Theoretical Bases of Clinical Medicine

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Masarykův onkologický ústav

Aim of TZKM?

- „Taste“ of clinical medicine...

Cíle předmětu TZKM?

- „Taste" of clinical medicine

- Breast Cancer
- Intravenous access in oncology

Questions to start with?

- What to do if it the studies is too much?

- What is the most frequent malignancy in women in the Czech Republic?
- What screening programme is about to be started?
- Can a breathlessness (dyspnea) be a sign of breast cancer?
- What is a central venous access?
- How to treat a intravenous port (port-a-cath)?

Recommended literature…

- Mika Waltari: The Egyptian (1945)
- Richard Gordon: Doctor in the house (1952), Doctor at Sea (1953)
- Samuel Shem: *The House of God* (1978)

Medical students congress in ancient India (700 B.C.)

- Samudrah ivah gumbheeram
- naivah shakyam czikitsitam
- vaktum niravaasheshainah
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- Uneasy is the Medicine
- Deep as a wide sea
- It is not possible to explain it in whole
- Not even in hundreds of thousands of verses
- (PhDr. Miltner- Lékařství staré Indie, Avicenum 1986)

Breast cancer

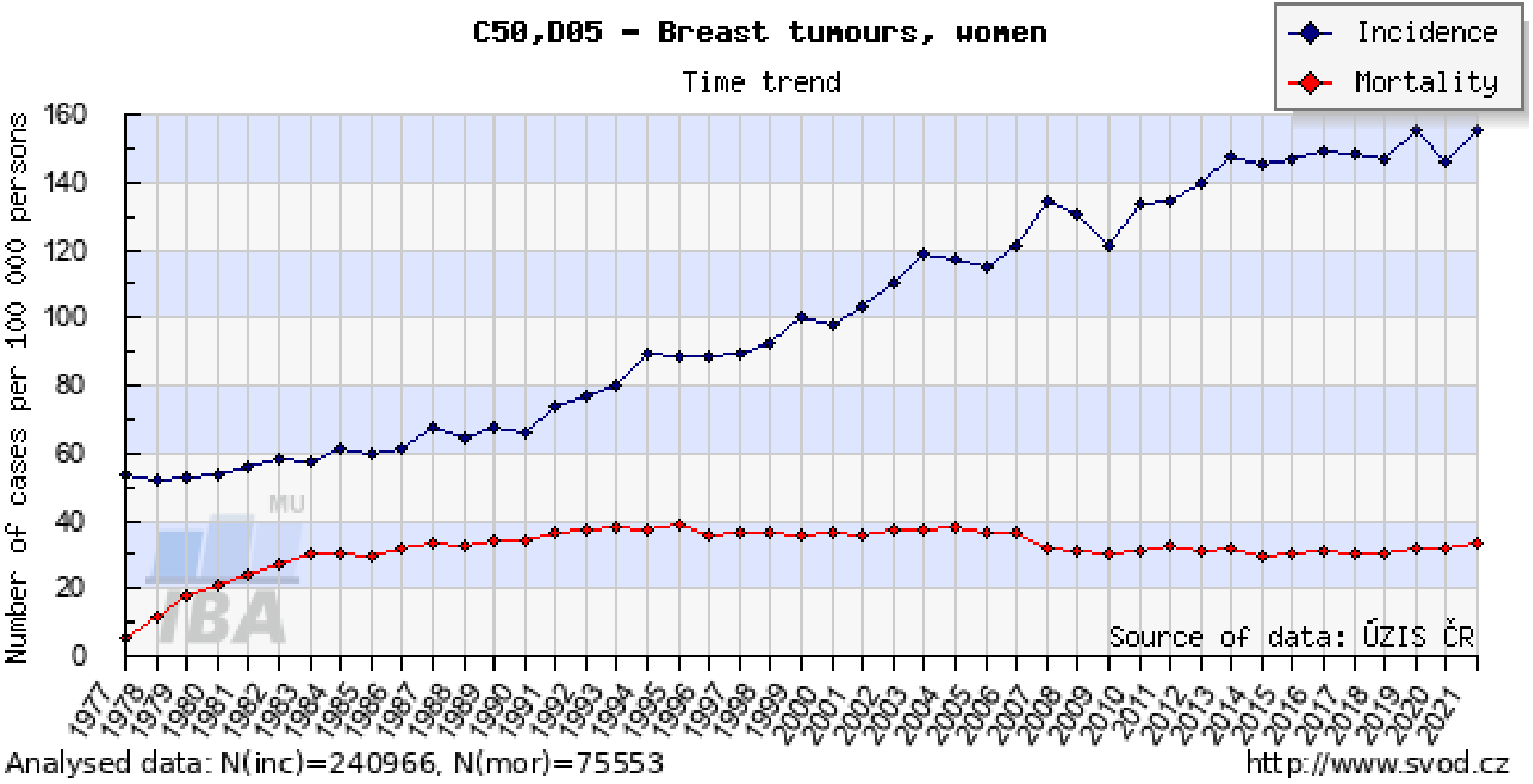
Incidence of the most frequent malignancies (CZE)?

order	males to 100k inhab.		females to 100k inhab		All to 100k inhab.	
1	?		?		?	
2						
3						
4						
5						

Most common malignancies- incidence
Health statistics Institute: Neoplasms 2018

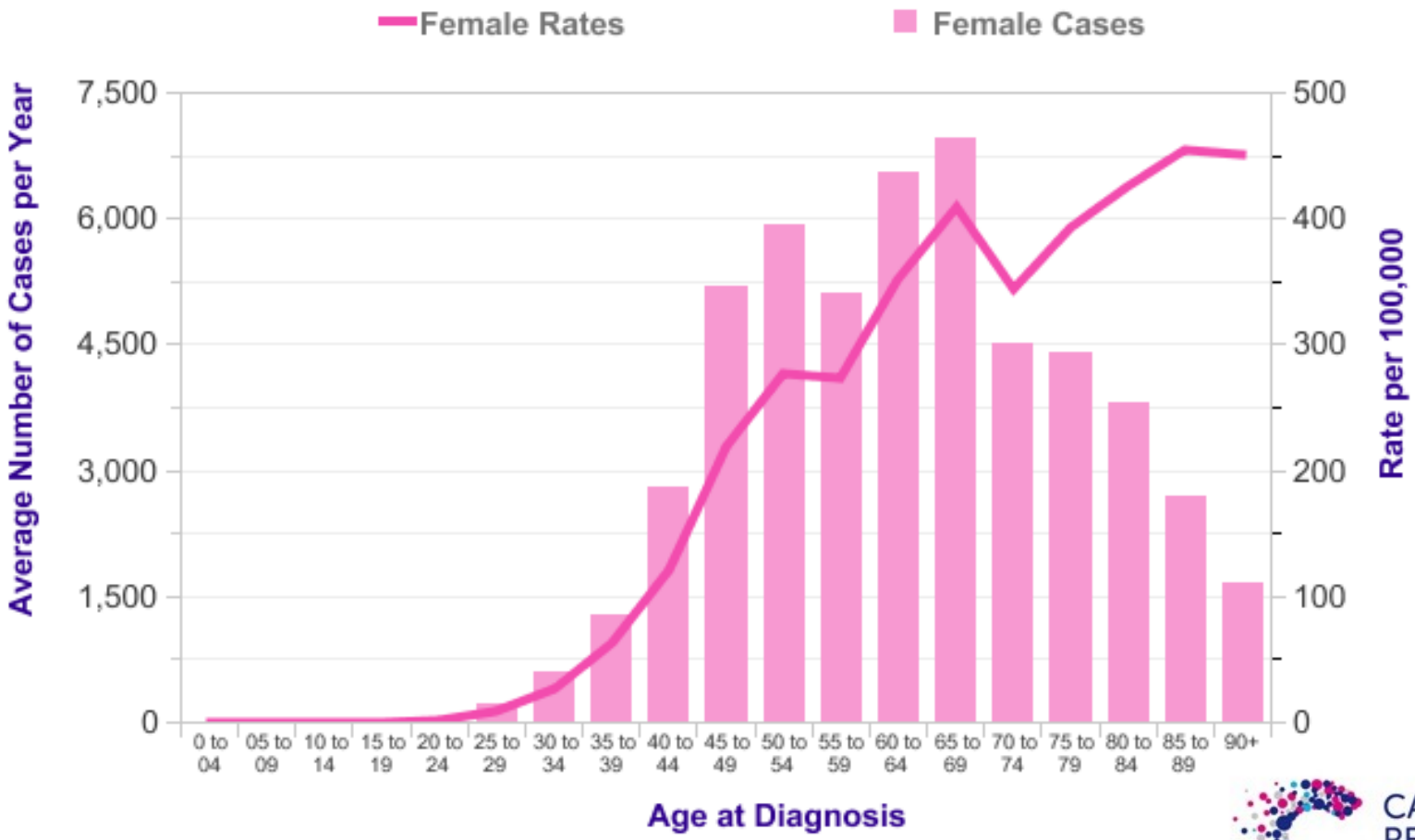
order	males to 100k inhab.		females to 100k inhab		All to 100k inhab.	
1	Skin nonmelanoma	287	Skin nonmelanoma	250	Skin nonmelanoma	268
2	prostate	152	breast	133	colorectal	68
3	colorectal	83	colorectal	54	lung	61
4	lung	79	lung	43	kidney	29
5	kidney	38	Uterus (corp)	36		

Incidence and mortality- Breast cancer CZE



Incidence BC age related

Breast Cancer (C50): 2011-2013
Average Number of New Cases Per Year and Age-Specific Incidence Rates per 100,000 Population, Females, UK



CANCER RESEARCH UK

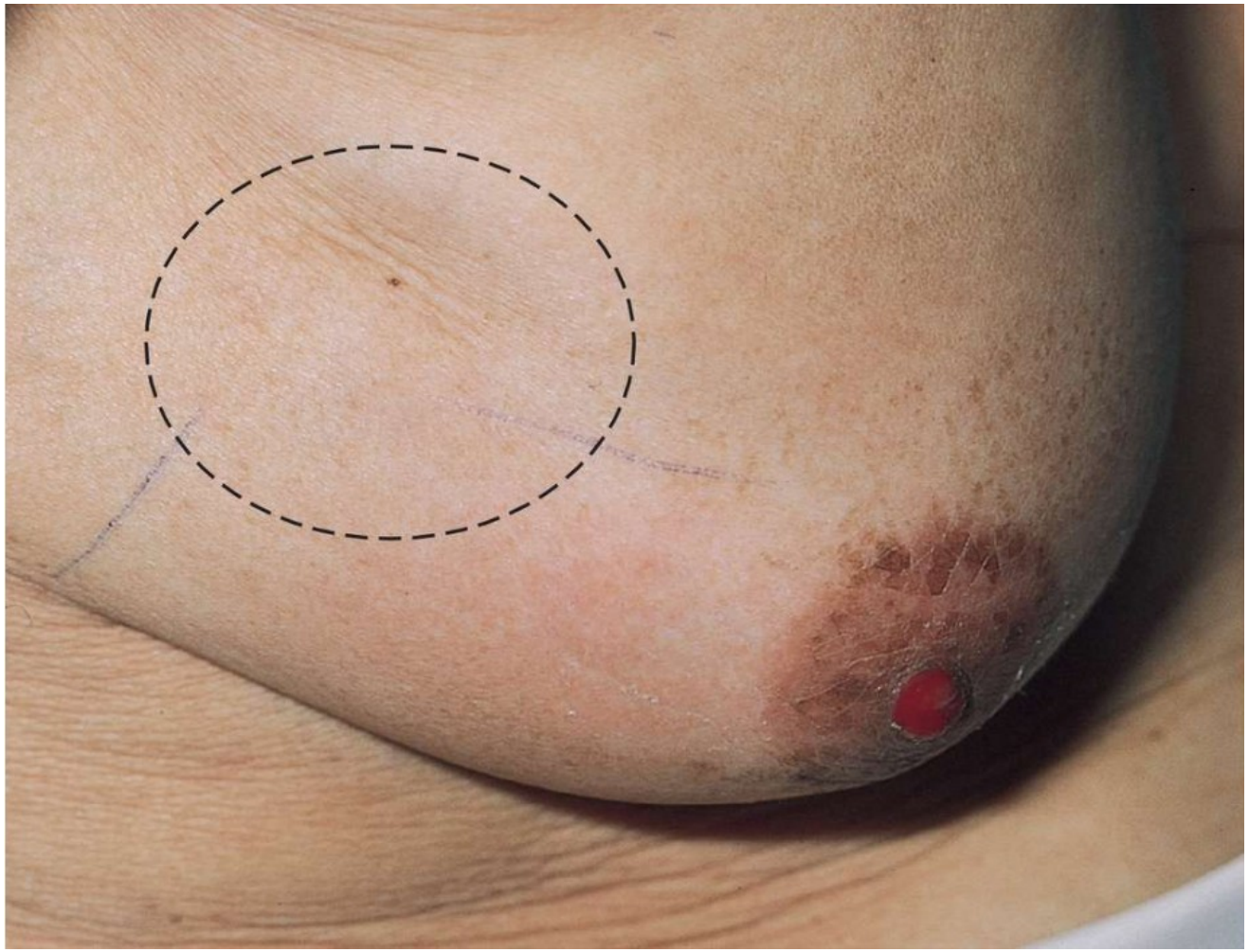
Clinical signs

What does a patient come with??

Clinical signs

- Breast resistance – lump
  - Upper lateral quadrant most frequent
- Edema of skin
- Erythema of skin
- Retraction of skin, ulceration
- Inversion of mammila
- Painless afections
- General symptoms – fatigue, weight loss, dyspnea…

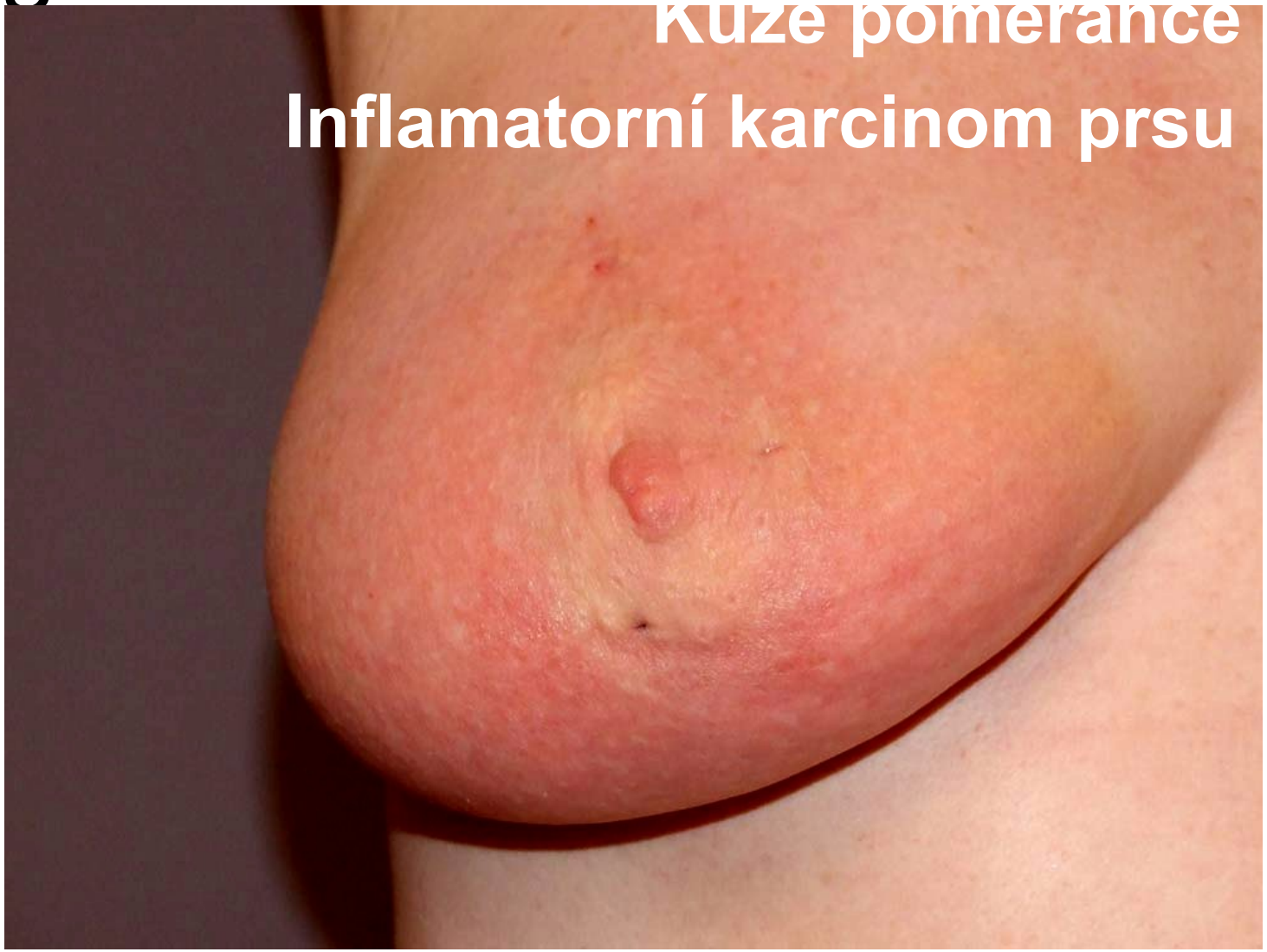
Lump



Advanced tumour

Skin retraction + "mosquito bites" infiltrates

Skin edema and erythema "peau d'orange"



Mammila inversion


18 1 1'98

Risk factors

Can I do something not to have it in future?

Risk factors

- **Family history**: breast cancer of 1st degree relative (parents, siblings, children)
  - One - relative risk 1,5 - 2,0
  - Two relatives 5,0
- **Early period onset:** before 12 yoa
- **Late menopause:** after 55 yoa
- **Nullipara** (no birth) + **no breast feeding**
- **Combined hormonal substitution**
- **Smoking, low physical activity, night shifts?**
- **Benign breast afections:** Atypical ductal hyperplasia
- **Genetic factors, various – 5-10 % of breast tumours**

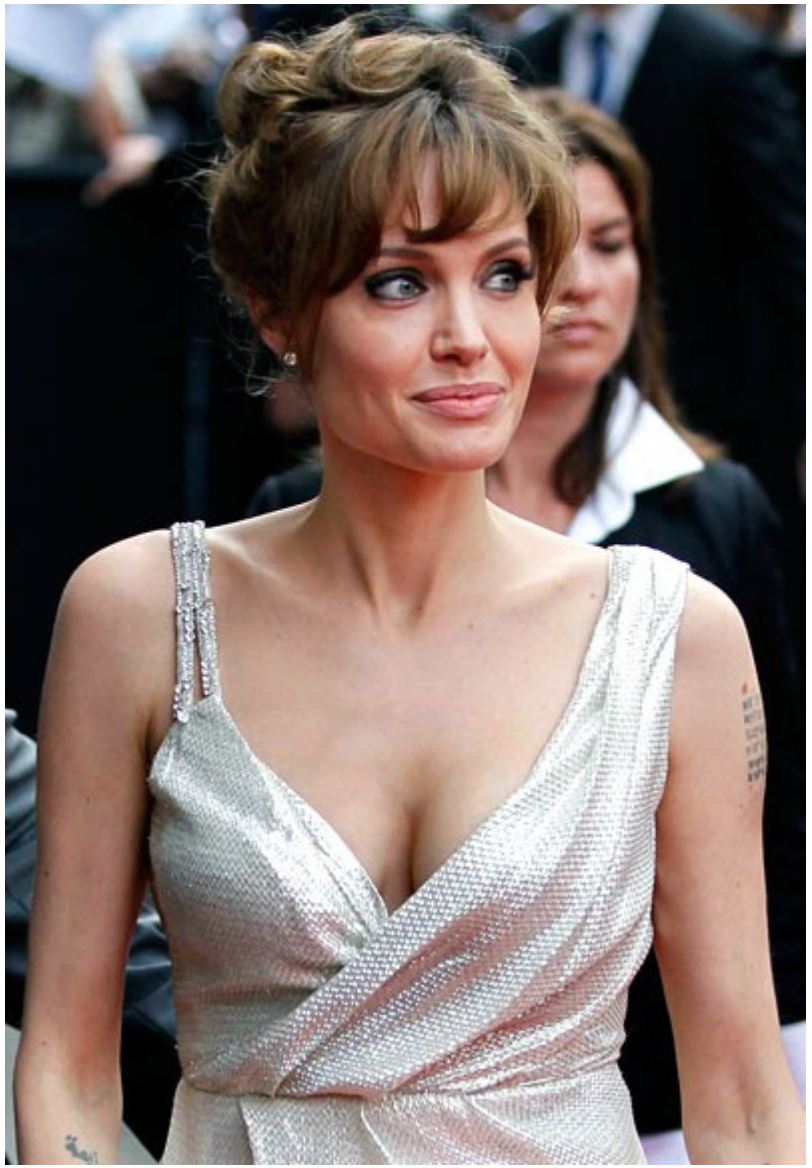
Genetic risk - example

- BRCA1 a BRCA2 genes – DNA repair - homologeous recombination
- Risk of ca breast in **BRCA1** mutation = 80% (lifetime), ovarian ca 60%, **BRCA2** mutation 70%, resp. 25%
- Only prevention bilateral mastectomy + salphingo-oophorectomy

Likelihood of a 25-year-old woman surviving to age 70

(without screening or medical interventions to prevent cancer)

Group	Percentage surviving to age 70
BRCA1 mutation	53
BRCA2 mutation	71
Typical woman	84



Screening – general principles

- Cheap
- Nonivasive
- Highly sensitive (few patients "escape")
- Effective (survival benefit...)

- Doesn't have to be specific

Screening -oncology

- Gynecologic
  - Cytology smears from cervix
  - From onset of regular gyno assessment
- Mammar
  - Mammograph after 45yoa every 2 yrs
- Colorectal
  - Occult stool bleeding after 50 yoa (hidden!! bleeding) or
  - Scr colonoscopy after 55 yoa
- Lung ca - low dose CT in risky population (start 2022)

- Soon:
  - Ca prostate? discussed

Diagnostics

How do we find it??

?

?

