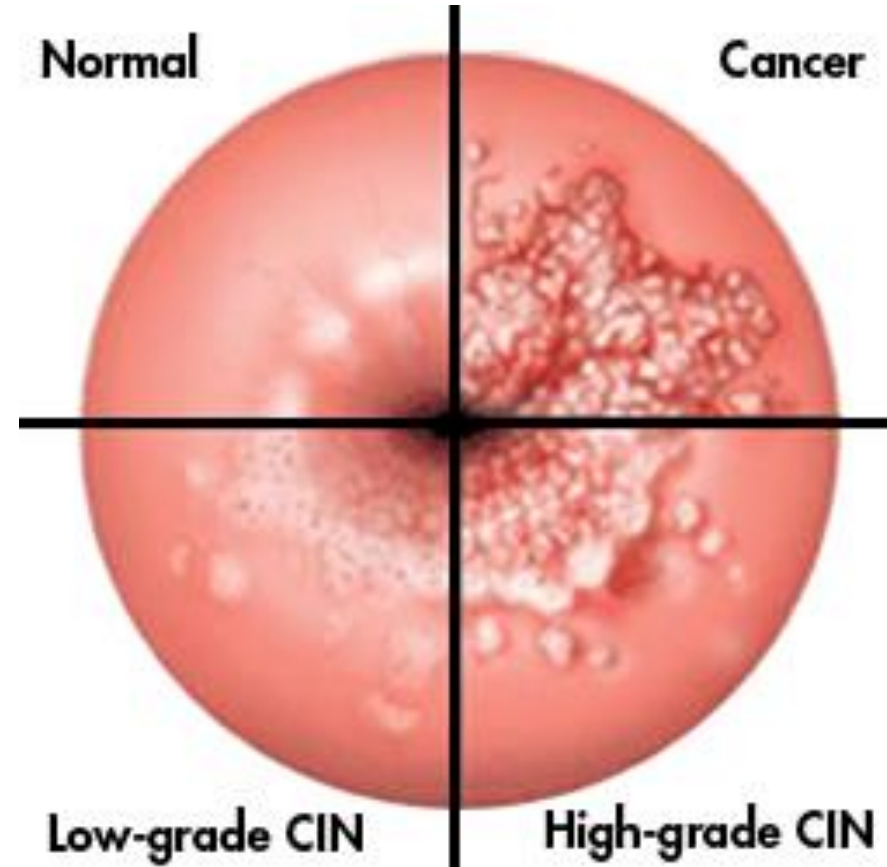


# Precanceroses

- stationary (lower risk of malignant changes, e.g. hyperplastic reaction around chronic fistulas)
- progredient (Barret's oesophagus, familial adenomatous polyposis)

# Carcinoma in situ

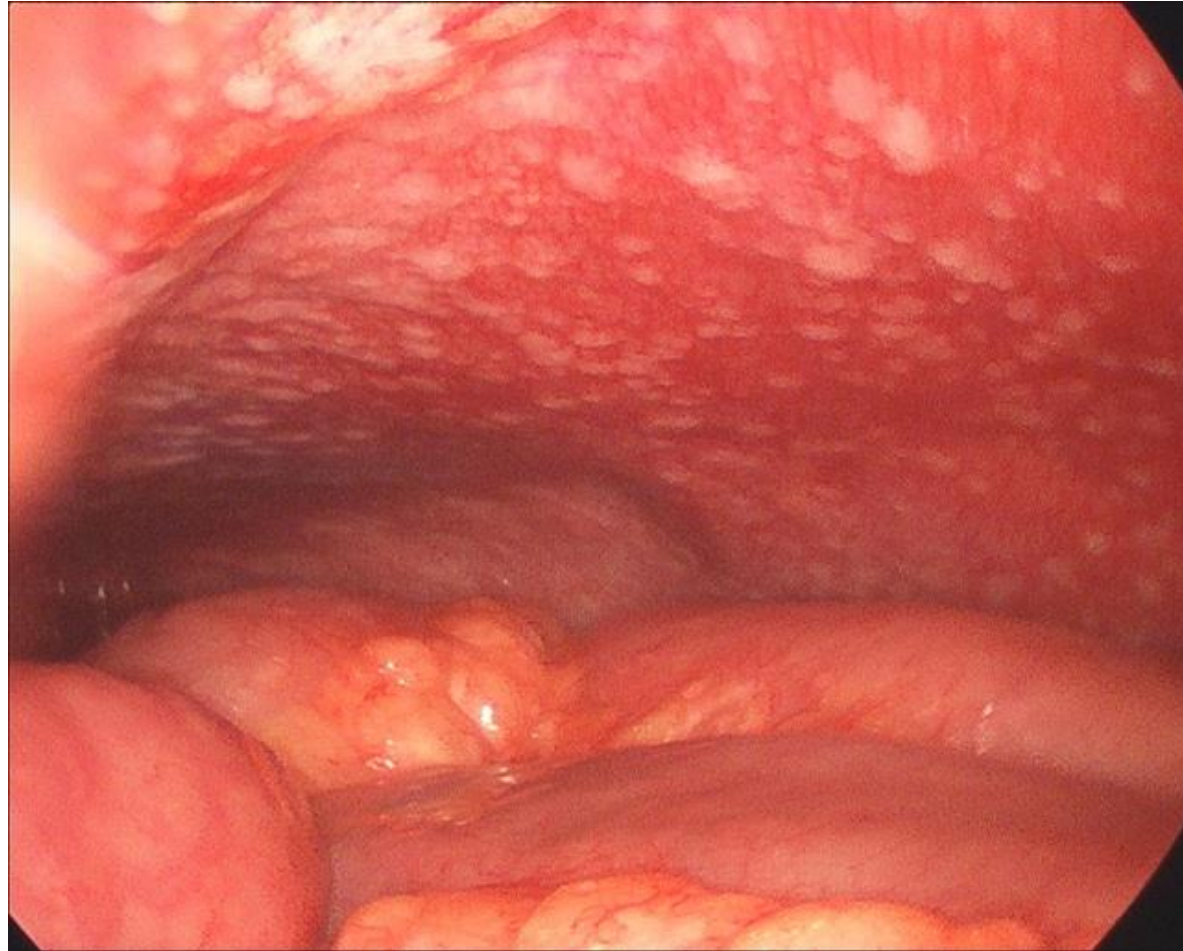
- Signs of malignancy
- Latency, resting state



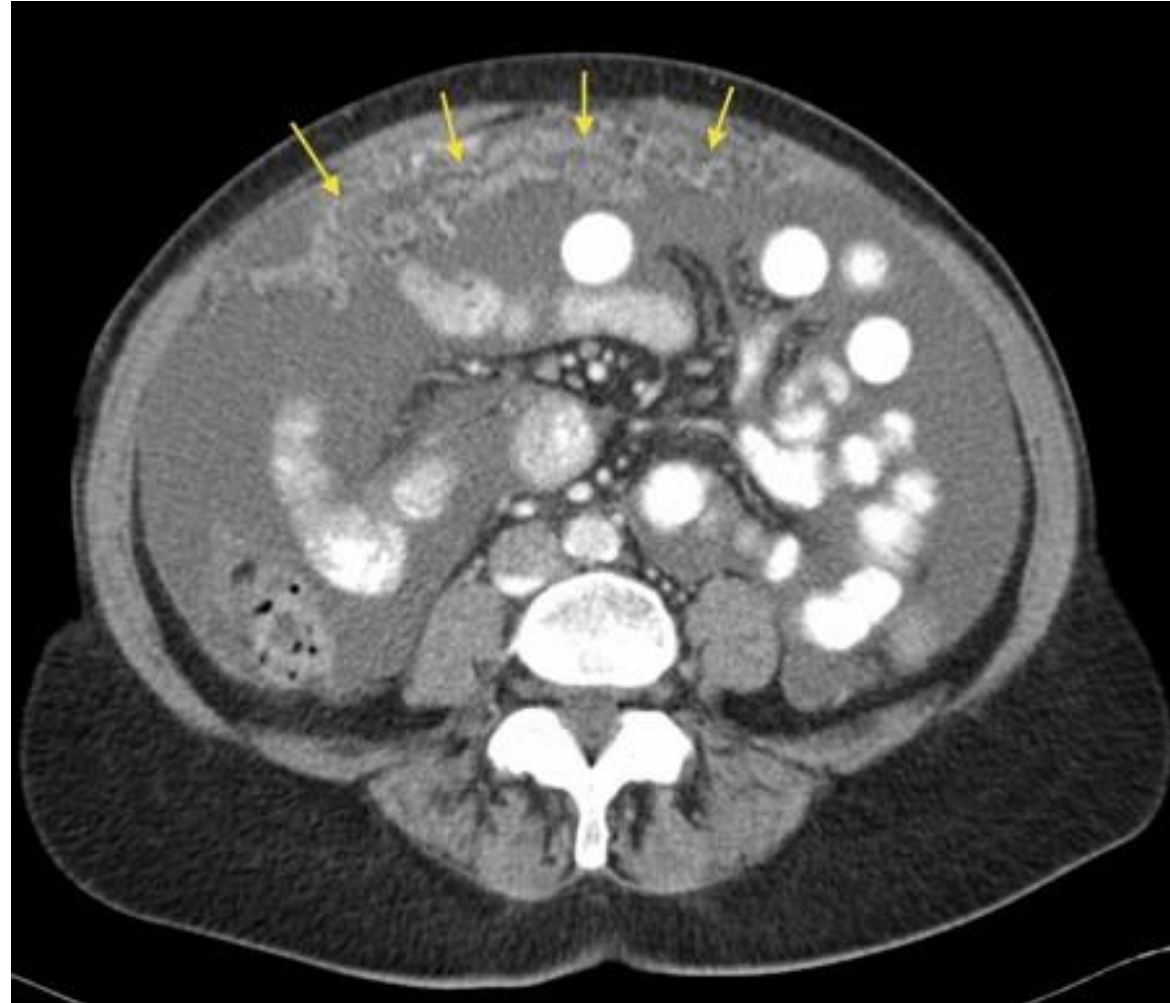
# Metastases

- Selective mts (prostate ca -> axial skeleton)
- Generalised mts
- Solitary mts (lung mts in renal carcinoma)
  
- Lymphogenic mts (vessel -> node)
- Hematogenic mts (direct growth into vessel)
- Implantation mts (peritoneum)

# Peritoneal carcinomatosis



# Peritoneal carcinomatosis



# Tumor classification

- Typing, staging, grading
- MKN-O /ICD-O/ classification
- 3-degree coding XXXX/YZ
- R classification after treatment

# Histopathology – *Typing*

- Tissue of origin
  - Mesenchymal (connective tissue –sarcoma)
  - Epithelial (-carcinoma)
  - Neuroectodermal (malignant melanoma)
  - Germinal (germinal cells, gonads – seminoma, yolk-sac tumor, teratom)
  - Choriocarcinoma (trofoblastic cells)
  - Mesothelioma (pleura, pericard, peritoneum)



