Kirurgisk behandling av kronisk lungembolism och pulmonell hypertension

Vad är CTEPH?

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Effektiv kirurgisk behandling finns vid en särskild form av pulmonell hypertension

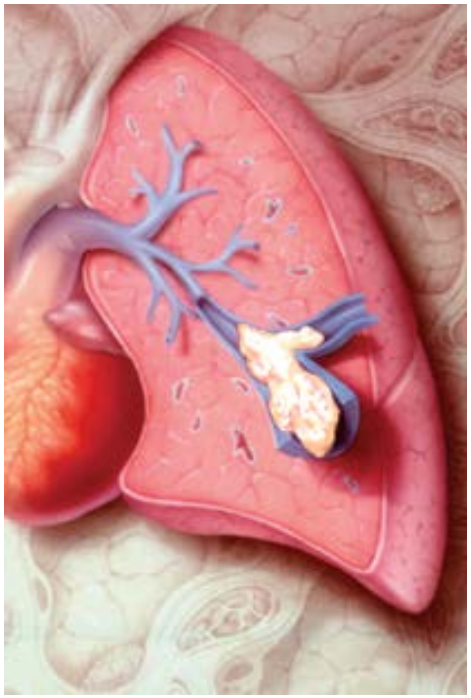
CTEPH: Chronic **T**hrombo-**E**mbolic **P**ulmonary **H**ypertension kallas ofta för **”kronisk lungembolism”**

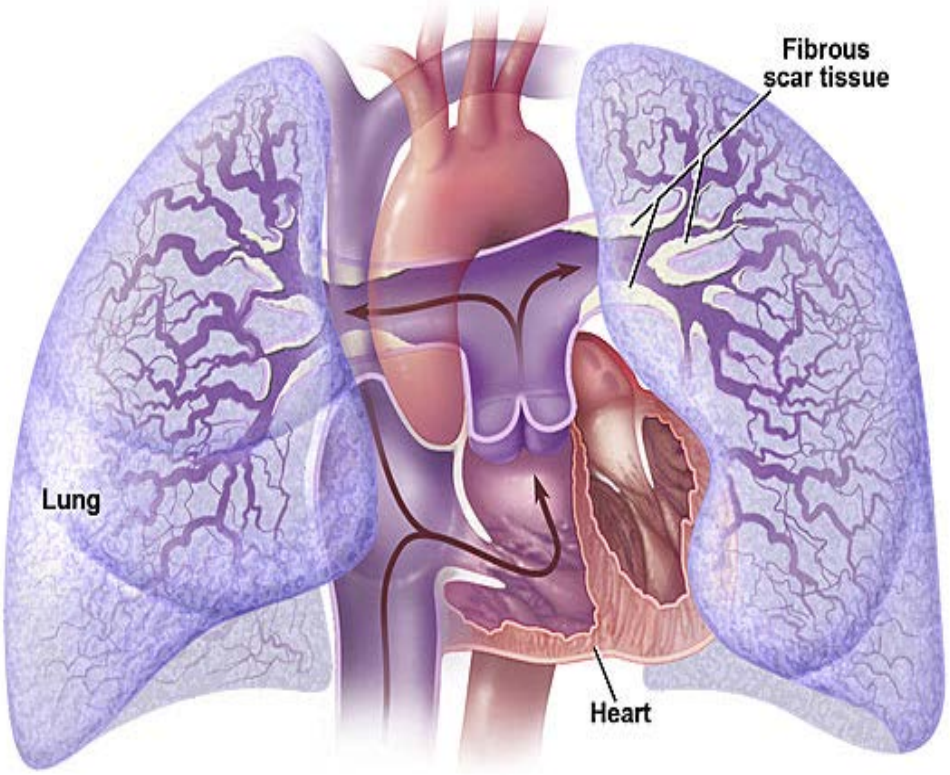
- Vad är CTEPH?
- Diagnostik
- Kirugisk behandling
- Resultat

Vad är CTEPH?

Chronic **T**hrombo-**E**mbolic **P**ulmonary **H**ypertension

- En distinkt orsak till pulmonell hypertension
- Orsakas av tromboemboliskt material som förtränger lungartärerna och deras grenar





Klassificering av pulmonell hypertension

1. Pulmonary arterial hypertension
- 1.1 Idiopathic
- 1.2 Heritable
  - 1.2.1 BMPR2 mutation
  - 1.2.2 Other mutations
- 1.3 Drugs and toxins induced
- 1.4 Associated with:
  - 1.4.1 Connective tissue disease
  - 1.4.2 Human immunodeficiency virus (HIV) infection
  - 1.4.3 Portal hypertension
  - 1.4.4 Congenital heart disease (Table 6)
  - 1.4.5 Schistosomiasis

1'. Pulmonary veno-occlusive disease and/or pulmonary capillary haemangiomatosis
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1''. Persistent pulmonary hypertension of the newborn

2. Pulmonary hypertension due to left heart disease
- 2.1 Left ventricular systolic dysfunction
- 2.2 Left ventricular diastolic dysfunction
- 2.3 Valvular disease
- 2.4 Congenital / acquired left heart inflow/outflow tract obstruction and congenital cardiomyopathies
- 2.5 Congenital /acquired pulmonary veins stenosis

3. Pulmonary hypertension due to lung diseases and/or hypoxia
- 3.1 Chronic obstructive pulmonary disease
- 3.2 Interstitial lung disease
- 3.3 Other pulmonary diseases with mixed restrictive and obstructive pattern
- 3.4 Sleep-disordered breathing
- 3.5 Alveolar hypoventilation disorders
- 3.6 Chronic exposure to high altitude
- 3.7 Developmental lung diseases (Web Table III)

4. Chronic thromboembolic pulmonary hypertension and other pulmonary artery obstructions
- 4.1 Chronic thromboembolic pulmonary hypertension
- 4.2 Other pulmonary artery obstructions
  - 4.2.1 Angiosarcoma
  - 4.2.2 Other intravascular tumors
  - 4.2.3 Arteritis
  - 4.2.4 Congenital pulmonary arteries stenoses
  - 4.2.5 Parasites (hydatidosis)

5. Pulmonary hypertension with unclear and/or multifactorial mechanisms
- 5.1 Haematological disorders: chronic haemolytic anaemia, myeloproliferative disorders, splenectomy
- 5.2 Systemic disorders: sarcoidosis, pulmonary histiocytosis, lymphangioleiomyomatosis neurofibromatosis
- 5.3 Metabolic disorders: glycogen storage disease, Gaucher disease, thyroid disorders
- 5.4 Others: pulmonary tumoral thrombothic microangiopathy, fibrosing mediastinitis, chronic renal failure (with/without dialysis), segmental pulmonary hypertension

Grupp 4
CTEPH

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Grupp 4
CTEPH

CTEPH är

- Ovanlig sjukdom med initialt diskreta symptom
- Allvarligt tillstånd med stor påverkan på livskvalitet och förväntad livslängd
- Potentiellt botbar!