Inicial diagnostics

- 62-yo woman
- New lump left breast (upper lateral quadrant)
- Overall healthy and good shape

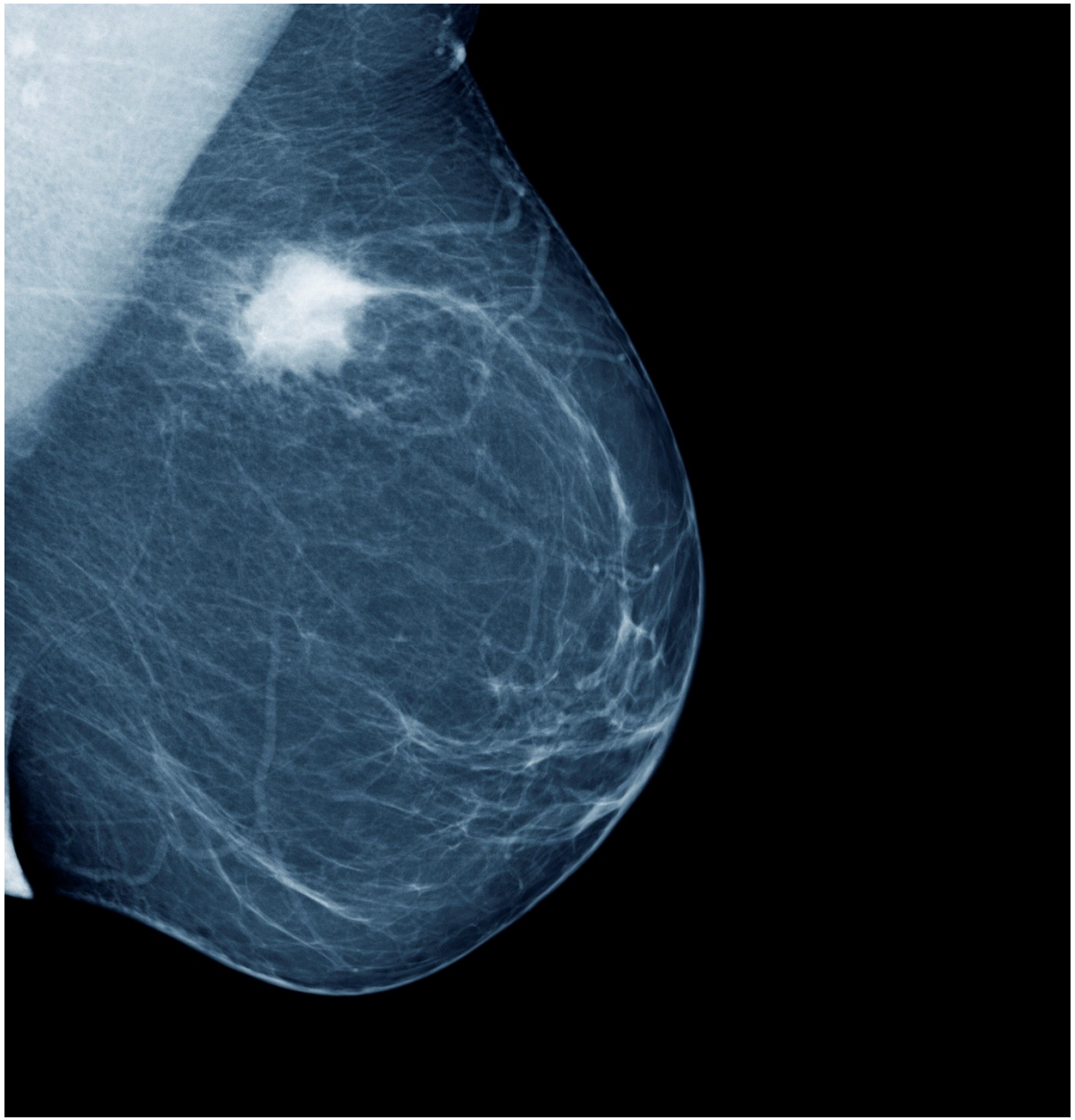
- What investigations???
- TNM staging...

Mammography

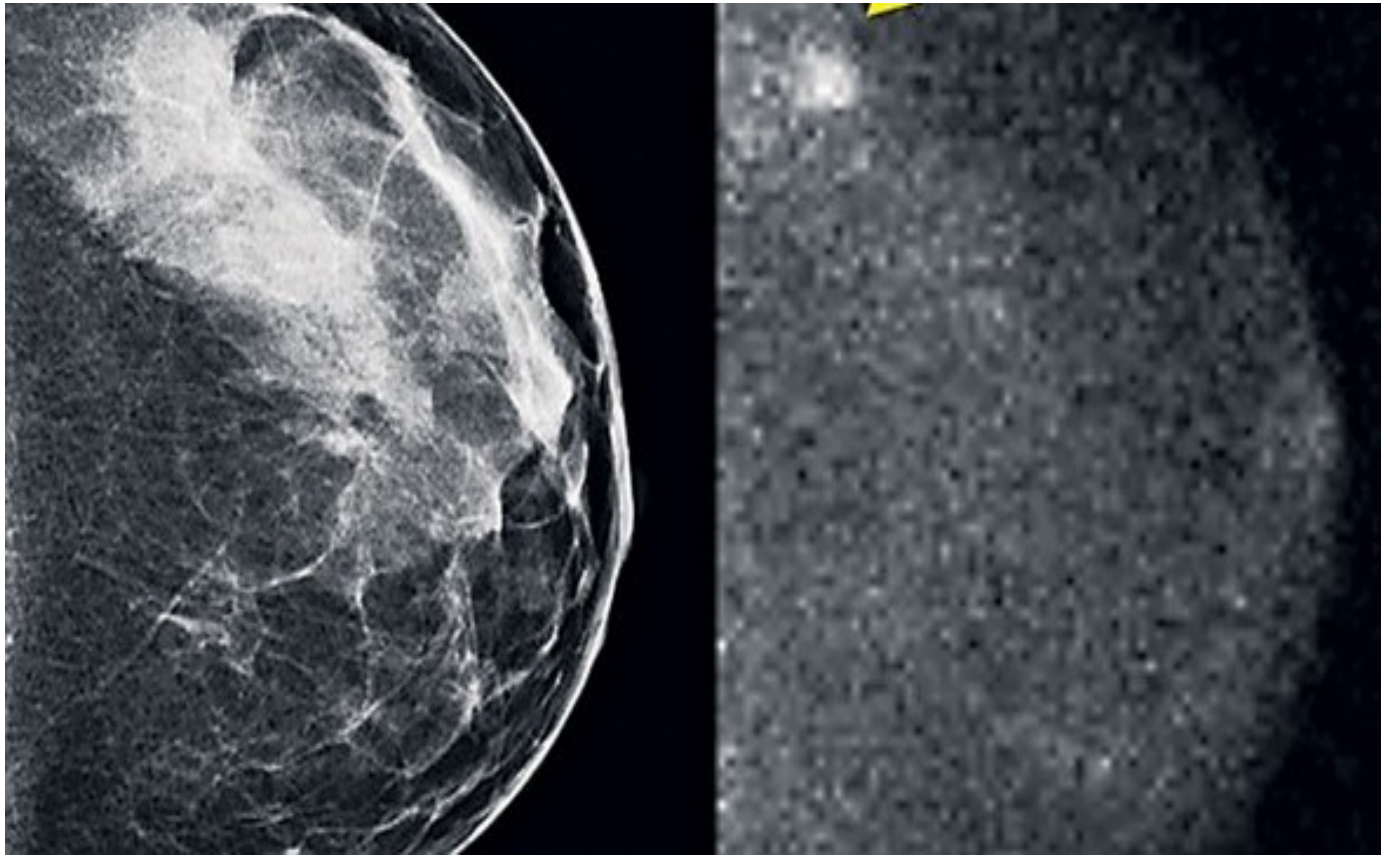
- Screening and diagnostic method for ca breast
- Very sensitive and specific
- Cheap and safe (low radiation)

- Size evaluation (in mm)
  - T stage
- Diagnostics of regional lymph nodes
  - N stage

- Sometimes US better or MRI



MMG, US

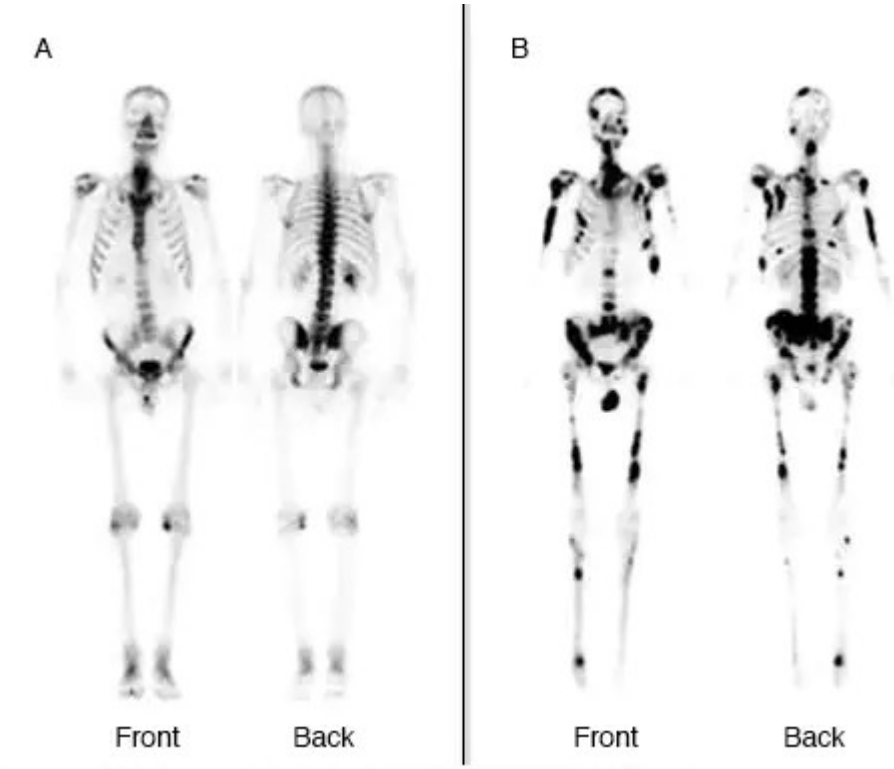


Staging Ca breast

T classification	Size, characteristics
T0	No evidence of primary tumour
T1	Tumour ≤20 mm largest diameter
T1a	Tumour >1 mm but ≤5 mm largest diameter
T1b	Tumour >5 mm but ≤10 mm largest diameter
T1c	Tumour >10 mm but ≤20 mm largest diameter
T2	Tumour >20 mm but ≤50 mm largest diameter
T3	Tumour >50 mm v největším rozměru.
T4	Tumour whatever size infiltrating chest wall and/or skin (ulceration, skin lesions)
T4a	Infiltrating chest wall (not only the muscle)
T4b	Ulceration and/or edema (including peau d'orange) of skin
T4c	either T4a or T4b.
T4d	Inflammatory carcinoma

Distant metastases - staging

- M stage
- Assessment:
  - Chest: Xray, CT scan
  - Abdomen and pelvis: ultrasound, CT scan
  - Whole body – PET/CT or PET/MRI, wb CT
  - Bones – scintigraphy
  - Brain – MRI or CT (with contrast!!)



Staging and survival – ca breast

Stage	T	N	M
I	T1	N0	M0
IIA	T0	N1	M0
	T1	N1	M0
	T2	N0	M0
IIB	T2	N1	M0
	T3	N0	M0
IIIA	T1-3	N2	M0
	T3	N1	M0
IIIB	T4	Any N	M0
IIIC	whatever T	N3	M0
IV	whatever T	whatever N	M1

Stage	5-y OS
I	95%
IIA	85%
IIB	80%
IIIA	67%
IIIB	41%
IIIC	49%
IV	15%

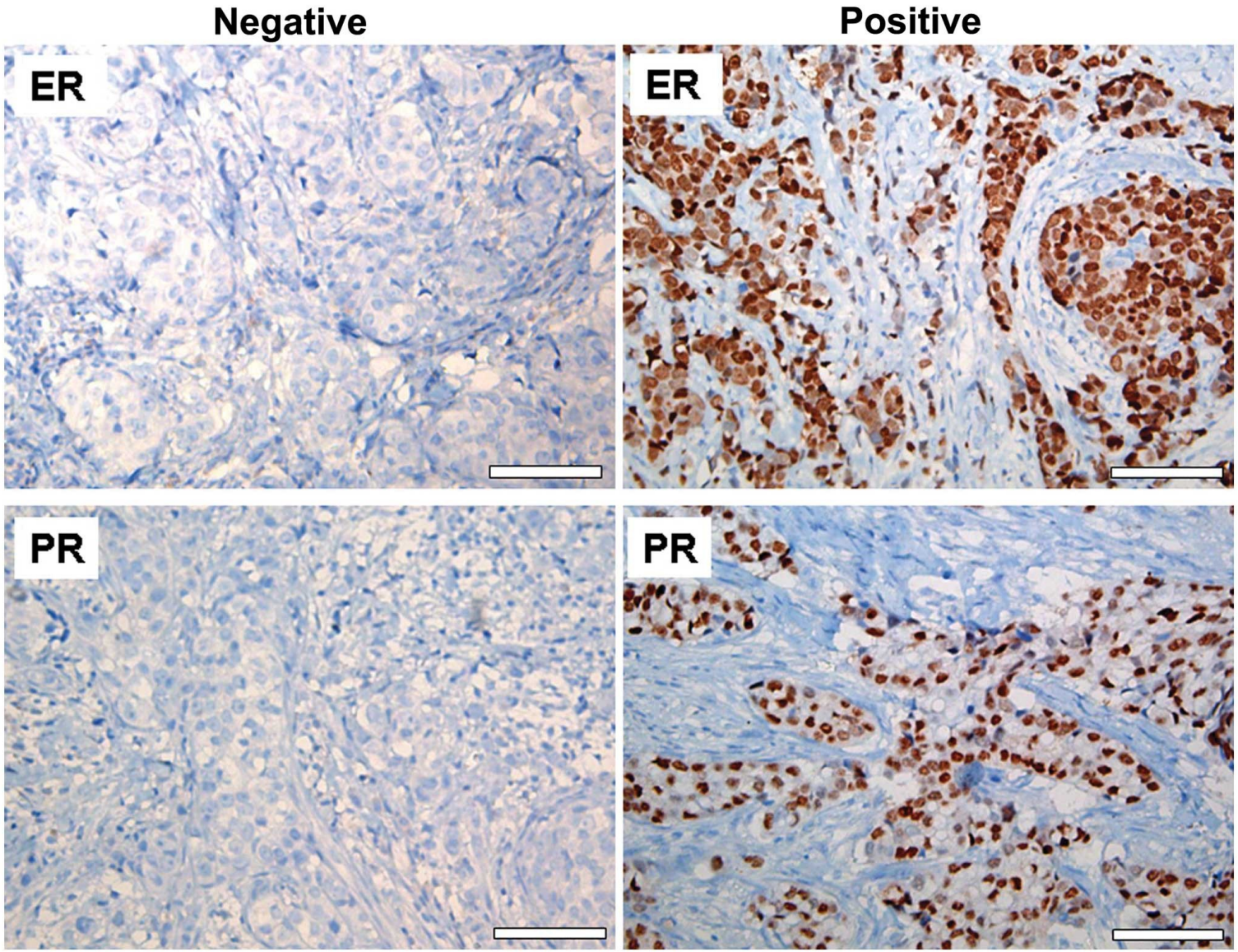
Histology

what do we deal with??

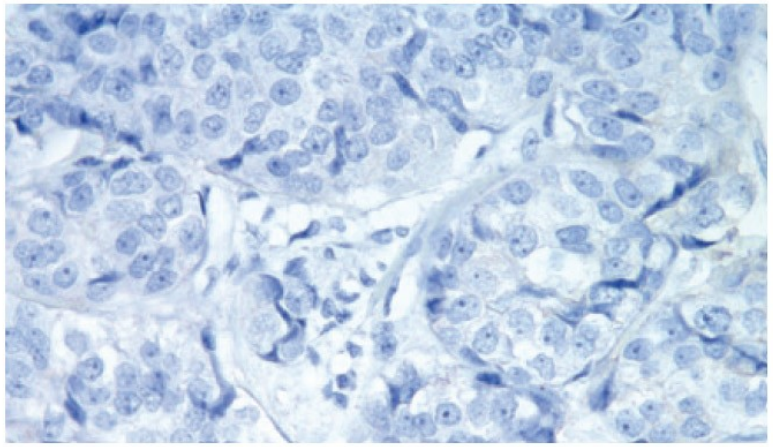
Histology = cells and stroma

- **Morphology - "typing"**:
  - Ductal (85%), lobular, medullar, mixed
- Grade of **differentiation** – "grading"
  - Grade 1 well diferentiated (good prognosis)- grade 4 undifferentiated (poor)
- Morpho-biology:
  - **Receptor expression:**
    - Estrogene
    - Progesterone
    - HER2 receptor
  - **Ki-67** – marker of proliferation (%)

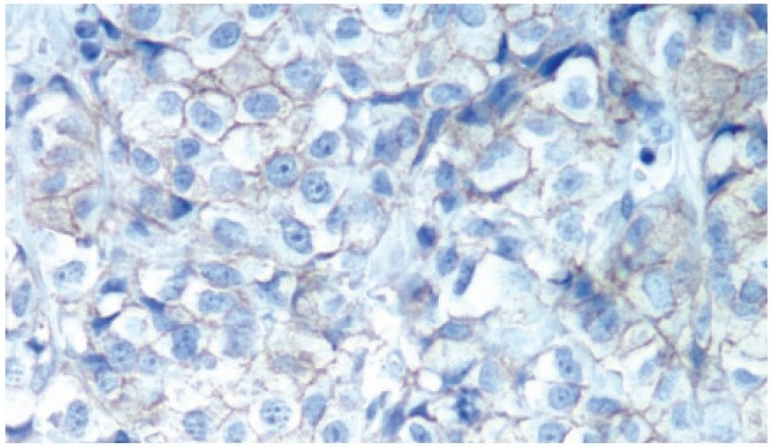
Expression ER a PgR - immunohistochemistry



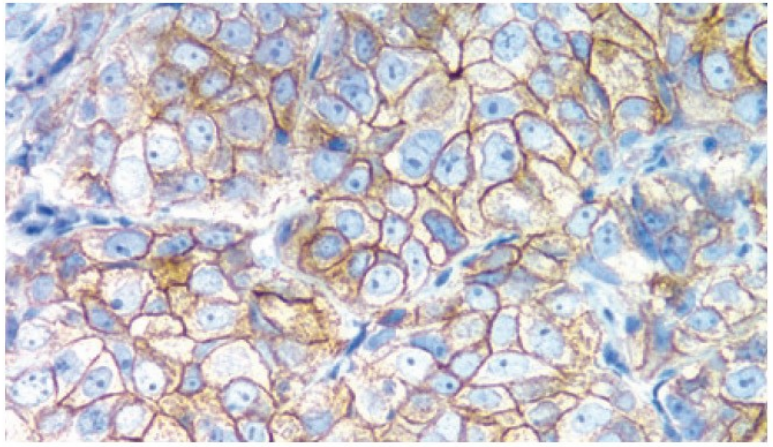
HER2 expression - immunohistochemistry



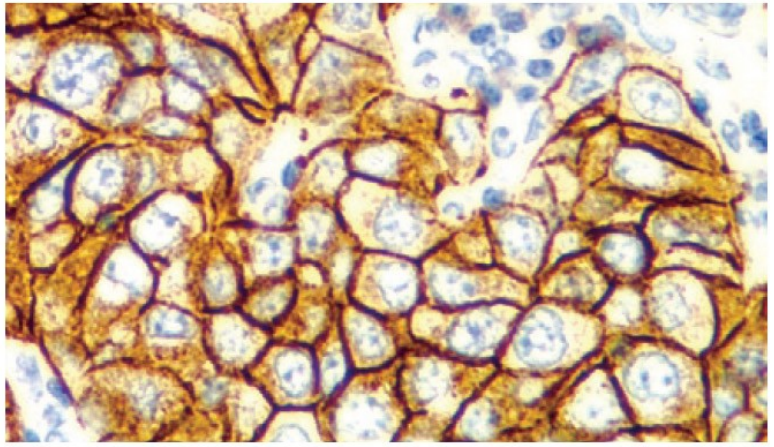
Score: **0** (40x)



Score: **1+** (40x)



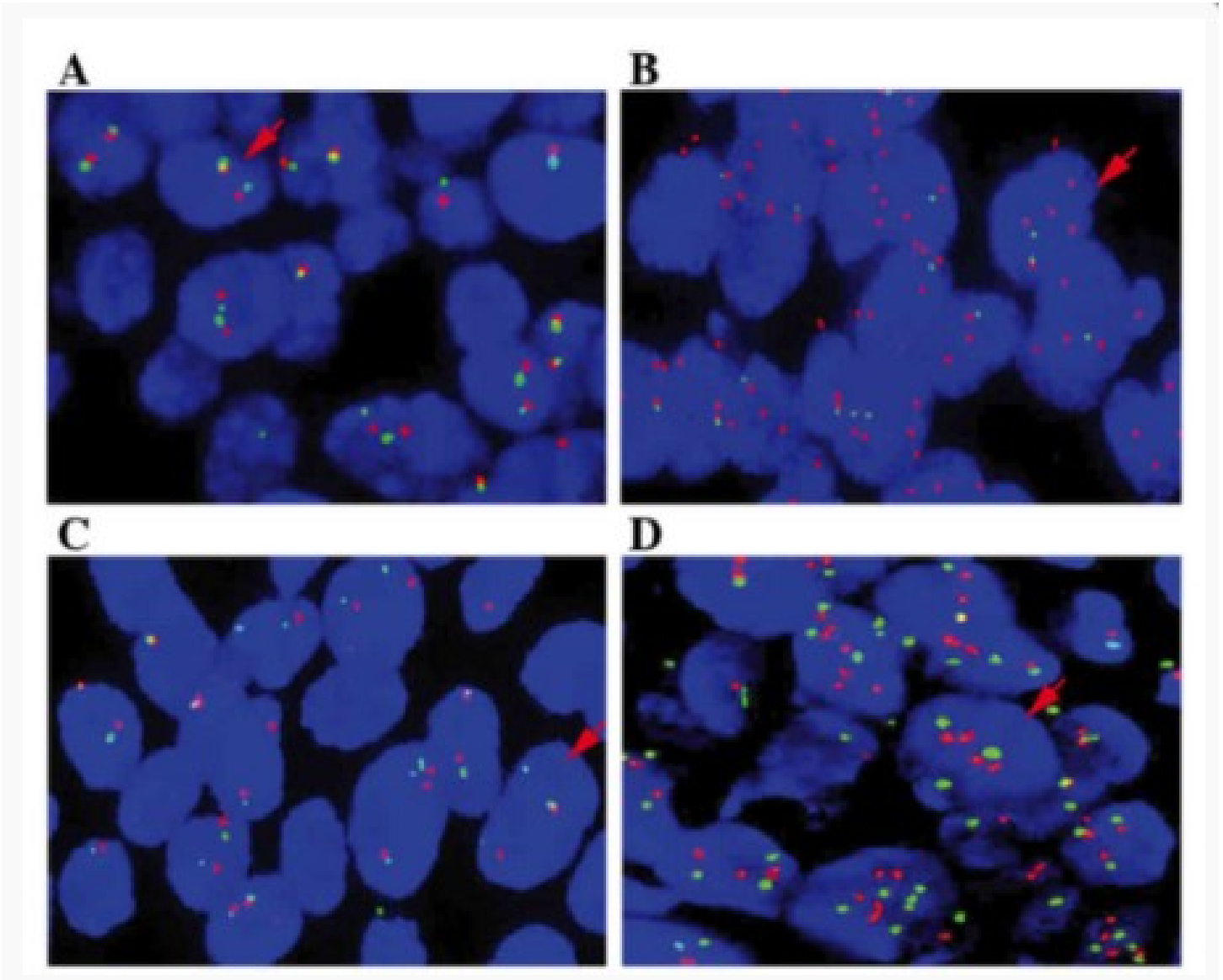
Score: **2+** (40x)



Score: **3+** (40x)

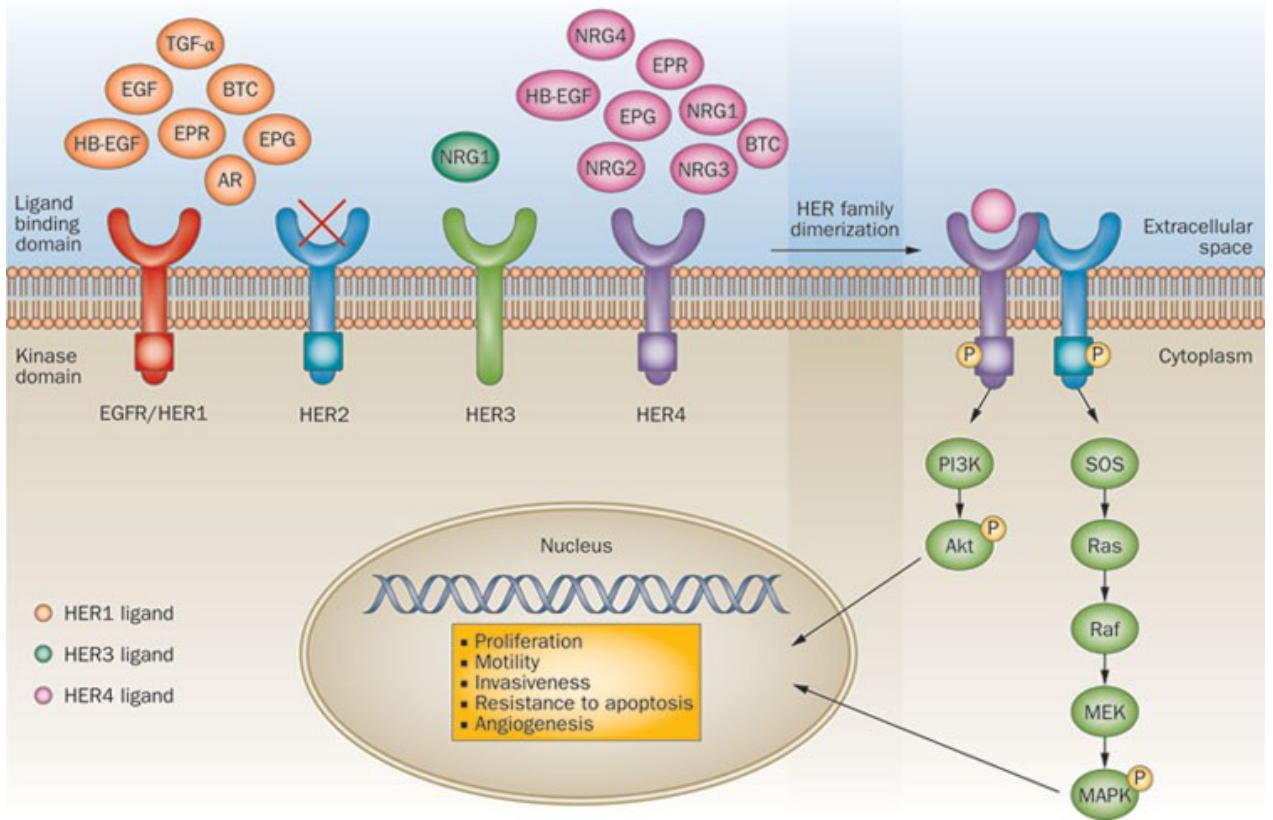
FISH

- A+C : No amplification HER2
- B+D: amplification



HER2 positive BC

- HER2 – transmembrane receptor
- Active through homodimerization (HER2-HER2) or heterodimerization HER2-HER3 or HER2-EGFR



Triple negative breast cancer -TNBC

ER negat, PR negat, HER2 negat

↓

Only modality – chemotherapy

- not hormones
- not targeted (perhaps besides-VEGF therapy)

- Immunotherapy??