# Mesenchymal tumors

- Connective tissue tumors
  - Fibrous tissues (fibroma, myxoma, myofibroma)
  - Fat cells (lipoma, liposarcoma, xanthoma)
  - Cartilage (osteochondroma)
  - Vessels
  - Muscle cells
  - Blood & lymphatic cells (leukaemia, lymphoma, myeloma)
- Fibroma (benign) – fibrosarcoma (malignant)

# Epithelial tumors

- Benign – papiloma, fibroepithelioma
- Malignant – squamous carcinoma, basalioma, urothelioma, adenocarcinoma (mamma, colon)
- Types
  - Covering epithelium
  - Glandular epithelium (adenomas)
  - Neuroendocrine epithelium (carcinoid)

# Neuroectodermal tumors

- CNS, peripheral nerves, skin tumors /melanocytes/
- Types
  - CNS: Neuro-, retinoblastoma, meningioma, astrocytoma, oligodendroglioma, feochromocytoma
  - Peripheral: Schwannoma, neurofibroma
  - Skin: naevus pigmentosus (benign), malignant melanoma
- Two tissues of different origin (mixed tumors)

# Histopathology – *Grading*

Microscopic determined degree of tumor differentiation

Important prognostic + predictive information

Higher = more sensitive to treatment

- G1 – high differentiation, low malignity level
- G2 – average diff., average malig.
- G3 – low diff., high malignity
- G4 – not differentiated tumor
- GX – impossible to determine differentiation

# Histopathology – *Staging*

- Determination of clinical phase
- Precancerosis -> preclinical stage ->  
-> clinical symptoms
- TNM classification, MKN-O classification
- Dukes system – colorectal cancer staging
- FIGO system – cervical cancer staging
- Clark & Breslow class. – malignant melanoma

# TNM Classification

- T = tumor (T0, TIS, T1-4, TX)
- N = lymph node (N0, N1-4, NX)
- M = metastasis (M0, M1, MX)

## pTNM

y – adjuvant therapy

r – relapse of malignancy

C – certainty factor (surgery, histology, autopsy)

# Classification

- MKN-O (ICD-O; *International classification of diseases for oncology*)
- 3-degree coding XXXX/YZ
  - XXXX = morphological type of tumor
  - Y = biological activity
  - Z = histopathological grading

# Classification

- C24 – infiltration of nonspecific parts of biliary tract
- C24.1 – tumor of major duodenal papilla (Vater papilla)
- C24.1 M-8160 – cholangiocarcinoma of Vater papilla
- C24.1 M-8160/3 (malig.) cholangiocarcinoma of Vater papilla
- C24.1 M-8160/32 averagely differentiated cholangiocarcinoma of Vater papilla



# R classification

- R0 - without residual tumor
- R1 - microscopic residual tumor
- R2 - macroscopic residual tumor
- R2a - macroscopic residual tumor, microscopically not verified
- R2b - macroscopic residual tumor, microscopically verified

# National oncological registry

- Collecting data since 1976
- Under IARC (International agency for research on cancer)
- screening, manifestation, date of 1st visit vs. date of dg., smoking, laterality,...

The form is titled "Incidence a léta zhoubného novotvaru" (Incidence and years of malignant tumor). It is a detailed medical form used for recording cancer cases. The form is organized into several sections, each with specific data points to be recorded:

- Demographic and Identification:** Includes fields for patient name, sex, date of birth, and hospital/clinic information.
- Clinical History:** Contains sections for "Anamnéza" (History), "Léčba" (Treatment), and "Výsledek" (Outcome), with checkboxes for various symptoms and treatments.
- Diagnosis and Staging:** Includes fields for "Diagnóza" (Diagnosis), "Stádium" (Stage), and "Typ nádoru" (Type of tumor).
- Operative and Therapeutic Details:** Contains sections for "Operativní výkon" (Operative procedure) and "Léčba" (Treatment), with checkboxes for various procedures and treatments.
- Follow-up and Prognosis:** Includes fields for "Délka života" (Life expectancy), "Prognóza" (Prognosis), and "Příčina smrti" (Cause of death).

# Fundamentals of surgical oncology

- Solid tumor removal
- Acute x planned therapy
- Curative x palliative therapy
- Qol improvement (cytoreductive surgery – debulking)

# Prophylactic surgery

- Inherited abnormalities
  - Surgery as a primary prevention of illness

BRCA 1, BRCA 2 – prophylactic mastectomy

Familial adenomatous polyposis – colectomy

Cryptorchism - orchidopexis

# Familial adenomatous polyposis

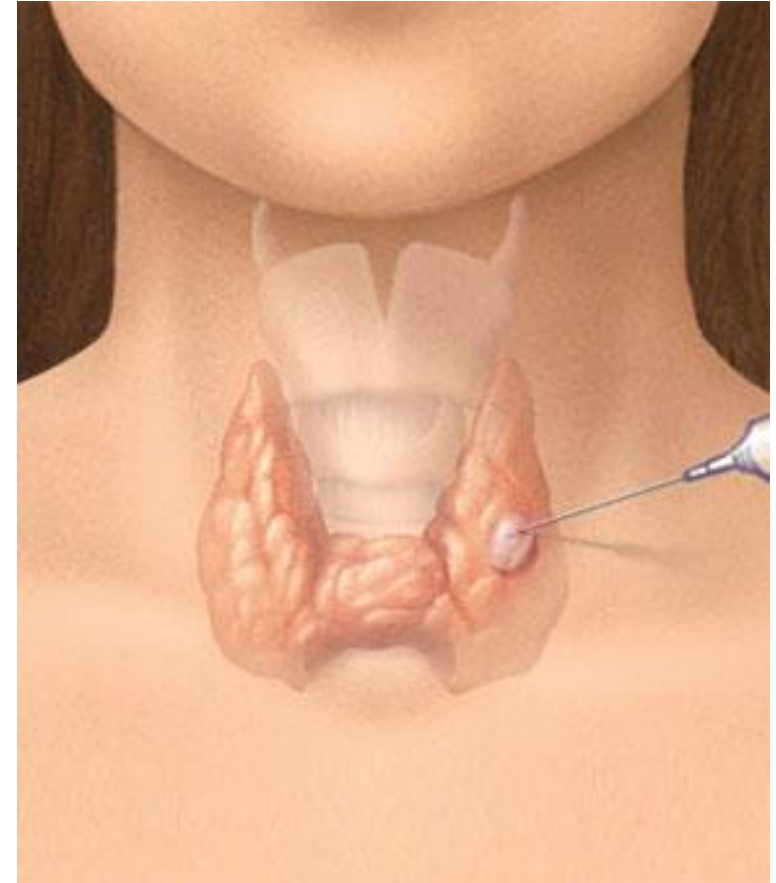


# Diagnostic surgery

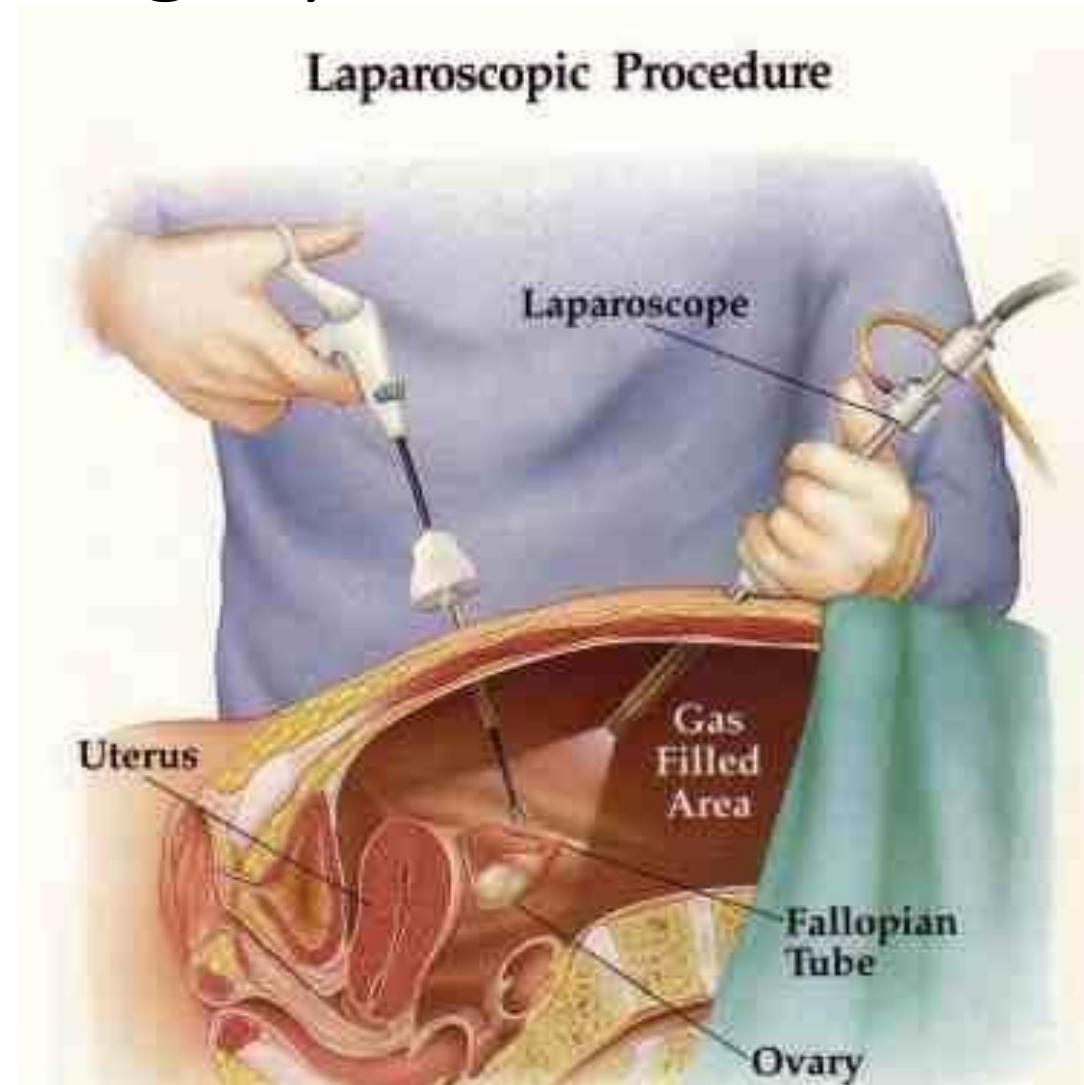
- Various ways of obtaining tissue sample
- Needle biopsy (CT, USG controlled)
- Explorative laparoscopy/laparotomy

