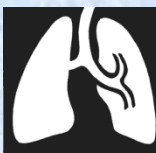


Pleural diseases

prof. MUDr. Miloslav Marel, CSc.,
as. MUDr. Libor Fila
Pulmonary Department 2nd
Medical Faculty, Charles
University, Prague

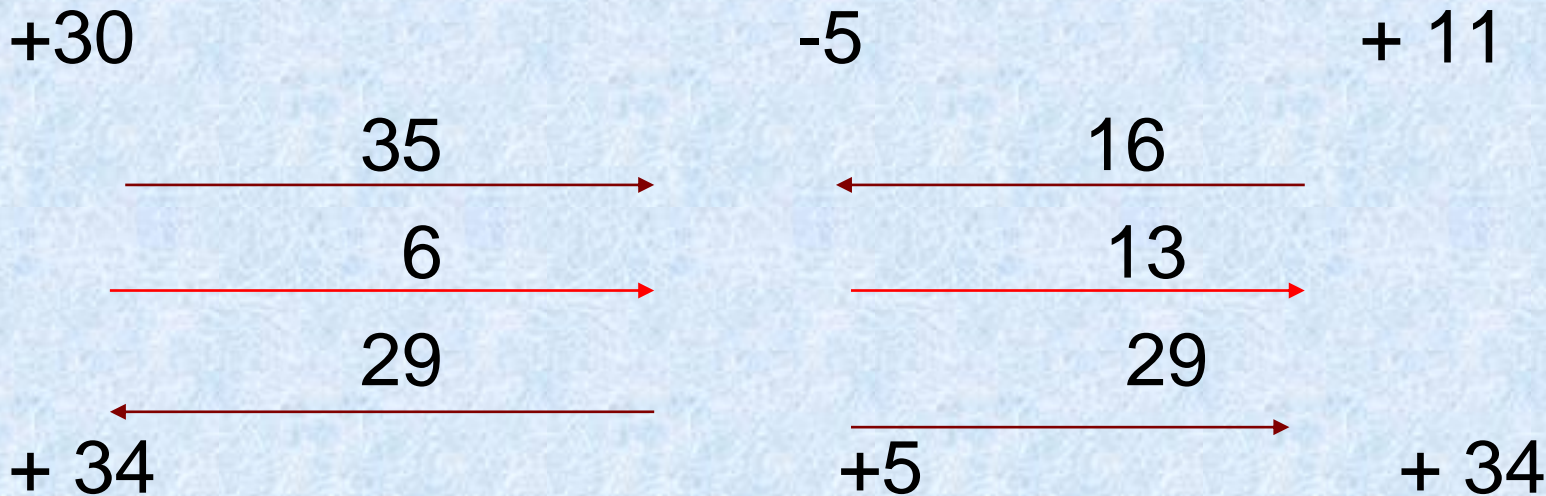


Definition

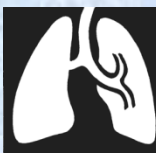
- More than 10-20 ml effusion in pleural cavity
- Increase production and decline resorption

Parietal.p. Pleur.fluid Visceral.p.

hydrostatic pressure

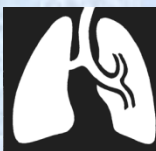


oncotic pressure



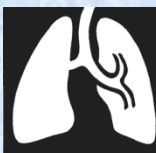
Pathophysiology-1

- Fluidothorax comes to existence if the resorptive capacity of pleura is overload (max. 700 ml/day) or pathologically diminished (tumor obstruction of lymphatics) or pathological proces blocked the resorption (koagulated haemothorax)
- Transsudate: increased hydrostatic pressure (cardiac failure), diminished oncotic pressure (hypalbuminémie), diminished intrapleural pressure (atelectázis), transdiafragmatic transport of fluid (ascites), pathological communication (urinotorax)
- Exsudate: increased permeability of vessels (pneumonie), interrupted continuiti of vessels (chylothorax), diminished lymphatic drainage (tumor), pathological communication (pseudocystis of pancreas)



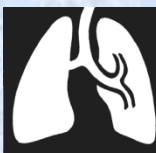
Pathophyziology – 2

- the consequences of pathological process in pleural cavity:
 - lung collapse (PNO)
 - compressive atelectasis of the lung (by effusion)
 - disorder of expandibility of the lung (trapped lung)
 - disorder of movement of the thorax wall (fibrothorax)
 - the flap of the mediastinum (vlání) (open PNO)
 - The translocation of mediastinum on the opposite side of the thorax than is pathological process (ventil type of PNO, rapid developed effusion)
 - sepsis (empyéma), anemia (haemothorax), cachexia and immunodeficiency (chylothorax)
- The consequences: ventilatory and respiratory disturbances and also the circulatory and metabolic disorders



Physical examination

- Decreased or absent breath sound
- Pleuritis sicca: pleural rub plus local pain
- Fluidothorax: larger hemithorax, tactile fremitus is absent
- percussion is dull
- splash during shaking with patient,
- near the superior border of the fluid breath sound may be accentuated (Škodův note) and diminished compressive breathing
- PNO: perccusion note is hyperresonant, breath sound is absent or reduced, absent tactile fremitus, the side of PNO is larger than contralateral side and moves less during respiratory cycle
-
- Fibrothorax - smaller hemithorax, reduced breath sound - haemothorax