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När skall man misstänka CTEPH?

- Hos pat med akut lungemboli som har kvarstående dyspné
- CTEPH inträffar hos 0,5–4% med akut lungemboli
- ~75% av pat med CTEPH har haft en tidigare akut lungemboli
- Tidiga sjukdomsfasen ofta asymptomatisk
  1. Dyspné
  2. PAH
  3. Högerkammarsvikt

Table 1. Risk Factors for Chronic Thromboembolic Pulmonary Hypertension.

Factors specific to pulmonary embolism
Recurrent or unprovoked pulmonary embolism
Large perfusion defects when pulmonary embolism detected
Young or old age when pulmonary embolism detected
Pulmonary-artery systolic pressure >50 mm Hg at initial manifestation of pulmonary embolism
Persistent pulmonary hypertension on echocardiography performed 6 mo after acute pulmonary embolism detected
Chronic medical conditions
Infected surgical cardiac shunts or pacemaker or defibrillator leads
Postsplenectomy
Chronic inflammatory disorders
Thyroid-replacement therapy
Cancer
Thrombotic factors
Lupus anticoagulant or antiphospholipid antibodies
Increased levels of factor VIII
Dysfibrinogenemia
Genetic factors
ABO blood groups other than O
HLA polymorphisms
Abnormal endogenous fibrinolysis

The NEW ENGLAND JOURNAL of MEDICINE

REVIEW ARTICLE

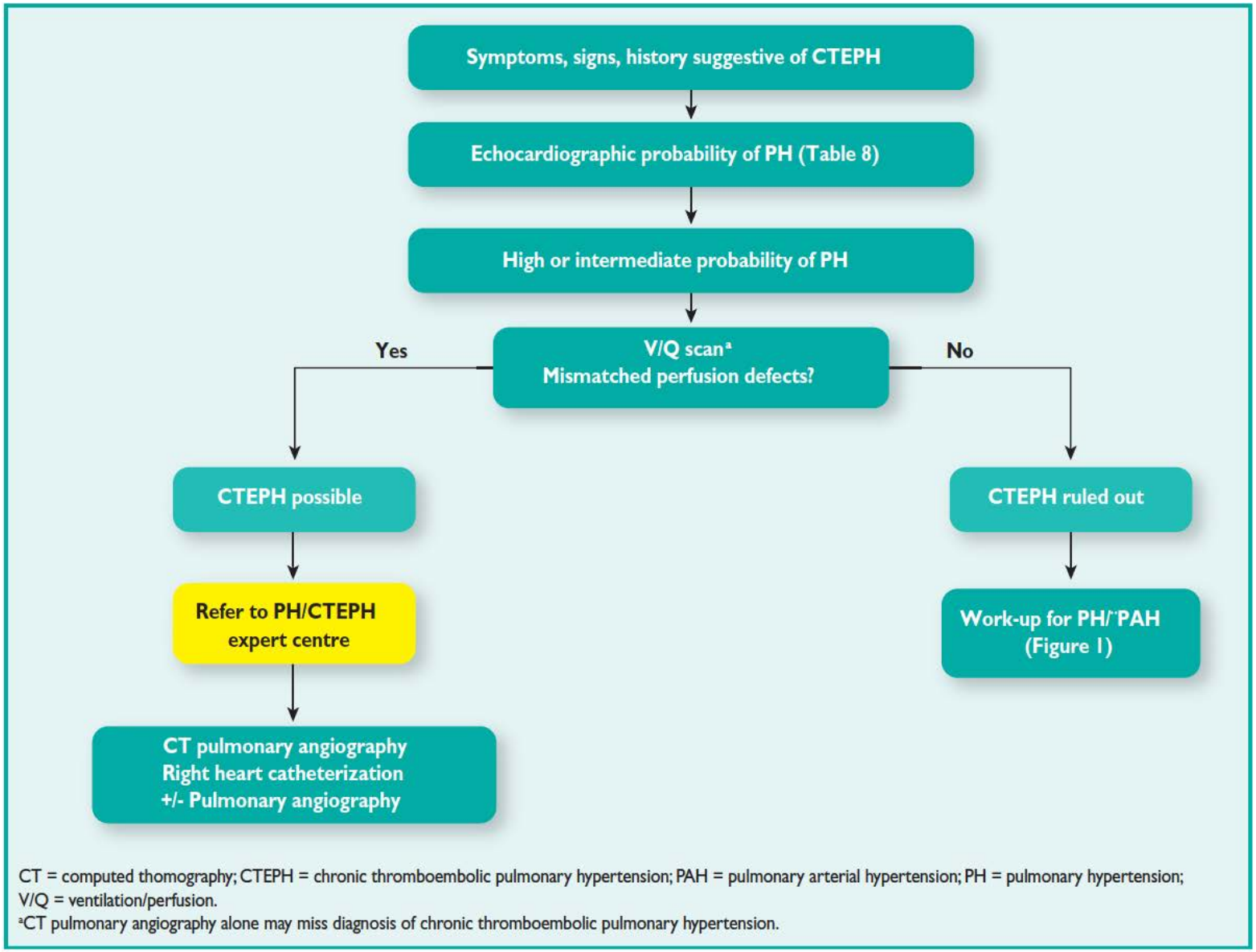
CURRENT CONCEPTS

Chronic Thromboembolic Pulmonary Hypertension

Gregory Piazza, M.D., and Samuel Z. Goldhaber, M.D.