Subtypes breast cancer

Luminal A

ER+, PgR+, HER2-, Ki67 low

Luminal B

ER+, HER2+ or -, and another risk factor:
PgR negative, Ki67 high

Triple negative

ER-, PR-, HER2 negat

HER2 overexpression (amplified)

Subtypes breast cancer

- Median overall survival

	OS (months)	site of metastases
• luminal A	26,4	bones, liver
• luminal B	19,2	bones, liver, lungs
• luminal/HER2+	15,6	bones, liver, brain
• HER2+	8,4	bones, liver, lungs, brain
• Triple-negative	6,0	lungs, brain

($p < 0{,}001$)

Kennecke H. et al, JCO 2010 Jul 10;3271-3277

Therapy

how to cure?

…if not cure, how to prolong life?

Principles of therapy

- Localized disease- attempt to cure
  - **Resection of primary tumour** – only possible curative approach
  - **Neoadjuvant** therapy in some cases – before the operation – chemotherapy or hormones
    - Aim is to shrink (downstage) the tumour and lessen the extent of surgery
  - **Adjuvant** therapy – after the operation
    - Aim to lower the risk for relapse
  - Toxicity (temporary) is not too relevant

- Metastatic disease – we can prolong life
  - **Systemic** treatment – chemotherapy, hormones, targeted treatment
  - Toxicity relevant! Quality of life!

Operation

remove it, if we can!!!

Mastektomy

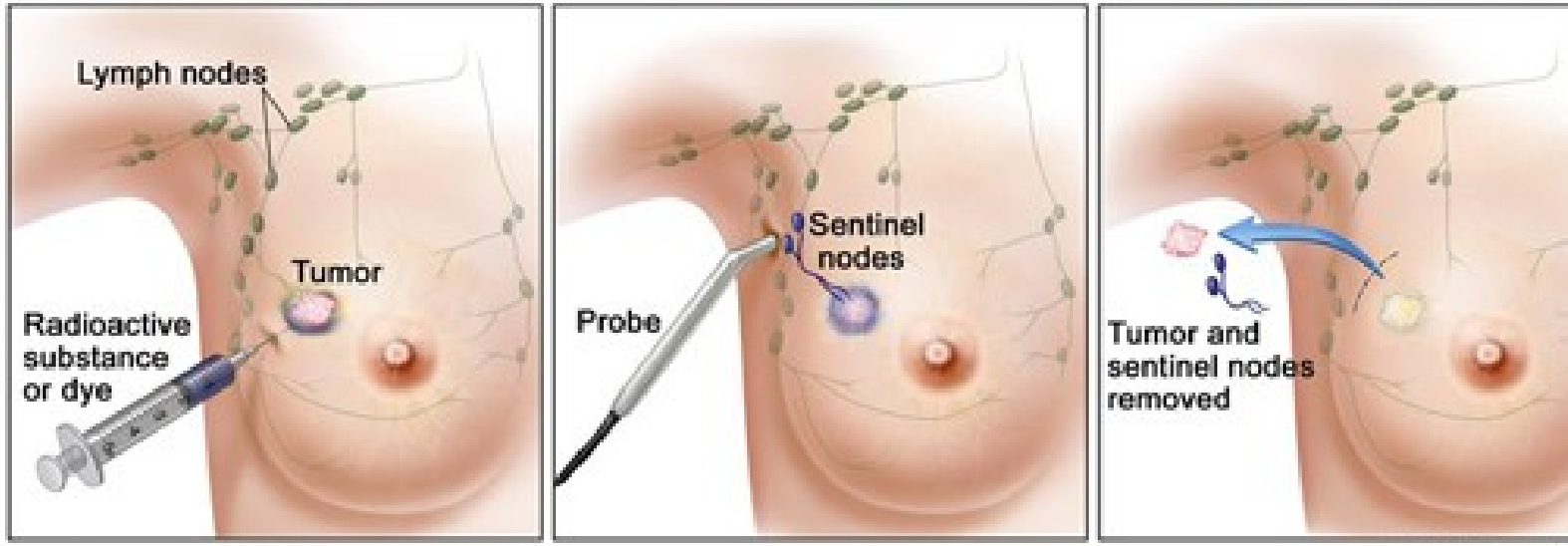
- **Total mastektomy** – removal of breast in whole

Partial mastektomy

- Breast saving operation – removing the tumour and small amount of surrounding tissue

- Aim to save natural shape and form of the breast

Operation in axil



- **Axillar dissektion - ALND**
  - Incision in axilla, removal of 10–40 lymph nodes of level I and II
  - All patients with lymf nodes involvement ("positive")
  - Real risk of long term lymfedema

- **Sentinel node biopsy – SNB**
  - **Sentinel lymph nodes –** first to be infiltrated (first to pass lympha from tissue surrounding the tumour
  - Removal of 1-3 lymph nodes in all patients with NO signs of LN involvement
  - I positive (infiltrated), ALND is pursued

Risks of nursing on an arm after ALND

- infection (i.g. erysipelas)
- cellulitis
- Lymphedema or its progression

- The risk is relative
  - e.g. Hand surgery can be safe

- Recomm.: choose the other arm if possible for blood taking, BP measurement
  - Not aplicable for emergency!!! (risk/benefit)

Adjuvant treatment

prevent relapse!!

Adjuvant treatment

- After the operation
- To minimize risk of relapse
  - Aim to kill residual microscopic disease
- Multimodal treatment:
  - Chemotherapy – 4 months
  - Targeted treatment (HER2 posit.) – 1 year
  - Radiotherapy – 5 weeks
  - Hormones (ER/PgR posit.)– 5–10 years or more

Chemotherapy - whom for?

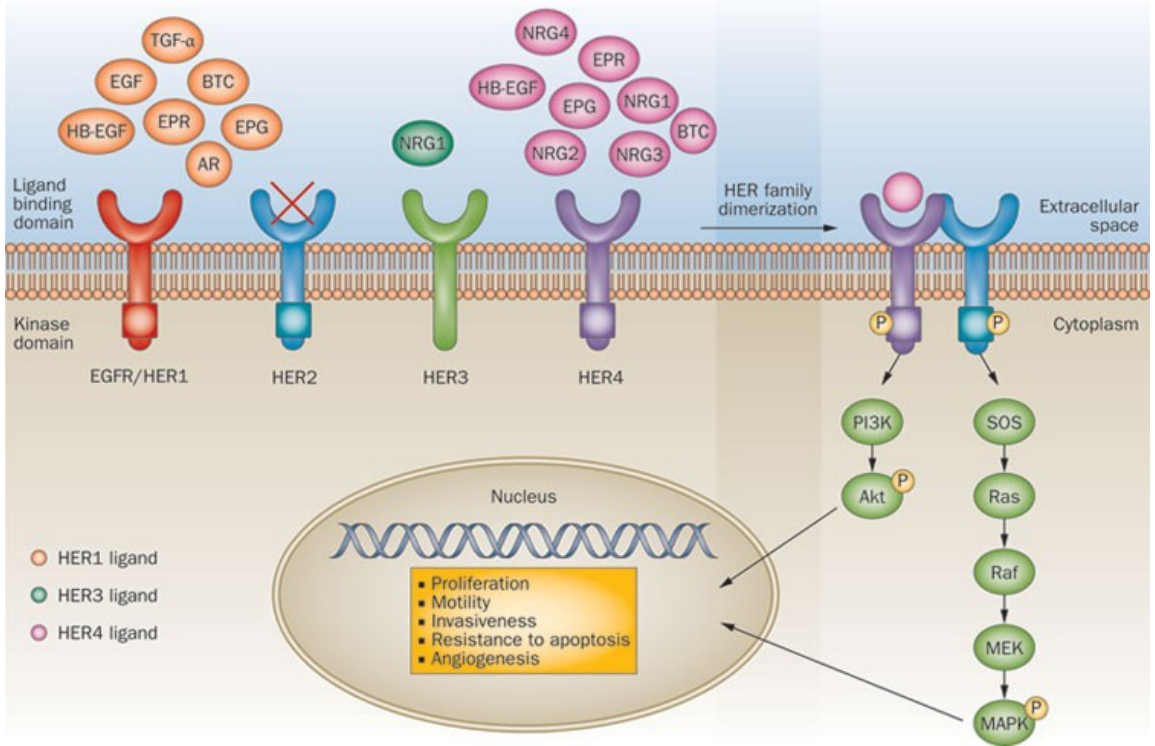
- Selected patients with risky tumours:
  - Large tumour
  - Positive lymph nodes
  - Biologically aggressive disease – triple-negative, HER2 positive

Chemotherapy and breast cancer

- Most used cytotoxic drugs:
  - **Antracyclines - Doxorubicin, Epirubicin**
  - **Taxanes - Paclitaxel, Docetaxel**
  - Cyclophosphamide, 5-Fluorouracil – only in combinations
- Combinations in adjuvant setting:
  - AC – doxorubicin + cyclophosphamide
  - AC followed by paclitaxel
  - FAC – flurouracil + doxorubicin + cyclophosphamide
  - FEC – flurouracil + epirubicin + cyclophosphamide
  - TAC – docetaxel + doxorubicin + cyclophosphamide
  - CMF – cyclophosphamide + methotrexate + 5-fluorouracil
- Metastatic setting:
  - Combination (more effective) or monotherapy (more gentle) – paclitaxel, epirubicin, vinorelbin, capecitabine

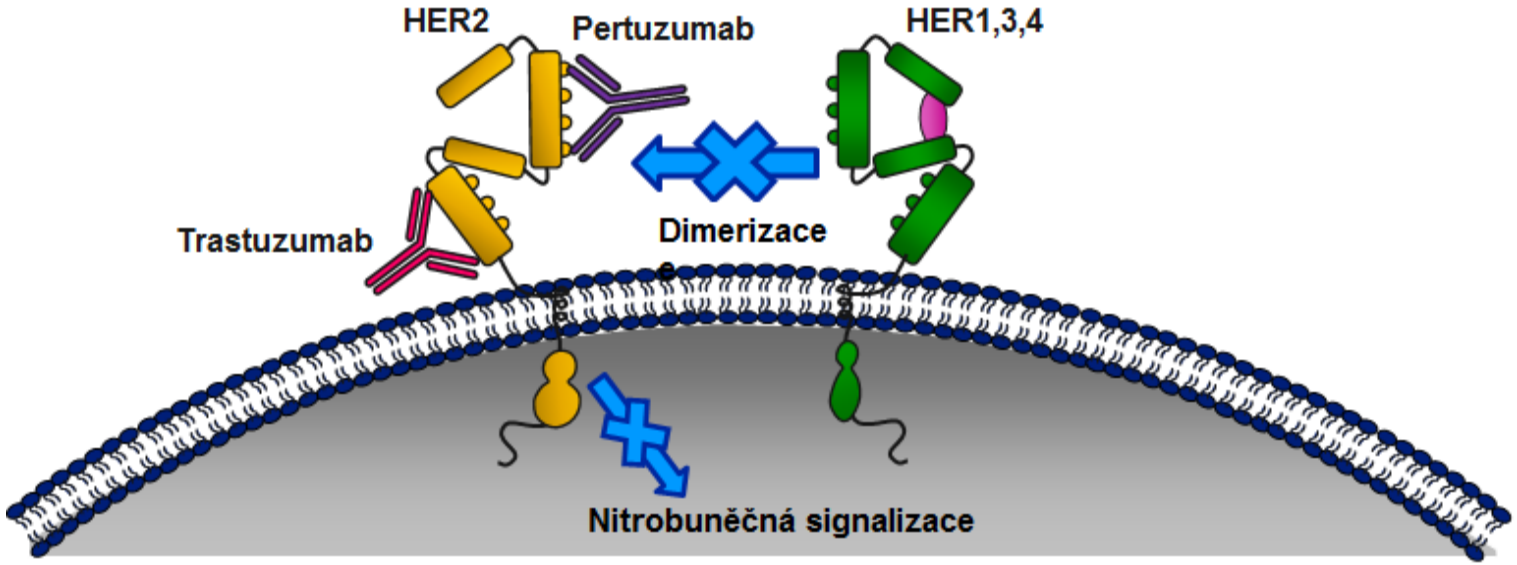
Targeted treatment

- Used in **HER2** positive breast cancers, approx. **15% pts**
- HER2 – transmembrane receptor, EGFR family (HER2=EGFR2)
- Activated by homodimerization (HER2-HER2) or heterodimerization (HER2-HER3 nebo HER2-EGFR)



HER2 positive breast cancer

- anti-HER2 therapy – **monoclonal antibodies** against HER2 receptor
- First used **Trastuzumab** (Herceptin™)
- Later generations – **pertuzumab, T-DM1**
- Adding to chemo adds effectléčby



Hormonal therapy

- Hormonal receptors expressed in **70 %** BC (estrogene or progesterone receptor) = hormone sensitive tumour

- Usually **low or moderate aggressive tumours** (Luminal A a B)

- Sensitive to hormonal treatment:
  - **Tamoxifen** (Selective Estrogene Receptor Modulator - SERM)
  - **Aromatase Inhibitors**
    - Non-steroidal AI (anastrozole, letrozole)
    - Steroidal (exemestane)
  - **Direct ER inhibitor** (fulvestrant)

Hormonal therapy- mechanism of action (MOA)

- ***1. competition*** – on estrogene receptor, modulation of ER – tamoxifen, direct ER inhibitor - fulvestrant

- ***2. inhibition*** – blockade of sythesis of estrogene (inhibition of aromatase enzyme in fatty tissue) – AI: anastrozole, letrozole, exemestan

- ***3. ablation*** – ovarian estrogene suppresion (farmacologic castration – LH-RH analogues – goserelin, buserelin, leuprorelin, triptorelin)

- ***4. adition*** - adding estrogenes, androgens or gestagenes – more in history

Hormonal treatment

- In adjuvant setting administered for **5-10 years**
- Very effective in **Luminal A** subtype of BC
- Some patients can be saved from chemotherapy and use hormones only
- **Treatment with low/minimal toxicity** (heat flushes, bones and joints pain, artificial menopause, *endometrial carcinoma and tamoxifen*)

Radiotherapy

- **After** operaci a chemotherapy
- **Always follows partial mastectomy**, sometimes total mastectomy (large tumour, positive LN)
- 5-6 weeks, dose 50-60 Gy
- Reduces risk of local relapse and improves OS
- Toxicity: dermatitis, skin deskvamation

Therapie of a disseminated incurable disease

no cure, rather prolonging life and improving/keeping its quality

Terms and Definition

- Curative- aim to cure
- Palliativní- (noncurative), cure not expected
  - Aim to prolong survival, quality of life
  - Invaziveness of the procedures according to life expectancy and pts' wish (years?? vs. days??)

- Causal treatment (anticancer)
- Symptomatic treatment (symptoms)

Therapy of metastatic disease

- SR=ER/PgR positive + breast cancer (Luminal A/B subtypes) -
  - **hormonotherapy** very effective
  - Tamoxifen → AI → Fulvestrant

- If not effective or SR- **chemotherapy**

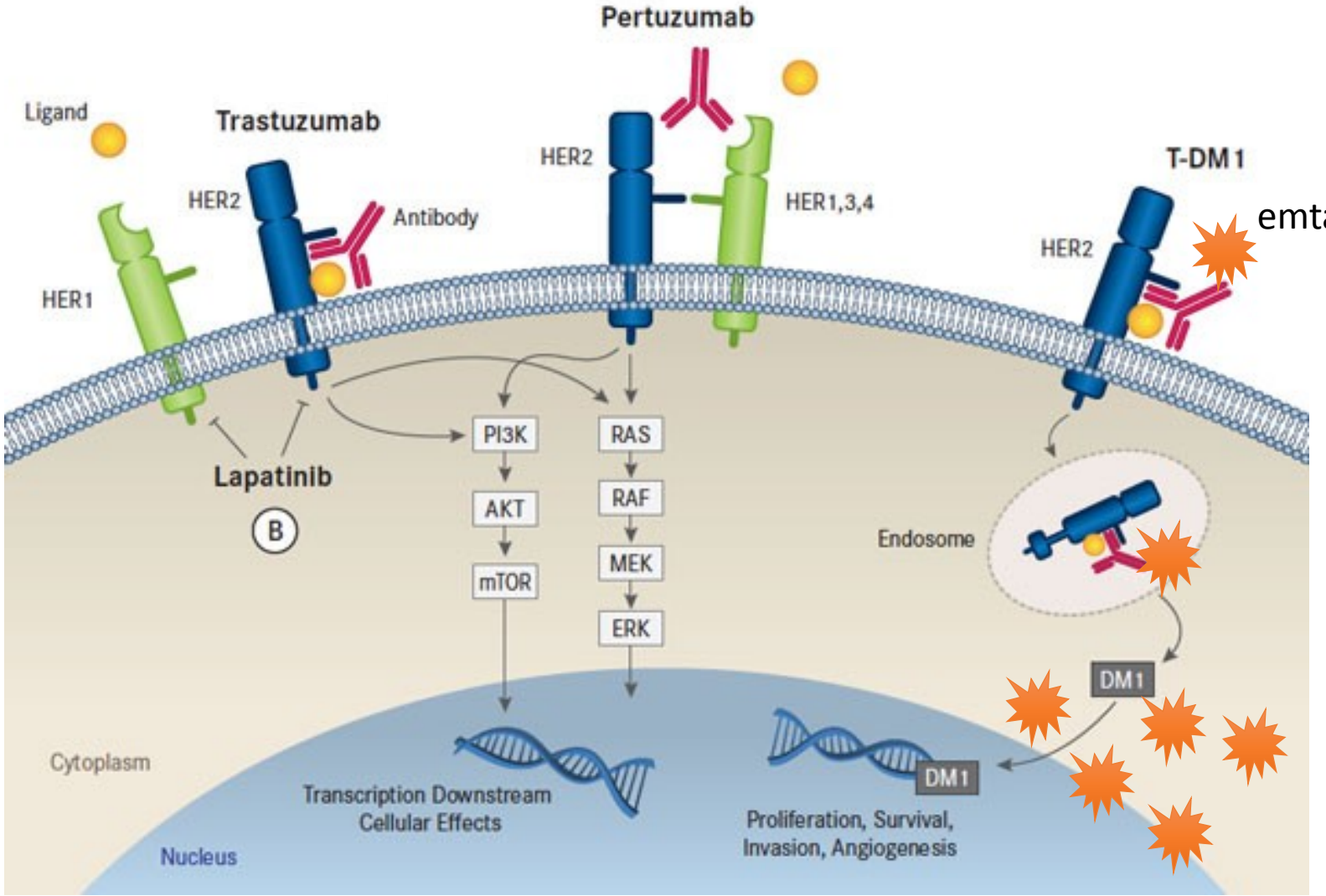
- HER2 positive tumours- combination with **targeted treatment** (trastuzumab, pertuzumab, T-DM1)

Chemotherapie

- Monotherapy better???
- If progression/toxicity, followed by further lines

- Antracyclines:
  - Doxorubicin
  - Epirubicin
  - liposomal doxorubicin
- Taxanes
  - Paclitaxel
  - Docetaxel
  - Nab-paclitaxel
- Vinca alkaloids
  - Vinorelbine
- Antimetabolites
  - Capecitabine
  - Gemcitabine
  - Fluorouracil
- Platinum derivates
  - Carboplatin
  - Cisplatin
- Other
  - Cyclophosphamide
  - Methotrexate
  - Eribuline

Anti-HER2 therapy



Disseminated hormone-dependent ca breast

- **Hormonotherapy**
  - Preferred
  - Chemotherapy
  - **If quick response and regression is needed**

- Response anticipated within
  - Homones 2-3 months
  - chemotherapy – 2-3 weeks

Specific and supportive care

- Bone mets – bone-modifying agents (BMA) – **bisphosphonates, denosumab**
- Painful bone mets – **radiotherapy**
- Brain involvement – **surgery, radiosurgery, radiotherapy**
- Pleural effusion – drainage, talcage

- Supportive care- anaemia, pain, nausea, neuropathy, nutrition, intravascular access management…
- Psychologic, psychosocial and spiritual help