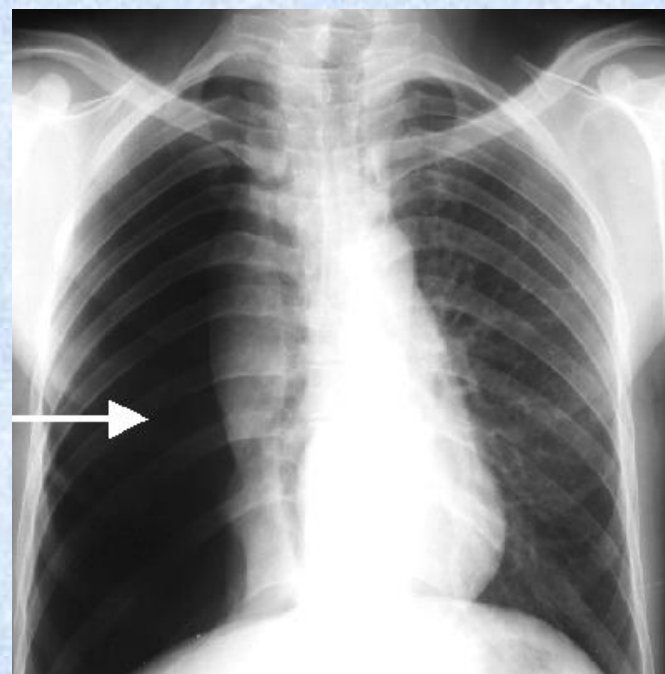
Radiographic examination

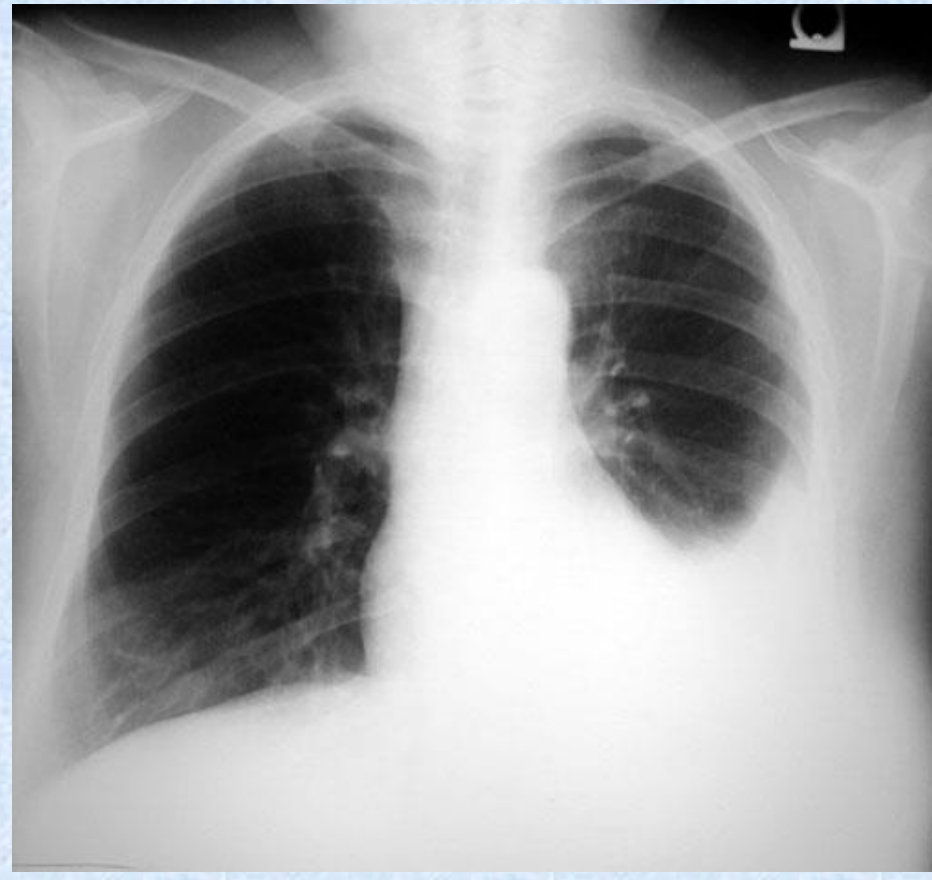
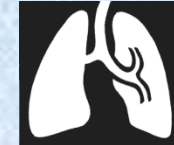
- **Fluidothorax:**
 - the lung float in the pleural fluid
 - fluid gravitates to the base of the hemitorax, particularly posteriorly
 - the lateral costophrenic angle is obliterated
 - the density of fluid is high laterally
 - lateral projection- the upper surface is semicircular high anteriorly and posteriorly, the shape changed according the position of the patients
 - AP 200 – 500 ml, lateral 50 – 100 ml, Riegler projection 20 ml
 - fluidothorax large (> 50 %) + mediastinum shift, middle (25 – 50 %) small (< 25 % hemithorax)
 - encapsulated fluid at the chest wall and in the interlobium (spindle shaped)
 - subpulmonal effusion



Radiographic examination -2

- **PNO:**
 - air accumulates in the highest part of the thoracic cavity - early kolaps of he upper lobes
 - lungs become smaller, thorax larger
 - density of the lung increases when the lung loses 90% of its volume
 - on the X ray may be seen the visceral pleural line and strip of the air without parenchymal structures
 - better seen in maximal expiration
 - fluidoPNO: horizontal level of the fluid
 - cave: skin folds may mimic a pleural line
 - diagnostic PNO- lung cancer infiltration of the wall, diaphragma and mediastinum

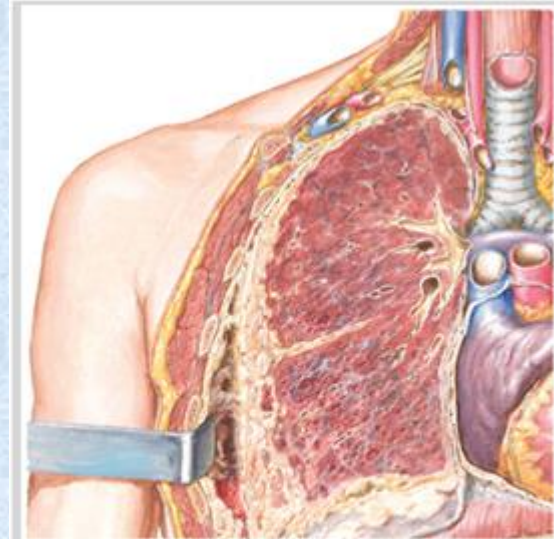






Radiographic examination - 3

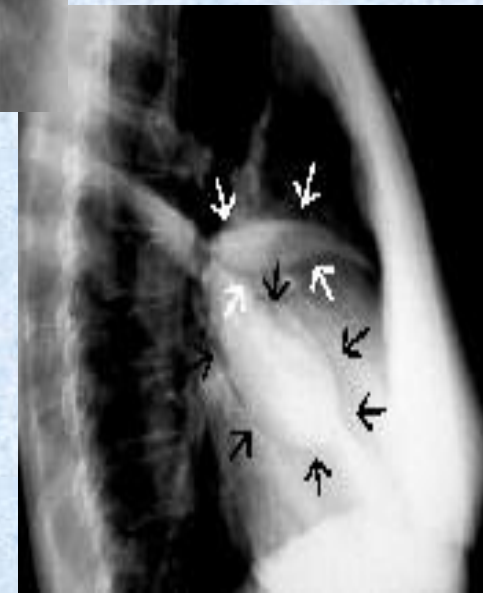
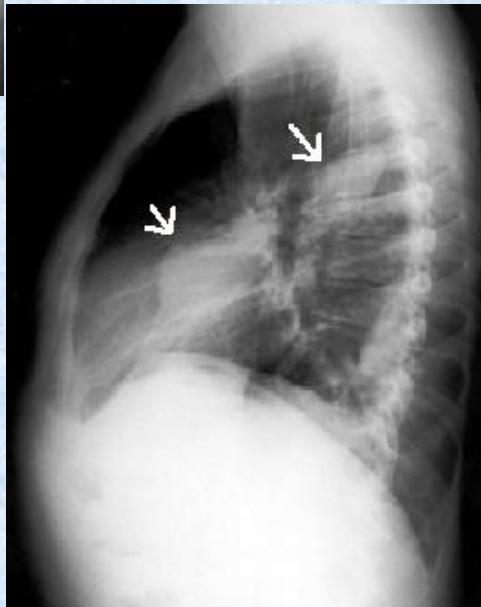
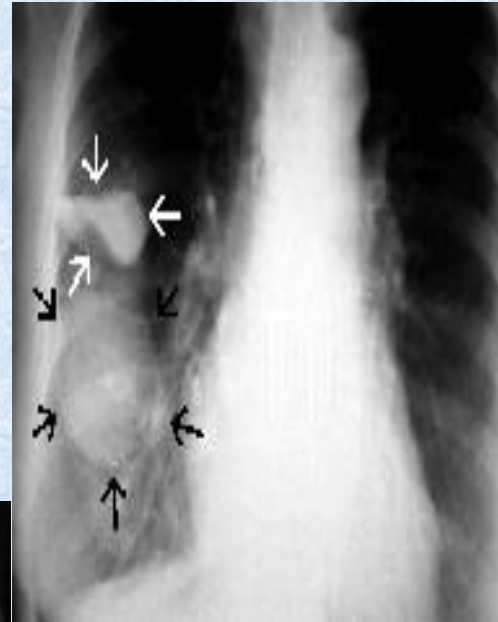
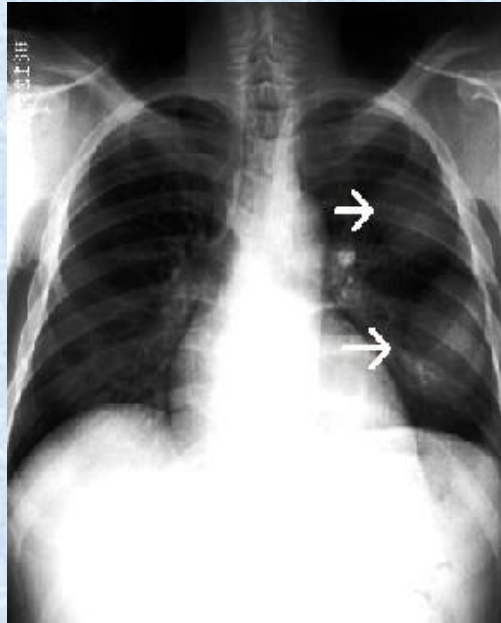
- **Pleural masses:**
 - diffuse (>1/4 chest wall) or local
 - nodular or surface
 - solitary, sharply defined - benign mesothelioma
 - malignant mesotheliomas encases the lung and mediastinum shifts to the side of the effusion, retraction of the hemithorax
 - bilateral changes : asbestos ; unilateral- after hemothorax, empyema, TB
 - rounded atelectasis in pleural scarring and pleural plaque - asbestos, „comet tail sign“ (deformed vasculature and bronchi from focus to hilar region)



Neoplastic growth encasing right lung, infiltrating interlobar fissure, and invading parietal pleura and pericardium. Hemorrhagic fluid in remainder of pleural cavity, Asbestosis of lung.



