Comment évaluer une hypertension pulmonaire en 2024

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5&6 AVRIL 2024

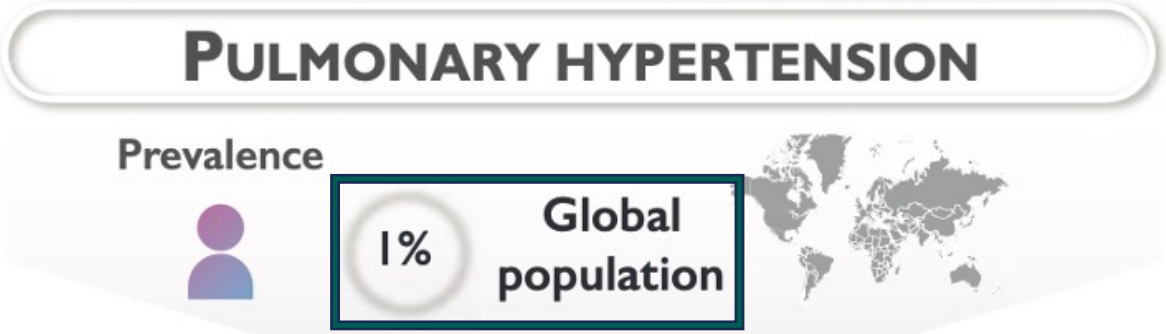
HÔTEL SHERATON · NICE

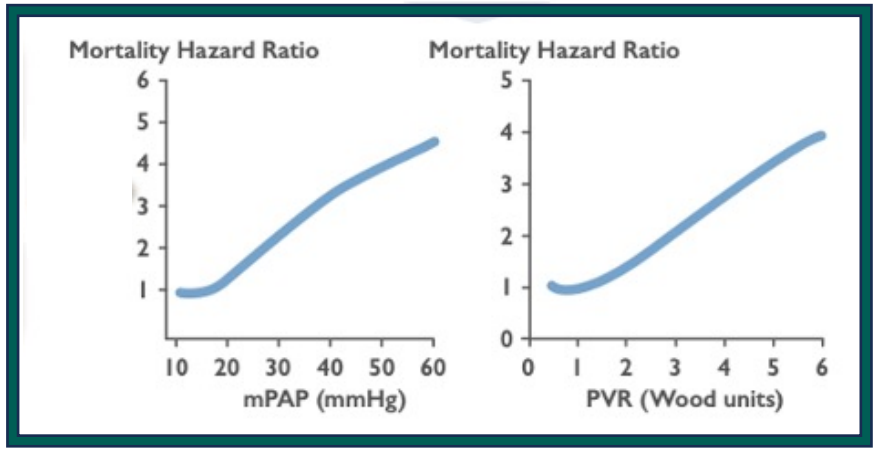
Plan

1. Pourquoi s'intéresser à l'hypertension pulmonaire ?
2. Comment évoquer une hypertension pulmonaire ?
3. Comment confirmer une hypertension pulmonaire ?
4. Pourquoi ça ne plaît pas aux cardiologues interventionnels ?
5. Comment la rendre intéressante ?

Pourquoi s’intéresser à l’hypertension pulmonaire ?

Épidémiologie





Multitude de pathologies

GROUP 1 Pulmonary arterial hypertension (PAH)
- 1.1 Idiopathic
  - 1.1.1 Non-responders at vasoreactivity testing
  - 1.1.2 Acute responders at vasoreactivity testing
- 1.2 Heritable[a]
- 1.3 Associated with drugs and toxins[a]
- 1.4 Associated with:
  - 1.4.1 Connective tissue disease
  - 1.4.2 HIV infection
  - 1.4.3 Portal hypertension
  - 1.4.4 Congenital heart disease
  - 1.4.5 Schistosomiasis
- 1.5 PAH with features of venous/capillary (PVOD/PCH) involvement
- 1.6 Persistent PH of the newborn