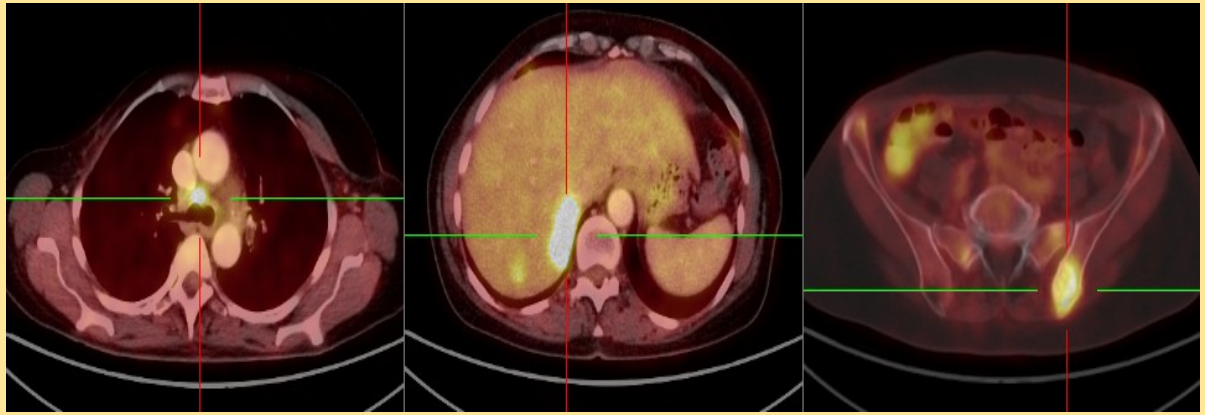
Case: Patient – 62yo woman

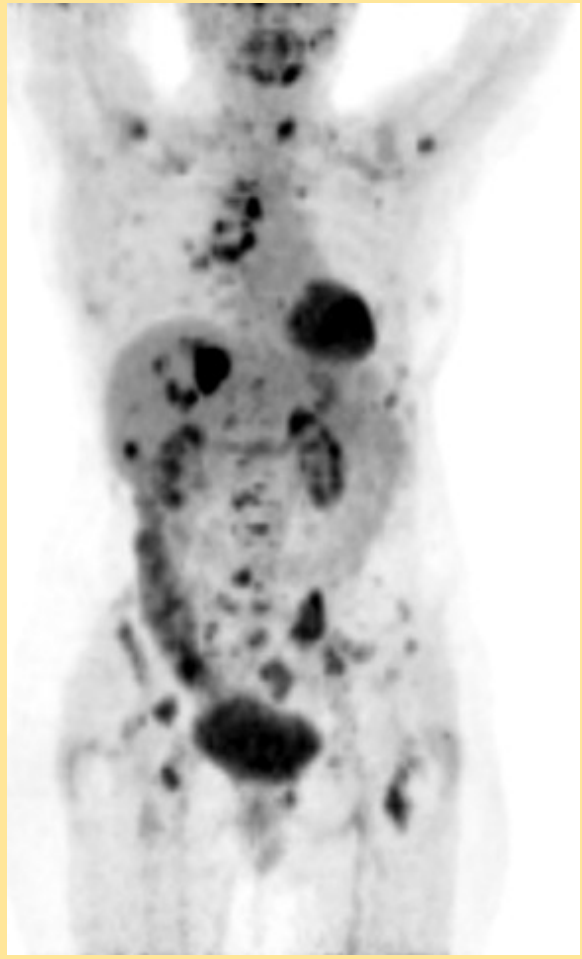
- 1999- Carcinoma mammae l.dx- pT1 pN1 (1/12) M0
- Low differentiation carcinoma ER-, PR+, G3
- St.p. RAME, adjuvant CHT 6x FAC and 5 yrs adjuvant hormones Tamoxifen
- 9/2011- relapse- soft tissues, bone mets, liver, tumor marker elevation
- Biopsy from liver lesions, phenotype: ER 80% PR 70%, Ki 67 25%

Case- continued

- 1/2012 to 11/2012 paclitaxel 1x weekly - effect: minimal response
- 11/2012 to 1/2013 capecitabine - effect of progression
- 1/2013 XENA (capecitabine+vinorelbine) to 4/2013, effect- progression (OSS, HEP)
- Still good shape, performance status (PS) 0 – no limitations, working, active

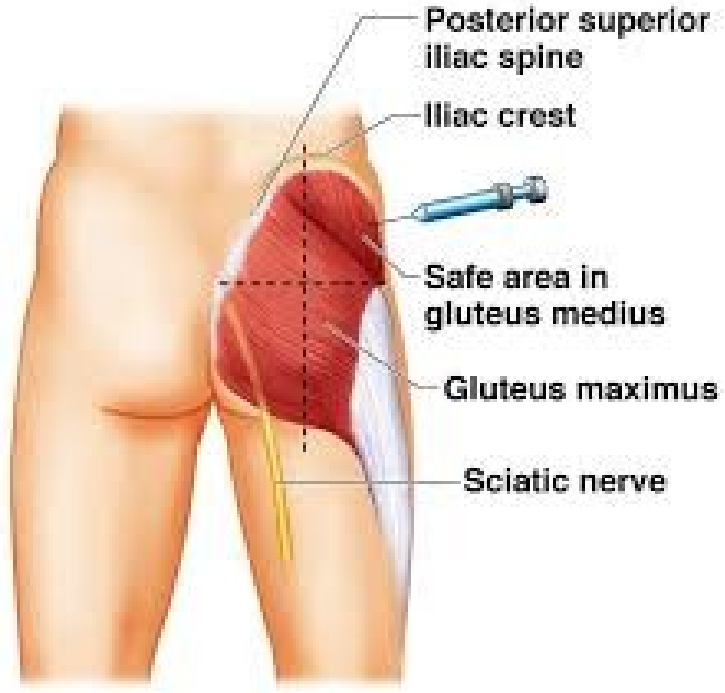
Case continued, PET/CT 4/2013 (after chemo)



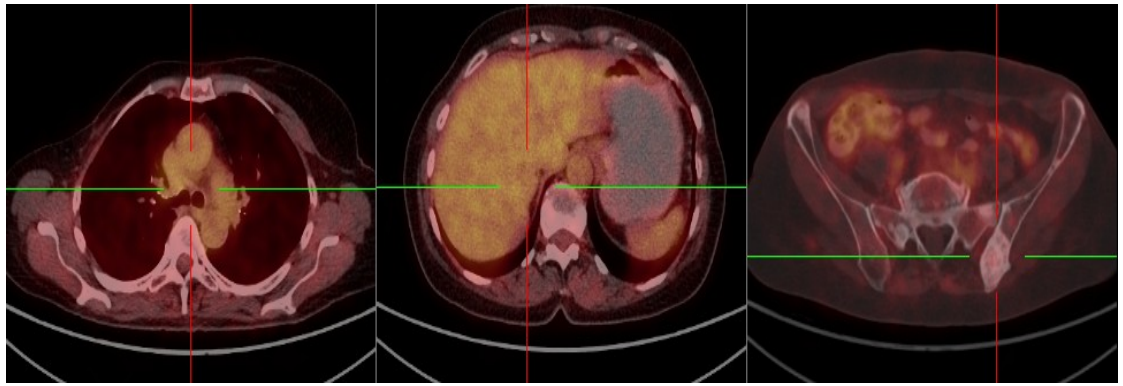


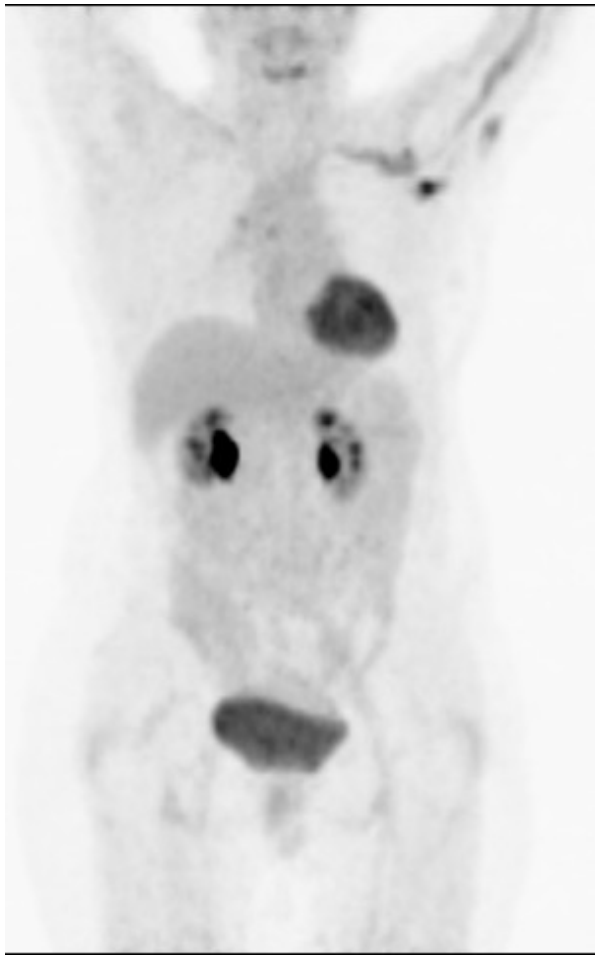
Case continued

- hormonotherapy fulvestrant
  - 500 mg every 4wks intra muscular



Within 10mths effect of:
overall improvement, all metastases regression (PET/CT - 3/2014)





Case 2: Pt, 52 years old

- 2/2010- ca left breast pT1b pN0 MO
- ER 80% PR 80%, low proliferation, HER 2 negative
- Parcial mastektomy + SNB, radiotherapy, adjuvant Tamoxifen

- 4/2014 dg liver lesions

Case 2: continued

Case 2: continued

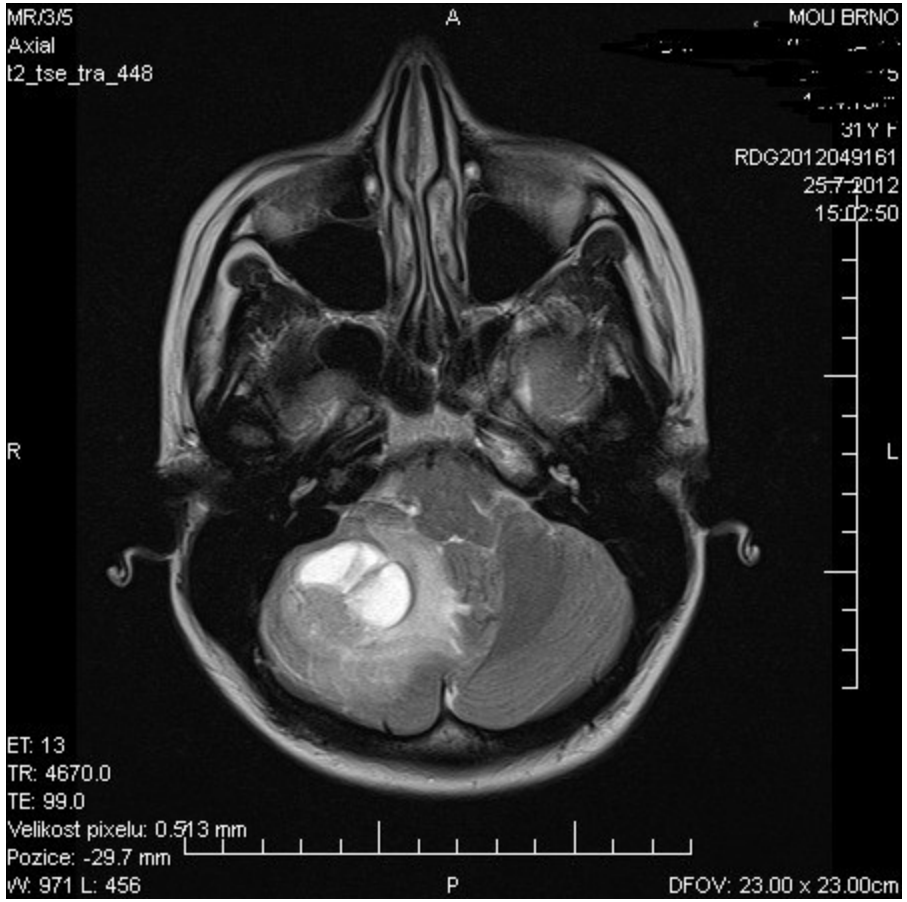
- 5/2014 – biopsy liver lesions
- Histology: lymfocytes infiltrating liver

- Radiologist: typical metastases – CT, US
- 7/2014- repeated biopsy liver-
  - Again- no cancer

Case 3: Female 29yo

- 2/2012 dg invasive ductal carcinoma
- triple negative, high proliferation (Ki-67 90%)- rapid growth T2N1M0
- Neoadjuvant chemo- AC (doxorubicin +cyclophosphamide)- effect after 3 cycles- propo 3 cyklech – progrese
- Změna na docetaxel- progrese after 2 cycles, carboplatin added- progression
- Mastectomy + ALND
- 9/2012-brain metastases

Case 3: Female 29yo



Ca breast: Summary

- Frequent malignancy in women
- Not one dissease – various subtypes (biology, behaviour)

- Complex multimodal treatment- operation, radiotherapy, chemotherapy, hormones, targeted treatment

- Supportive care complex and important

Side effects of chemotherapy

- Blood cell production (bone marrow, hematotoxicity)
- Germinal cells (spermias, eggs)
- Mucose (GI tract et al.)
- Nerves (feeling, movement, hearing)
- Organs – heart, kidneys, liver, brain

- Often irreversible, long term

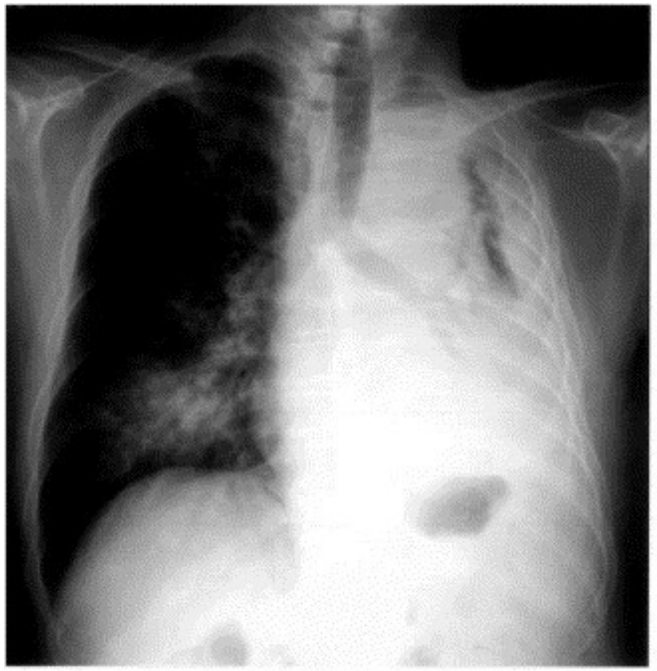
Pří

Nežádoucí účinky cílené léčby

- Alergická reakce
- Únava
- Vyrážka/jiná kožní toxicita
- Průjmy
- Hypertenze (vysoký krevní tlak)
- Proteinurie (bílkovina v moči)
- Další (útlum krvetvorby, krvácení, nechutenství, hubnutí, chřipkové příznaky ad.)

- Většina reverzibilní (po vysazení léku se upraví)
- Některé vedou k přerušení/vysazení léčby

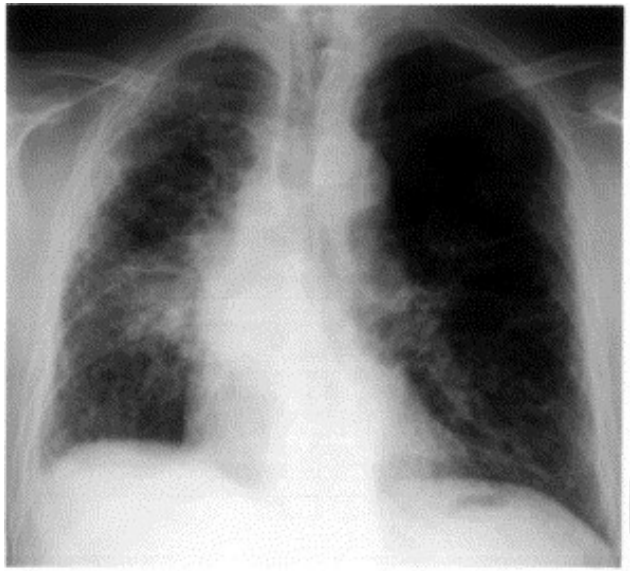
- Irreverzibilní také
  - Poškození orgánů: (srdce – snížení funkce, plíce – vazivovatění, snížení funkce, neinfekční záněty)



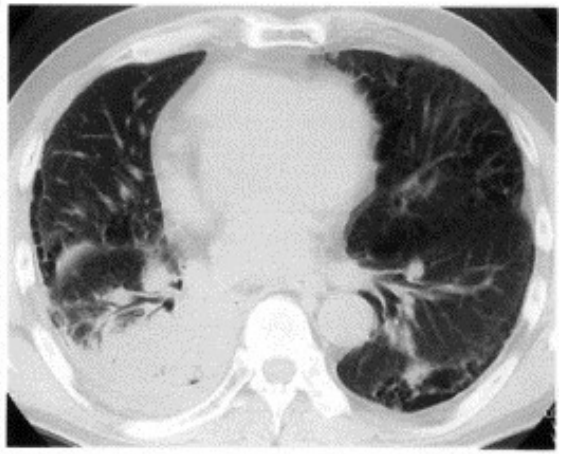
(a)

(b)

Pulmonary fibrosis

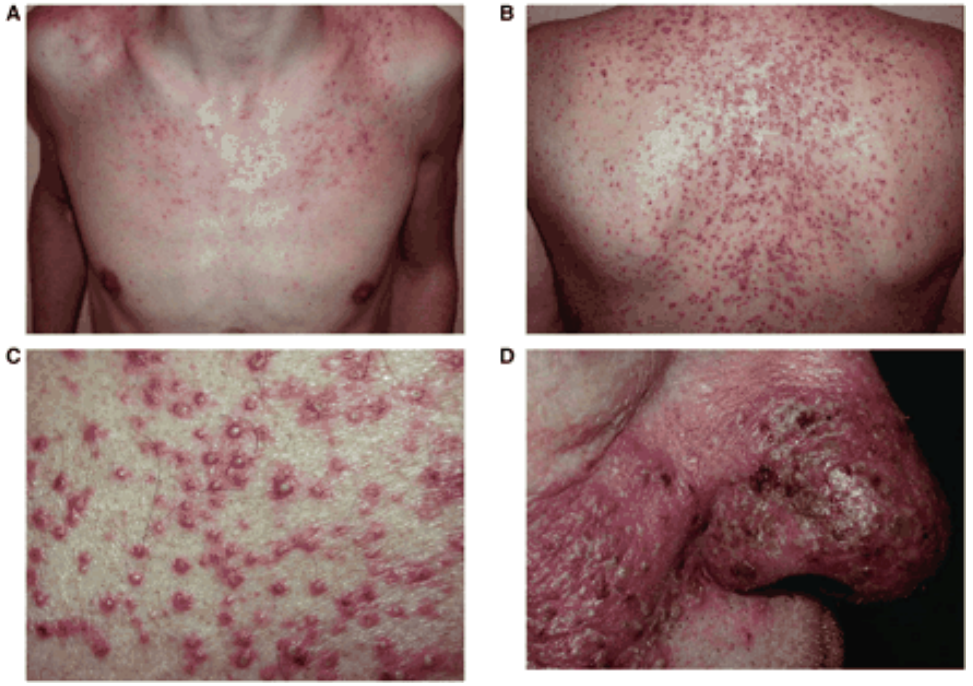


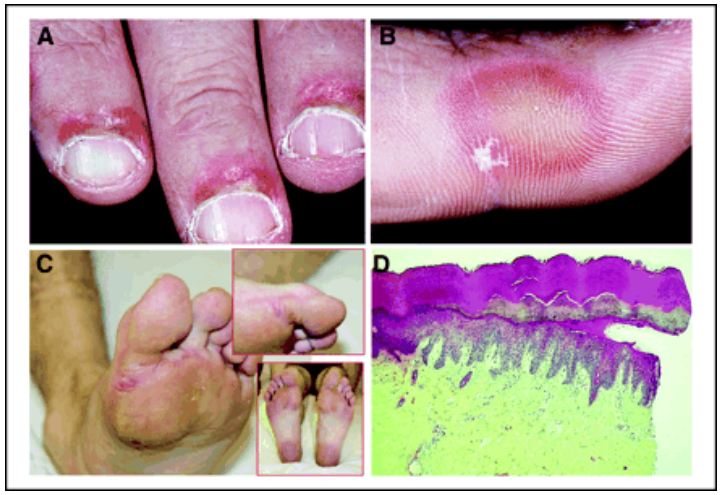
(a)



(b)

Skin symptoms – acne, blisters

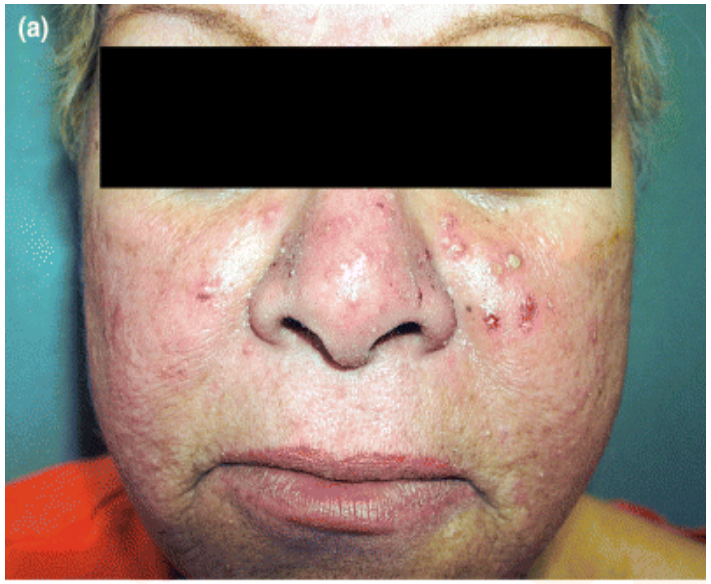




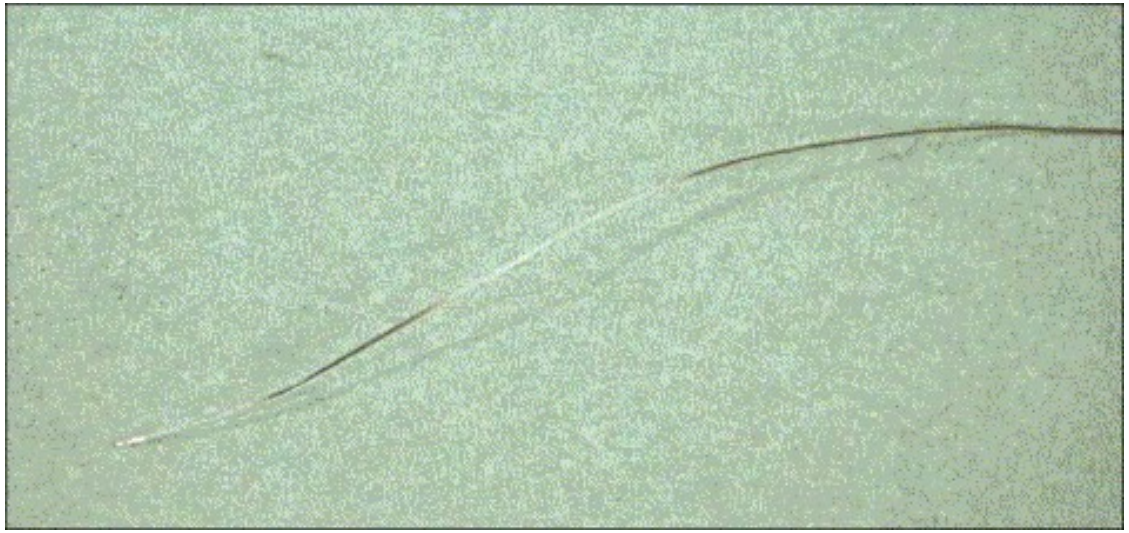
Treatment of rash effective

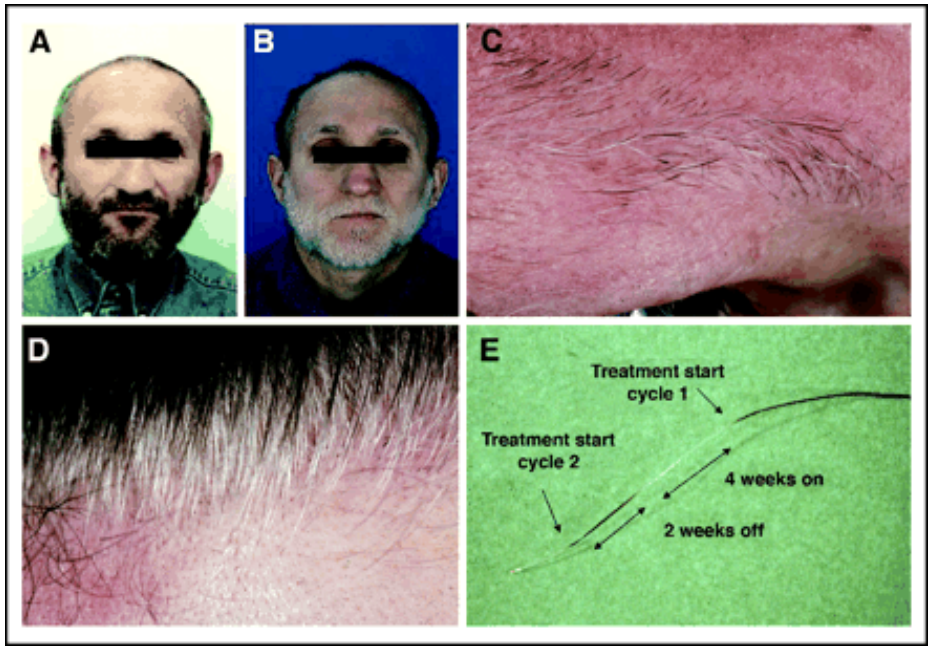
A.