NEJM 2011;364:351-60

Diagnostisk algoritm för CTEPH



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Normal lungscint (ventilations/perfusionsscint) **utesluter** CTEPH

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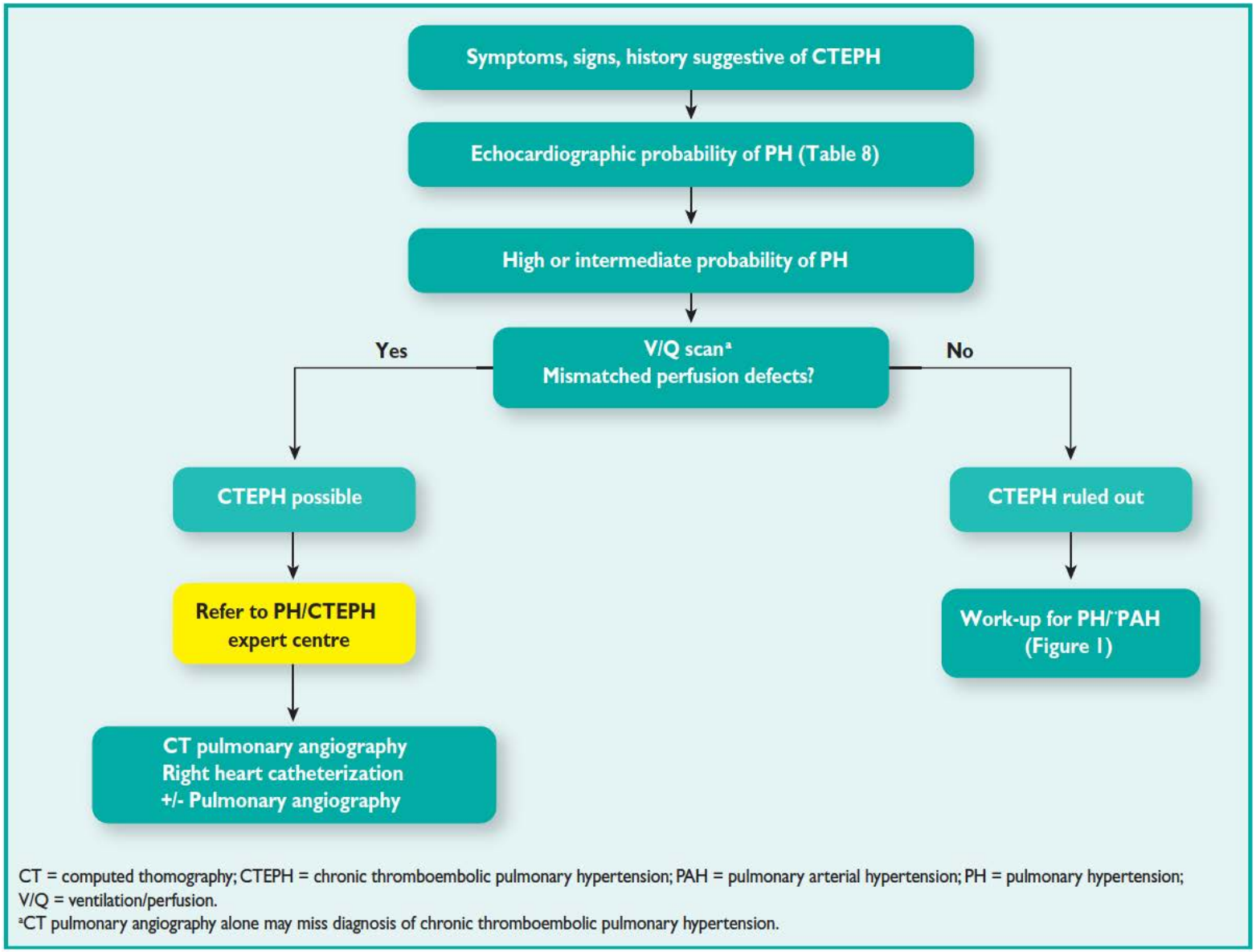
Diagnostisk algoritm för CTEPH



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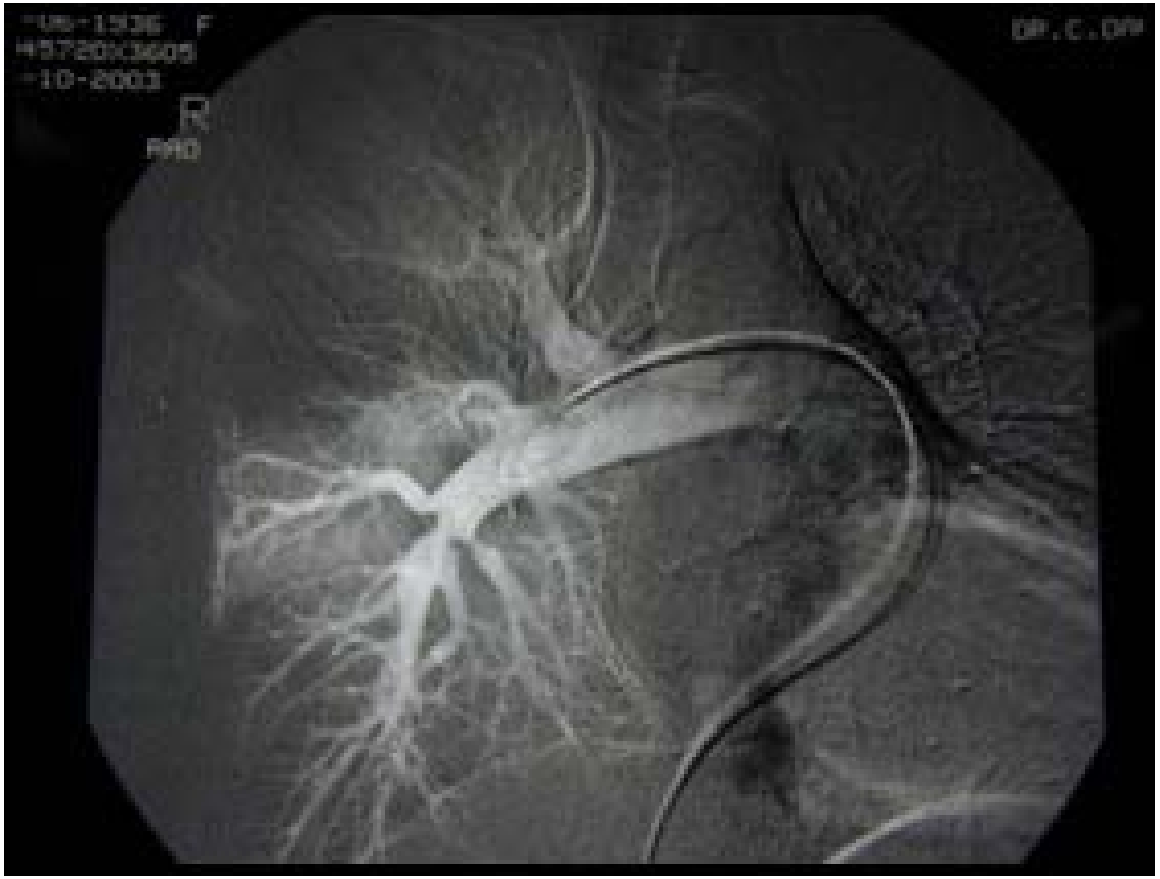
Diagnostik