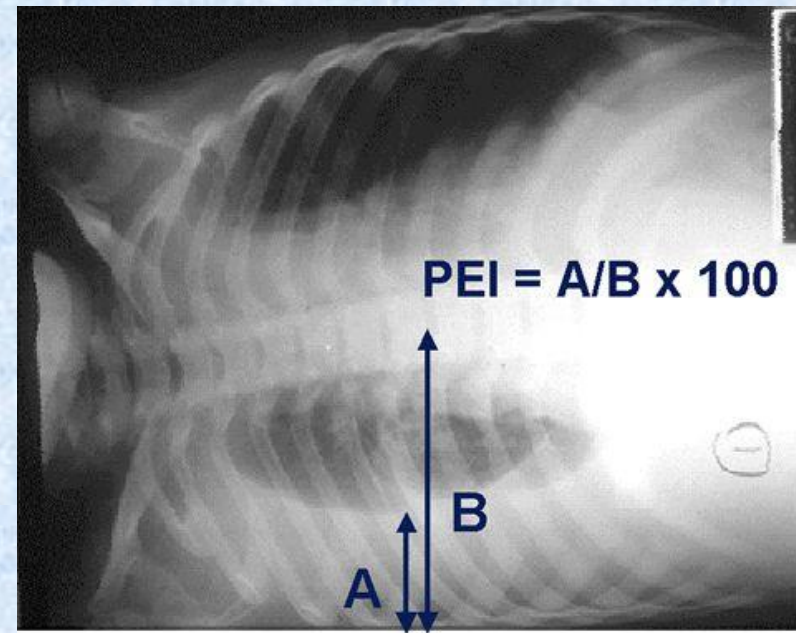
Interlobar pleural effusion





Rtg. effusions - 2

- eff. paramediastinál, simulation of atelectázis middle lob.
- Loculated eff. - adhesion between viscer. and pariet. pleura, hemotorax, empyem, tbc. . D- shaped effusion, no air bronchogram- dgn UZ
- Interlobular. Eff.- cardial – pseudotumor, i
- *Rigler, Fehre - laterogram*





Pyopneumothorax vs absces



- pyopneumothorax při br - pl. píštěli versus plicní absces (CT, UZ). Při hyperventilaci UZ prokáže protichůdné pohyby viscer. a pariet. pleury pokud je proces v pleur. dutině a symetrické pokud je v plíci (absces). CT může prokázat útlak plíce empyemem což nečiní absces, CT s kontrastem prokáže cévy v parenchymové lézi, ne v pleurální

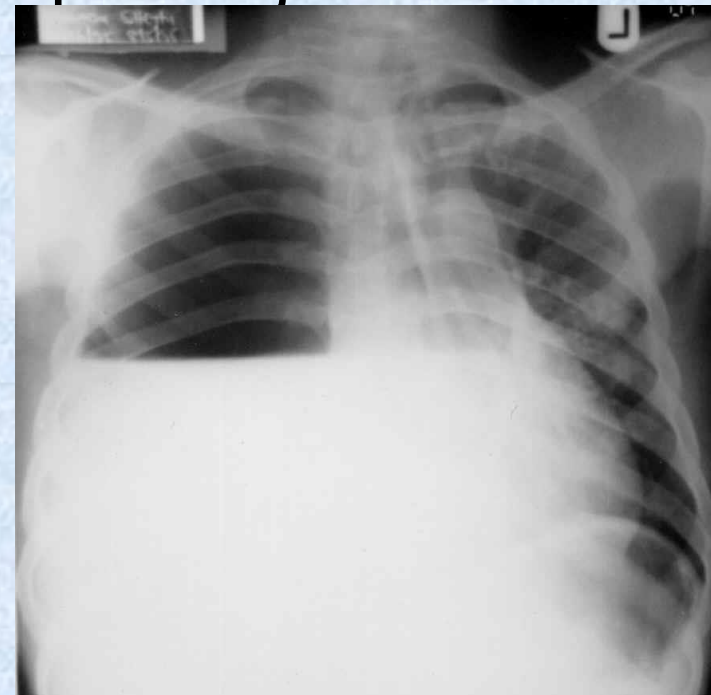




Figure 4 CT scan of left empyema with pleural enhancement (a) and suspended air bubbles (b).

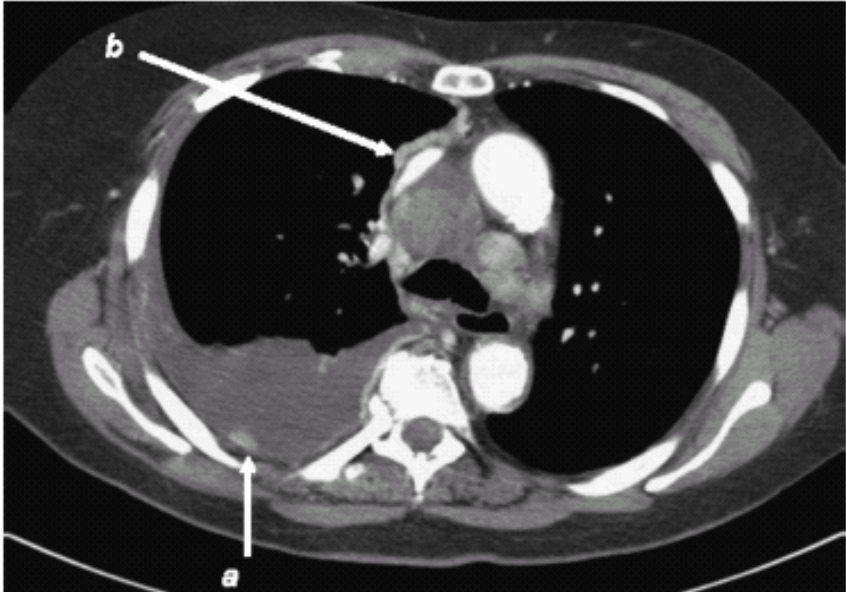
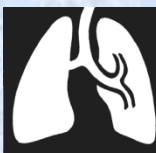
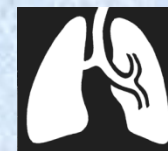


Figure 5 Right malignant pleural effusion with enhancing nodular pleural thickening (a) extending over the mediastinum (b).



Ultrasound

- Sonds 3,5 -5– 7 MHz, bedside, without radiation
- **PNO**
 - also small PNO in lying patients
- **Fluidothorax**
 - 50 – 100 ml
 - appropriate location for thoracentesis or drainage
 - fluid loculation
 - fluid versus pleural thickening
 - lung absces versus empyema with bronchopleural fistula
- **Pleural masses**
 - are seen of the 5 mm size
 - biopsy under sonogr. control

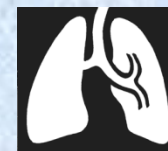


CT and HRCT

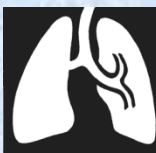
- Distinguish according the density - air fluid and tissue (fat, calcification), with contrast, biopsy under CT control
- PNO: also very small PNO in lying (ventilated patients, polytrauma), PNO versus bulae
- Fluidothorax- 20-50 ml, also in interlobium distinguish fluid subpulmonalis versus subphrenic
- Hemothorax: density of coagula,
- Chylothorax density of fat
- Malignant effusions: postcontrast better seen pleural masses



CT and HRCT –2

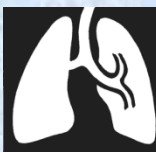


- Empyema: postcontrast seen pyogenic membranae, may distinguish encapsulated empyema (spindle, obturated angles, , shifted vessels and bronchi) from peripheral lung absces, drainage under CT control in encapsulated empyemas
- Pleural masses: HRCT is better to discovered pleural plaques, CT better in case of lung cancer - staging (invazion to the chest wall, diaphragma and mediastinum, existence of fluid);
- in mesotheliomas evaluated thickness of the pleura (included mediastinal pleura and interlob. pleura), of the fluid, calcification , invazion and retraction changes, enlargement of the lymphatic nodules . No definite distinguishing of the benign and malignant tumors.