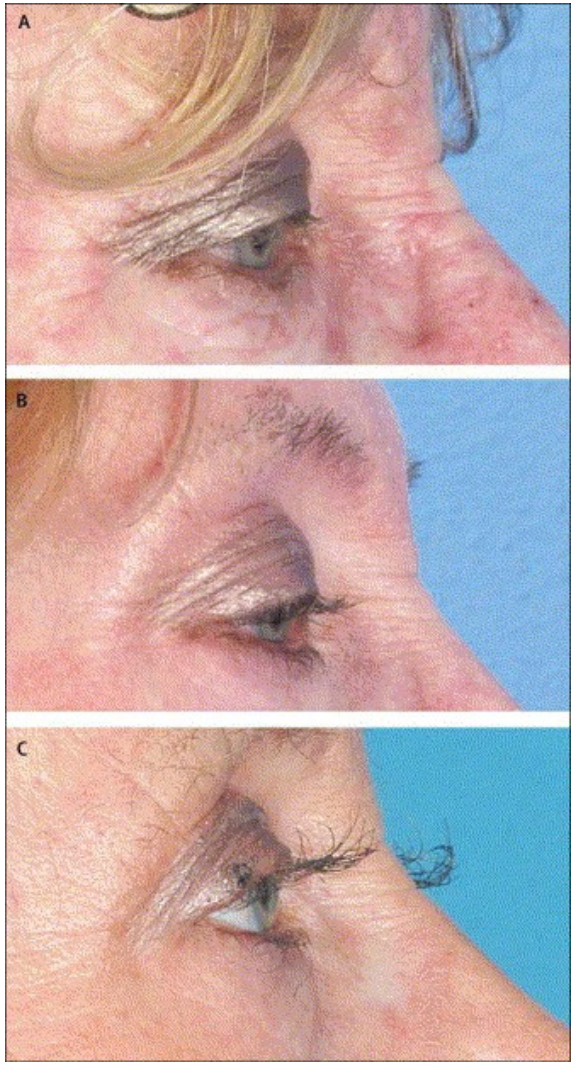
B.



Hair + eye lashes







Vascular /intravenous access in oncology

- Complex
- Dynamic evolution (material, methods)
- evidence based

- Professional society
  - Society for ports and permanent catheters

  www.sppk.eu

  - World Congress of Vascular Access (WoCoVA.com)
  - guidelines

SPOLEČNOST PRO PORTY A PERMANENTNÍ KATÉTRY

WoCoVA
6th World Congress on Vascular Access

What is right (state of the art)? - 2023

- Choose a proper access, right indication
- Right procedure (implantation)
- Check the position of the tip of catheter
- Complication- special and skilled personnel
- Interdisciplinary team?

- **Right function, minimal burden for the patient**

Why interdisciplinary?

- Indication (what for?)..... oncologist
- Implantation.....surgeon, radiologist, oncologist
- Nursing .....registered nurse

- complications..... surgeon, hematologist, etc.?
- state of the art? news? Legal aspects?

- Everybody knows his part...

What is important to choose well?

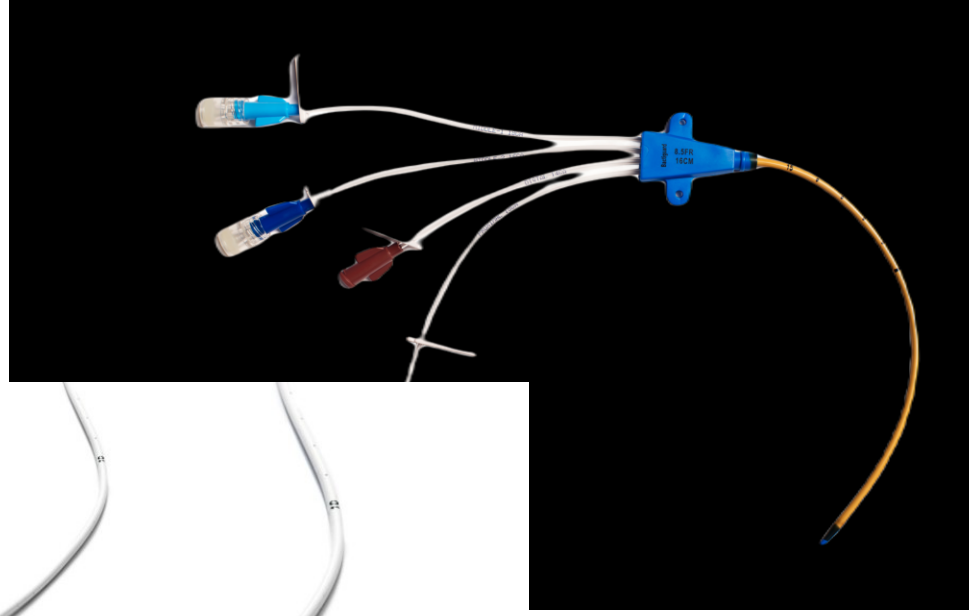
- For how long?
- What for? (infusions, chemicals, nutrition, blood taking)
- What will be administered? (pH, irritants, osmolality?)
- Where will be administered (hospital, home setting)
- Safety while inserting
- Infectious and thrombotic risk management
- Patient's preference (arm, chest)

- ...economics?

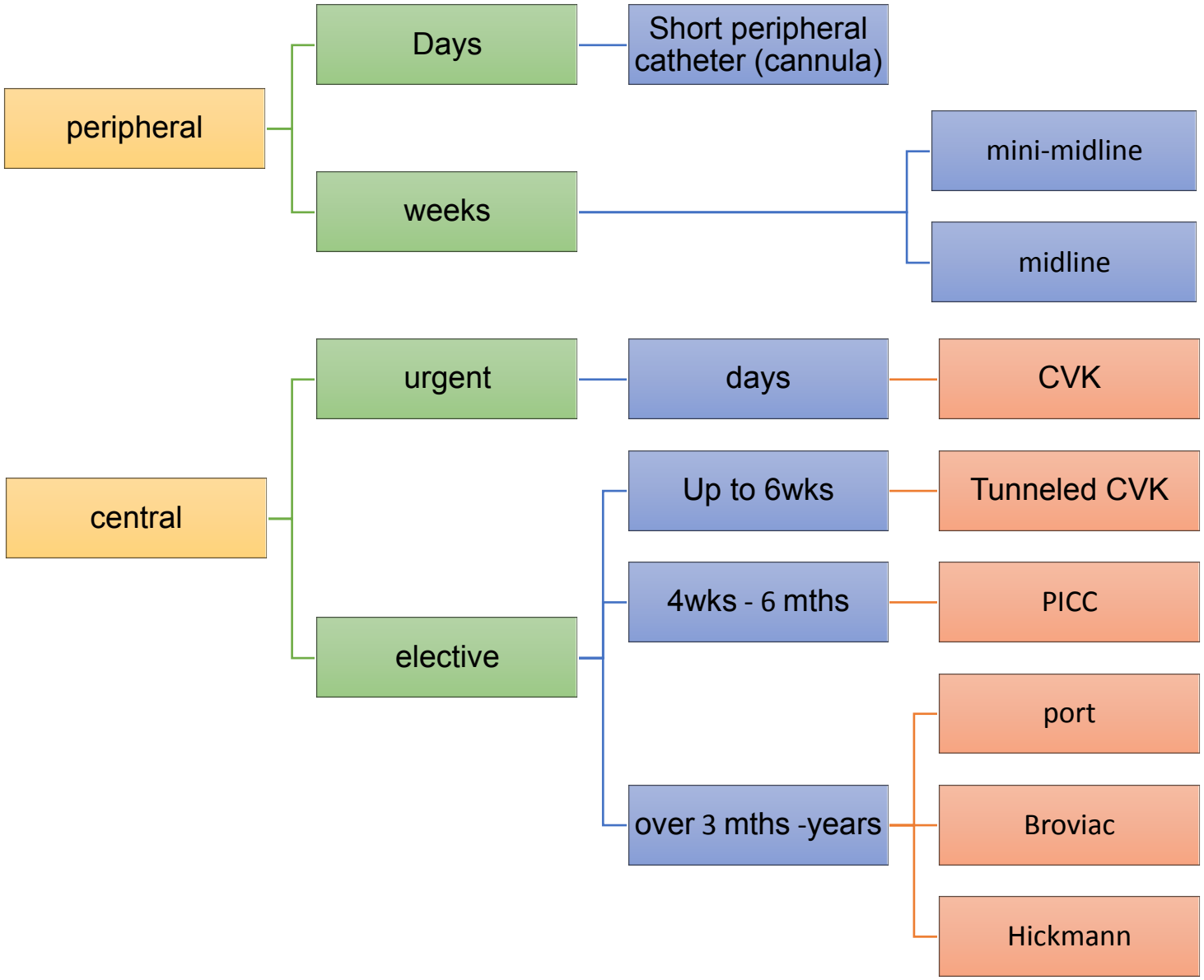
Cathegories

- Location of the tip
  - periferal
  - central

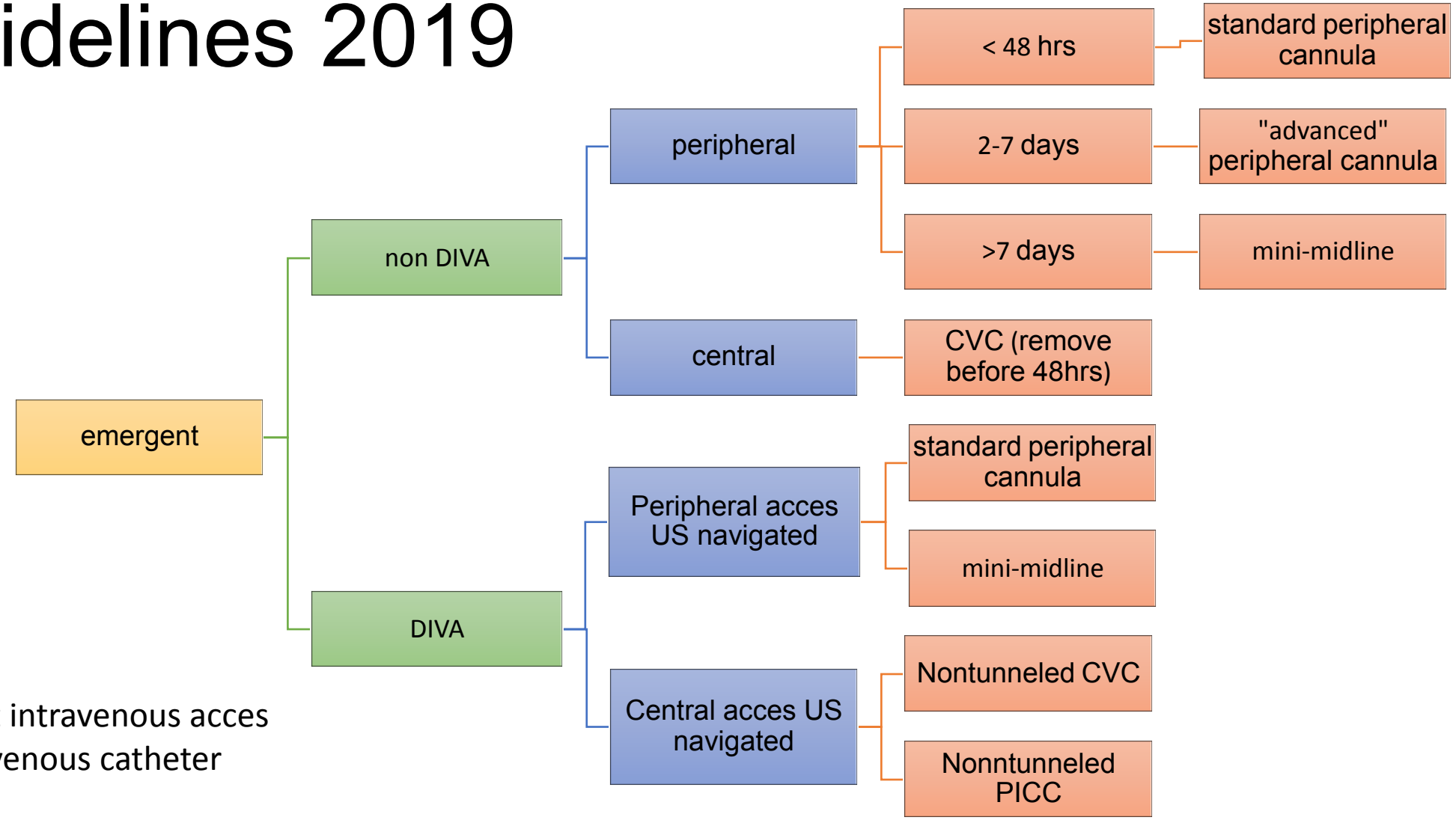
- Lenght of use
  - Short term (up to 7 days)
  - Middle term (ap cca 4-6 týdnů)
  - Long term = permanent
    (months even years)



Choice

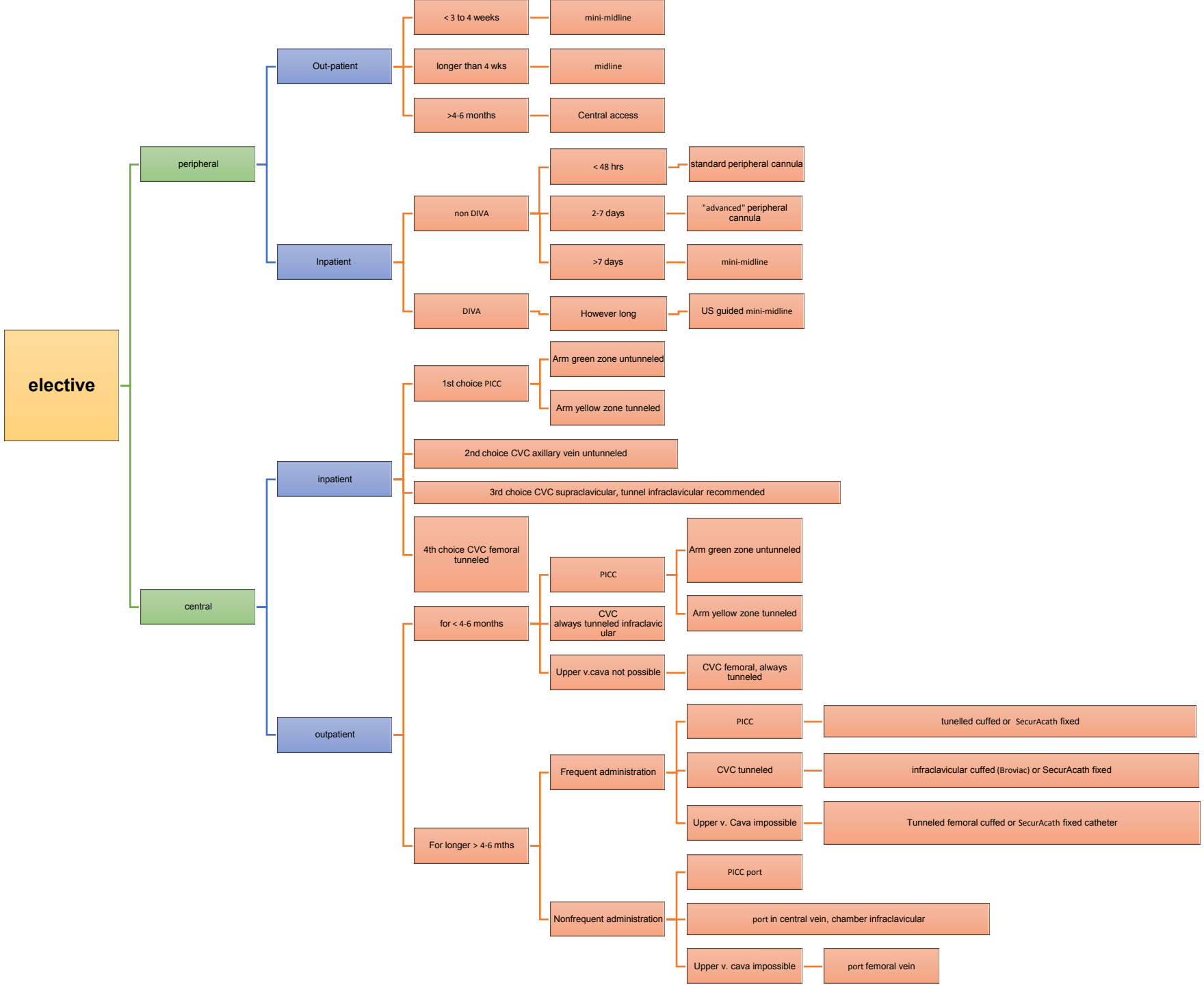

peripheral
Days
Short peripheral catheter (cannula)
weeks
mini-midline
midline
central
urgent
days
CVK
elective
Up to 6wks
Tunneled CVK
4wks - 6 mths
PICC
over 3 mths -years
port
Broviac
Hickmann

Guidelines 2019



DIVA = difficult intravenous acces
CVC = central venous catheter

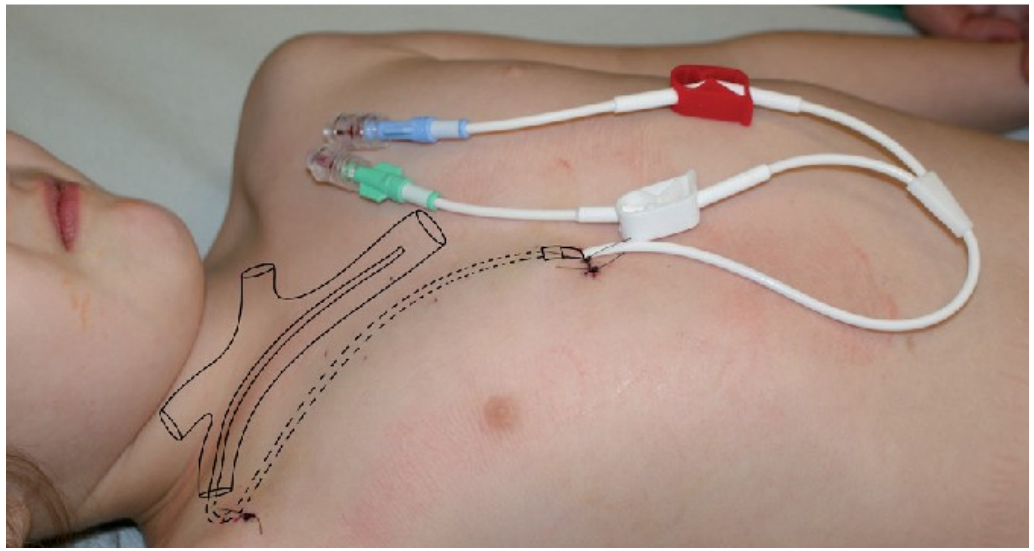
According to Italian guideline GAVeCeLT 2019 (Gli Accessi Venosi Centrali a Lungo Termine)


elective
peripheral
Out-patient
< 3 to 4 weeks
mini-midline
longer than 4 wks
midline
>4-6 months
Central access
Inpatient
non DIVA
< 48 hrs
standard peripheral cannula
2-7 days
"advanced" peripheral cannula
>7 days
mini-midline
DIVA
However long
US guided mini-midline
central
inpatient
1st choice PICC
Arm green zone untunneled
Arm yellow zone tunneled
2nd choice CVC axillary vein untunneled
3rd choice CVC supraclavicular, tunnel infraclavicular recommended
4th choice CVC femoral tunneled
outpatient
for < 4-6 months
PICC
Arm green zone untunneled
Arm yellow zone tunneled
CVC always tunneled infraclavicular
Upper v.cava not possible
CVC femoral, always tunneled
For longer > 4-6 mths
Frequent administration
PICC
tunelled cuffed or SecurAcath fixed
CVC tunneled
infraclavicular cuffed (Broviac) or SecurAcath fixed
Upper v. Cava impossible
Tunneled femoral cuffed or SecurAcath fixed catheter
Nonfrequent administration
PICC port
port in central vein, chamber infraclavicular
Upper v. cava impossible
port femoral vein

Purpose of tunnelization

- Exit site of catheter different from insertion site

- Why?
  - Optimal fixation
  - Easier nursing
  - Smaller risk of complication (infection)



ZIM = „Zone Insertion Method“

- Robem Dawson - optimal choice of catheter exit site for PICC

JAVA, 2011

PICC Zone Insertion Method™ (ZIM™): A Systematic Approach to Determine the Ideal Insertion Site for PICCs in the Upper Arm