- EKO
- CT angio
- Lungscint
- Hjärtkat
- Pulmonalisangiografi
- Coronarangio

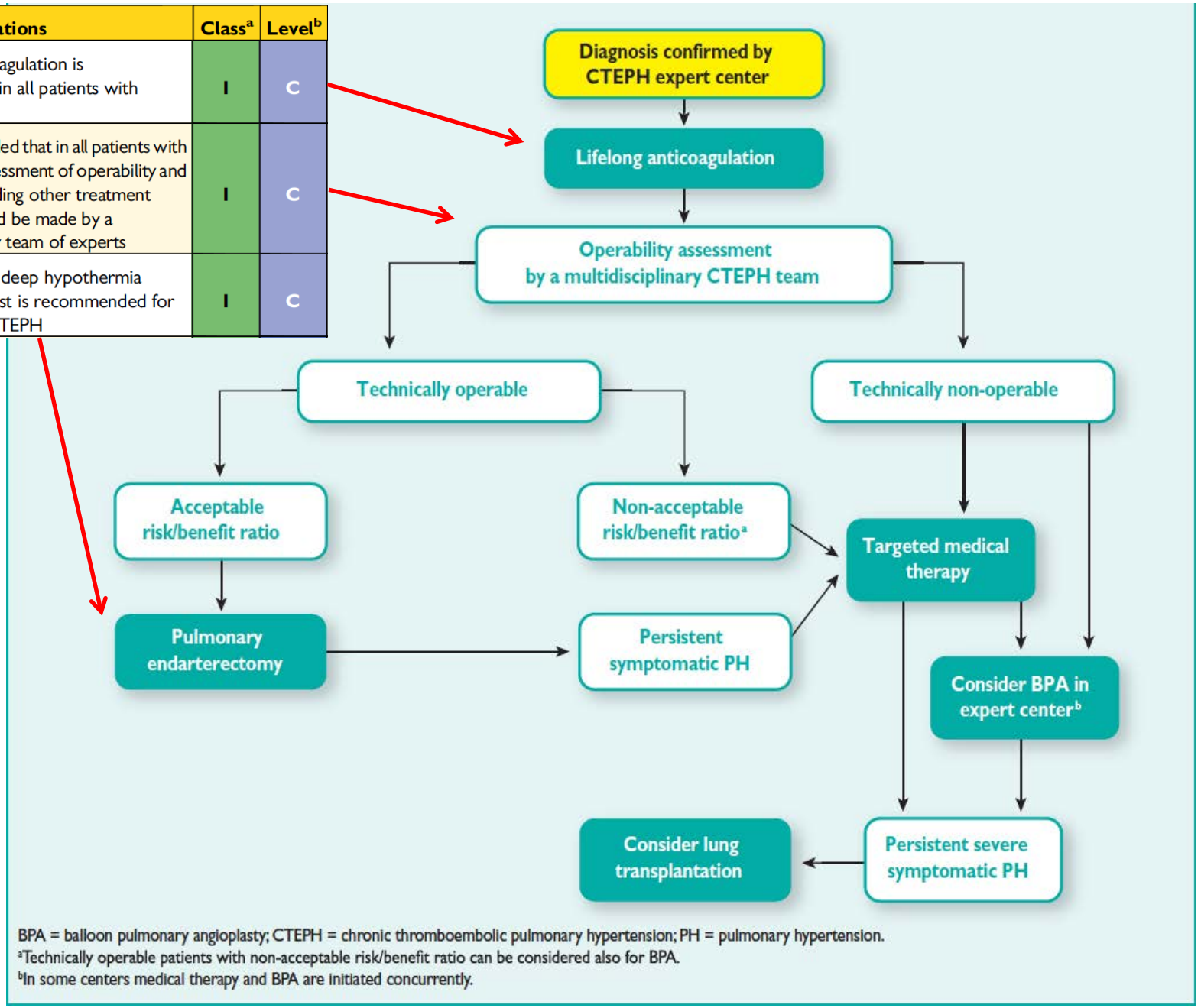


Diagnos klar !

→

Operationsfall ???

Recommendations	Class[a]	Level[b]
Life-long anticoagulation is recommended in all patients with CTEPH	I	C
It is recommended that in all patients with CTEPH the assessment of operability and decisions regarding other treatment strategies should be made by a multidisciplinary team of experts	I	C
Surgical PEA in deep hypothermia circulatory arrest is recommended for patients with CTEPH	I	C



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Kirurgi vid CTEPH

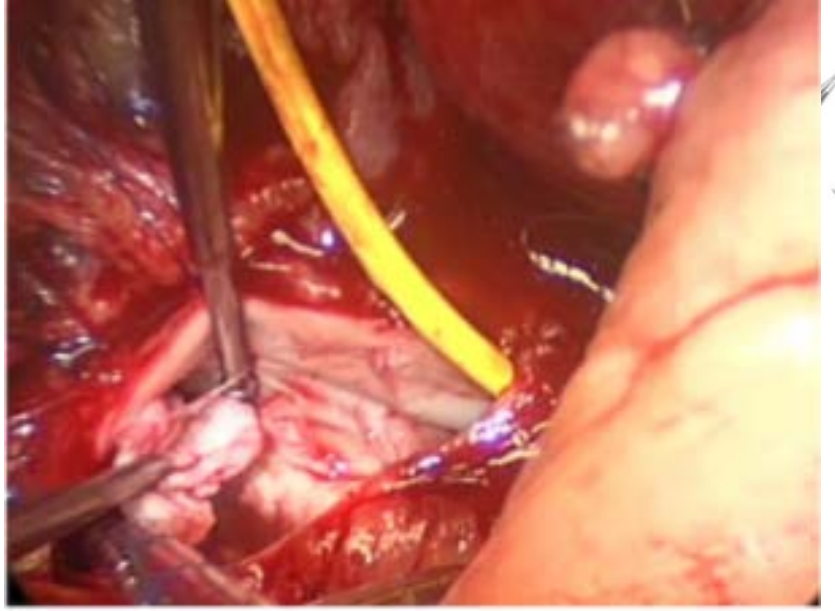
Operationsindikationer

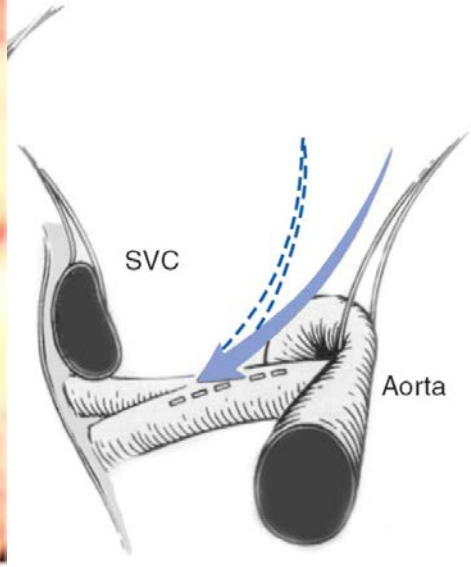
- Symptom
- PAH
- Centrala (operabla) förändringar
- Acceptabel risk

