Accuracy of imaging techniques in the detection of pulmonary metastases

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What is it?
We need excellent imaging

- Every newly detected pulmonary nodule requires CT – no doubts

Merry CM et al. Chest 2004; 125; 2175-82.
What can we do for nodules < 10mm?

- **Cytology**
- **Fiberobronchoscopy including EBUS, miniprobes or bronchonavigation**
- **FNAB**
- **PET/CT ?**
- **Ask thoracic surgeon**

Tan B.B et al. Chest 2003; 123 (1); 89-96.
Important features differentiating between malignant and benign lesions

- Size, density, margins' shape
- HU or SUV value
- Calcification type
- VDT

Radiology 2000; 214; 73-80.
A J Roentgenol 2002; 178; 1053-57.
Probably malignant

- Size,
- „Corona radiata”,
- Upper lobe location.

Probably malignant

- < 10 mm  0, 69% - 5,0%
- 10 – 19 mm  - 25,0%
- 20 – 30 mm  - 33,0%

Radiology 2003; 226; 756-61.
J Thorac Cardiovasc Surg 2004; 128; 254-59,
Type 1: round


Malignant in 34 %
Type 2: lobulated

Malignant in 82%

Type 3: densely spiculated

Malignant in 97%

Type 4: ragged


# Malignant in 93%.
Type 5: tentacle and polygonal

Malignant in 80%
Type 6: halo


- Malignant in 100%.
VDT: $V = \frac{4}{3}\pi r^3$

- $40 \text{ days} < T_1 < 360 \text{ days}$: malignant
- $T_2 > 480 \text{ dni}$: benign

Enlargement of the diameter from 8 mm to 10 mm means doubling of the volume
No size changes in CT

- Stable size for 2 years -
  65% probability of benign nature

Am. J. Roentgenol.: 1997; 168; 325-28
Probably benign
Clinical features suggesting malignancy

- Age > 50 yrs,
- Long term smoking or asbestos exposure
- Medical history:
  - regarding patient,
  - regarging patient`s family.

J Natl Cancer Inst 2001; 93; 277-83.
Radiology 2003; 226; 756-61.
81 years old patient – 3 years after laryngectomy
Sigmoidectomy 9 months ago. PET/CT 4 months ago - SUV 3.5. Now - SUV 4.3. Resected: tuberculoma.
21-years old lady after resection of Ewing sarcoma. CT – three small nodules in the right lung. Resected – all benign
16-year-old girl with Ewing history. Resected - metastasis
How to identify the tumor?
How to identify the tumor?
Type 1 by Noguchi: homogeneous in density. „Pure ground –glass opacity” (GGO).
Type 2: - homogeneous increase in density. Semiconsolidation.
Type 3: - heterogeneous in density. Solid component < 50% + GGO halo
Type 4: - Mixed, heterogeneous in density. Patterns of solid component and GGO.
Type 5: - predominantly solid component +
surrounding GGO < 50%.
Type 6: - pure solid.
Back to imaging
Sensitivity

- **CT slices 5mm**
  - Lesion
    - 10mm – 100%
    - >6mm – 95%
    - <6mm – 69%

- **CT slices 3mm**
  - Lesion
    - All lesions 89%
    - 1 – 4 mm 75%

Pfannschmidt 2008
Accuracy

Less lesions visible than palpable (% of nodules missed by CT)

- Margaritoria 2002 18%
- Parsons 2004 22%
- Parsons 2007 46% !!!
- Kayton 2006 12%
- Eckardt 2014 21%

Average 22%
Is therefore VATS less useful than thoracotomy for metastasectomy?

Metaanalysis:

- 235 VATS
- 311 thoracotomy

Long term survival:

- 1yr, 3yrs, 5yrs – NO DIFFERENCE

Nevertheless

- VATS should be reserved for single mets
- CT slices should not exceed 3mm plus volumetric measurement and image reconstruction
- Aggressive primary tumors require regular and frequent CT scanning (first CT 4-6 weeks after resection)

Thank you for your attention