Robert B. Dawson
MSA, BSN, RN, CRNI, CPUI, VA-BC

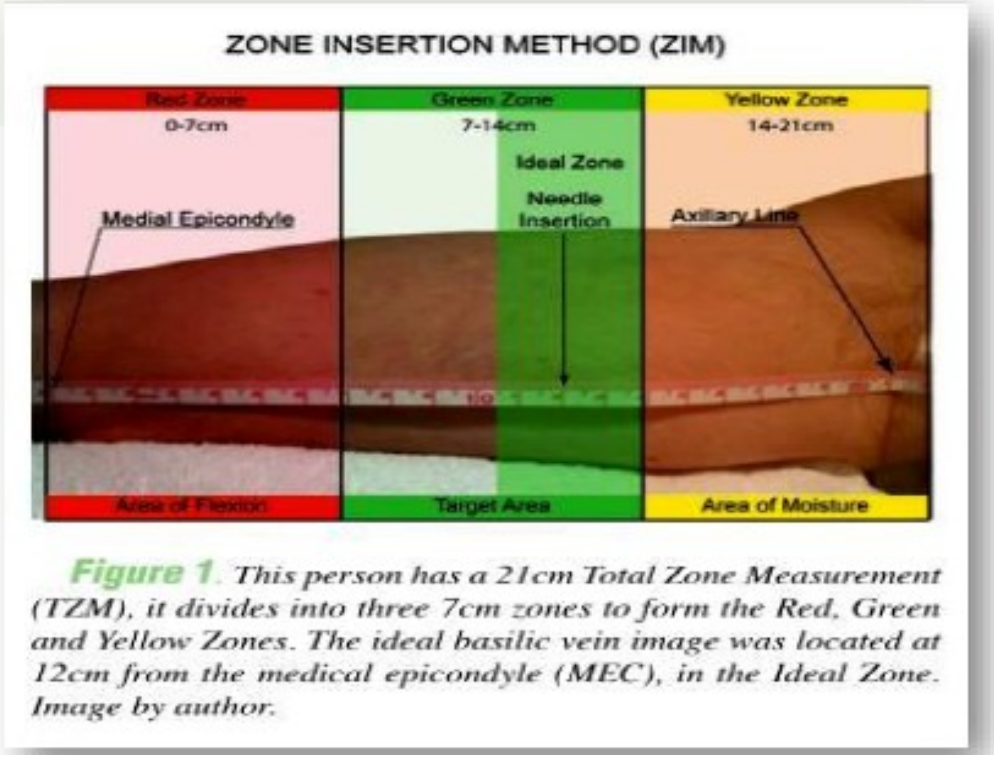
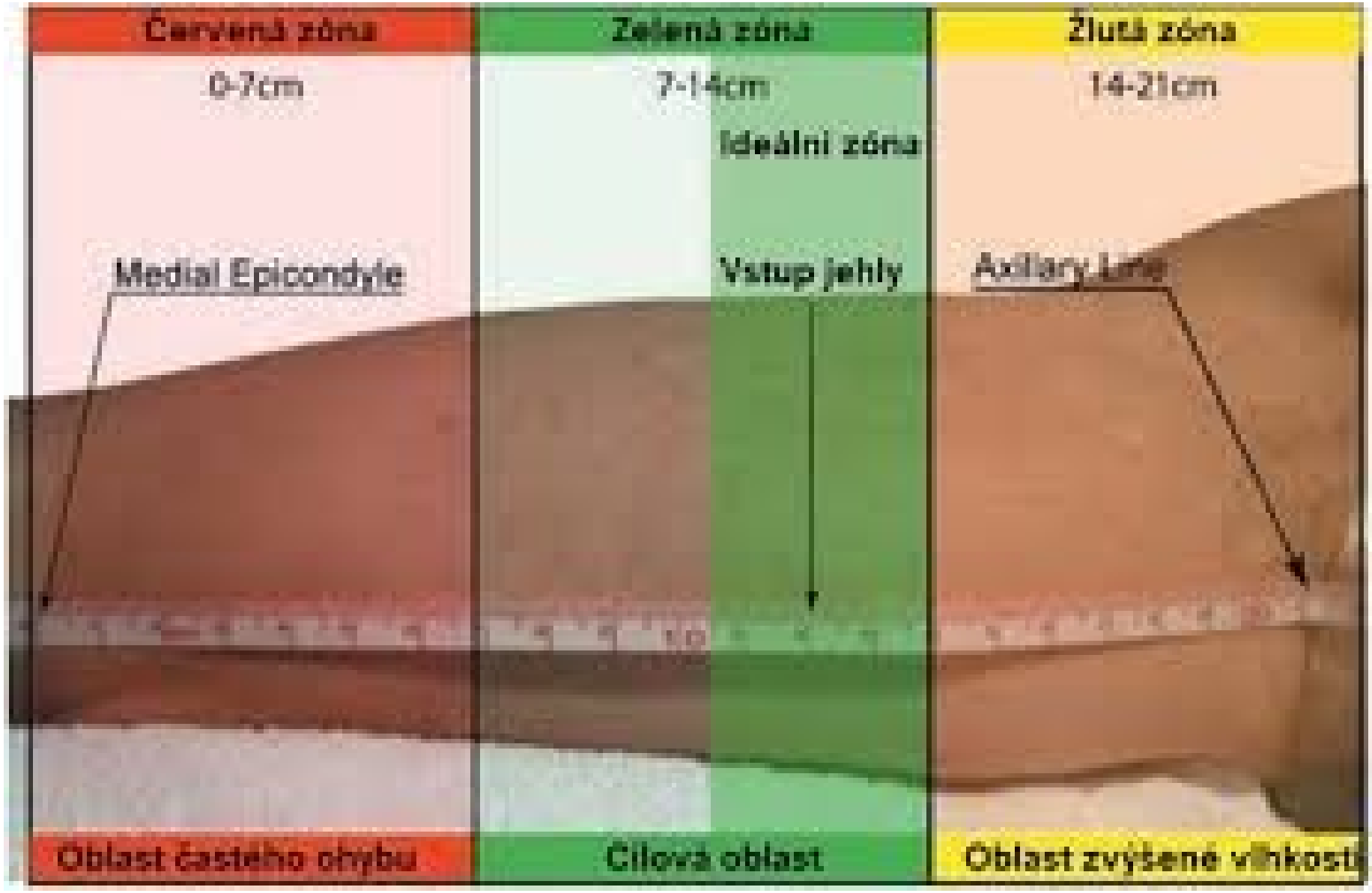
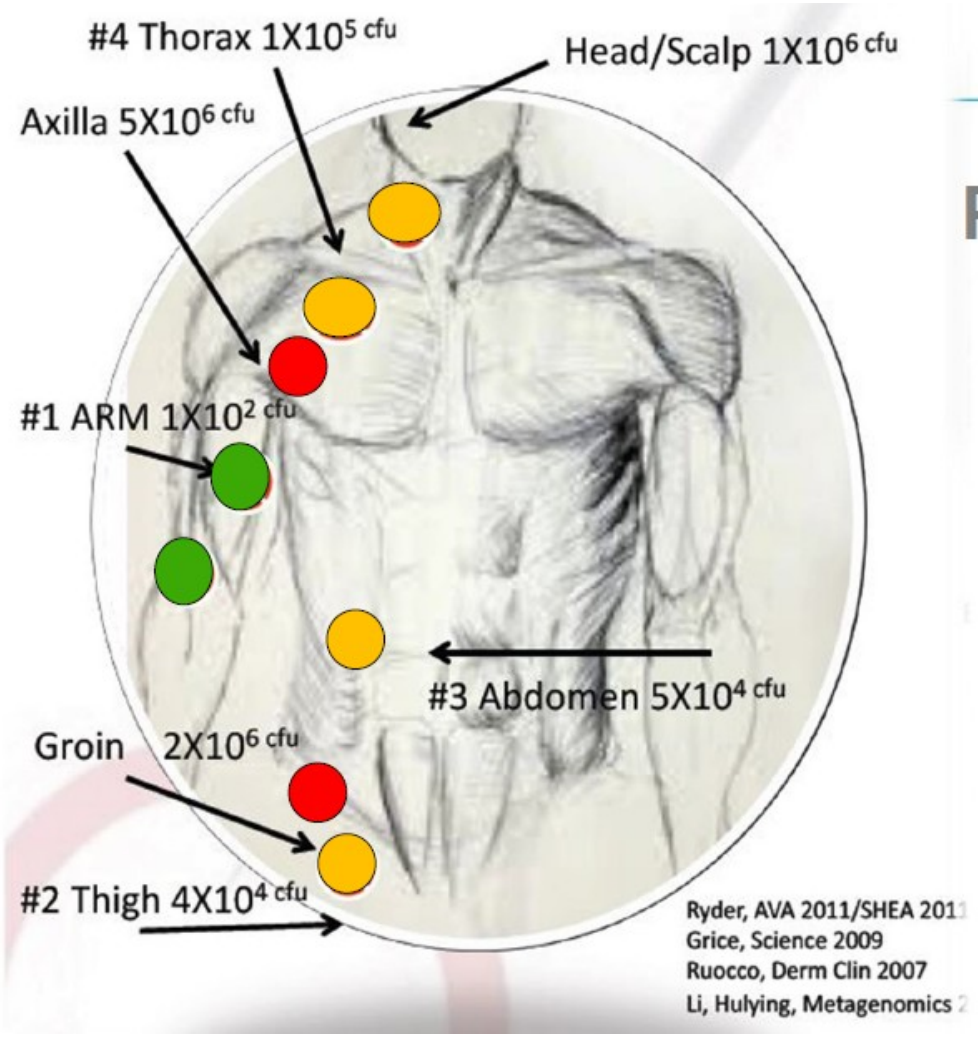


Figure 1. This person has a 21cm Total Zone Measurement (TZM), it divides into three 7cm zones to form the Red, Green and Yellow Zones. The ideal basilic vein image was located at 12cm from the medical epicondyle (MEC), in the Ideal Zone. Image by author.


Červená zóna
0-7cm
Zelená zóna
7-14cm
Žlutá zóna
14-21cm
Ideální zóna
Medial Epicondyle
Vstup jehly
Axillary Line
Oblast častého ohybu
Cílová oblast
Oblast zvýšené vlhkosti

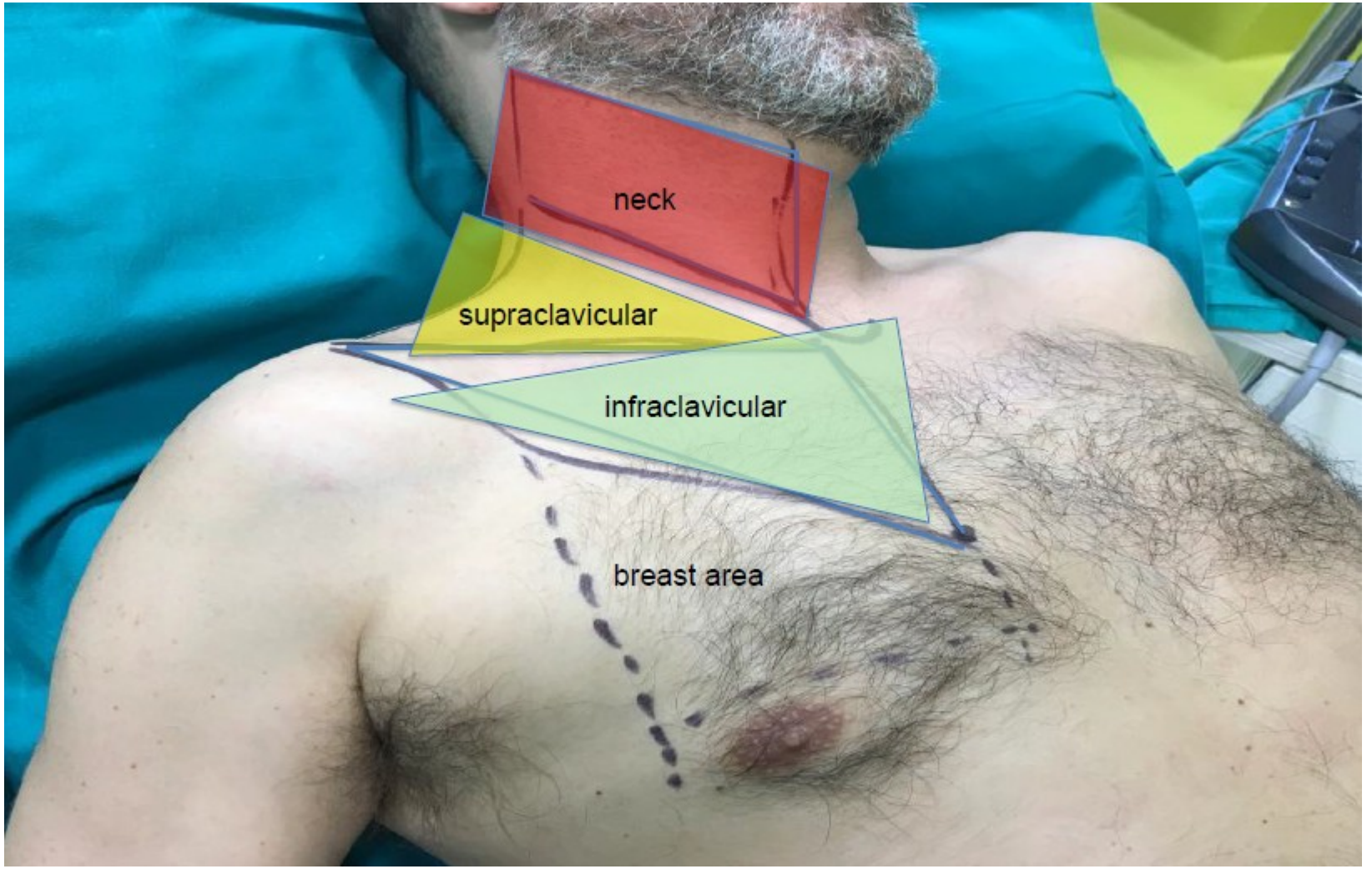
Bacterial skin colonization



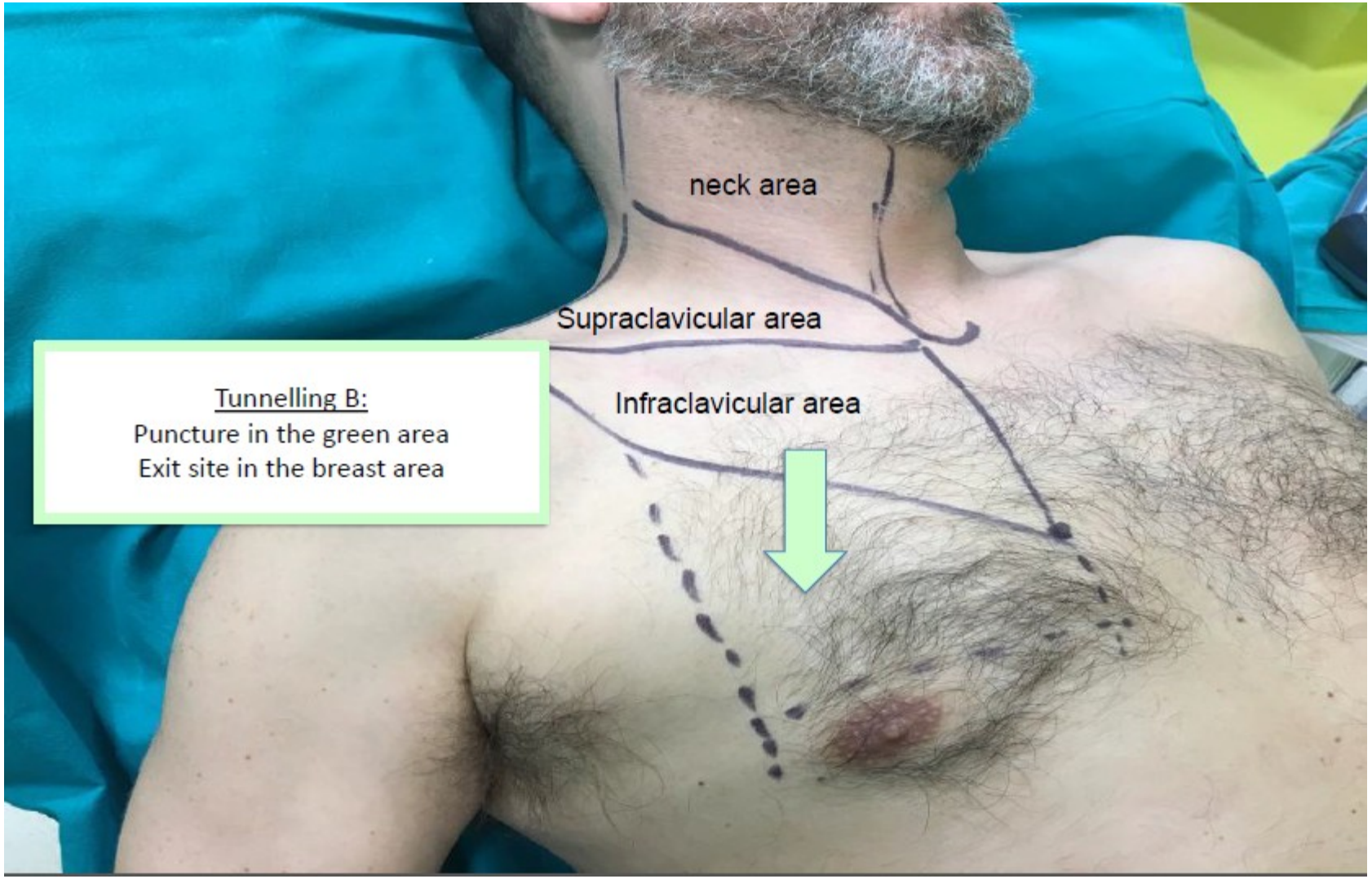
Pathogenesis

- Skin as entry site
- Important for non-tunneled catheters

ZIM for central venous access



S laskavým svolením prim. Maňáska



S laskavým svolením prim. Maňáska

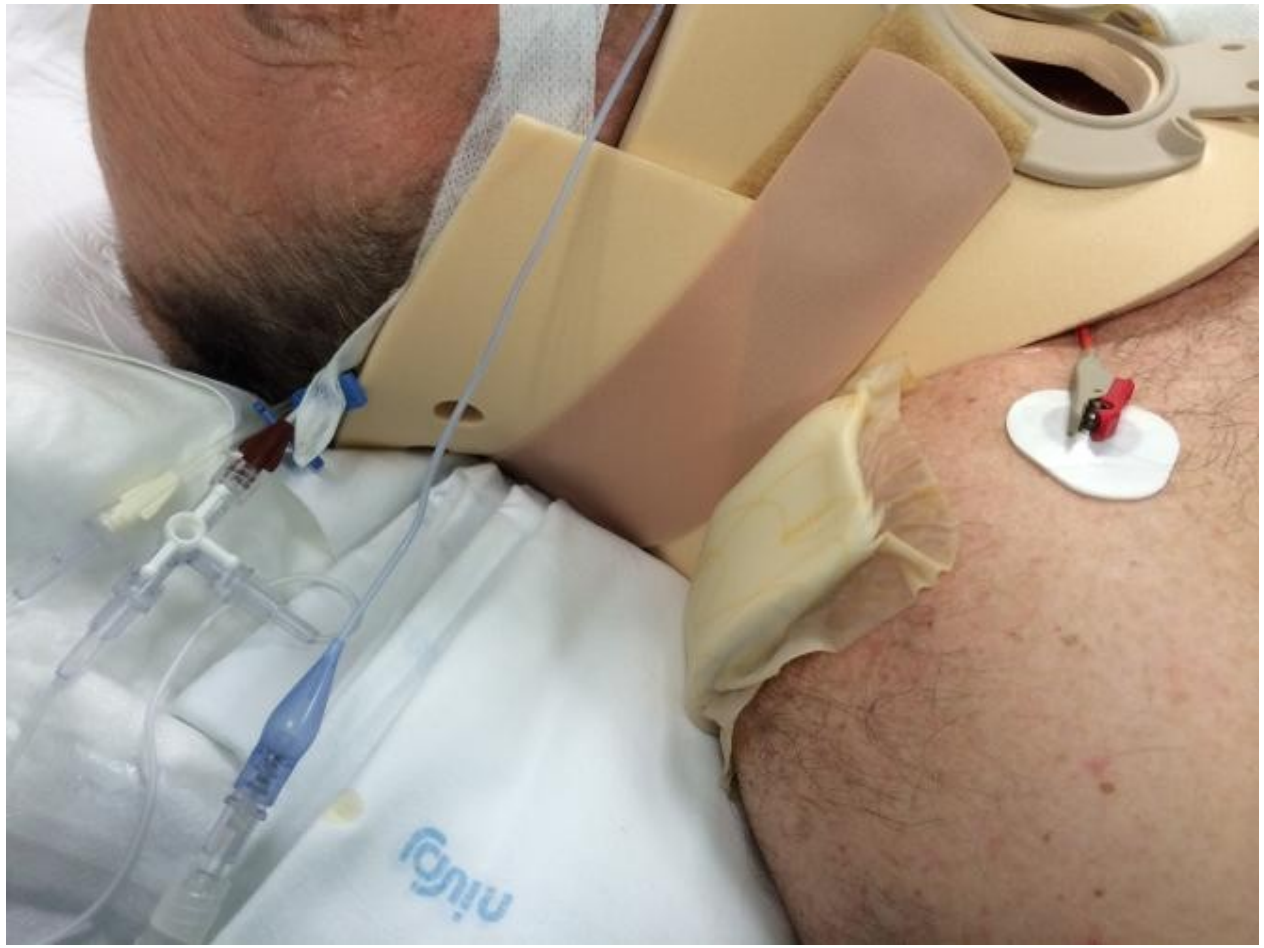
?

S laskavým svolením prim. Maňáska

?