# Diagnostic surgery

- Biopsy
  - FNAB (thyroid gland)
  - Core biopsy (breast)
  - Incisional biopsy (forceps – endo)
  - Probatory excision

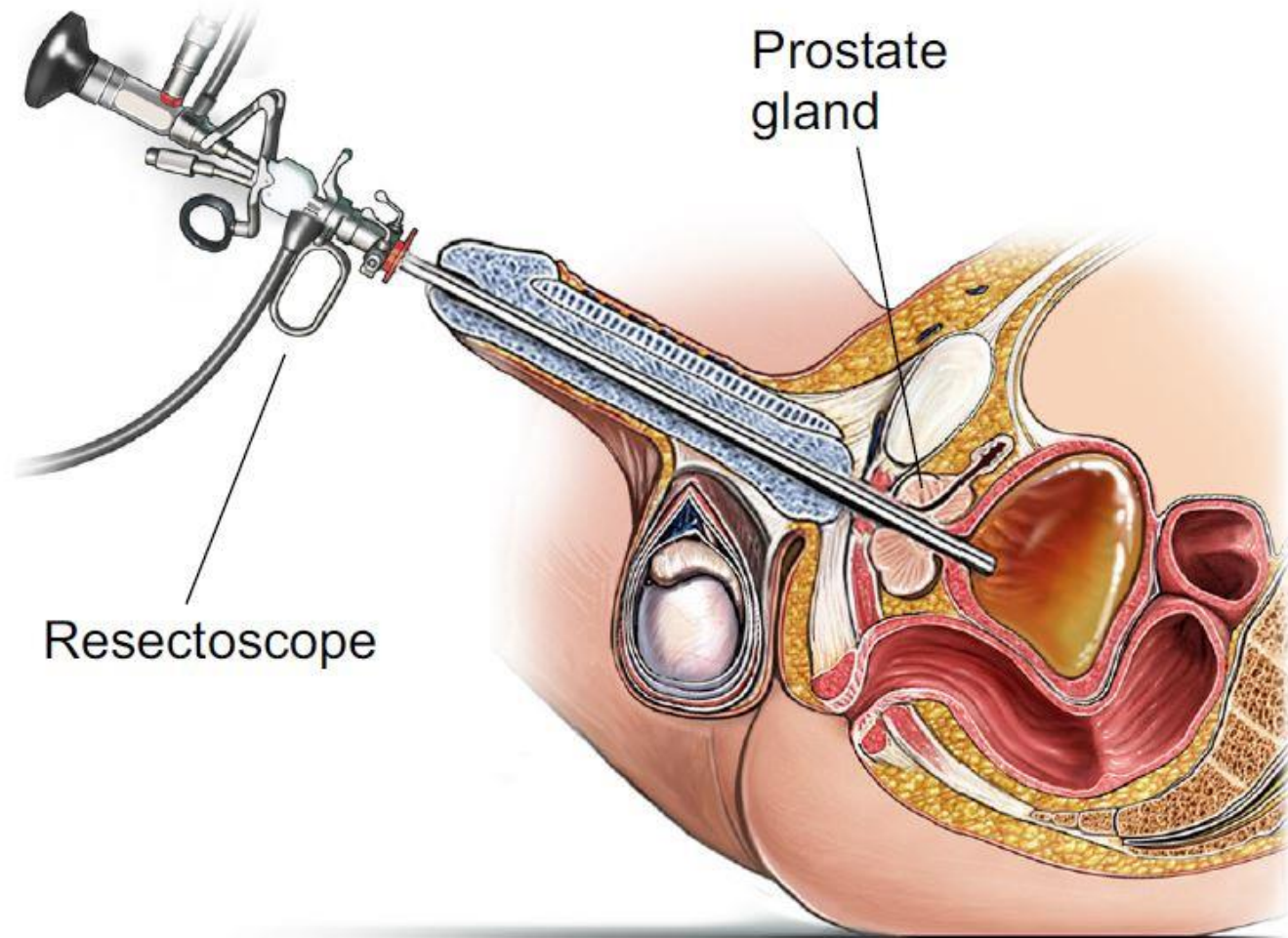


# Diagnostic surgery





# Endosurgery



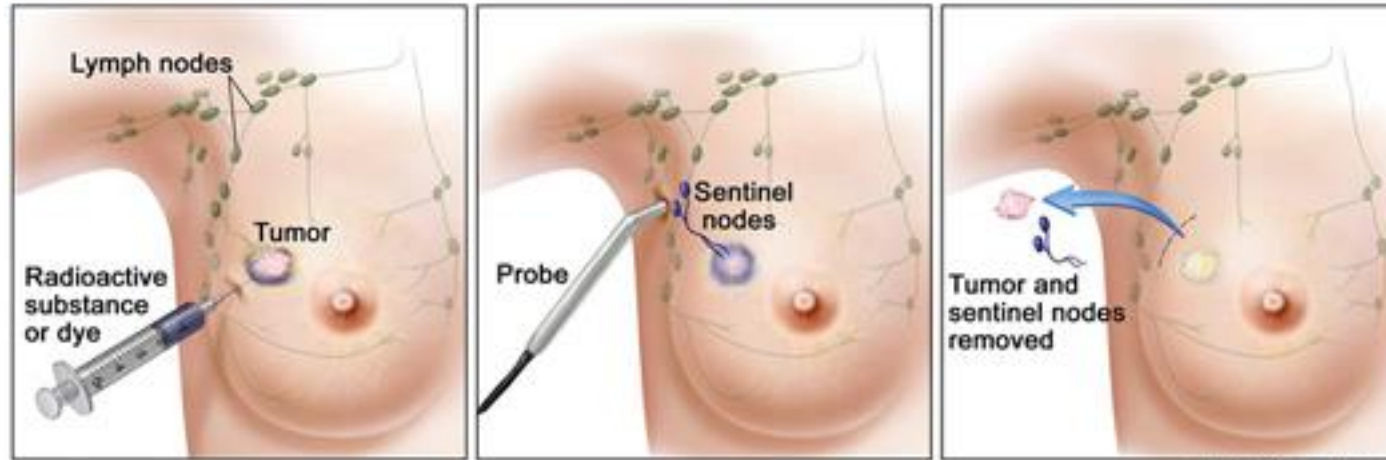
# Curative surgery

- Radical surgical intervention to prevent relapse
- Multivisceral surgery – removes surrounding tissues & organs with primary tumor
- Used in localised forms of illness

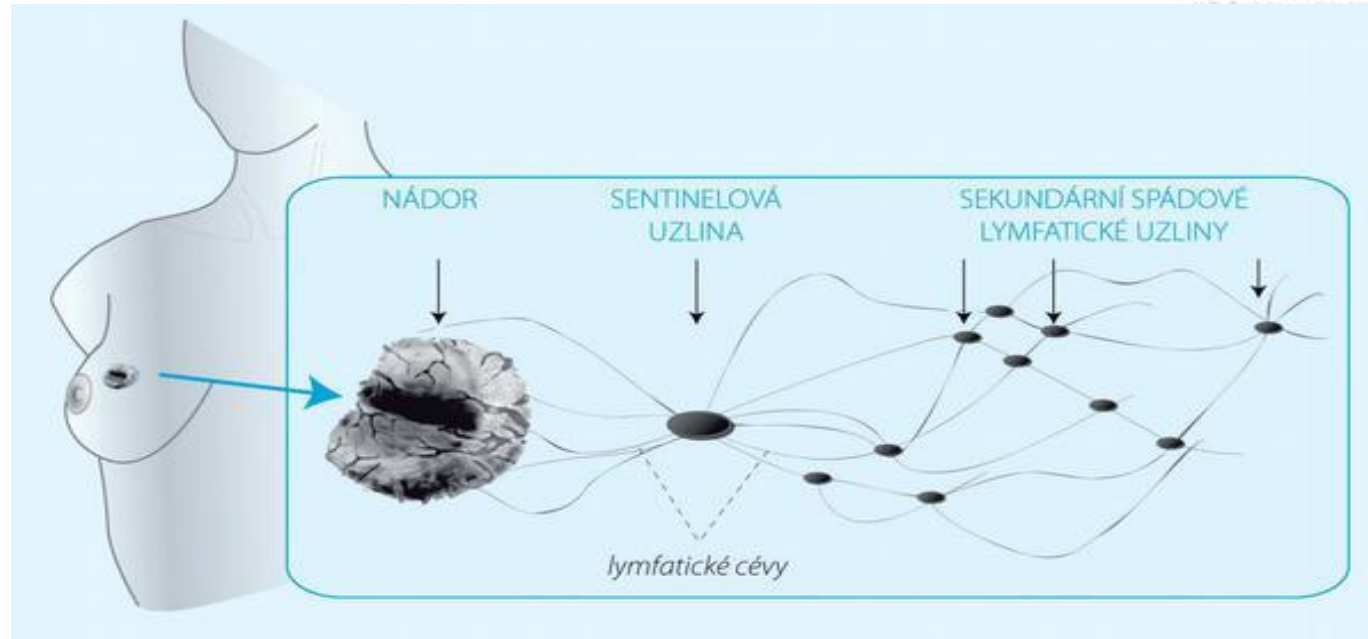
# Regional lymph nodes removal

- Elective
  - Prophylactic lymph node dissection (no signs of dissemination in surgery + histology)
- Therapeutic
  - Removal in damaged lymph nodes (thyroid gland papilar Ca)