GROUP 2 PH associated with left heart disease
- 2.1 Heart failure:
  - 2.1.1 with preserved ejection fraction
  - 2.1.2 with reduced or mildly reduced ejection fraction[b]
- 2.2 Valvular heart disease
- 2.3 Congenital/acquired cardiovascular conditions leading to post-capillary PH

GROUP 3 PH associated with lung diseases and/or hypoxia
- 3.1 Obstructive lung disease or emphysema
- 3.2 Restrictive lung disease
- 3.3 Lung disease with mixed restrictive/obstructive pattern
- 3.4 Hypoventilation syndromes
- 3.5 Hypoxia without lung disease (e.g. high altitude)
- 3.6 Developmental lung disorders

GROUP 4 PH associated with pulmonary artery obstructions
- 4.1 Chronic thrombo-embolic PH
- 4.2 Other pulmonary artery obstructions[c]

GROUP 5 PH with unclear and/or multifactorial mechanisms
- 5.1 Haematological disorders[d]
- 5.2 Systemic disorders[e]
- 5.3 Metabolic disorders[f]
- 5.4 Chronic renal failure with or without haemodialysis
- 5.5 Pulmonary tumour thrombotic microangiopathy
- 5.6 Fibrosing mediastinitis

Multitude de traitements

	Starting dose	Target dose
Calcium channel blockers		
Amlodipine	5 mg o.d.	15–30 mg o.d.[a]
Diltiazem	60 mg b.i.d.[b]	120–360 mg b.i.d.[b]
Felodipine	5 mg o.d.	15–30 mg o.d.[a]
Nifedipine	10 mg t.i.d.	20–60 mg b.i.d. or t.i.d.
Endothelin receptor antagonists (oral administration)		
Ambrisentan	5 mg o.d.	10 mg o.d.
Bosentan	62.5 mg b.i.d.	125 mg b.i.d.
Macitentan	10 mg o.d.	10 mg o.d.
Phosphodiesterase 5 inhibitors (oral administration)		
Sildenafil	20 mg t.i.d.	20 mg t.i.d.[c]
Tadalafil	20 or 40 mg o.d.	40 mg o.d.
Prostacyclin analogues (oral administration)		
Beraprost sodium	20 µg t.i.d.	Maximum tolerated dose up to 40 µg t.i.d.
Beraprost extended release	60 µg b.i.d.	Maximum tolerated dose up to 180 µg b.i.d.
Treprostinil	0.25 mg b.i.d. or 0.125 mg t.i.d.	Maximum tolerated dose

	Starting dose	Target dose
Prostacyclin receptor agonist (oral administration)		
Selexipag	200 µg b.i.d.	Maximum tolerated dose up to 1600 µg b.i.d.
Soluble guanylate cyclase stimulator (oral administration)		
Riociguat[d]	1 mg t.i.d.	2.5 mg t.i.d.
Prostacyclin analogues (inhaled administration)		
Iloprost[e]	2.5 µg 6–9 times per day	5.0 µg 6–9 times per day
Treprostinil[e]	18 µg 4 times per day	54–72 µg 4 times per day
Prostacyclin analogues (i.v. or s.c. administration)		
Epoprostenol i.v.	2 ng/kg/min	Determined by tolerability and effectiveness; typical dose range at 1 year is 16–30 ng/kg/min, with wide individual variability
Treprostinil s.c. or i.v.	1.25 ng/kg/min	Determined by tolerability and effectiveness; typical dose range at 1 year is 25–60 ng/kg/min, with wide individual variability

Recherche

National Library of Medicine
National Center for Biotechnology Information

ClinicalTrials.gov

NOT YET RECRUITING

NCT06176118 NEW

Clinical Trial of 2-HOBA in **Pulmonary Arterial Hypertension**

NOT YET RECRUITING

NCT04915300

Apabetalone for **Pulmonary Arterial Hypertension**

RECRUITING

NCT05975905

A Study to Investigate the Safety and Efficacy of KER-012 in Combination With Background Therapy in Adult Participants With **Pulmonary Arterial Hypertension** (PAH) (TROPOS Study).