Kontraindikationer (relativa)

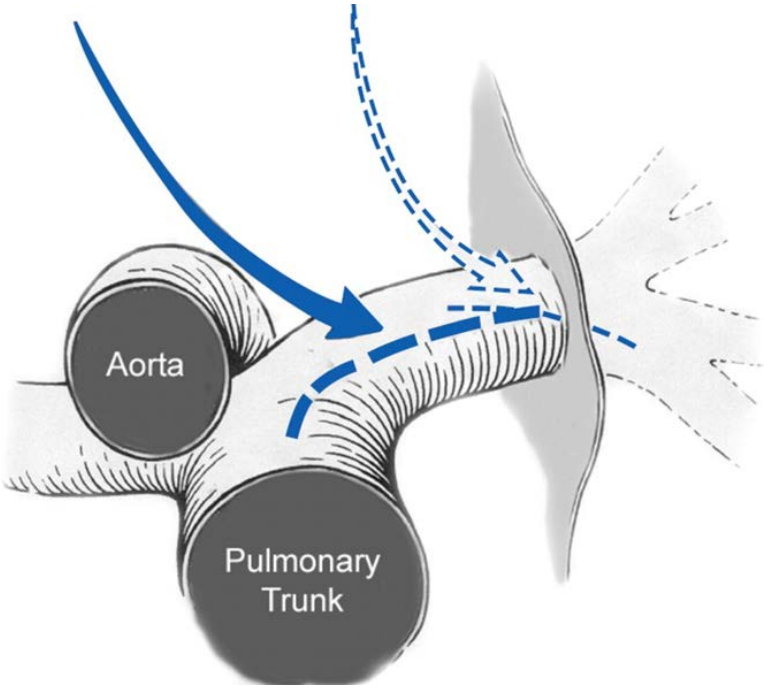
- Svår KOL
- Kraftigt nedsatt vänsterkammarfunktion

Kirurgisk teknik

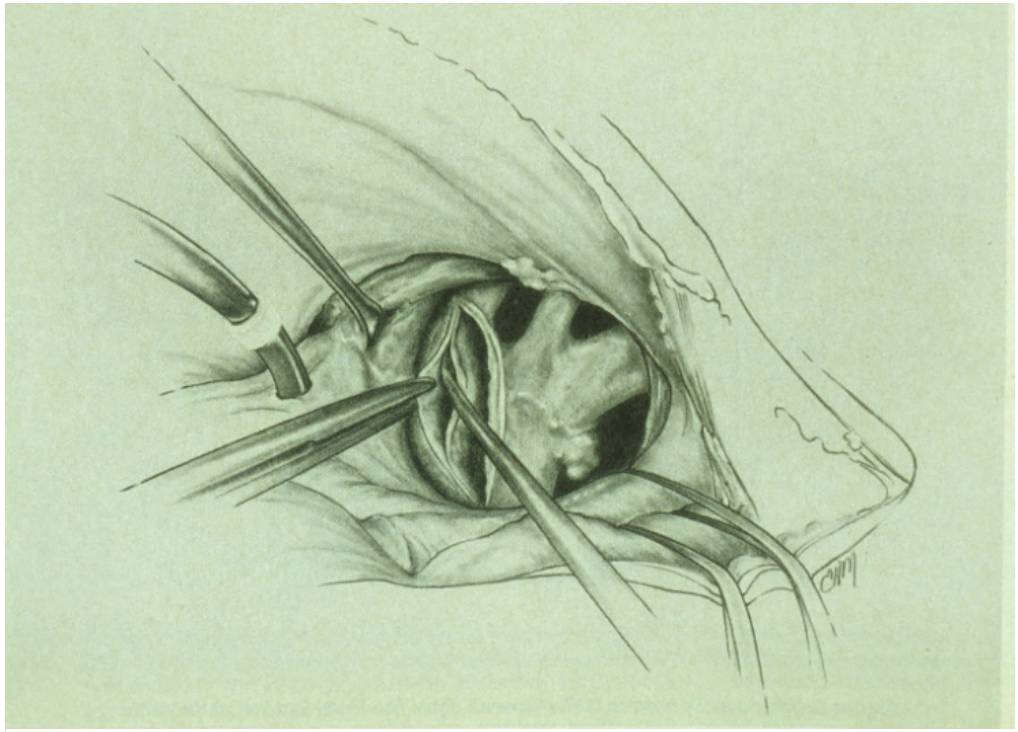


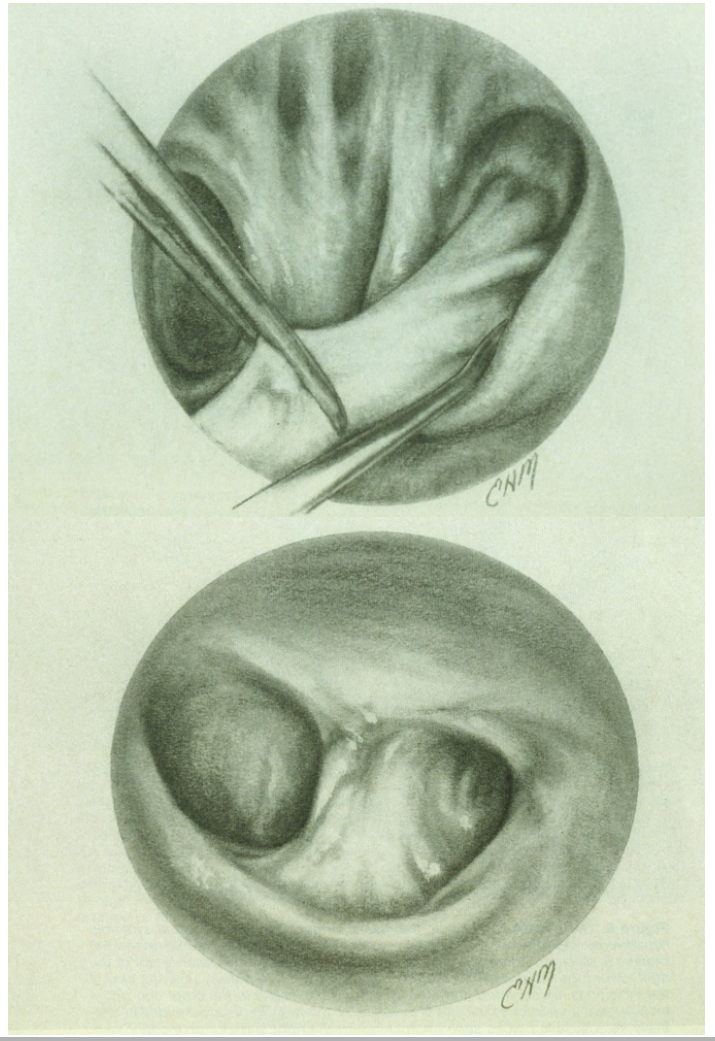


- Median sternotomi
- Hjärtlungmaskin
- Djup hypotermi (18 °C)
- Perioder med cirkulatorisk arrest
- Intraperikardiell incision av lungartärer
- **Endartärektomi** – ej embolektomi eller ”trombektomi”