# Sentinel node biopsy



© 2010 Terese Winslow



# Sentinel node biopsy

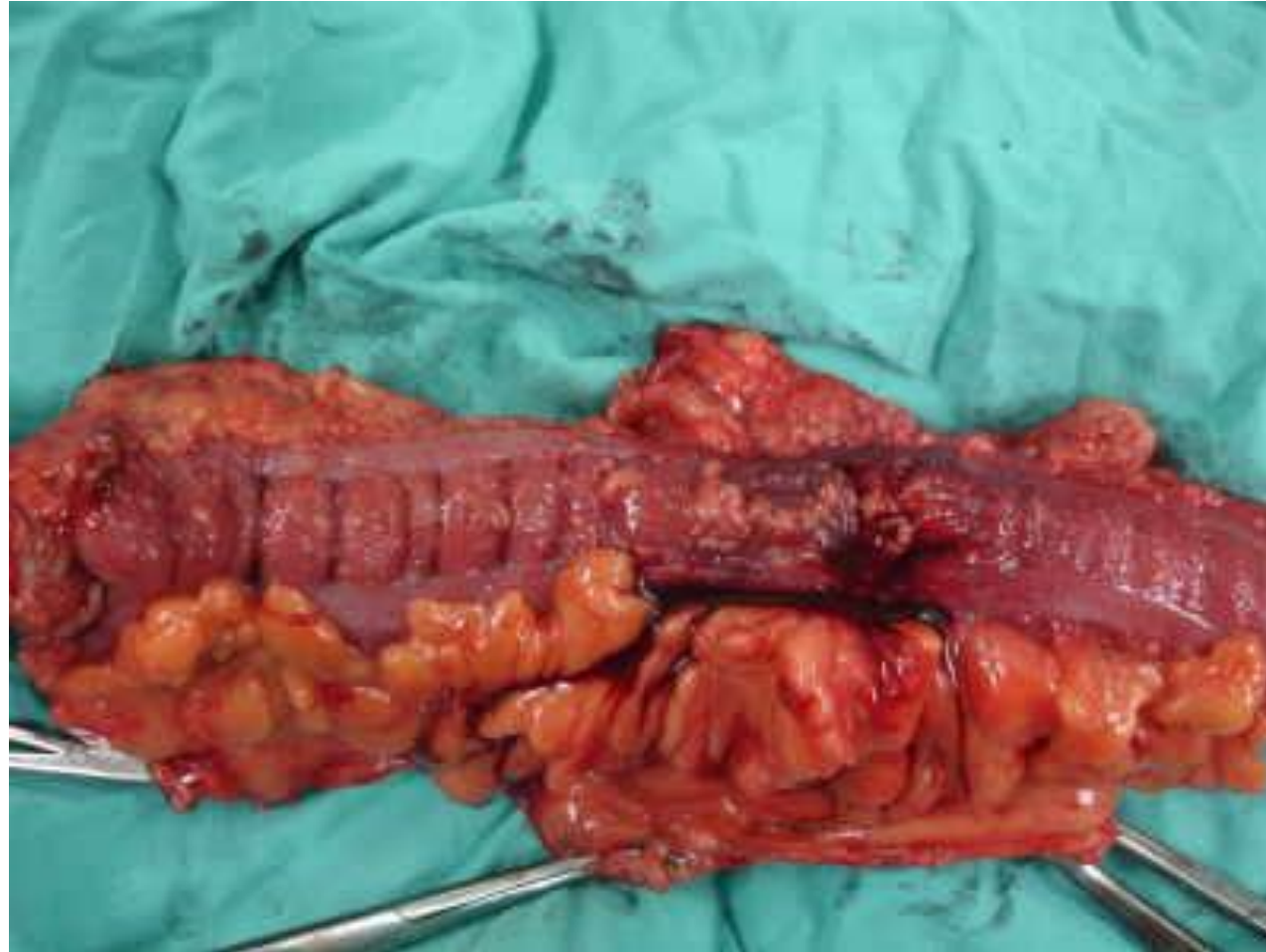


- Sentinel = guard
- First grade lymph node
- Ca mammae
- Melanoma

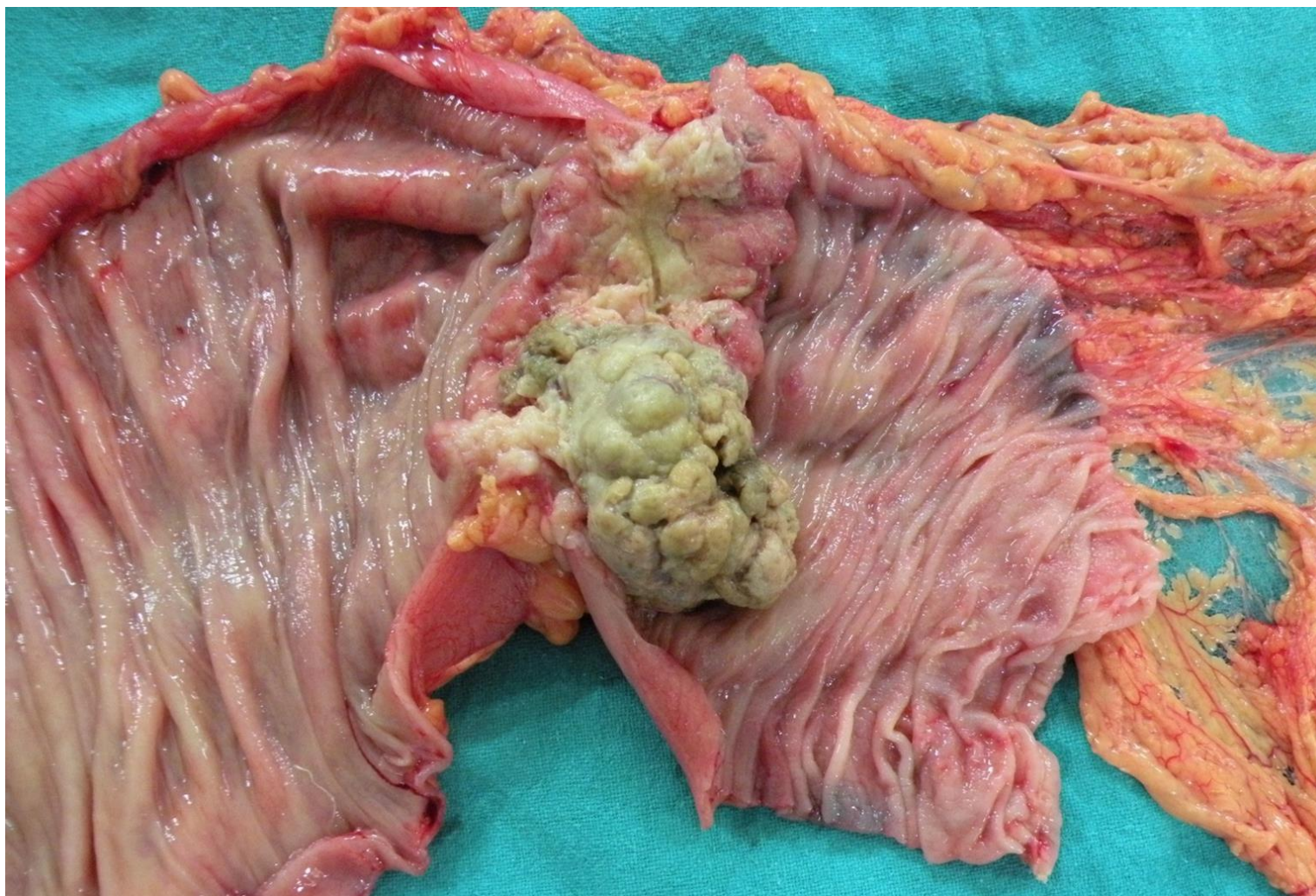
# Treatment of metastases

- Palliative surgical intervention
  - (lung + liver mts of CRCA)
    - 1/3 increase of long term survival in colorectal cancer patients
- Ethanol instillation
- Cryodestruction
- Locoregional chemotherapy (intraarterial port-catheter)
- Solitary mts – better prognosis

# Colon resection



# Colon resection





# Palliative surgery

- ↓ tumor tissue mass
- ↑ other treatments effectiveness
- Method of choice in case of imminent local complications
  - Ileotransversostomy to alleviate symptoms of obstruction (inoperable caecal cancer)
  - Choledochojejunostomy to prevent jaundice (unresectable pancreatic tumor)

# Nonsurgical methods

- Chemotherapy
- Radiotherapy
- Hormonal / Immunotherapy
- Laser
- Cryosurgery
- Radiosurgery (gamma knife)
- Endoscopic mucosectomy

# Interdisciplinary care

- Masarykův onkologický ústav
- Indication committees
  - Mammary, Melanoma, Digestive oncology, Urology

# Interdisciplinary care

## **Members of the multiprofessional team**

- Site-specialist surgeon
- Surgical oncologist
- Plastic and reconstructive surgeon
- Clinical oncologist/radiotherapist
- Medical oncologist
- Diagnostic radiologist
- Pathologist
- Speech therapist
- Physiotherapist
- Prosthetist
- Clinical nurse specialist (rehabilitation, supportive care)
- Palliative care nurse (symptom control, palliation)
- Social worker/counsellor
- Medical secretary/administrator
- Audit and information coordinator

Special oncosurgery

# Gastrointestinal surgery

- Oesophagus
- Stomach
- Intestines + rectum
- Liver
- Pancreas, gall bladder, biliary tract

# Oesophagus

- Risk factors: alcohol abuse, smoking, GERD, Barrett's precancerosis
- Dg.: X ray – passage, endoscopy, CT
- Symptoms: dysphagia, weight loss, cough, back pain
- Therapy: rt, cht, surgery

# Stomach

- Risk factors: smoking, poor food choices, infection (H. Pylori)
- Dg.: US, endoscopy, CT
- Symptoms: ditto + anemia
- Therapy: rt, cht, surgery – partial/total resection, palliative - gastroenteroanastomosis



# Liver

Primary tumor – hepatocellular Ca (hep C)

Secondary – liver mts (CRCA), more frequent

Dg.: US, oncomarkers – AFP

Symptoms: from primary tumor, cirrhotic – like symptoms

Therapy: surgical – metastatectomy, liver resection (segmentectomy, lobectomy)

# Pancreas, gall bladder, biliary tract

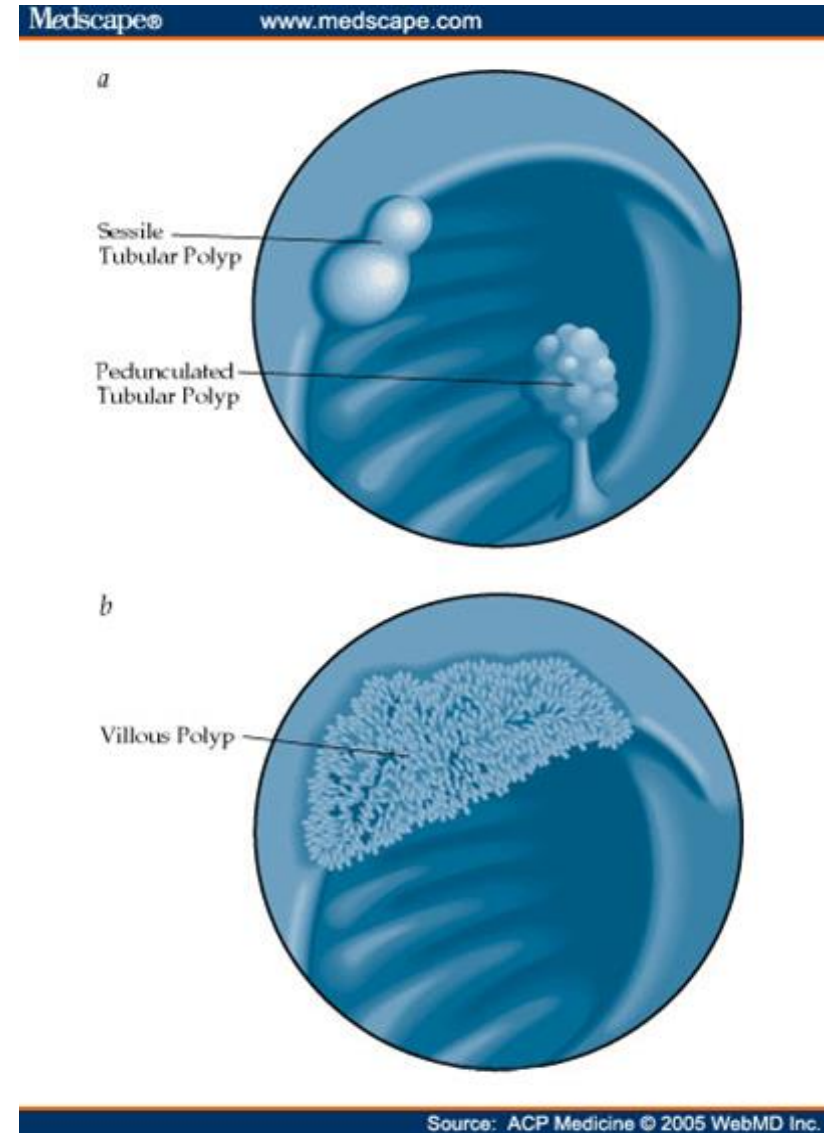
- AdenoCa (most frequent)
- Chemoresistant
- Late diagnosis
- Therapy: palliative bypass surgery, liver resection, RT