MRI and scintigraphy

- **MRI:**
 - no radiation, not necessary iodine contrast media
 - expensive, no in patients with metallic protezes and claustrophobic
 - long duration of the examination, worse distinguishing then modern CT
 - better imaging of the soft tissue of the thorax delineation of the vessels and tracheobronchial tree: infiltration of the chest wall by tumors
 - distinguish the tissue and fluid
 - identifying of haemothorax that has been present more than a few days
- **Scintigraphy:**
 - ventilatory scan (^{133}Xe) to evaluation of BP fistula
 - PET scan to distinguish metastases to pleura



Thoracentesis

- Dg and th method in PNO a fluidothorax
- Dg: to obtained fluid to examination, therapeutically to enabled reexpansion of collapsed lung
- Th: symptomatic evaluation of the fluid in dyspnoic patients (thick needle, local anesthezia)
- Technic: et the upper edge of the lower rib !
 - in PNO - patients halvesitting, punction in 2. – 3. intercostal space in the medioclavicular line
 - in evacuation of the fluid - sitting patients, punction mostly in the scapular or axilar line, 2. intercostal spaces under the upper line of the fluid - no tactile fremitus,, in encapsulated effusion image-guided punction , in a small effusion only if the lateral decubitus position proves the thickness of the fluid more than 10 mm

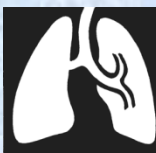
Thoracentesis -

2



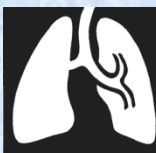
Th puncture: evacuation of 1,0 – 1,5 l,
also by aspirator (no negativ intrathoracic pressure then –20
cm H₂O: reexpansion edema)

- Dry puncture : no fluid, bad localisation, , bad technic, obese patients (short needle)
- complications: PNO, infection, bleeding, collapse , cough, dyspnoe, pain, puncture of the liver or spleen
- Contraindication: hemoraggy status - PLT under 50 000 ??, noncompliance of the patients, higher creatinine, relative: artef. ventilation ??
- control RTG after puncture??? PNO ?? Symptomatic in most cases



Pleural fluid

- The gross appearance:
 - transsudates: clear, straw-colored; urinothorax smelt like urine
 - exsudates: straw color, reddish color, turbidity
 - haemothorax: haemorrhagic - HTK more than 20 or more than 50% of HTK in blood
 - empyema: thick, turbid, , green, yellow, smelly, supernatant is clear
 - chylothorax: milky turbid , in supernatant turbidity remains
 - chocolate sauce - amebiasis with hepatopleural fistula
 - black colour - aspergillus
 - high viscosity, sometimes bloody – malignant mesothelioma



Prof R.W.Light

St. Thomas Hospital, Nashville, Tennessee, USA

1972 „Light“ criteria to distinguish exsudates from transsudates.

At fullfilling of one or more criteria as acts of exsudate;
transsudates do not fullfill any criterium

(F - fluid, S - serum, F / S - ratio)

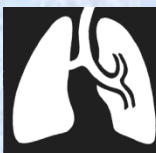
- 1) F/S total protein > 0,5
- 2) F/S lactatedehydrogenasis > 0,6
- 3) F lactatedehydrogenazis > 2/3 upper limit in serum

„ too stricts for transsudates“

Ref. Ann. Intern. Med. 1972, 77, p. 507-513

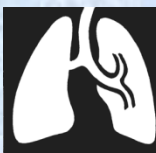


Further criteria to distinguish Transsudates/Exsudates



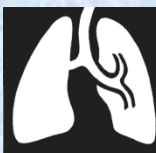
- Tot. protein over 30 g/l bears witness for exsudat
- Tot. protein S minus Tot. protein F over 31 g/l bears witness for transsudate (*gradient*)
- ALB S minus ALB F over 12 g/l bears witness for transsudate (*gradient*)
- cholesterol over 1,55 mmol/l in F - exsudate
- cholesterol_{F/S} > 0,3 -exsudate
- bilirubin index: fluid/ serum is in exsudates over 0,6
- *Czech Toušek 1960 recommended to examine Tot Protein in F and also in S , Cholesterol S/F over 16= transsud, about 2= exsud, LDH highest in empyemas and malignant effusions*





Examination of patients with pleural effusions

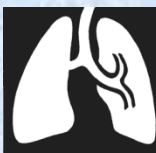
- Anamnesis - GIT, heart, surgery, trauma,...
- Physical examination:- fremitus pectoralis
- RTG, CT, sono 3,5-7 MHz
- thoracocentesis 1-1,5 litre , no more.. More than minus 20 cm H₂O dangerous , 10% PNO
- Fluid examination – pH under 7,2 risk of empyema, under 7,0 drainage necessary, also when is glucosis under 2,2 mmol/l, LDH over 16,7ukat/l
- TAG over 1,24mmo/l- chylothorax, ADA over 45 U/ml, TB- ADA2



Pleural fluid - 3

Biochemistry cont.:

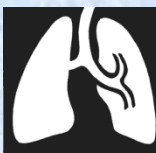
- pH, glucose and LDH: markers of inflammation event. tumor in pleura space (pH and glucose lower; LDH higher) , to compare with pH in blood
- pH low in reumatoid effusions, normal in SLE.
- Higher ADA and , IF- γ : markers in TB
- Triglyceride increases in chylothorax, more than 110mg/dl, to examine in every unexplained effusion
- Amylase- increase in acute and chronic pancreatitis and in ruptura of oesophagus and in about 10% adenoca
- Hematokrit in fluid for verification of hemothorax (>50% HTK of the blood) or more than 20
- Cholesterol: increase in pseudochylothorax – long lasting TB effusion



Pleural fluid - 4

Microbiology:

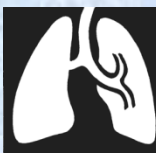
- nonspecific pathogens:
 - microscopy
 - cultivation including anaerobic
 - detection of bacterial antigen
- MTB:
 - microscopy
 - cultivation including the accelerated methods
 - genetic methods (PCR, MTD)
- Mycotic infection - rare
 - microscopy
 - cultivation



Cytology of the fluid

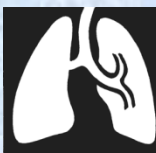
Cytology:

- May-Grünwald-Giemsa staining – tumor effusions PAP IV – V, predominance of polymorphonuclear cells, lymphocytes or mesothelial cells
- Leucocytes kvantitative and also differential : eosinophilic effusion (>10% EF in the first puncture) and plasmocytic effusion (>5% plasmocytes)
- Electron microscopy (mesothelioma)
- Immunohistochemistry CEA, HMFG -1 (tumors)
- Flow cytometry –quick measurement of nuclear DNA - aneuploidy in 75% adenocarcinomas
- Chromosomal analysis - tumors