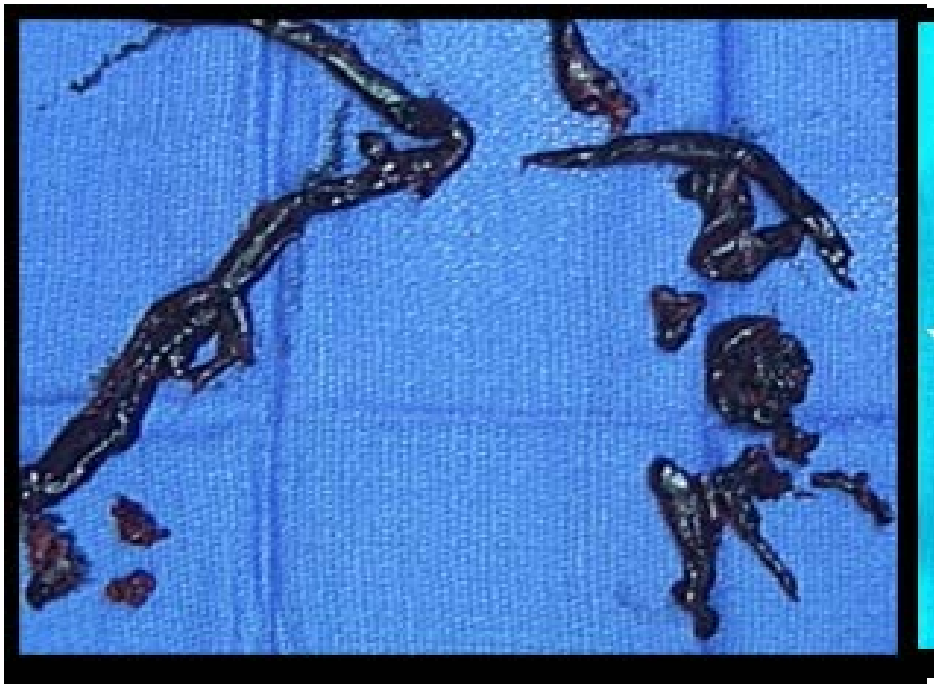


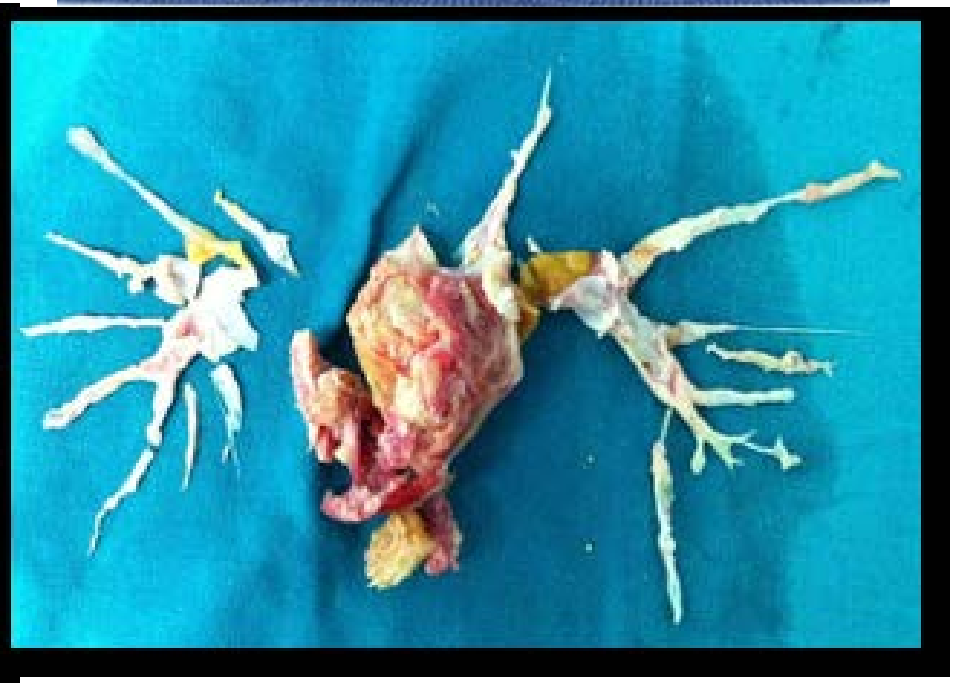
Intraperikardiell incision av lungartärer, endartärektomi





CTEPH inte samma sak som akut lungemboli





Akut lungemboli

CTEPH

Surgical management and outcome of patients with chronic thromboembolic pulmonary hypertension: Results from an international prospective registry

Eckhard Mayer, MD,[a] David Jenkins, FRCS,[b] Jaroslav Lindner, MD,[c] Andrea D'Armini, MD,[d] Jaap Kloek, MD,[e] Bart Meyns, MD,[f] Lars Bo Ilkjaer, MD,[g] Walter Klepetko, MD,[h] Marion Delcroix, MD,[f] Irene Lang, MD,[h] Joanna Pepke-Zaba, MD,[b] Gerald Simonneau, MD,[i] and Philippe Dartevelle, MD[j]

Objective: Pulmonary endarterectomy is a curative surgical treatment option for the majority of patients with chronic thromboembolic pulmonary hypertension. The current surgical management and postoperative outcome of patients enrolled in an international registry on chronic thromboembolic pulmonary hypertension were investigated.