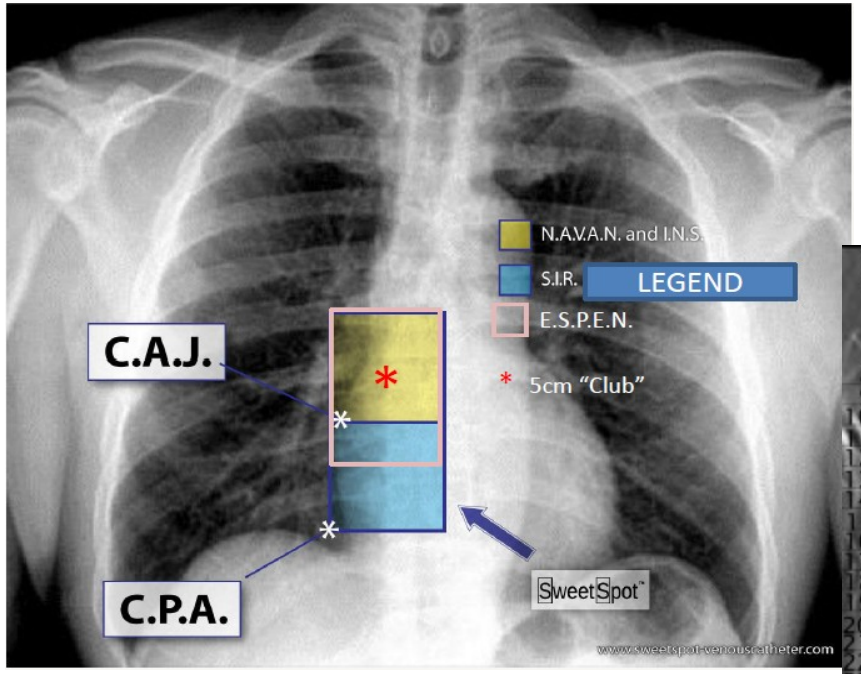
S laskavým svolením prim. Maňáska

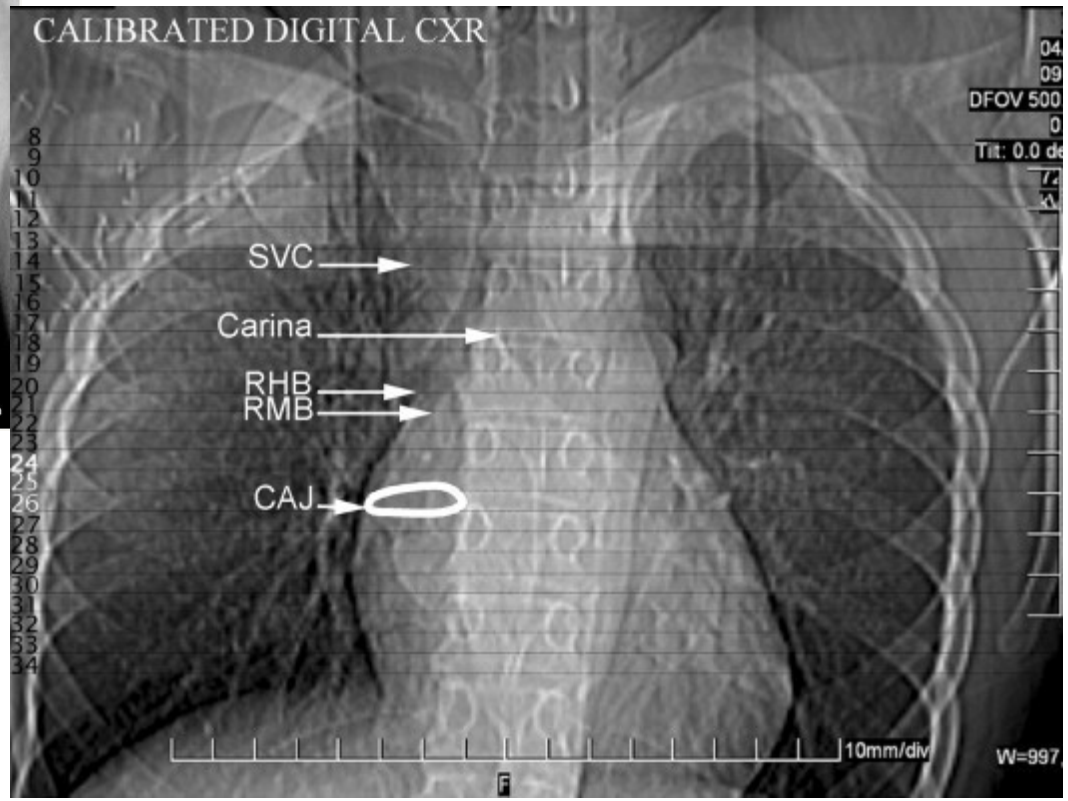
?



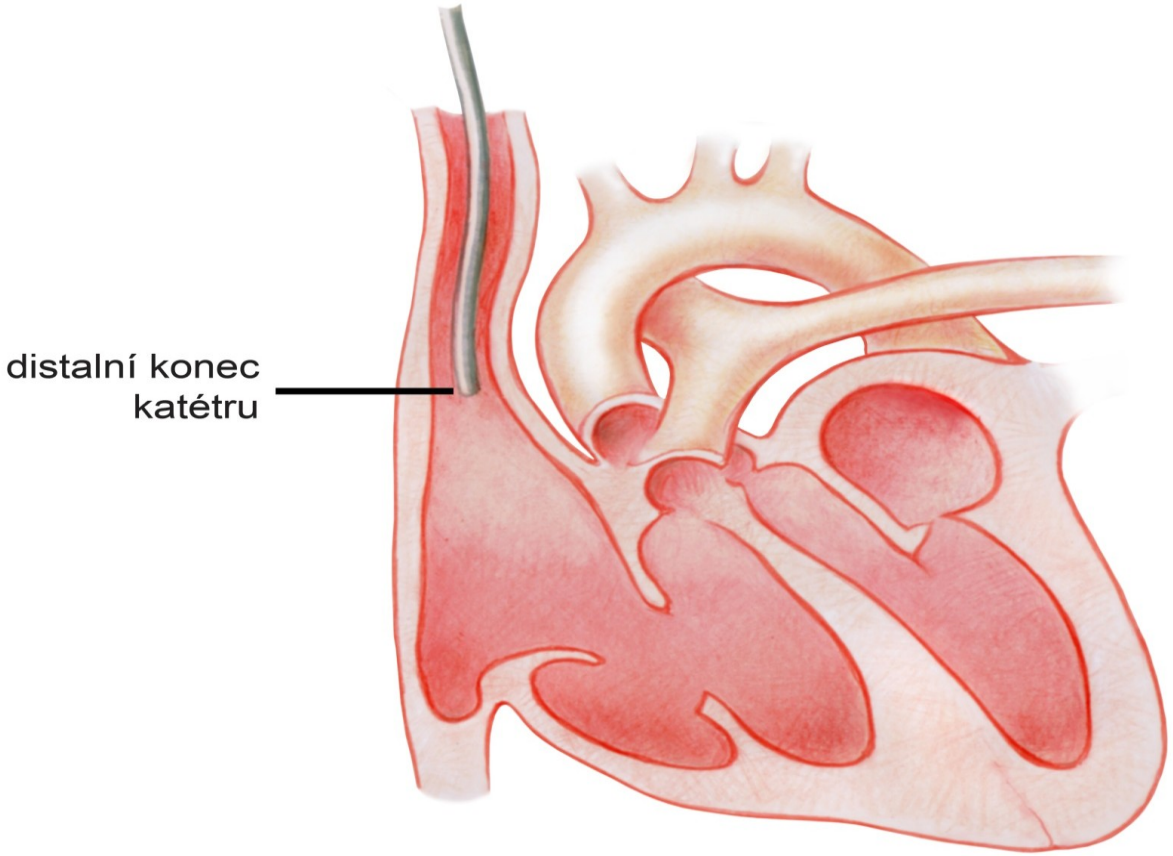
S laskavým svolením prim. Maňáska

What "central" means?

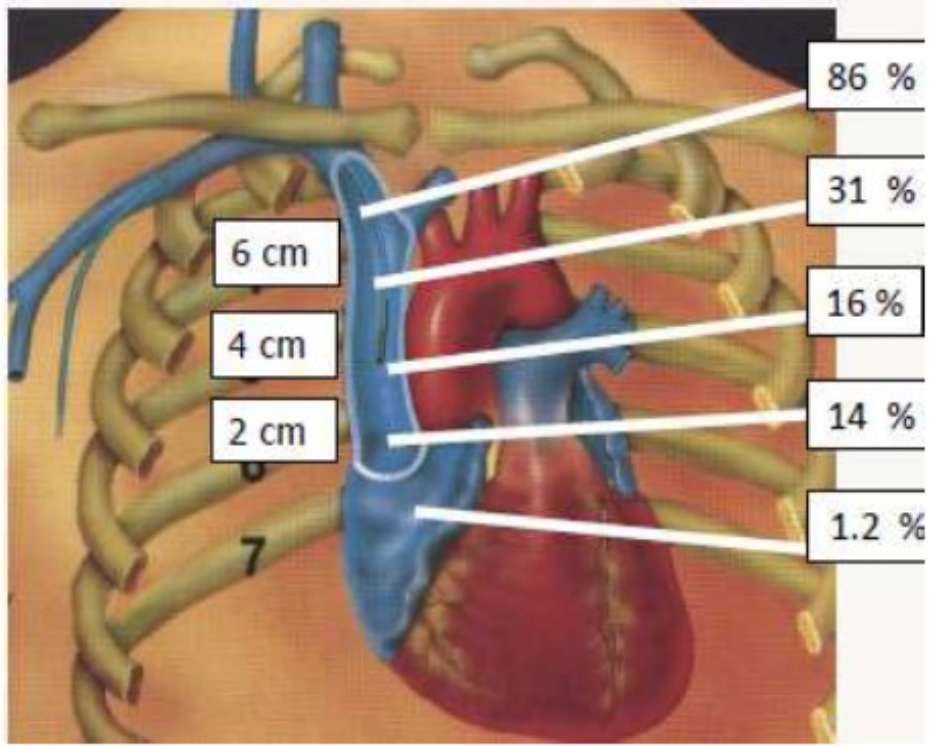




Distal tip of catheter



Silicone Venous Access Devices Positioned with Their Tips High in the Superior Vena Cava Are More Likely to Malfunction-Petersen



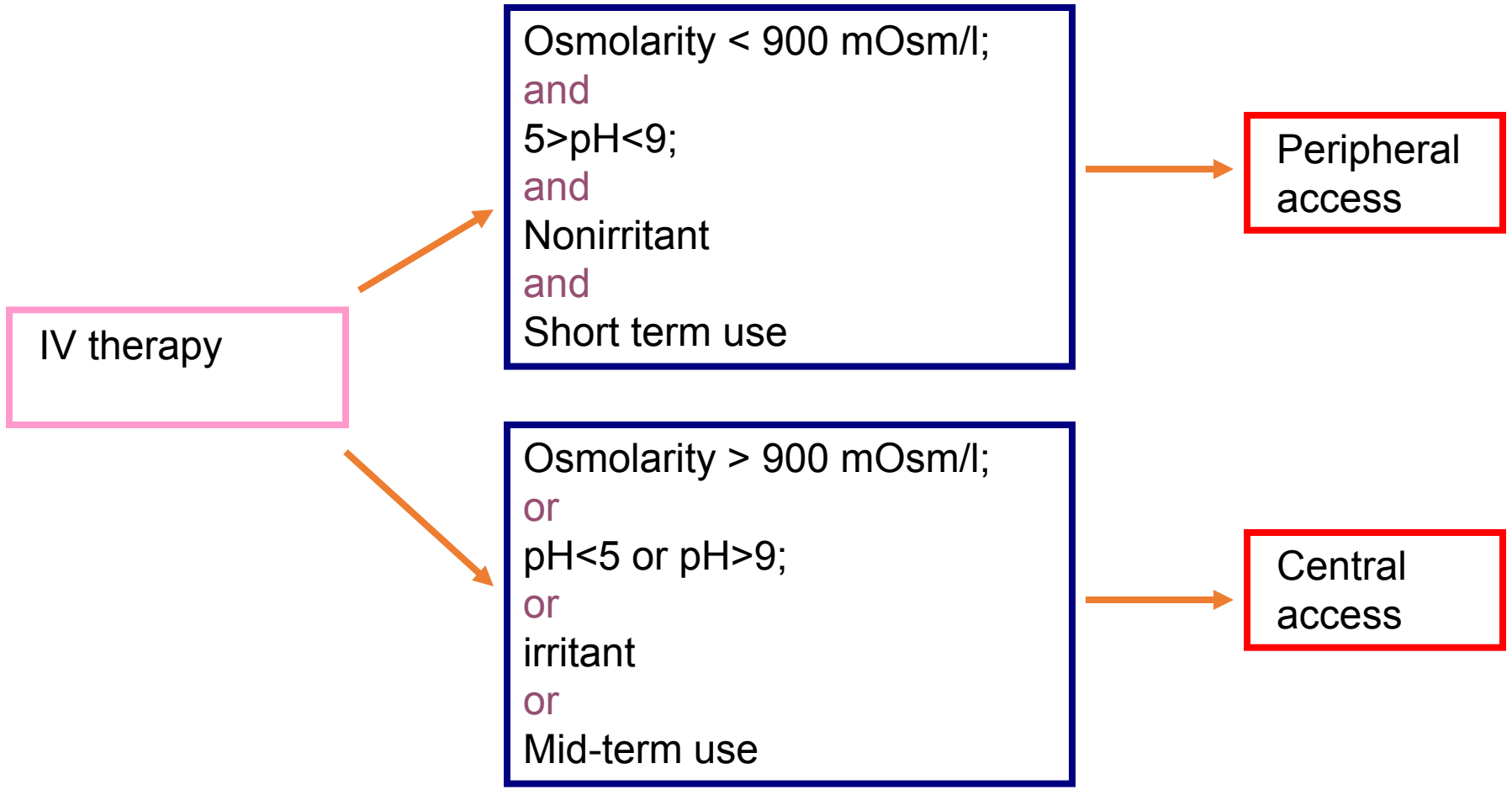
Durability proportional to depth

- –RA 245d
- –SVC/RA 116d
- –SVC 100d

Source: Peterson et al. CVC Malfunction and Catheter's Tip Position. Am J Surgery 1999. Vol 178: 38-41

WoCoVA
4th World Congress on Vascular Access

Peripheral or central access?



Steve Hill – Procedure Team Manager
Christie Hospital NHS Foundation Trust, Manchester (UK)

Complication when inserting long term access

Port, Broviac, PICC

- Failure to introduce
- Pneumothorax (not in PICC)
- Artery puncture
- Hematoma
- Nerve irritation
- Primary malposition
- Ductus thoracicus damaged (not in PICC)

Complication prevention

- Right indication of the type of venous access
- Appropriate vein and site of access (entrance and exit site)
- Ultrasound navigation
- Correct placement of tip of catheter

Xray check – necessary?

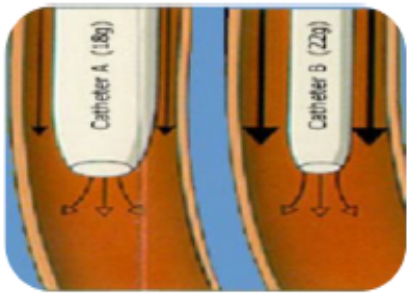
- US guidance is safe
- Experience of the performer
  - ….not necessary??

- Xray is a clear legal evidence of right position and absence of complications...

Catheter – vein ratio

Less than 45%

PICC and vein ratio CVT Sharp R., 2015



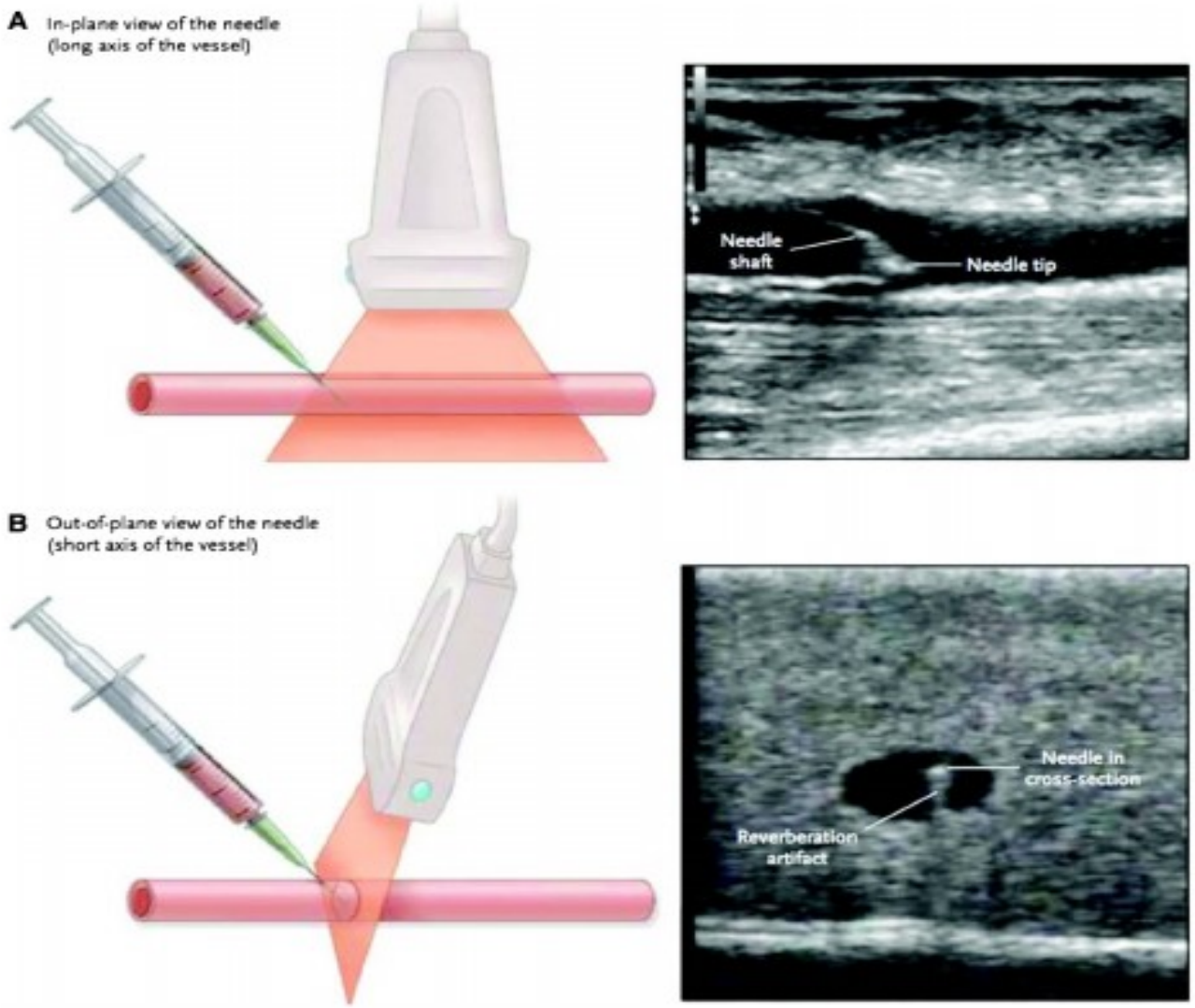
Just enough to do the job!

Catheter

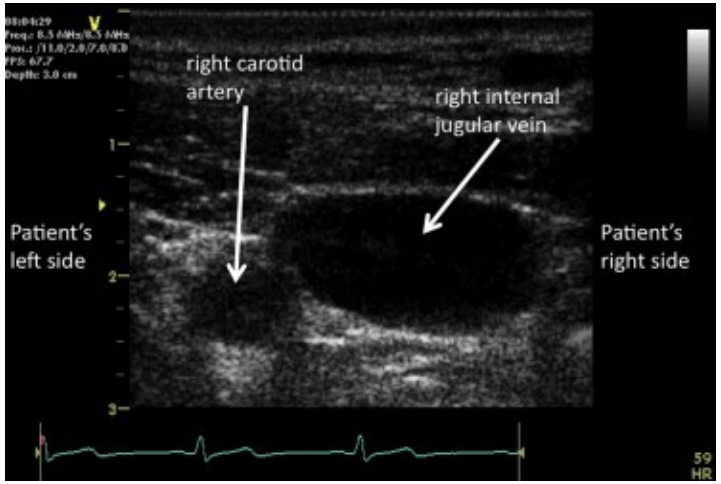
Vein Diam.	Area	4 Fr/1.[illegible]5mm diam. 1.[illegible]43mm²	5Fr/1.[illegible]67mm diam. 2.[illegible]19mm²	6Fr/2.[illegible]mm diam. 3.[illegible]14mm²
3.0mm	7.07mm²	20%	31%	44%
3.5mm	9.62mm²	15%	23%	33%
4.0mm	12.57mm²	11%	17%	25%
4.5mm	15.9mm²	9%	14%	20%
5.0mm	19.64mm²	7%	11%	16%
5.5mm	23.76mm²	6%	9%	13%