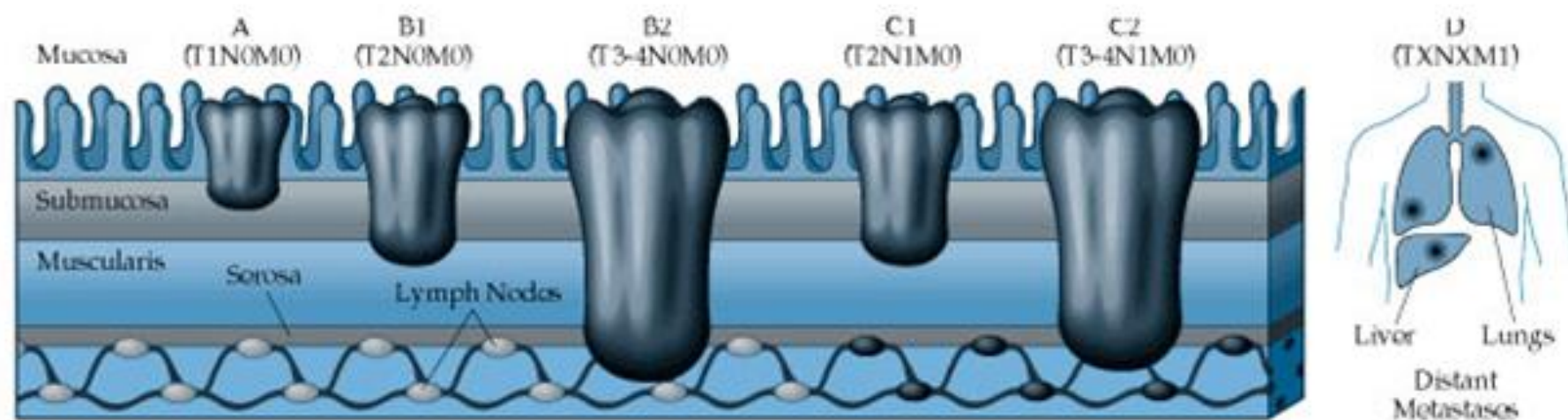
# Colorectal carcinoma

- No. 1 cause of death in males, 2nd in females in CZ  
(7800 newly diagnosed/year)
- Unfavorable prognosis
  - Short term troubles
  - Occurrence under 30y
  - Nondifferentiated Ca
  - Infiltrating form
  - Angioinvasion
  - Lymphatic metastases

# Colorectal carcinoma

- Unknown etiology
- High fibre diet x diet rich in red meat
- Familiar anamnesis !!
- Preexisting adenomas -> precanceroses -> tu
- Colonoscopic polypectomy decreases the risk of CRCA





### Staging of and Prognosis for Colorectal Cancer

Stage		Description	Five-Year Survival (%)	
Dukes	TNM		1940s and 1950s	1960s to Present
A	T1N0M0	Infiltration no deeper than submucosa	80	> 90
B1	T2N0M0	Infiltration of muscularis; no penetration through colonic wall; no lymph node involvement	60	85
B2	T3-4N0M0	Extension through colonic wall; no lymph node involvement	45	70-75
C1	T2N1M0	Infiltration of muscularis; no penetration through colonic wall; lymph node involvement	15-30	35-65
C2	T3-4N1M0	Extension through colonic wall; lymph node involvement		
D	TXNXM1	Distant metastases	< 5	< 5

Note: see reference 91.

# Colorectal carcinoma

- Early diagnosis -> better prognosis
- Adenomatous polyp -> Ca (10 years)
- Prevention – screening (50 years >> – I.+II. St. TNM 90%)
  - Haemoccult test, colonoscopy
- Follow up in risk groups
  - Adenom. polypi, FAP, UC, M. Crohn

# CRCA examination

- Anamnesis
- Examination (per rectum!)
- Rectoscopy, biopsy
- Colonoscopy / irrigography
- Lung Xray
- Ultrasound, CT, MR, PET
- Gynaecological / urological examination

# CRCA examination

- CT
  - Local tumor staging, extracolonic propagation
  - Regional lymph nodes
  - Distant mts detection
  - Virtual colonoscopy
- PET
  - Preoperative tumor detection, staging
  - Local relapse detection
- MR
  - Tumor relapse detection
  - Tu / scar tissue / postradiation changes differentiation



# CRCA surgery

- Resection
  - Radical
  - Paliative
  - Planned x acute
- Anastomoses – colostomy, ileostomy
- Explorative laparotomy (ascites evacuation)
- Pain management
- Psychotherapy

# CRCA surgery

- Radical – curative resection
  - Excision of ca incl. Lymph nodes en bloc
  - „no touch technique“
    - Colon ligature over + under tumor, ligation of vessels
  - Block resection (spreading to surrounding tissues)
  - Mts resection (ONLY in solitary mts in one surgery)

# CRCA surgery

- Total pancolectomy (PCE) + ileostomy (*Brooke*)
- Total PCE + continent ileostomy (*Kock*)
- Restorative PCE + IPAA (ileo-pouch anal anast.)
- Subtotal colectomy + IRA (ileo-rectal anast.)

# Total pancolectomy (PCE) (Brooke)

+

Permanent stomy without special training

Eliminated CRCA risk

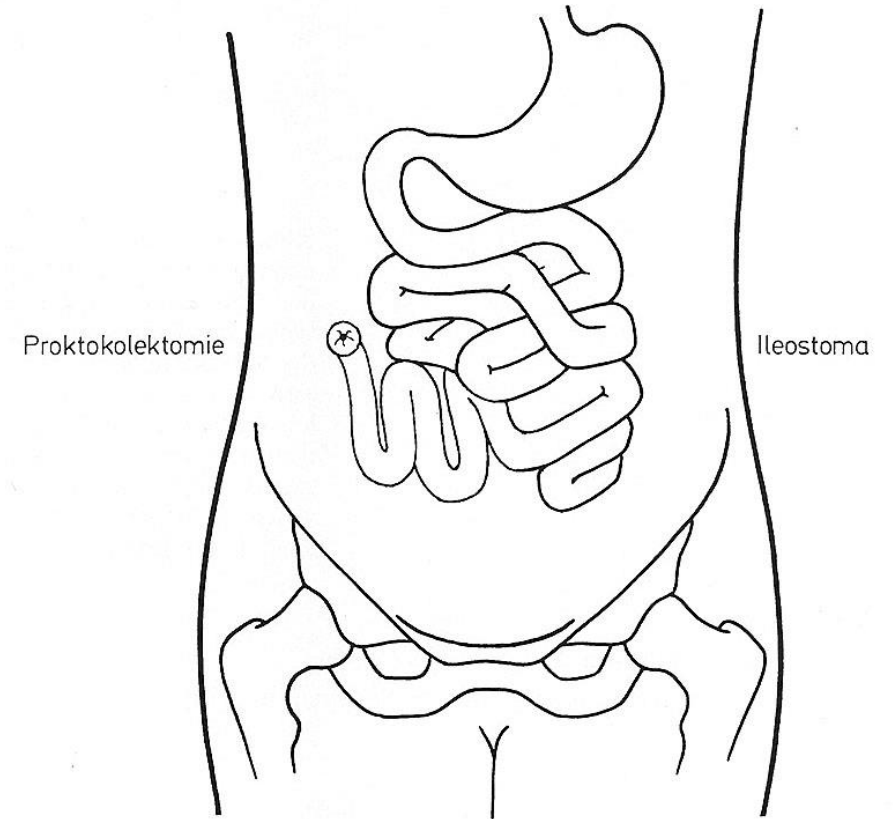
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Peristomic irritation