Cells in pleural fluid

- Polymorphonuclear cells: bacterial infection, pulmonary infarctus, trauma, pancreatitis, PNO, in the early stage of TB,
- Eosinophils: presence of blood or air in pleural space; allergy, parasites, viruses, fungi, asbestos, Churg - Strauss syndrome; rare in TB and tumors
- Lymphocytic picture: TB (<0,5% mesothelial cells), tumors, viruses, pulmonary embolisation, postcardiac injury syndrome
- Lymphocyto-mesothelial: transudates, tumors
- Mesothelial picture: tumors
- Erythrocytic predominance : tumors, pulm.infarctus, trauma

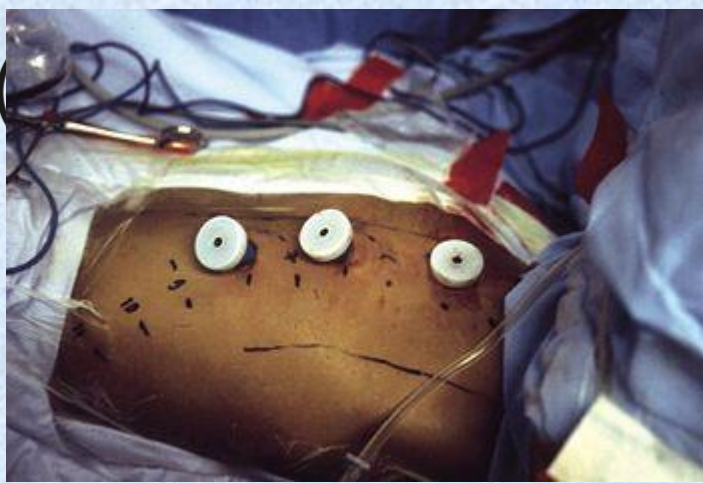


Needle biopsy of the pleura

- In suspicion to TB or tumorous etiology of effusions, no success of cytology or bacteriology
- Biopsy needle: Abrams, Vim-Silvermanova, Cope, Raja, Trucut
- Biopsy after local anesthesia - more samples more effect, up to six samples, after biopsy control X ray
- Complication: PNO, bleeding, infection, tumor growth in the biopsy channel -mesothelioma
- Contraindication: hemorrhagy status, empyema
- Today more preferable thoracoscopy in indicated cases

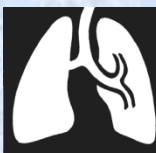


Thoracoscopy



Diagnostic and therapeutical method in disease

- Dgn in those where the noninvasive methods did not bring the solution, especially in suspicion to tumors, TB asbestoz
- Senzitivity: malignant eff.- 95%, TB pleuritis - 99%
- Therapeutic in PNO, infection – empymea, encapsulated effusions, in hemothorax, chylothorax, TB pleuritis and tumorous eff.
- In local anesthesia („medical“); One port- rigid or semirigid thoracoscope, or in general anesthesia – surgical method, selective ventilation of the lungs, video-asisted („VATS“, 3 ports: camera, thoracoscop, forceps)
- During thoracoscopy biopsy, „stappler resection“ of the lung - LVRS (PNO), lysis of the adhesions, , evacuation of the effusion, drainage, debridement, talcage or abrazion of the bullae on the pleura surface , ligation of ductus thoracicus



Thoracoscopy- 2

- Complication: infection, bleeding, air-leak, tumor growth to the chest wall, subcutaneous emphysema, arrhythmie
- Contraindications: obese patient (short ports), bad function of the lung (incapability to ventilate one lung), adhesions after pleurodesis, hemoragical status
- Conversion to thoracotomy: 5 – 25% procedure; technical problems, local findings or perioperative complications – bleeding, adhesions, decortication
- Mortality of the VATS 0,5 – 2%

Incidence of pleur. effusion in USA- estimation by prof Light

Type of effusion	abs. number
1. cardiac failure	500 000
2. bacterial pneumonias	300 000
3. malignant illness	200 000
lung	60 000
breast	50 000
lymphomas	40 000
other	50 000
4. pulm. embolization	150 000
5. viral pneumonias	100 000
6. liver cirrhosis with ascites	50 000
7. gastrointestinal diseases	25 000
8. colagenosis	6 000
9. tuberculosis	2 500
10. exposition of azbest	2 000
11. mesothelioma	450

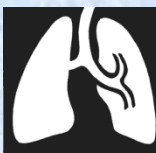


Epidemiological study 1988

Type:					<i>n</i>	%
Cardiac	.	.	.	.	65	45,8
Tumorous	.	.	.	.	31	21,8
Pneumonic	.	.	.	.	24	17,0
Embolization	.	.	.	.	8	5,6
Haemothorax	.	.	.	.	6	4,2
Inductive	.	.	.	.	4	2,8
Uremic	.	.	.	.	2	1,4
Myxedéma	.	.	.	.	1	0,7
Reumatoid	.	.	.	.	1	0,7
					<hr/>	
					142	100

Incidence of pleur. effusions in region - 0,32% population / year

Marel, M. et all: The Incidence of Pleural Effusion in a Well-Defined Region - Epidemiological study in Central Bohemia. CHEST, 1993,104,1486-89



Clinical manifestations and useful tests

- Symptoms
 - pleuritic chest pain
 - nonproductive cough
 - dyspnoe
 - also asymptomatic (up to 23%)
- Symptoms of the basic disease
 - cardiac heart failure, pneumonia, pulm. embolia, malignancy, TB, reumatic disease, GIT disease, trauma
 - occupational exposition (asbest)
 - iatrogenn. influence (chest and abdominal surgery, instrumental procedures in oesophagus and great vessels)

Diferential diagnosis of pleural effusions

I. Transsudates

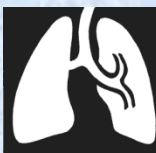
1. CHF
2. Ci hepatis
3. Nefrotic sy
4. Glomerulonefritis
5. Myxedéma
6. Pulmonary embolisation (20%)
7. Sarkoidosis

II. Exsudates

1. Metastatic tumors
2. Prim. Pleural tumors
3. Infection
 - Nonspecific. Bacterial Infection
 - Tuberculosis
 - Viral
4. Gastrointestinal disease
 - Pankreatitis
 - Subphrenic absces
 - Esophageal perforation
 - Dia-phragmatic hernia
5. Pulm. Embolisation (80%)
6. Colagenosis
 - Reumatoid pleuritis
 - SLE
 - Wegener granulomatozis
7. effusion after drugs
 - Nitrofurantroin
 - Methylsergid
 - Procarbazin
 - Methotrexat
 - Practolol
8. Varias
 - Expozition to asbest
 - Uremia
 - actino therapy
 - Meigs syndrom
 - Post heart atacs syndrom
 - Chronic alelectasis
9. Hemothorax
10. Chylothorax
11. Idiopatic



Clinic - X ray – pleural effusion



Lateral projection

Fluid more 10 mm

yes

no

Dgn. thoracentesis

Follow up

Are fulfilled this criteria?

F/S t.protein > 0.5

F/S LDH > 0.6

F LDH > 2/3 upper limit s.

yes

no

exsudate

transudate

Appearance of fluid, cytology, pH
Amylaza, glucose, bakteriology, MTB

Bronchoscopy, V/P scan, cytology

Biopsy of pleura, tumor markers, cytology

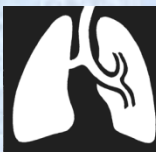
Toracoscopy

Toracotomy

CHF?
Ci of the liver?
Kidney disease?
Embolia (20%)?
Sy VCS ?
Meigs.sy?