RECRUITING

NCT05147805

A Study to Evaluate the Efficacy, Safety and Pharmacokinetics of Treprostinil Palmitil Inhalation Powder in Participants With **Pulmonary Arterial Hypertension**

RECRUITING

NCT05679570

Satralizumab in the Treatment of **Pulmonary Arterial Hypertension** (SATISFY-JP Trial)

RECRUITING

NCT04811092

Study of Sotatercept in Newly Diagnosed Intermediate- and High-Risk PAH Participants (MK-7962-005/A011-13)

ACTIVE, NOT RECRUITING

NCT05135000

Study of Efficacy and Safety of LTP001 in **Pulmonary Arterial Hypertension**

Conditions

COMPLETED WITH RESULTS

NCT04576988

A Study of Sotatercept for the Treatment of **Pulmonary Arterial Hypertension** (MK-7962-003/A011-11)(STELLAR)

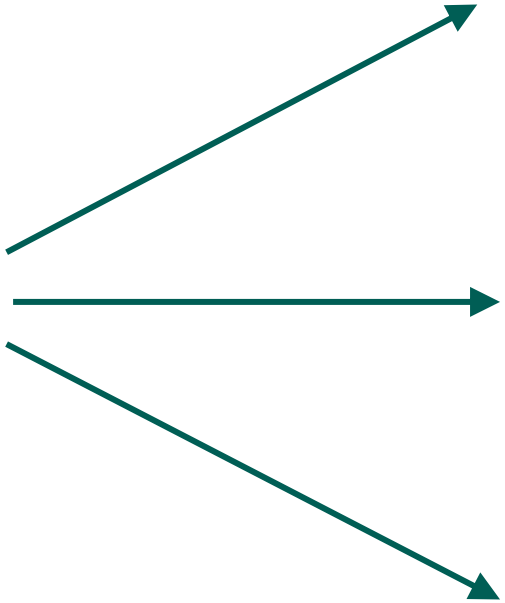
Comment évoquer une hypertension pulmonaire ?