Psychological effect

Urinary + sexual dysfunction

+ ileostomy



# Total PCE + continent ileostomy (*Kock*)

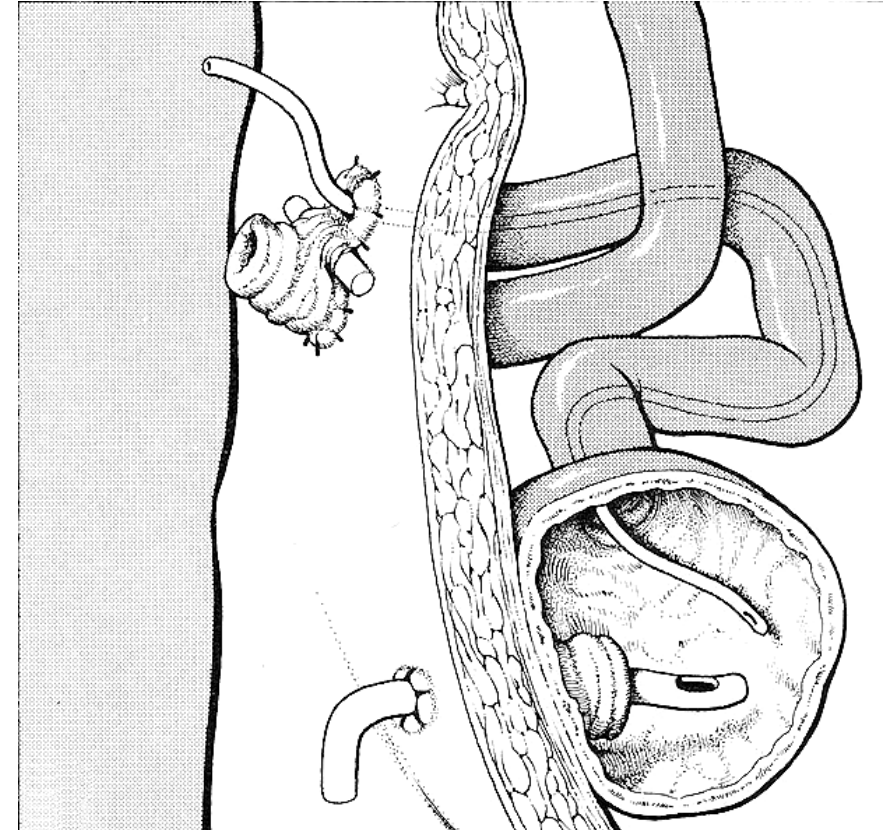
+

Same as PCE sec. Brooke

-

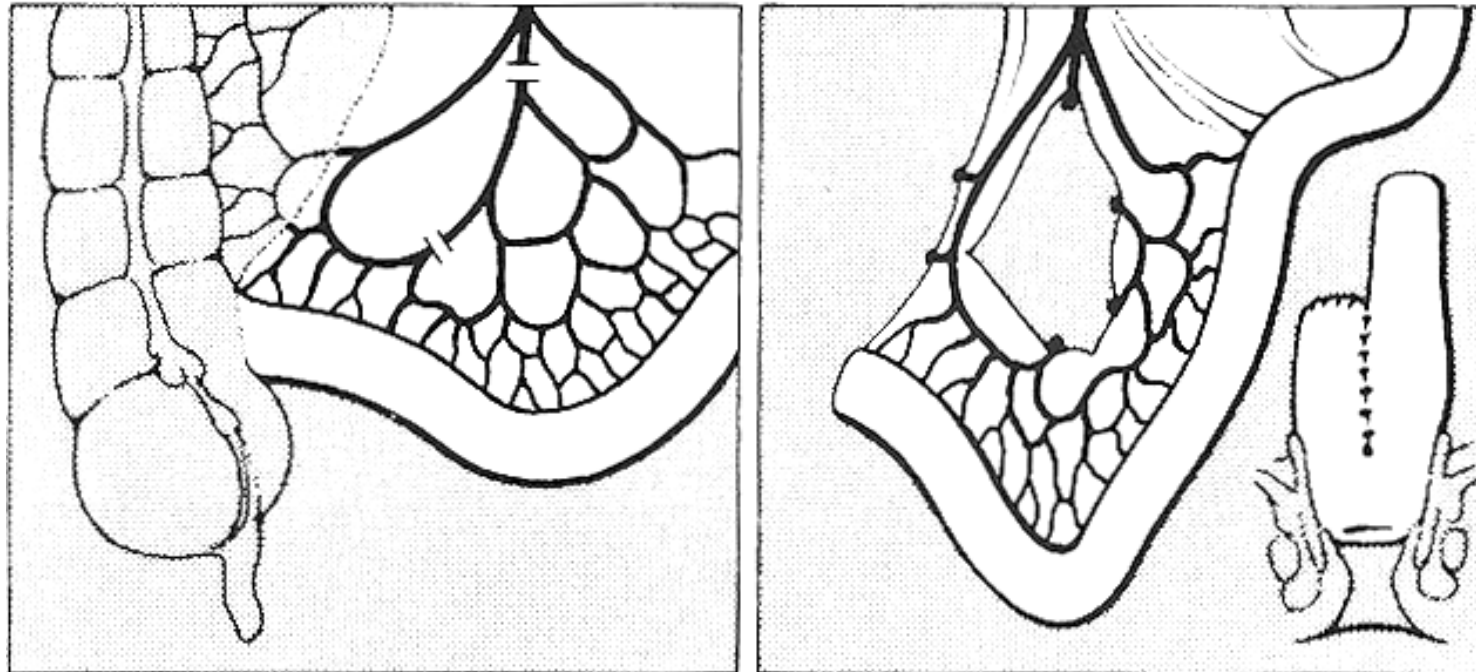
Complicated surgery

Risk of pouchitis



# Restorative PCE + IPAA (ileo-pouch anal anastomosis)

- + elimination of colorectal mucosa, continence, no permanent stomy, w/o sexual dysfunction
- ongoing small CRCA risk



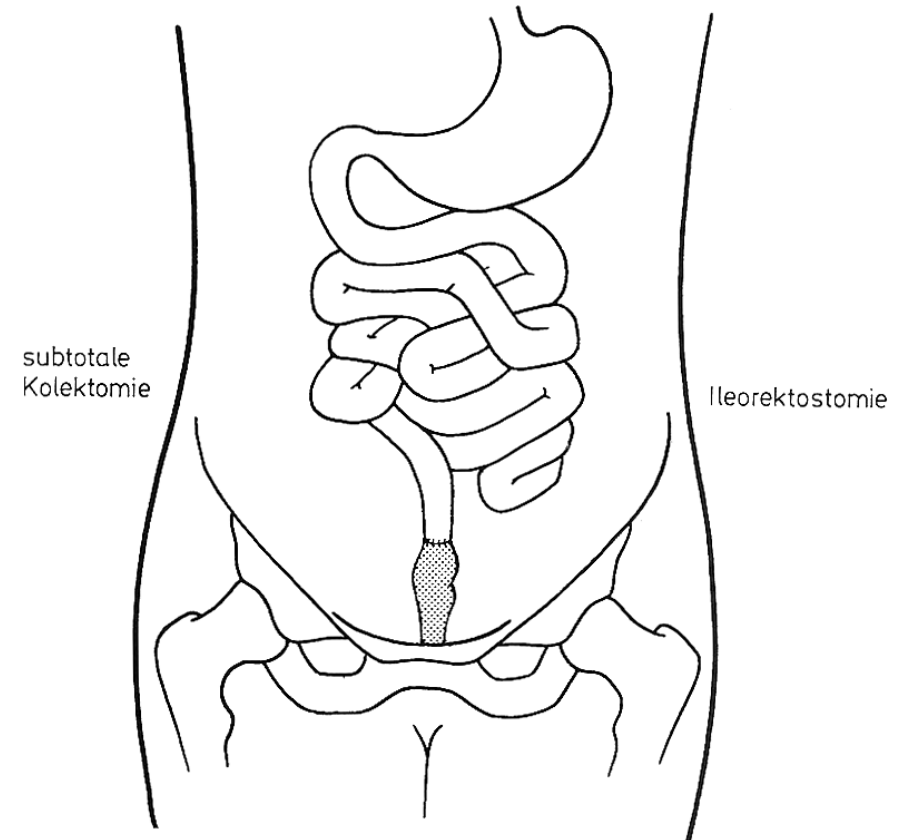
# Subtotal colectomy + IRA (ileo-rectal anastomosis)

+

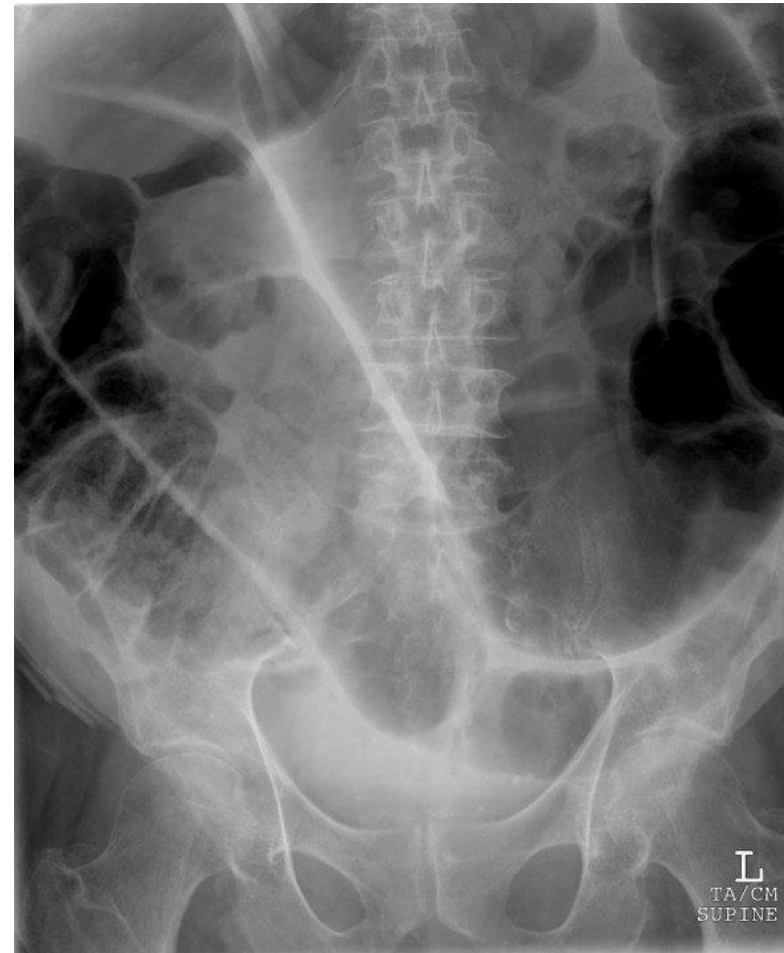
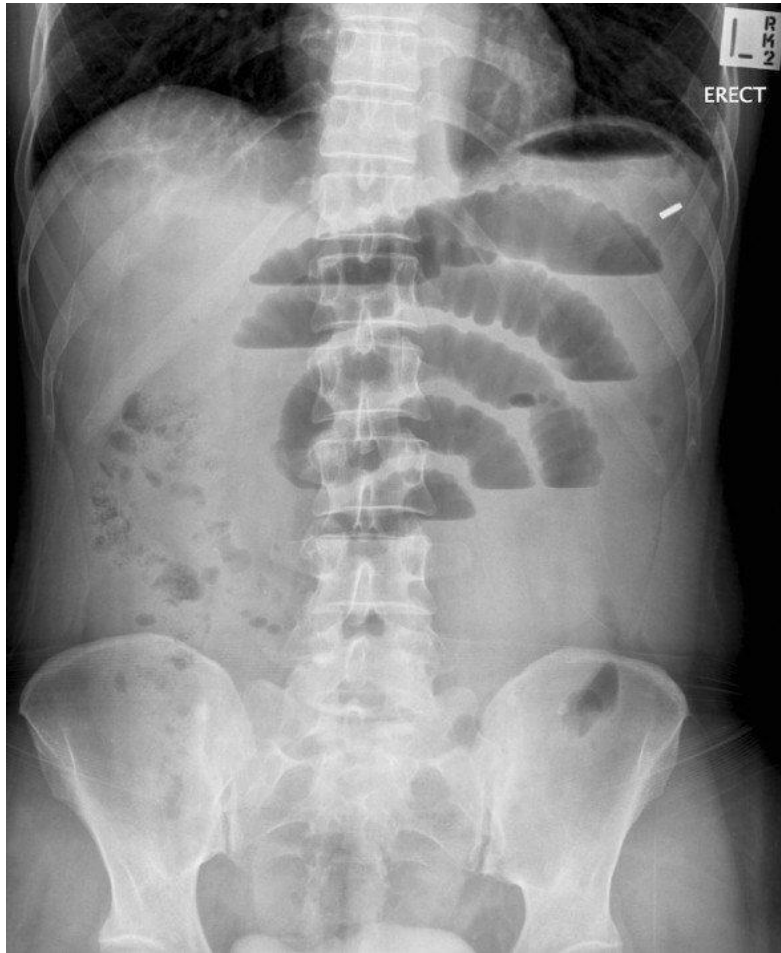
No permanent stomy  
w/o sexual dysfunction  
Easy follow up