Tuberculosis



Sure dgn:

- 1) MTB cultivation positive from fluid ev biopsy of pleura
- 2) MTB cultivation positive from sputum plus existence of pleur. fluid
- 3) Histology proved TB granuloma in pleural biopsy

Probable dgn:

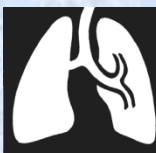
- 1) Exsudate
- 2) Mx positive
- 3) cytology – predom. lymphocytes, rare mesothelial cells
- 4) Exclusion of other reasons

Fig.1 (05.10.05)



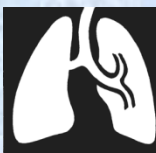
Fig.2 (21.04.06)





TB pleuritis

- TB antigen in pleural cavity – hypersensitiv. reaction
CD4..neutrofils.. makrofages.. Production of gama interferonu from T-helper typ I lymphocytes
- Bk mp under 5%, kp 24-58%, pleur. biopsy? Inductive sputum pozit. up to 52% in Tb pleuritis
- Nonspecific inflammatory markers: ADA 2 isoenzym 31 studies n=4738, senzitiv 92% specificita 89%. ADA in TB over 45 U/ml. Cytokines- IFN-gama senzitiv. 89% specific. 97%, better than ADA
- Specific markers of imunnity reaction: IGRA test – gama IFN from T_H1 cells after stimulation by Mycobakt. TB, not after Mycobact.bovis!! . Detekction of sequences DNA from MykoTb.- amplification methods - 40 studies proved them in fluid, specificity 95%, senzitiv 43-77%
- Diferentiation between TB and malignant eff. -model: ADA over 40, age under 35, fever over 37,8, erythrocytes in fluid under 5×10^9 , senzitiv 96% specificity 92%, other model: ADA, gamaIFN, a PCR
- *ERS journal 2008.*



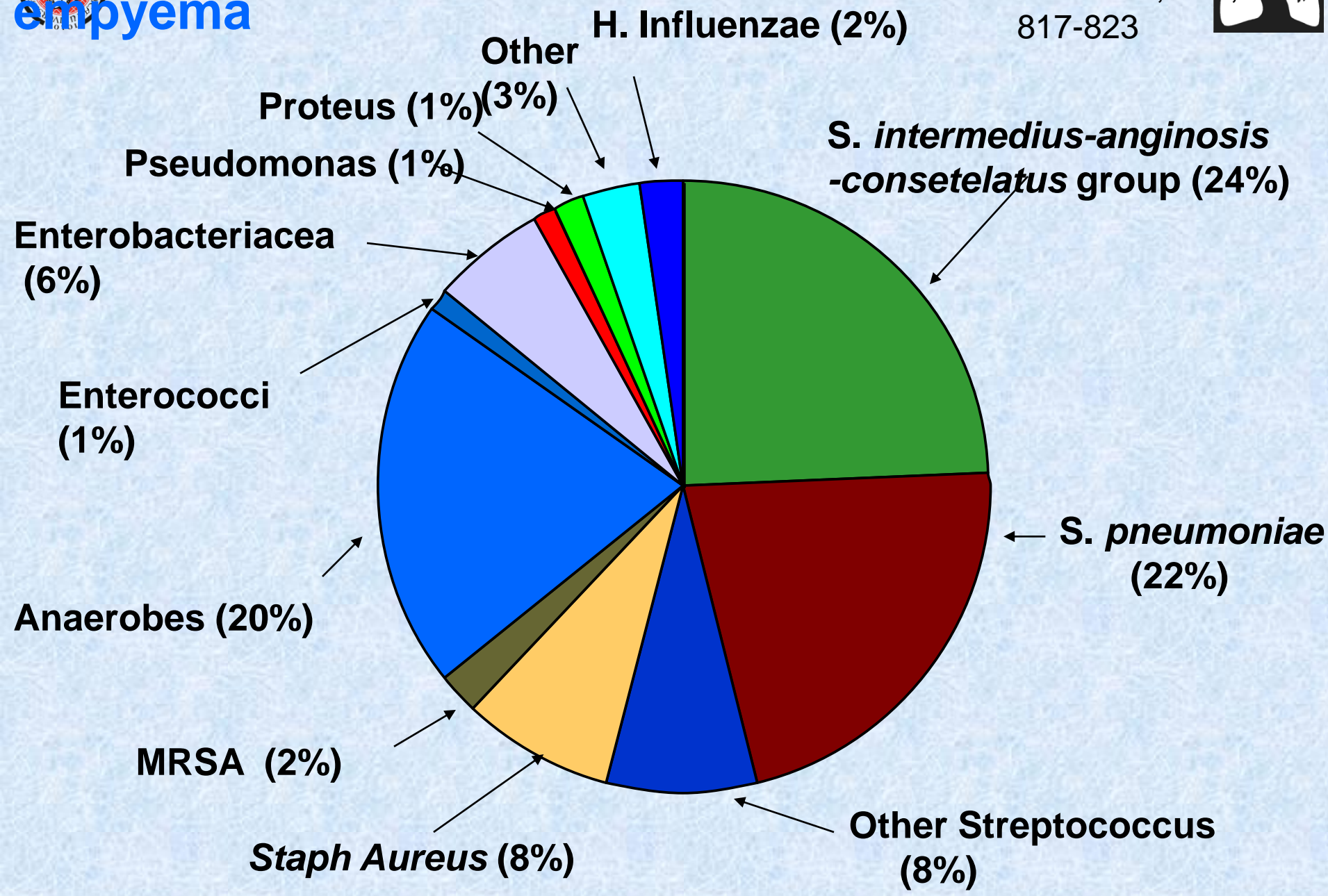
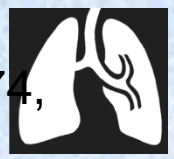
Empyema of the chest

- 1) Pus in the pleural space
- 2) Cytology – destroyed polymorphonuclears
- 3) pH low, glucose low, LDH high, aerob., anaerob. cultivat.
- 4) Basic disease, immunocompromised

Community acquired empyema

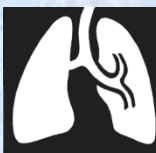


AJRCCM; 174,
817-823





So which antibiotics should we be using empirically ?

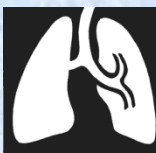


Community acquired empyema

- Cefuroxime 1.5g tds + Metronidazole 400mg tds
- Clindamycin 300mg qds po + Ciprofloxacin 500mg bd

Hospital acquired empyema

- Vancomycin 1g bd + Meropenem 1g tds
- Teicoplanin 400mg bd for 3 doses then 400mg daily and Meropenem 1g tds



Fibrinolytics

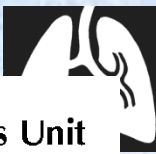
- Indication: lysis of a fibrin adhesions, debridement fibrinopurulent plague on pleura and lysis of coagula – infected effusions, hemothorax
- streptokinase 250 000 UI. or urokinase 100 000 UI
- Instillation through drain in 20 – 100 ml saline in 2 – 4 hours
- 1x daily, 3 – 5 (– 14) days
- Success in 85 – 90 %
- Infected effusions in early phases ,if no success then thoracoscopy (in 2 – 3 weeks) or thoracotomy (in 4 – 6 weeks)
- In hemothorax, in the start of treatment only drainage, safety time for instillation of fibrinolytics are 2 days