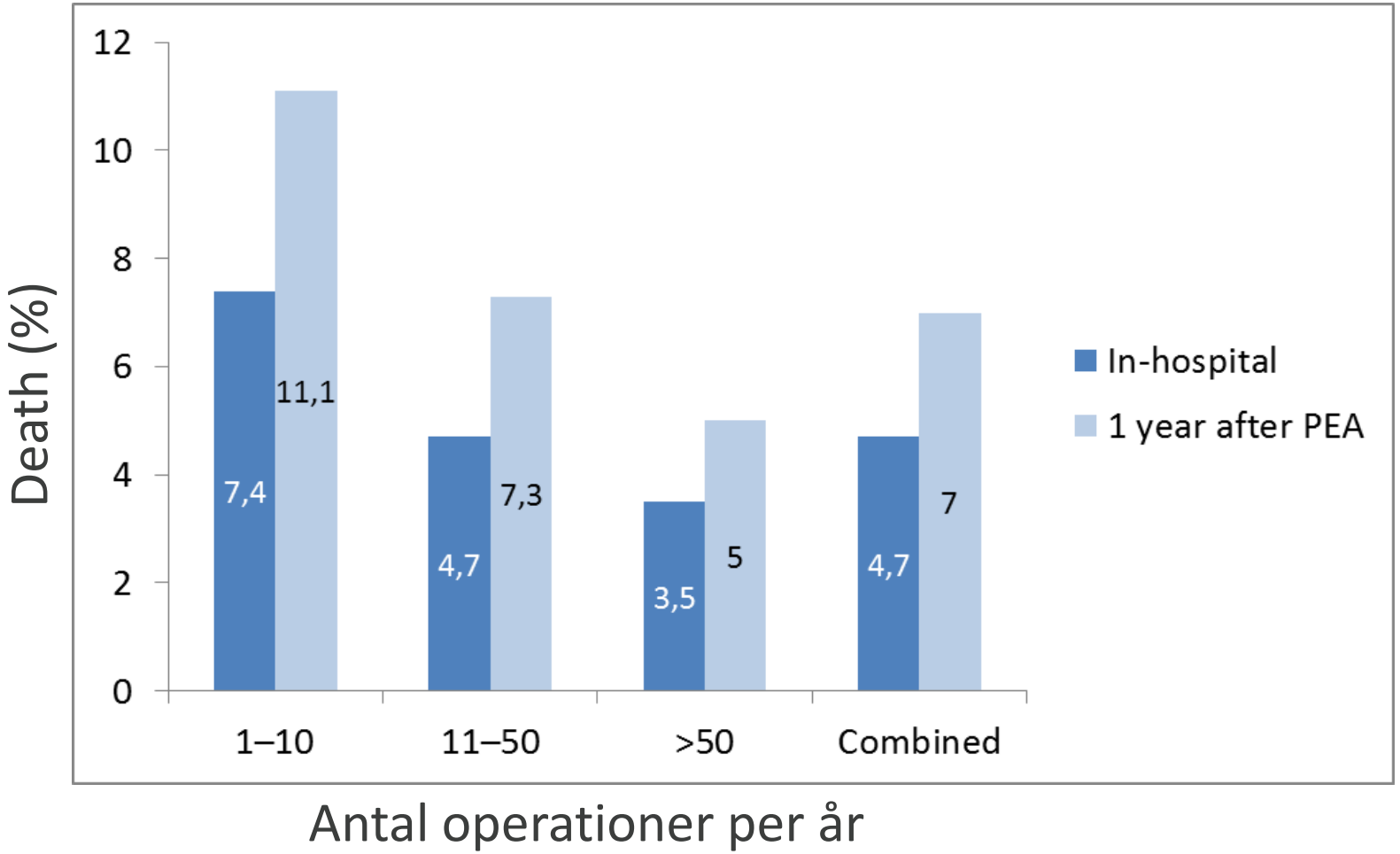
Methods: The registry included newly diagnosed (≤6 months) consecutive patients with chronic thromboembolic pulmonary hypertension from February 2007 to January 2009.

Results: A total of 679 patients were registered from 1 Canadian and 26 European centers, of whom 386 (56.8%) underwent surgery. The median age of patients undergoing surgery was 60 years, and 54.1% were male. Previous pulmonary embolism was confirmed for 79.8% of patients. Perioperative complications occurred in 189 patients (49.2%): infection (18.8%), persistent pulmonary hypertension (16.7%), neurologic (11.2%) or bleeding (10.2%) complications, pulmonary reperfusion edema (9.6%), pericardial effusion (8.3%), need for extracorporeal membrane oxygenation (3.1%), and in-hospital mortality due to perioperative complications (4.7%). Documented 1-year mortality was 7%. Preoperative exercise capacity was predictive of 1-year mortality. Postoperative pulmonary vascular resistance predicted in-hospital and 1-year mortality. In patients evaluated within 1 year after surgery, the median pulmonary vascular resistance had decreased from 698 to 235 dyn.s.cm^{-5} (95% confidence limit, 640–874 and 211–255, respectively, n = 70) and the median 6-minute walk distance had increased from 362 to 459 m (95% confidence limit, 340–399 and 440–473, respectively, n = 168). New York Heart Association functional class improved with most patients progressing from class III/IV to class I/II.

Conclusions: Pulmonary endarterectomy is associated with a low in-hospital mortality rate and improvements in hemodynamics and exercise capacity. (J Thorac Cardiovasc Surg 2011;141:702-10)

Överlevnad efter operation i relation till centervolym

Registerstudie: 26 center i Europa och 1 i Canada (totalt 386 pat)