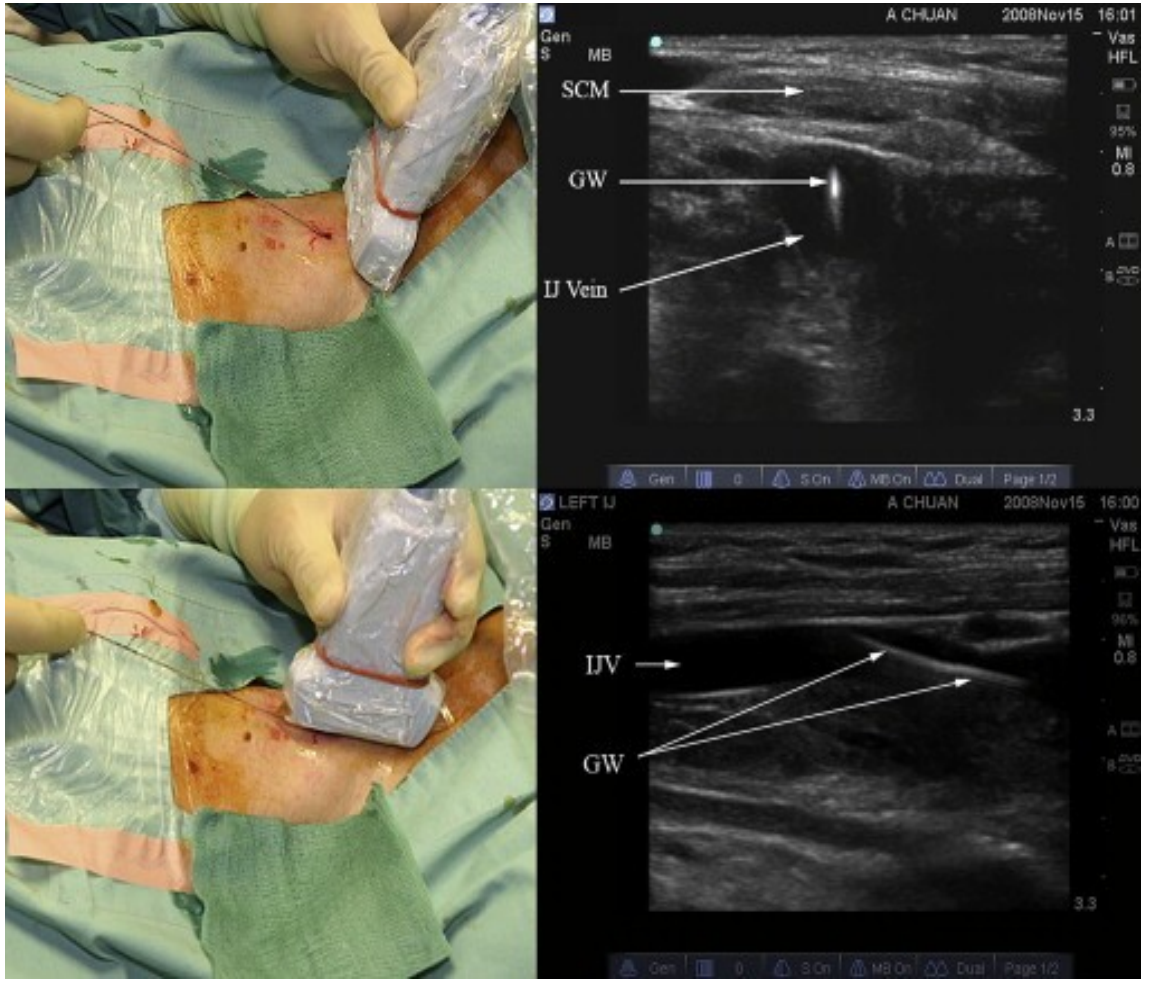
UZ LEUVEN

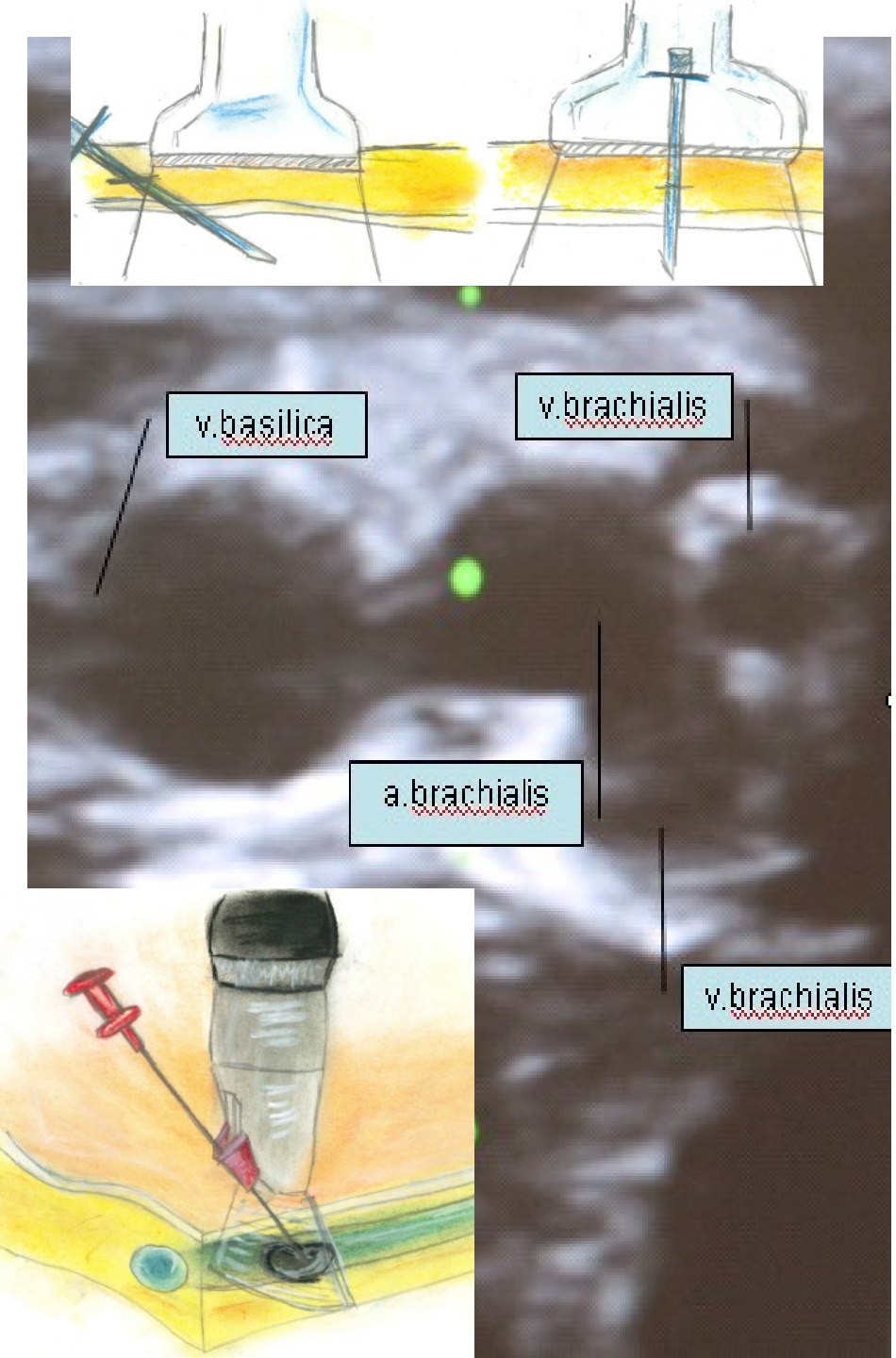
Ultrasound guidance



Ultrasound guidance






v.basilica
v.brachialis
a.brachialis
v.brachialis


18/04/2011 09:38


18/04/2011 09:39

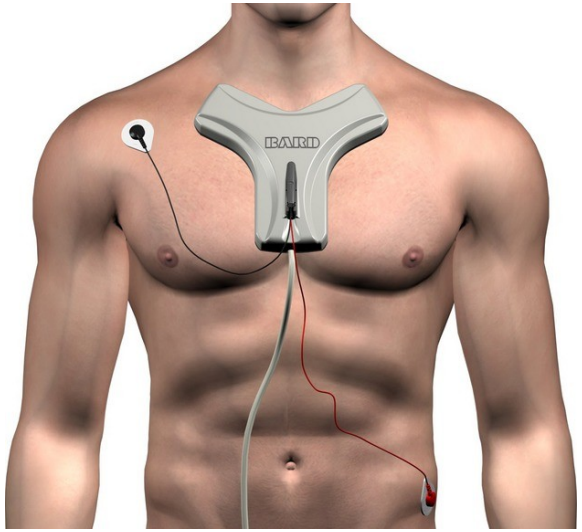
What is US good for?

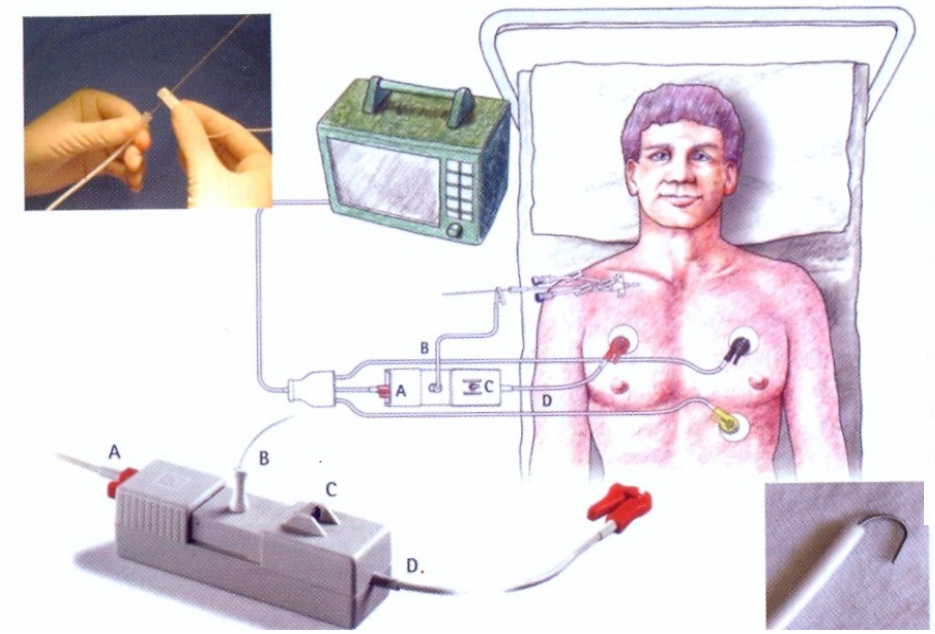
- Not for "hitting the right vein"
- rather to avoid complications and risks and malfuction immediately and in time

- choice of optimal site =
  - Better side? left/right
  - Best vein (lumen, unexpected anatomical structures, valves etc.)
  - Optimal entrance/exit site position
  - Check of the entire vein course...

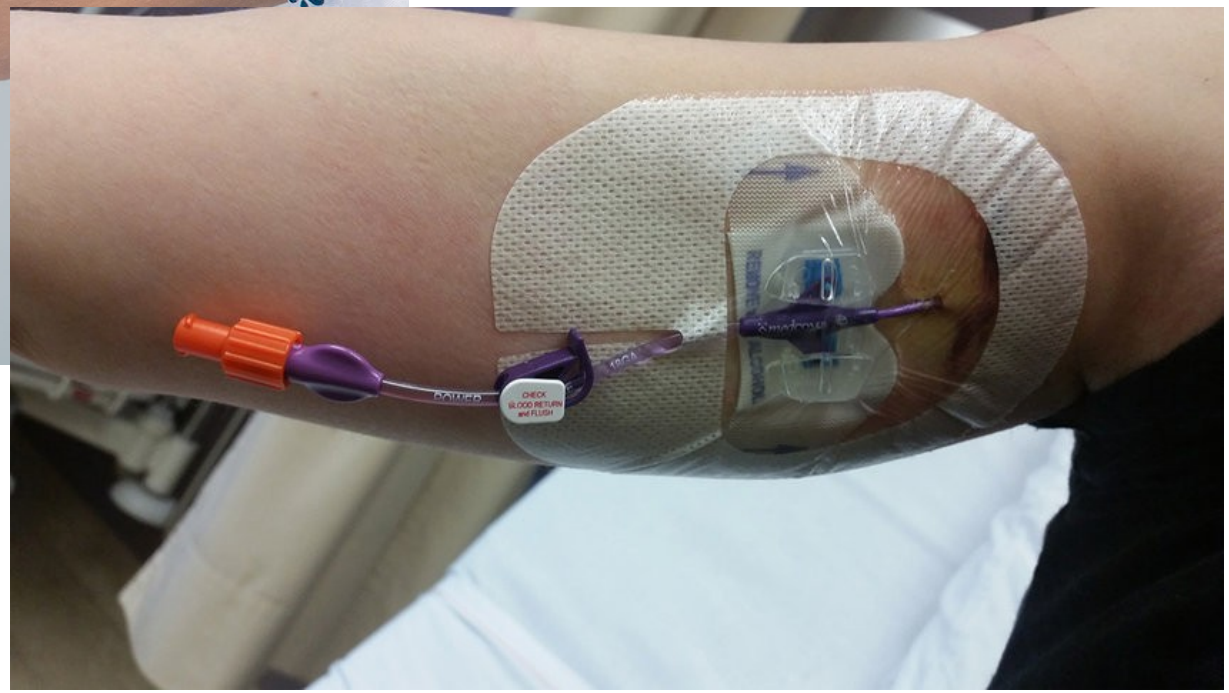
Tip position check?

- Estimate (measure on surface)
- Xray
- Intravasal ECG monitoring
- Magnetic guidance

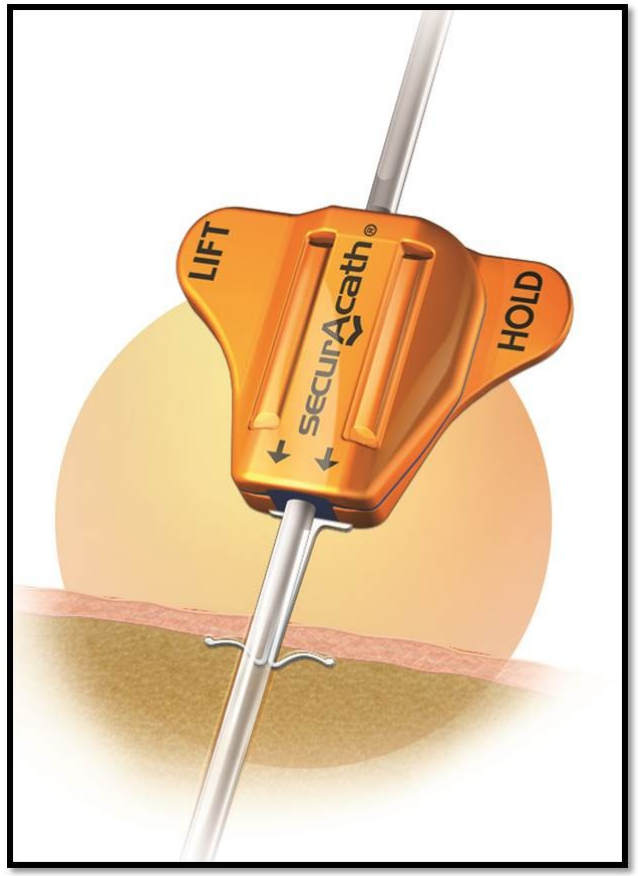


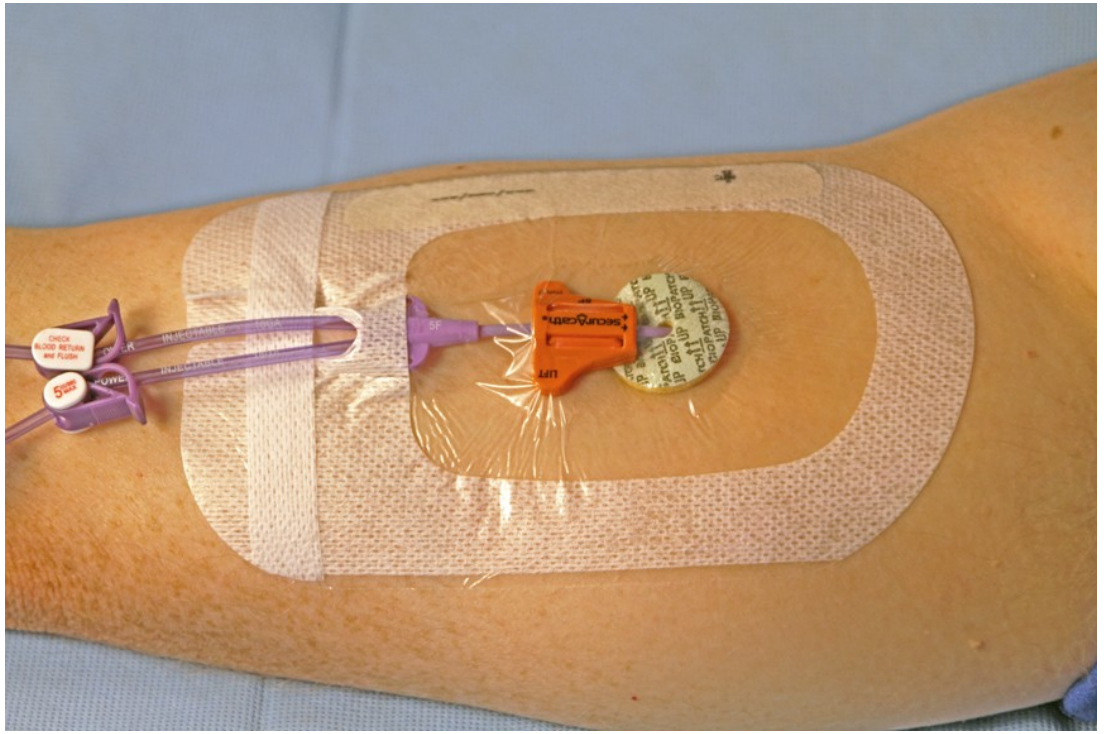


Stitchless fixation

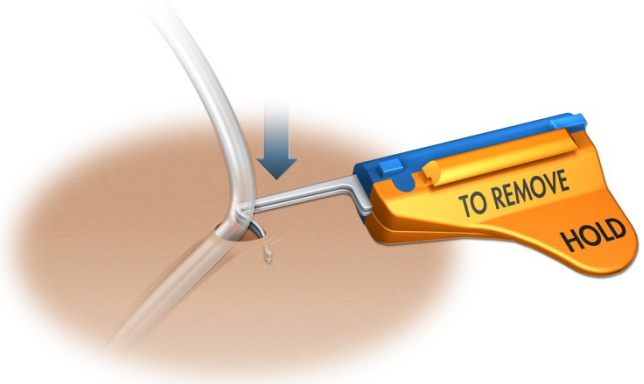


Stitchless fixation Securacath






TO REMOVE
HOLD


TO REMOVE
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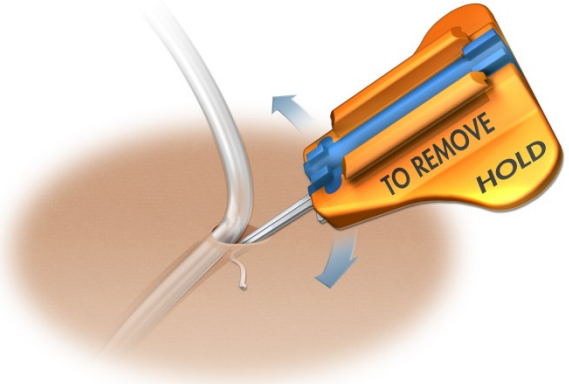
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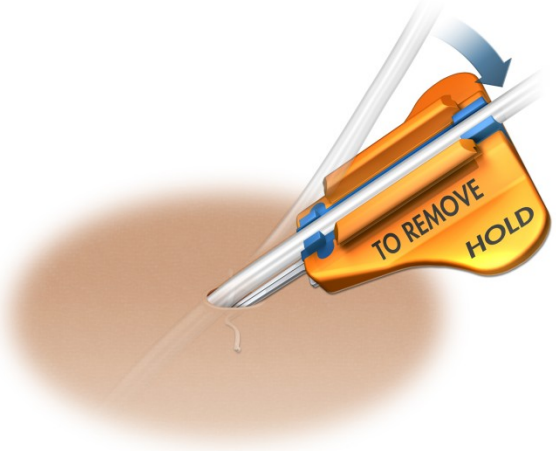
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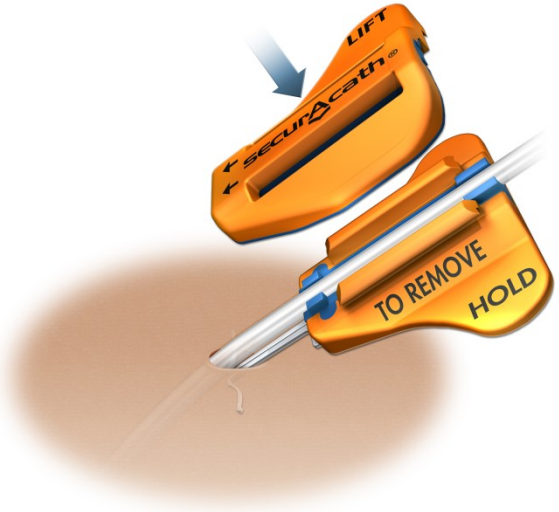

LIFT
securAcath
TO REMOVE
HOLD


LIFT
securAcath
HOLD

Tissue glue (acrylic)

Complications -infection + thrombosis

- Peripheral cannula, CVC and midline
  - Always extract
  - (Pittiruti M, Hamilton H, Biffi R et al. ESPEN Guidelines on Parenteral Nutrition: central venous catheters (access, care, diagnosis and theraphy of complications) Clin Nutr 2009; 28:365-77)
- PICC
  - Local infection - try to treat
  - Thrombosis- treat in situ, do not remove- full anticoagulation until the explantation
  - (Debourdeau P, Farge D, Beckers M et al. International clinical practice guidelines for the treatment and prophylaxis of thrombosis associated with central venous catheters in patients with cancer. J Thromb Haemost 2013; 11:71-80)
- Broviac, port
  - Try to treat and save

When to remove a Broviac or port

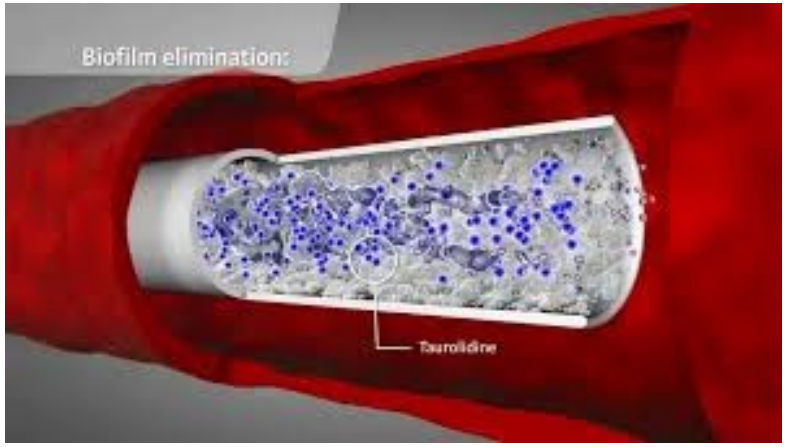
- Severe sepsis
- Tunnel infection (tunnelitis)
- Septic thrombosis
- Endocarditis
- Osteomyelitis
- Port chamber abscess
- Infection mycotic, Staph. aureus
  - G- bacteria, Staph koag. Neg. Or Enterococcus –treat

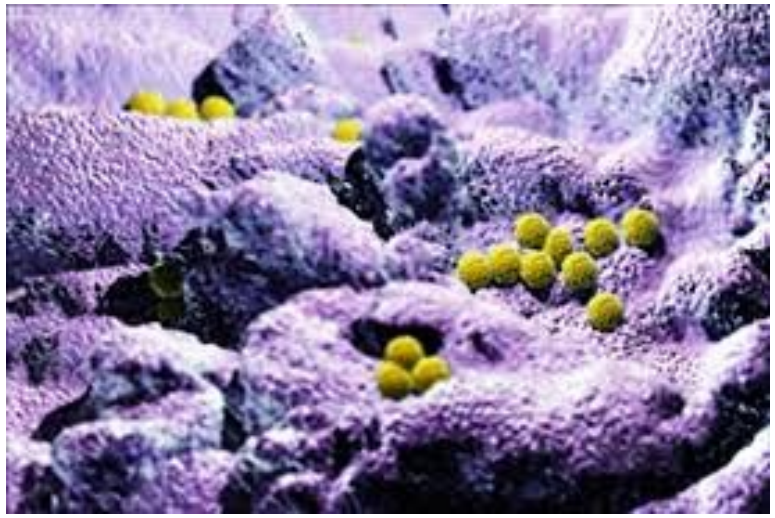
- AB i.v. for 2 weeks, endocarditis 6 weeks, osteomyelitis 8 weeks

Meemmel LA, Allon M, Bouza E et al. Clinical practice guidelines for the diagnosis and management of intravascular catheter-related infection: 2009 update by the Infectious Disease Society of America. Clin Infect Dis 2009; 49:1-45

Fernandez-Hidalgo N, Almirante B, Calleja R et al. Antibiotic-lock theraphy for long-term intravascular catheter-related bacteremia: reset of an open, non-comparative study. J Antimicrob Chemother 2006; 57: 1172-80

Taurolidin in prevention of **biofilm** formation and its destruction





Complication prevention cont'd

- **Right indication**
  - Home or frequent administration- tunneled cath. Or port or picc
  - Inpatients – PICC better than untunneled catheter

- **Right flush technique**
  - start/stop method – short bolus of saline repeated (2mls) producing turbulent flow
  - Saline or taurolidin stopper (no more heparin)

PICC or port?

- indikation (who decides)?
- purpose
- Estimated time of use

- Nursing (PICC weekly, port every 6weeks)
- Swimming, sports, activities?
- Risks evaluation
- Availability (team, economics etc.)

PICC or port – length of use

- chemo 3-6 months (till a year)..... PICC
- chemo longer than 4-6 months .....port, PICC port

Economics (czk- ZUM)

PICC	port	PICC port
Cost 4884,-	Cost 5900,-	Cost 6400,-
(incl. Securacath, glue, ECG lead)	mikro 7700,-	
Implantation 1090 points	Approx. 1000 pts.	Approx. 1000 pts.

Nursing cost complex (material, time...)

PICC	port
desinfekce, rukavice, tampony, proplach, lepení , bezjehlový konektor 53,50Kč	desinfekce, sterilní a obyč. rukavice, tampony, proplach, lepení, jehla 54,60Kč
četnost 4x???	četnost 1x
celkem 214,-Kč	celkem 54,60Kč
	jehla s křidélky 117,50Kč
vykazujeme ošetření PICC 09237...45b.	
á týden???	
	odběr – jehla 30,-Kč

Summary: what is right (state of the art) in venous access in 2023?

- Appropriate access, indication
- Right indroduction technique (US guided)
- Check of the catheter tip position
- Complication audit and multidisciplinary skilled and experienced team
- "vascular team"?

- Right funcion, minimal burden

Thank you for attention