-

Risk of CRCA  
Lifelong follow up

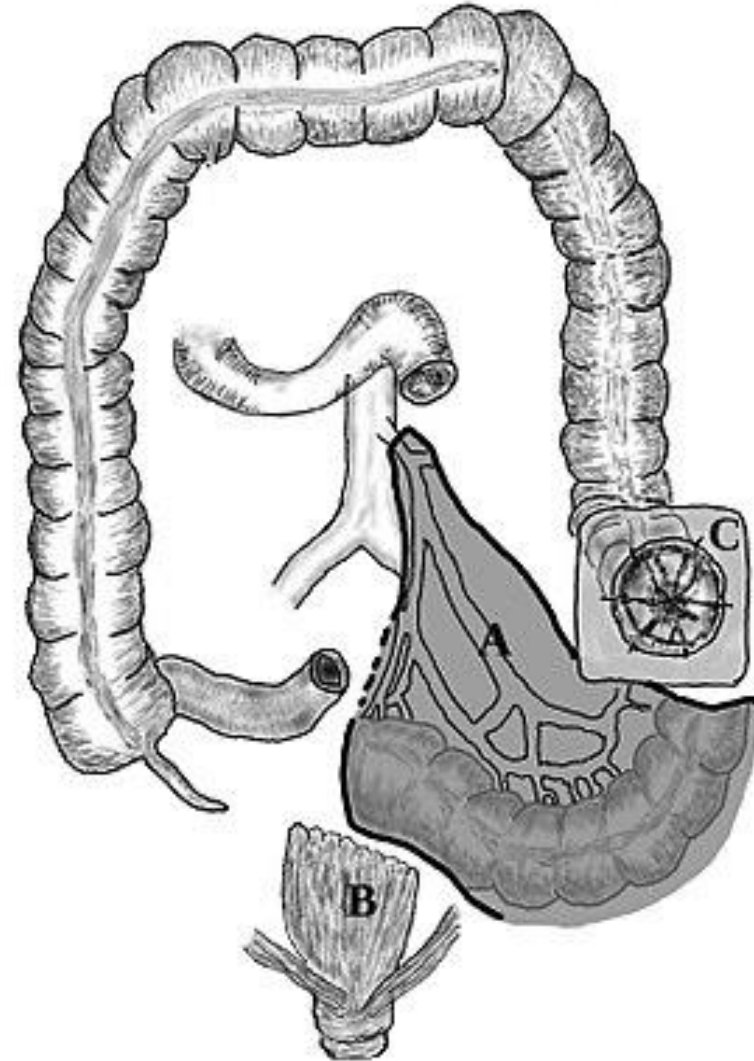


# Emergency room X rays



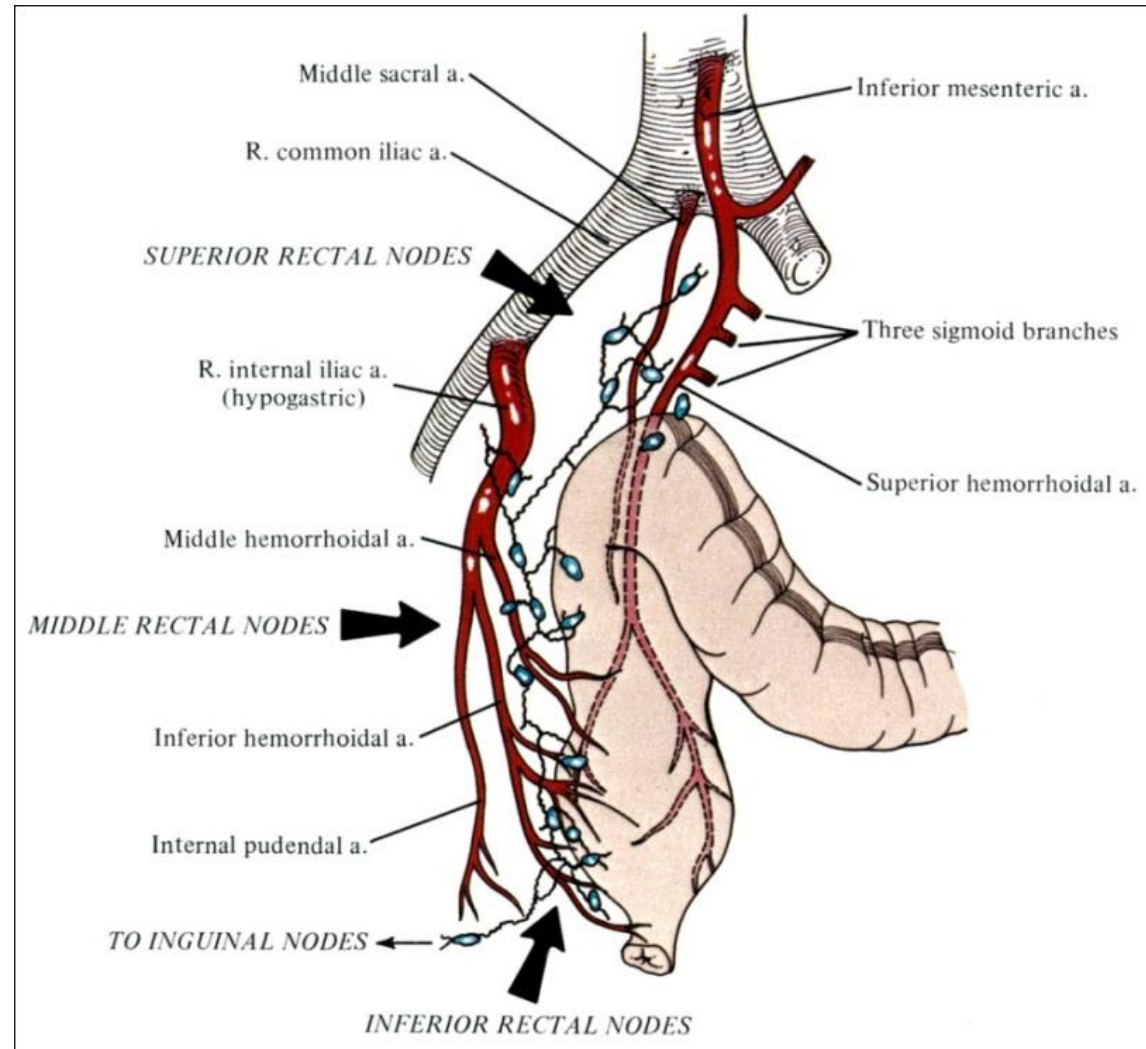


# Hartmann's surgery



# Rectal carcinoma

- Lower 15cm
- Special surgical approach
  
- Upper 1/3
- Lower 2/3



# Rectal carcinoma

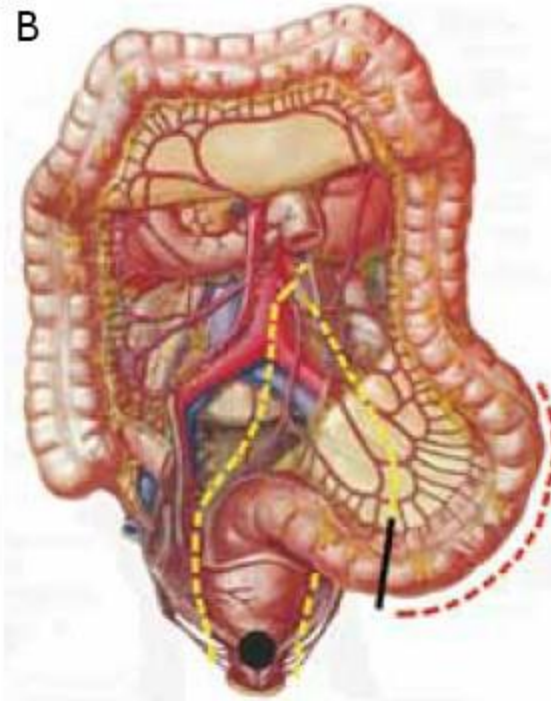
- Upper 1/3 of rectum (12-15cm)
  - Mobilisation and transection 5cm under tumor
  - Partial mesorectal excision
  - Lower anterior resection + anastomosis
    - Stapler / by hand