Algorithme

1 **Suspicion clinique**

2 **Vmax IT**

3 **Centre de compétence / référence**



> 3,4 m/s : Probabilité élevée → Étape 3

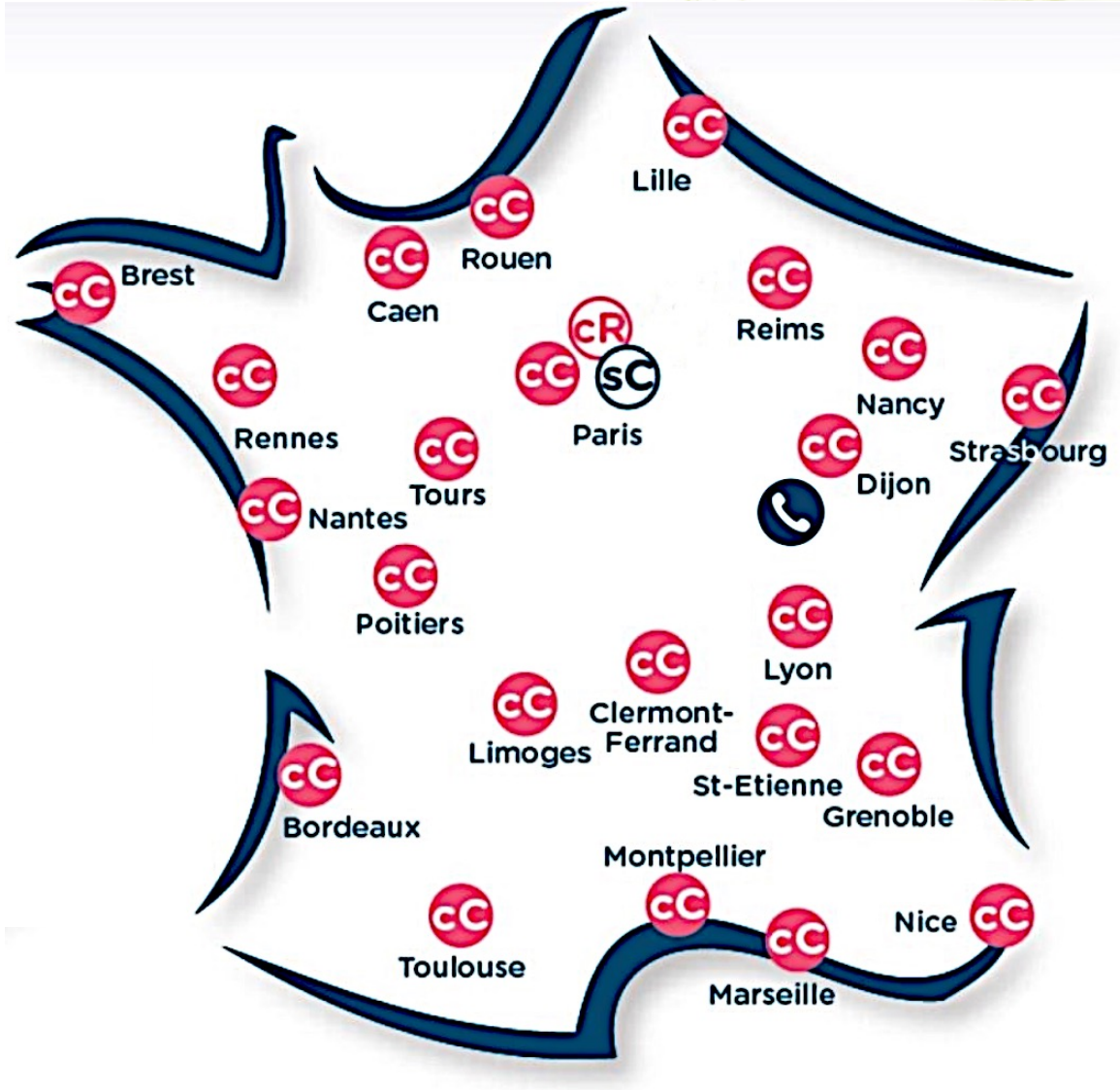
> 2,8 m/s - ≤ 3,4 m/s : Probabilité intermédiaire → Étape 3 **SI**

- Présence d'autre signe échographique d'HTP
- **OU** Présence d'arguments pour une étiologie pré-capillaire potentiellement curable (groupe 1 – post-embolique)