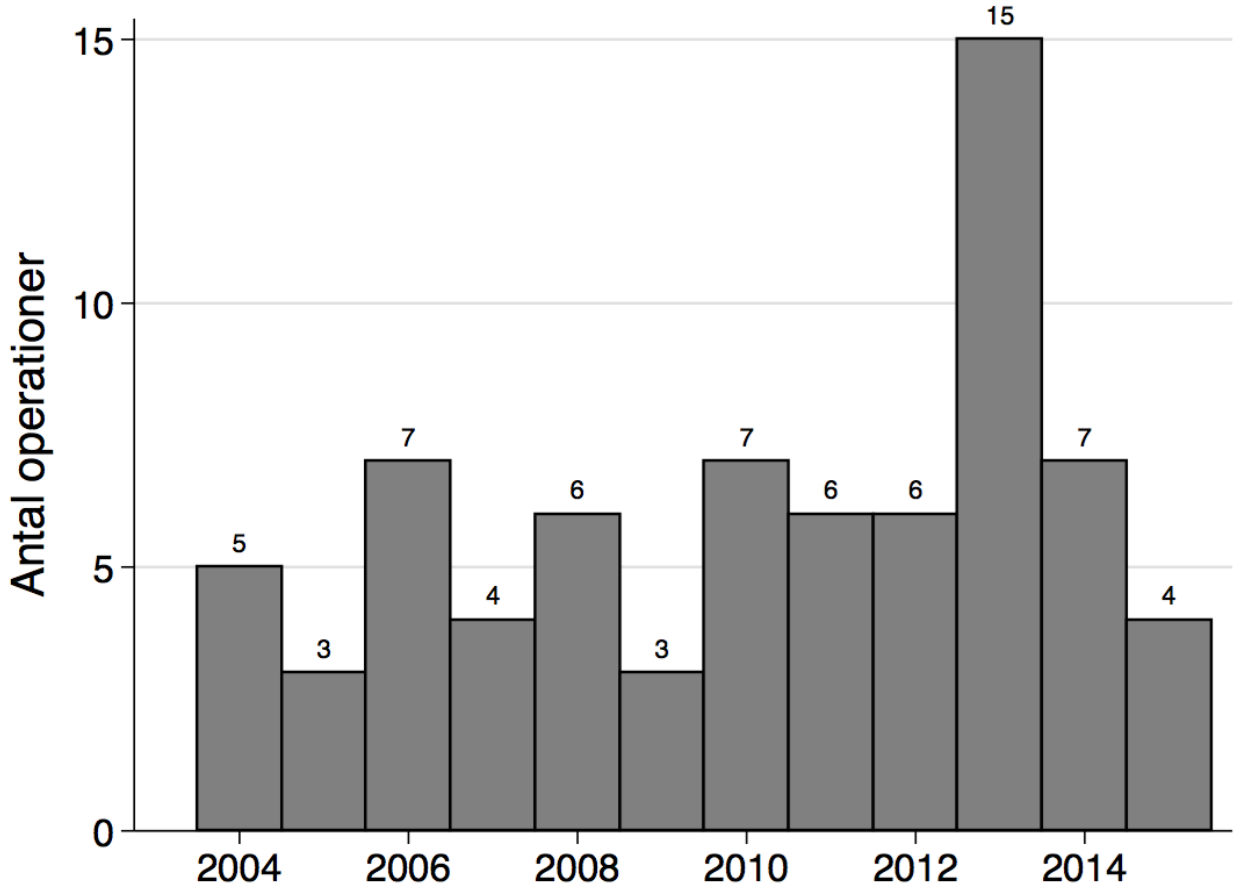


Mayer et al. J Thorac Cardiovasc Surg 2011;141:702–710.

TEA pulmonalis 2004 - 2015, Karolinska

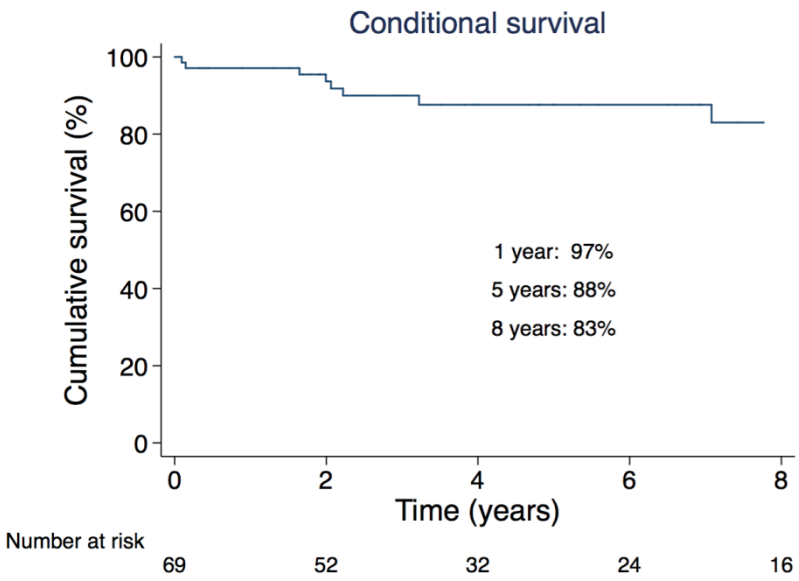
Antal operationer: 73

Tidig mortalitet (inom 30 dagar): **5,5 %** (4/73)

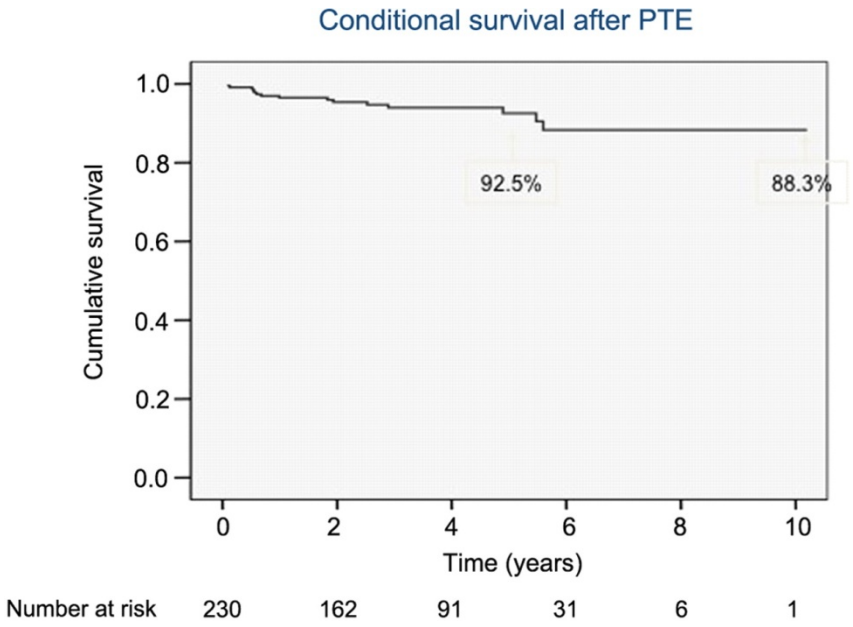


Långtidsöverlevnad efter TEA pulmonalis exkl tidig mortalitet

Stockholm (2004-2015)



Cambridge (1997-2006)



Resultat efter kirurgi vid CTEPH

- Avlägsna tromboemboliskt material och väggförtjockning dvs det innersta vägglagret i lungartärerna
- Normalisering av trycket i lungartärerna hos ca 2/3 av patienterna
- Ca 4 dagars intensivvård, ca 2 veckors sjukhusvistelse, 2-3 mån återhämtningsfas
- Efter 3 mån – 1 år:
  - Bättre hemodynamik (hjärtminutvolym, PA-tryck)
  - Bättre funktionsgrad (6MWD, NYHA-klass)

Freed DH *et al. J Thorac Cardiovasc Surg* 2011;141:383–7

Sammanfattning

- CTEPH är en distinkt orsak till PAH
- Allvarligt men potentiellt botbart tillstånd
- Kirurgi är den enda effektiva behandlingen vid CTEPH
- Resultat i Stockholm jämförbara med större internationella center

Kunskap om sjukdomen och dess behandling behöver spridas