# Rectal carcinoma

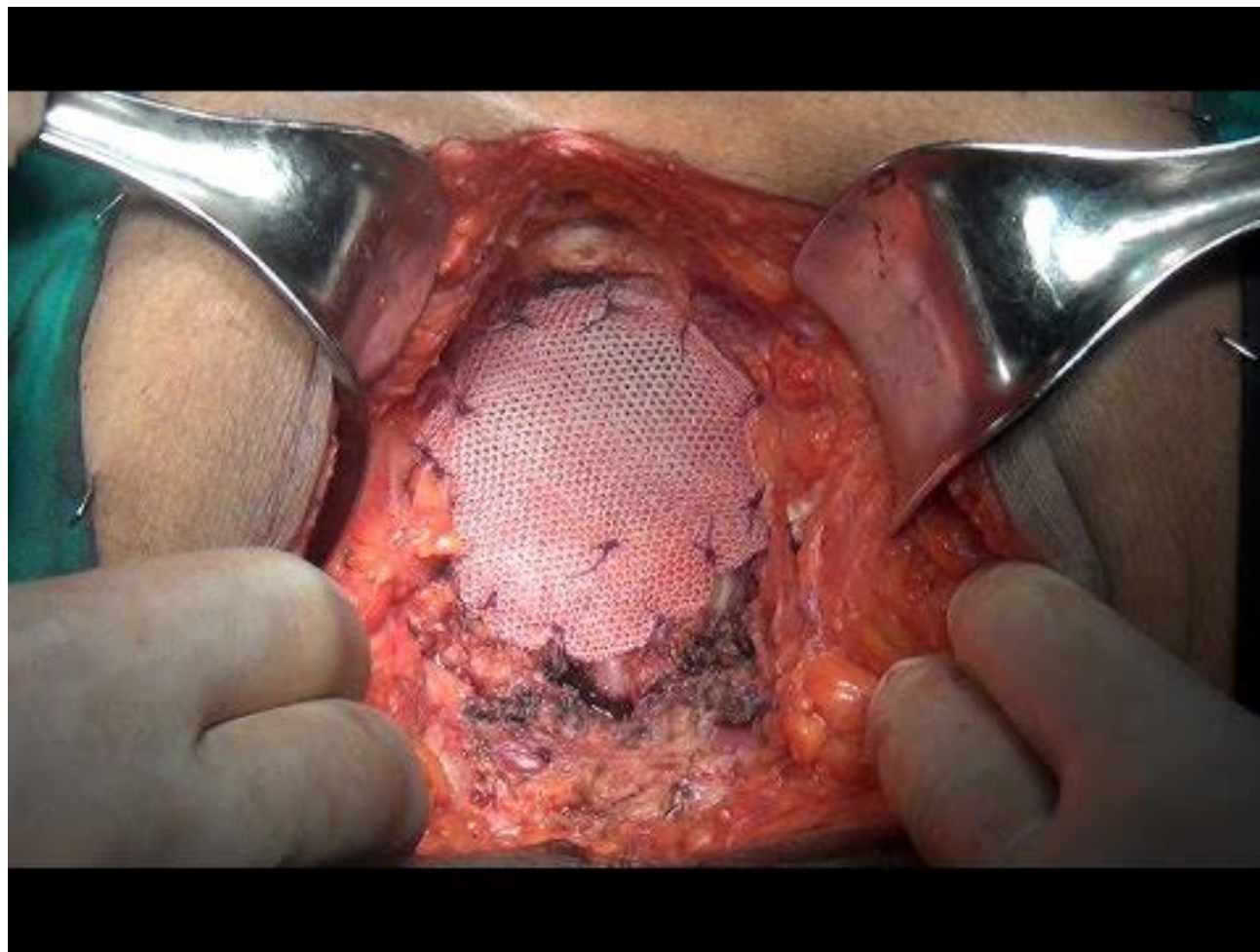
- Lower 2/3 of rectum (5-6cm to 11-12cm)
  - Lower anterior resection + anastomosis (colorectal/coloanal)
  - a.+v. mesenterica inferior ligation
  - Lienal flexure mobilisation
  - Total mesorectal excision (TME)
    - $12 >$  lymph nodes in resectate (-> TNM)
    - $< 12$  lymph nodes -> incorrect clinical staging

# Rectal carcinoma

- Tumor localisation under 5-6cm
- Abdominoperitoneal extirpation of rectum sec. Miles



# Rectal carcinoma



# Mammary carcinoma

- Most frequent Ca in women
- Hormonally dependent
- > 30% of all malignancies
- ČR – 1 in 12 women
- Europe – 1 in 10 women
- USA, GB, Scandinavia – 1 in women -> endemic occurrence

# Mammary carcinoma

- Sporadic occurrence (spontaneous mutation)
- Familiar occurrence (genetic abnormalities)
- Hereditary occurrence (BRCA1, BRCA 2)

Invasive ductal Ca (72%)

Invasive lobular Ca (13%)

Ca in situ (6%)

Erysipeloid. Ca, Paget's Ca



# Mammary carcinoma

- Clinical findings
  - Squamiae, encrustation
  - Usuration of nipple
  - Propagation to areola
  - Propagation deep to the mammary tissue
  - 50% palpable mass -> invasive ductal Ca

# Mammary carcinoma



# Mammary carcinoma



# Mammary carcinoma in men

- 1 male to 100 females per year
- 36 newly diagnosed per year
- Maximal incidence +/- 70 years
- 85% infiltrative ductal Ca

# Diagnostic methods

- Ultrasound
- Mammography
- CT, PET CT
- MR
- Ductography, ductoscopy
- Laseromammography
- Transluminiscence
- Digital thermography – dynamic optical breast imaging system

# Prognosis according to tumor size

- | • Diameter of tumor in cm | • 5year survival |
|---------------------------|------------------|
| • <1cm                    | • 99%            |
| • 1-3cm                   | • 91%            |
| • >3cm                    | • 85%            |

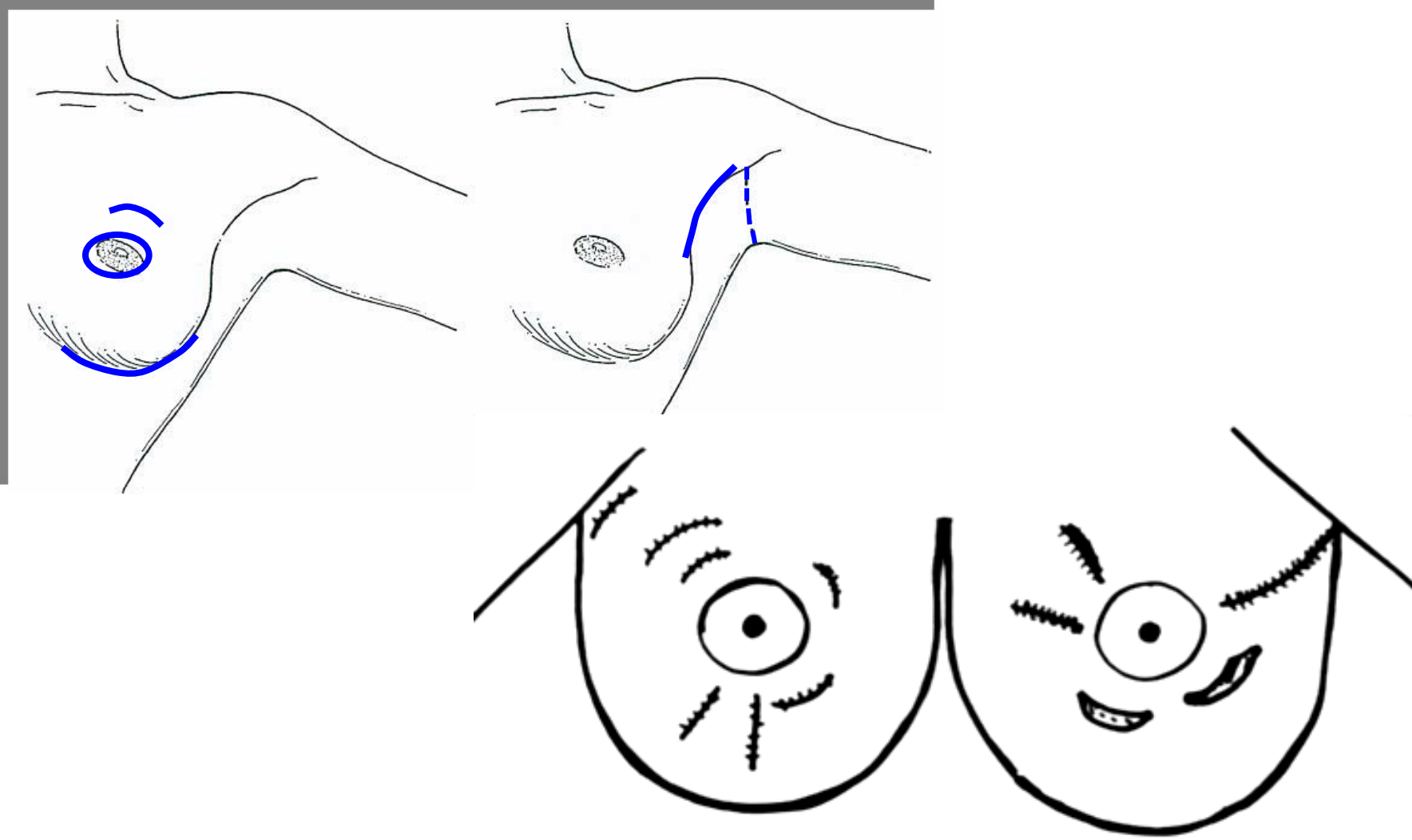
# Surgical treatment

- Breast surgery
  - Breast sparing surgery
  - Radical mastectomy
  - Reconstructive surgery
- Axillar region surgery
  - Radical exenteration
  - Sentinel node extirpation





# Segmentectomy technique



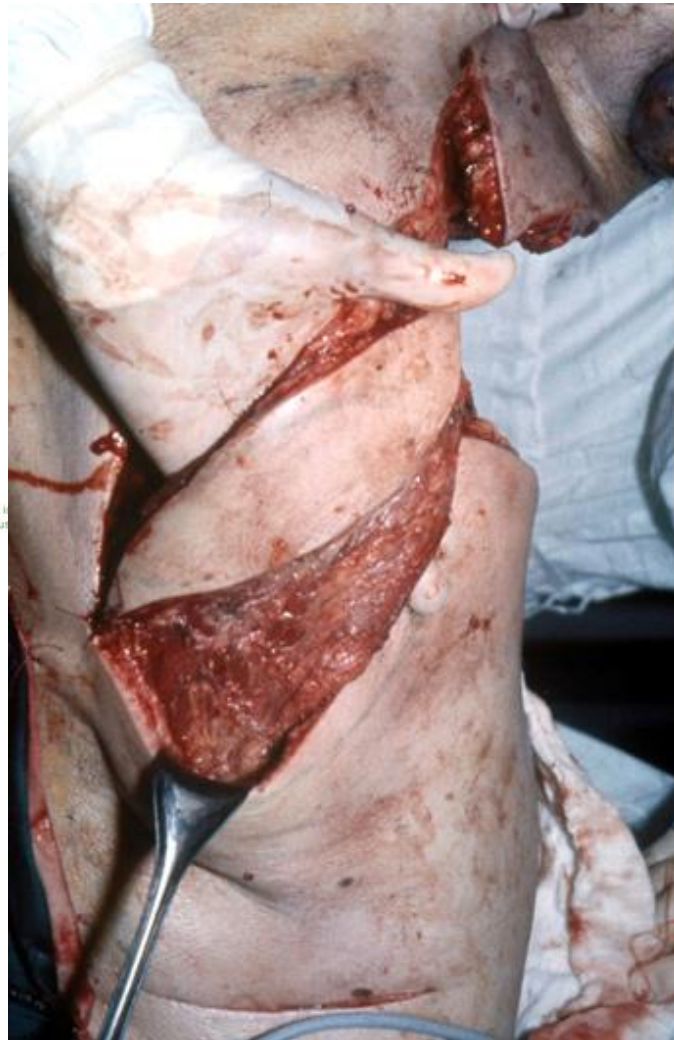
# Sanative surgery



# Fasciocutaneous flap



# Latissimus dorsi flap



# Postradiation risks

- Edema, altered skin sensation
- Fibrosis of mammary tissue
- Rib fractures
- Damage to lungs + heart

# Damage to the lymphatic vessels

- Fixed chronic lymphoedema -> elephantiasis
- Lymphostasis – limited arm movements, feeling of heaviness in the arm, increased circumference
- Dg.: examination + lymphoscintigraphy