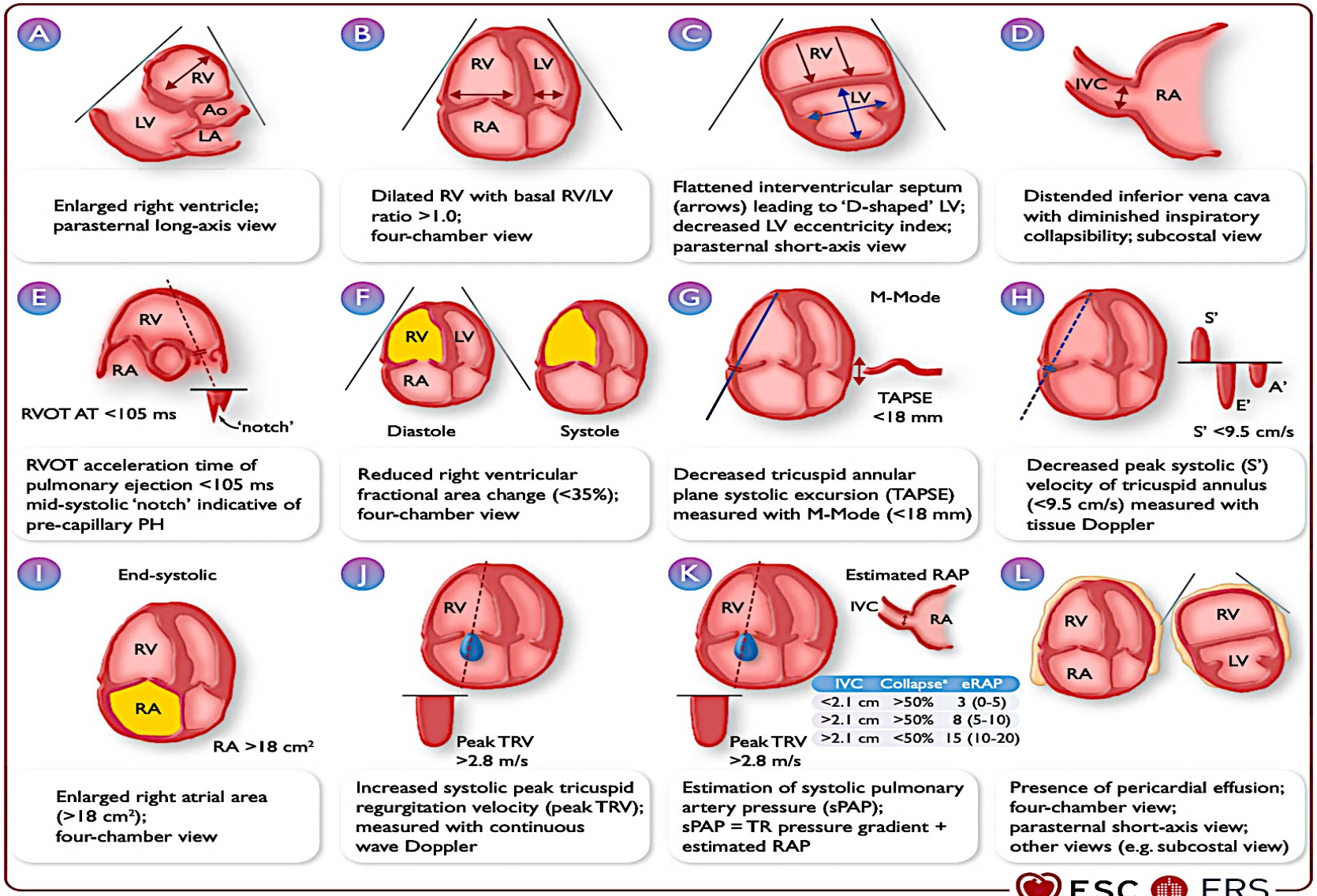
≤ 2,8 m/s : Probabilité faible → Étape 3 **SI**

- Présence d'autre signe échographique d'HTP
- **ET** Présence d'arguments pour une étiologie pré-capillaire potentiellement curable (groupe 1 – groupe 4)

L’offre de soins



ETT : Pas que les PAPs !



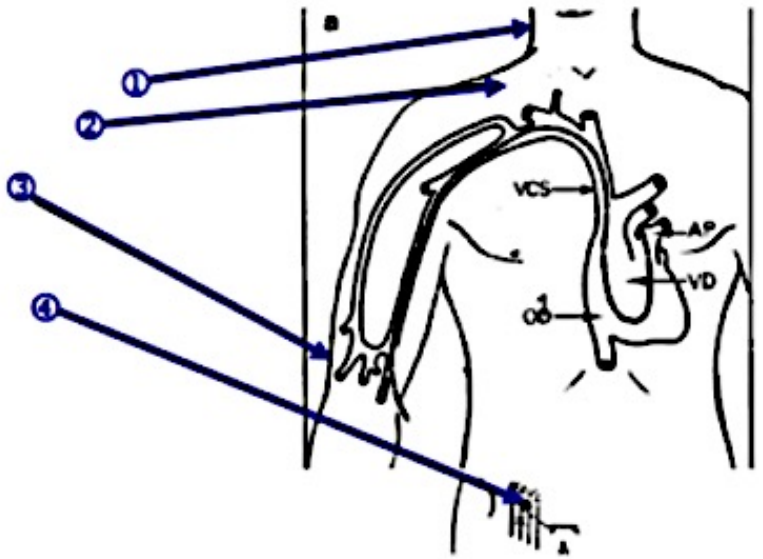
Comment confirmer une hypertension pulmonaire ?