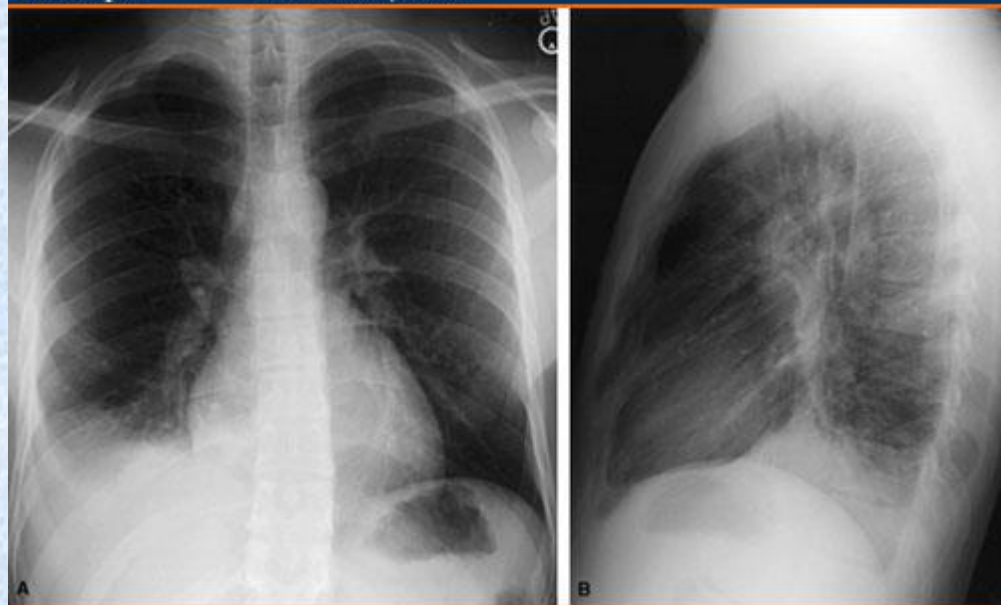
Conclusions

MRC
Medical Research Council

Clinical Trials Unit



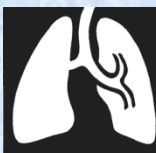
- Antibiotics
 - monotherapy only for pneumococcal proven disease
 - probably no need for erythromycin
 - usually add anaerobic cover
 - hospital disease – MRSA, coliforms and anaerobic infection
- Intra-pleural drugs
 - more trials blinded to radiology



Parapneumonic effusions

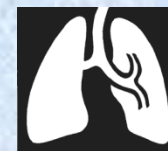
- 1) Pneumoniae, absces, bronchiectasie
- 2) Cytology – polymorphonuclears
- 3) pH low, glucose low, LDH high

2007, CHEST 131,1442: Pneumococcal antigen in pleural fluid proved by quickly imunochromatograph. test was in 24 from 34 pts with pneumocoal pneumonia pozitive



Cardiac hydrothorax

- 1) Transsudates
- 2) Cardiac failure
- 3) Afebrile, no pleural pain
- 4) Cytology – various, mesothelial predominance, lymphocytes, low cellularity



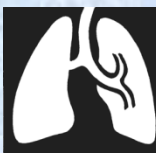
Effusions by pulm. embolisation

- 1) 80 % exsudate, 20 % transsudate
- 2) Lung perfusion scan event.
ventilation scan, event. pulm.
angiography compatible with
pulm. embol.
- 1) clinical picture, exclusion of other
reasons
- 2) Cytology – erythrocyte, eosinophils,
lymphocytes

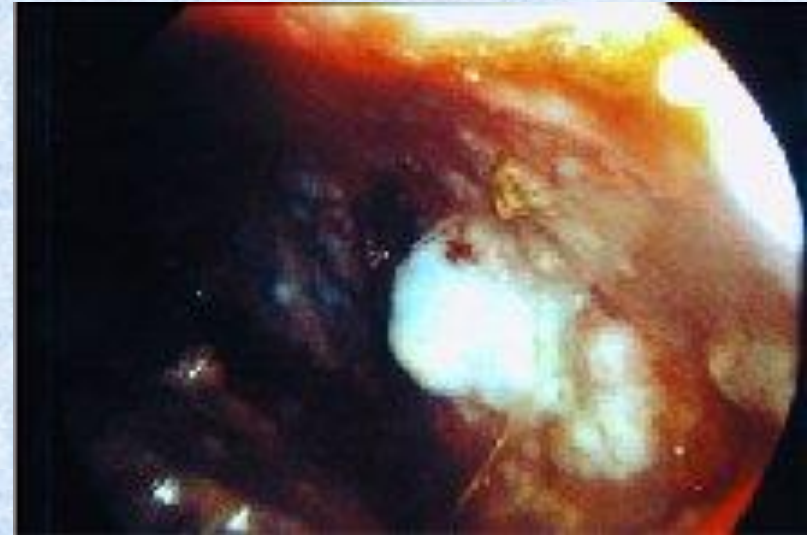
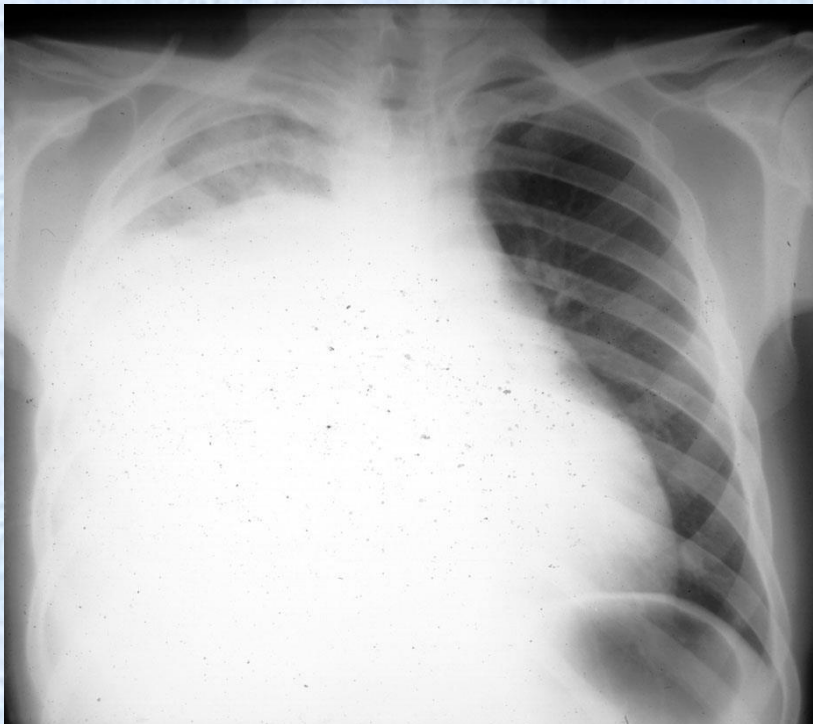


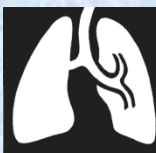


Malignant pleural effusion



- 1) Positive cytology (Pap IV, V)
- 2) Biopsy of pleura posit. – blind needle
biopsy (Abrams, Raja...)
- thoracoscopy
- 3) autopsy





Paramalignant effusion

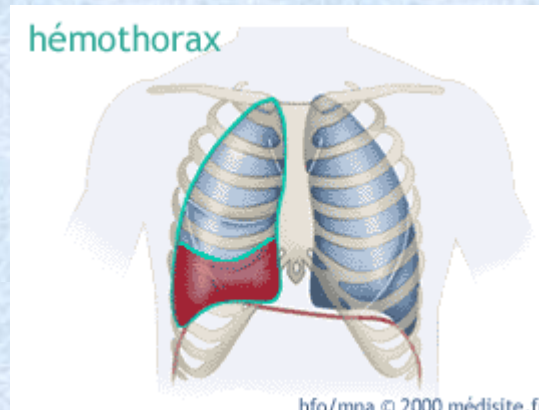
- 1) Intrathoracal malignancy
- 2) Pleural cavity is not directly afflicted by tumor, cytology repeatedly neg., biopsy of parietal pleura negat. ev. toracoscopy nor autopsy do not prove tumor in pleura
- 3) Different pathophysiological mechanics : Obstruction of lymphatics, poststenotic pneumonia, atelectasis, sy VCS, drug adwers reaction



Exsudates - haemothorax



- Hemorrhagic fluid, HTK > 50% htk periferal blood; blood coagula in pleural cavity (surgery autopsy)
- Cases of : trauma , iatrogenic , other- pulm. emboly, PNO, tumors, haemoragical status, aneurysma aortae, endometriózis (catameniál haemothorax), extrameduláry haemopoézis, pancreatic pseudocyst)
- Complication : coagula, empyéma, fibrothorax (organization already after 4 days)
- Dg: thoracocentesis plus SONO or CT control (CT picture with denzity of blood)
- Therapy: ATB; chest drainage or urgent thoracotomy with revizion of the cavity:
- Severe bleeding (> 1000 ml) or prolonged (> 150 ml/h > 3 hours) ; early VATS (in 2-4 days)
development of fibrothorax
breath RHB, event. decortication and pleurectomy