Comment confirmer une hypertension pulmonaire ?

Cathétérisme cardiaque droit

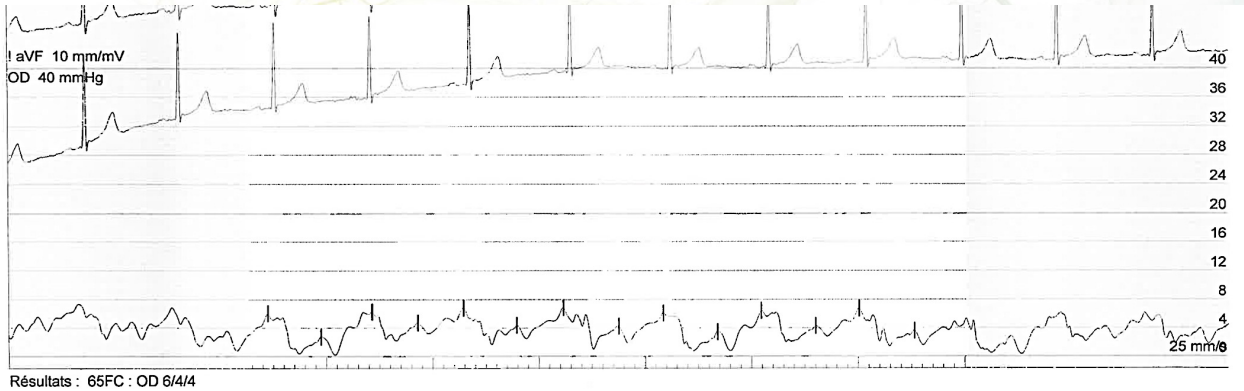
Voie d’abord

- Multiples
- Désilet 6 ou 7F
- Avantage de la voie brachiale :
  - ≥ 92 % de succès
  - Moins de complications
  - Examen facilité (sonde de Swan conçue pour la voie haute)



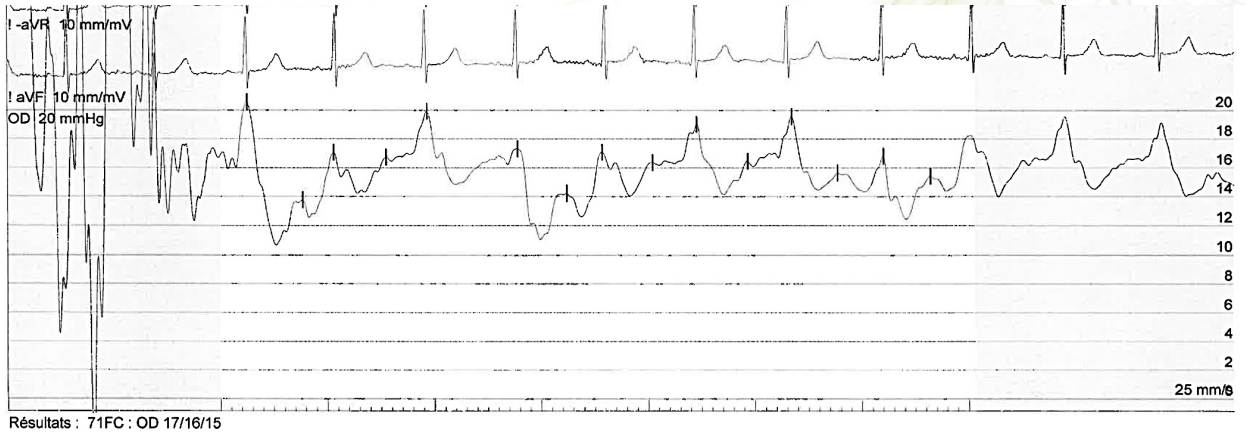
Oreillette droite

Non pathologique :