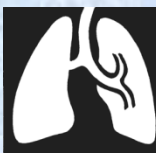




Exsudates - chylothorax

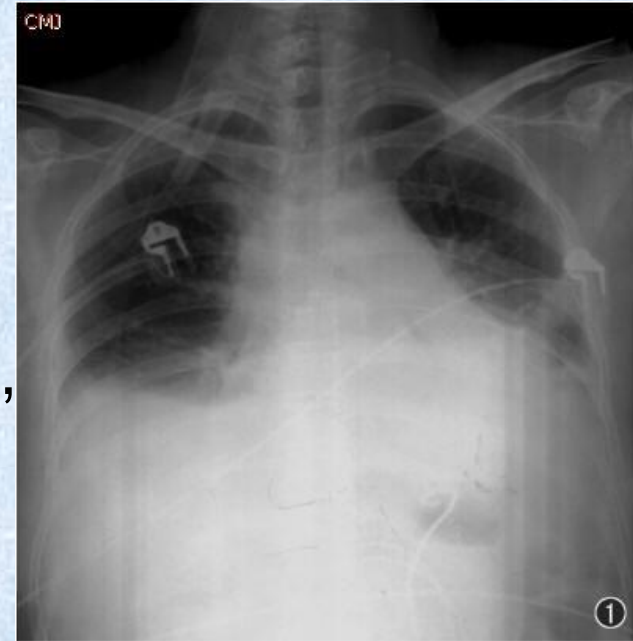


- Milky fluid, TAG $> 1,24$ mmol/l or presence of chylomicrons (elfo lipoproteines examine in TAG 0,55 – 1,24 mmol/l)
- TAG examine in any undiagnosed fluids (transsudate and exsudates)
- Chylothorax 5x time more frequently in right side,
- in dct. thoracicus 1,5 – 2,5 l chylus/day,
- Reasons: trauma in 25%, iatrogenic: surgery, radiotherapy, tumors 54% (mostly lymphomas), other 6% (LAM,), idiopatic 15% (kongenital, Down sy)
- complication: malnutrition, imunodeficit; mortality 10% !
- Dg: CT of the chest, lymfography, thoracocentesis, biopsy of mediastinal tumors
- dif dg macroscopic empyema or pseudochylothorax
- Th: spontane resorption possible, diet , parenterální nutrition, toracocentesis or drainage, pleurodezis, ligation of dct. thoracicus, pleuroperitoneál shunt, pleurectomy



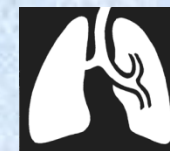
Postcardiac injury syndrom

- Fever, pain, pleuropericarditis, dyspnoe, lung infiltrates, pericardial rub, leucocytes over 10 000, 3 weeks after - AIM, (Dressler), after heart surgery 1-6 months, after chest trauma, after implantation of pacemaker, after angioplastic or bypass surgery
- Incidence: Dressler 1-4%, 17-30% after heart surgery
- Immunology-antibody against action, myosinu
- Th: nonsteroid antiflogistics, corticosteroids.....
- For dgn is important the anamnesis...



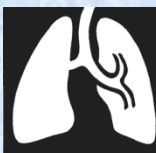


Pleuroperitoneal shunt



- Alternative method of the treatment of fluidothoraxes in patients where is not possible pleurodesis- trapped lung or pleurodesis has failed
- Mostly in malignancy and chylothorax
- In local anesthesia subcutaneous implant two catheters which are connected with small chambers with one way valve (the direction of the flow of the fluid is from pleural space to the peritoneum)
- The patients by the presur to the chambers alone pump the fluid from the chest
- Complication: ocluzion of the shunt, infection, obezity
- No dissemination of the tumor cells to the peritoneum
- In chylothorax improving of the nutritional and imunological status
- Firma Denver Biomaterials, USA (ČR: Euromedical s.r.o.)



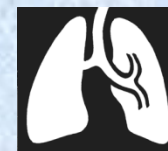


Chest drainage

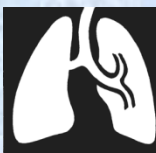
- Indicated for evacuation of the fluid or air from pleural space, especially in infected effusions, haemothoraxes, chylothorax, recurrent and tumorous effusions (pleurodézis),
- After thoracoscopy and thoracotomy, in bronchopleural fistula, preventive drainage in ventilated patients with very high inspiratory pressure (10% risk of tension PNO)
- Drain introduced in lying patients in local anesthesia (elevated chest of 30°, in position on the healthy side) in the 4. – 5. intercostal space in the anterior or middle axilar line, in PNO are pushing ventrocranial in large effusion dorsocaudal
- In encapsulated effusions recommend image-guided drainage
- Fluid spontaneously flows to the bottle or is active aspirated (– 5 up – 20 cm H₂O), Pleurevac



Chest drainage - 2

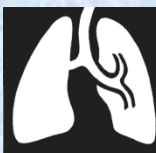


- Large effusion evacuated slowly, optimally with the control of pleural space pressure
- After insertion of the drain to perform chest X ray to verify good position of the drain and then to measure the amount of fluid (à 24 hours., haemothorax more frequently)
- Intrapleural application of the drugs possible - streptokinazis, doxycyklin, antiseptic (Betadin)
- contraindication: obliteration of the pleura space, noncorigated coagulopathie and terminal status; relativ: large adhezion and bullae, ipsilateral pneumonectomy, diaphragmatic hernia
- complications: trauma of the chest organs, subcutaneos emphysema, infection,, bleeding, obturation of the drain, reexpanzive edema,



Pleurodesis

- To prevent reaccumulation of fluid or air in pleural space
- Indication only in symptomatic patients in whom is proved that after evacuation of fluid they are asymptomatic Their lung is expandable and they are not in terminal phaze of incurable disease
- In recidive of PNO, tumor and nontumor effusions including heart congestive failure, liver cirrhosis, chylothorax, postcardiac injury syndrom
- Contraindication is planed transplantation of the lungs (COPD, CF, LAM;)
- Th pleurodesis is done by repeated toracocentesis, chest drainage or VATS



Pleurodesis- 2

- Physical irritation – abrasion, laser, chemical materials - talc, doxycyclin, bleomycin, AgNO_3 , or biological agents - vakcína C. parvum, fibrin, TGF- β .
- Destroying of mesothelial cells – inflammation – activation of hemocoagulation with creating of fibrin adhesions and consequently collagen adhezions
- During pleurodesis is not recomand corticosteroids and also nonsteroidantireumatics
- Effect evaluated after 1 and 3 months; complet response if the status is stabilisated , reacumulation up to 25%, partial respons if reacumulation up to 50%, failure at reacumulation more than 50% of fluid

Types of effusion



	1998	1999	2000	2001	total
malignant	22	21	28	33	104
paramalignant	17	12	15	22	<u>66</u>
					170
Parapeumonic	10	11	12	12	45
Cardiac	2	4	16	8	30
empyem	0	10	3	8	21
TBC	3	0	4	0	7
Posttraumatic	1	2	3	2	8
Postperikardektomy	3	1	0	2	6
Inductive	1	2	1	0	4
Paraembolic	0	1	1	1	3
haemothorax	0	0	2	2	4
chylothorax	1	0	0	0	1
Hepatic	0	0	1	0	1
unclear	2	6	4	8	<u>20</u>
Total	23	37	47	43	150

Indication of pleurodesis in „our“ patients



Pleurodesis in 91 pts from total set of 320 pts

		succes	failure	?	succes in
C. parvum	50x	27	18	5	60%
Bleomycin	6 x	1	3	2	25%
talc	30 x	20	2	8	90%
doxycyclin	25 x	17	3	5	85 %

Adverse event:

	fever	pain	dyspnoe
C.parvum	23%	16%	10%
Talc	0	20%	0
Bleomycin	20%	0	0
Doxycyclin	20%	10%	0