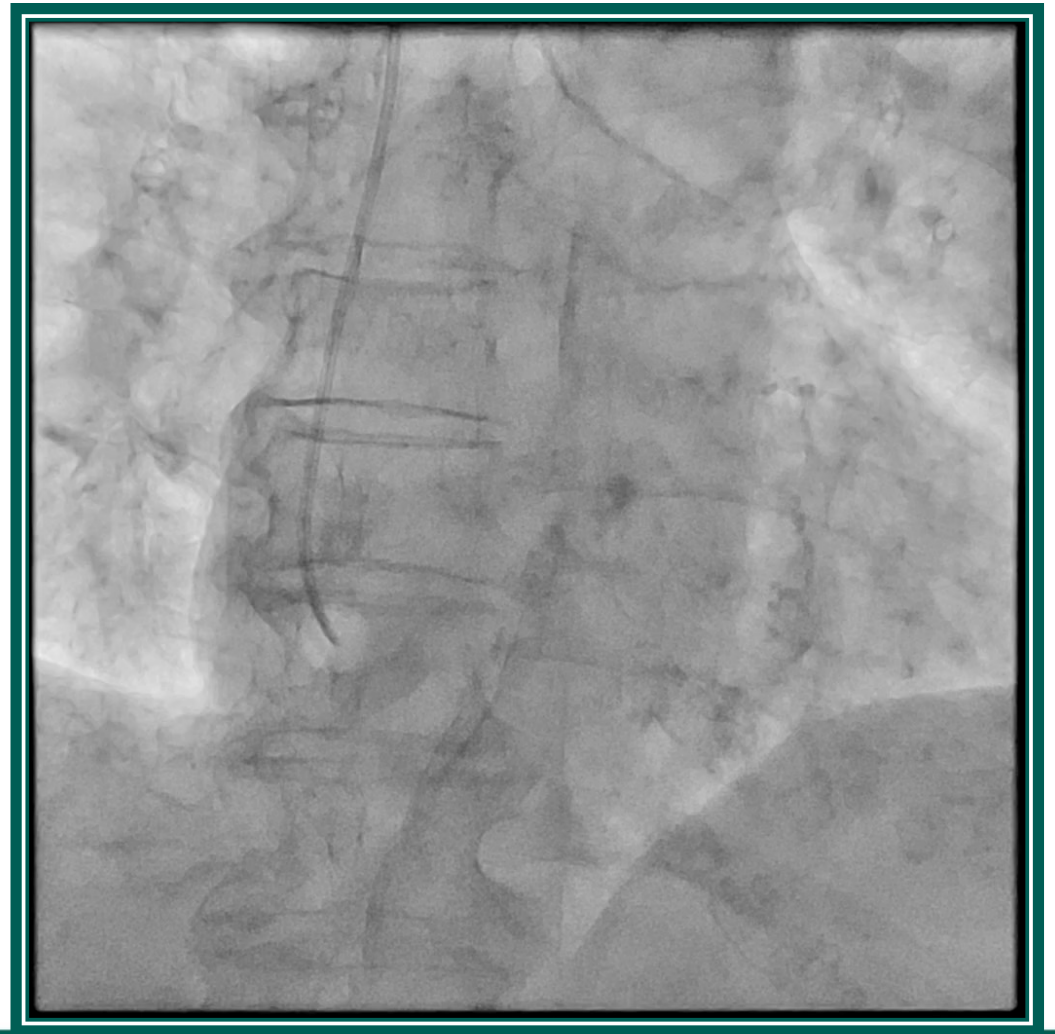
Résultats : 65FC : OD 6/4/4

Pathologique :



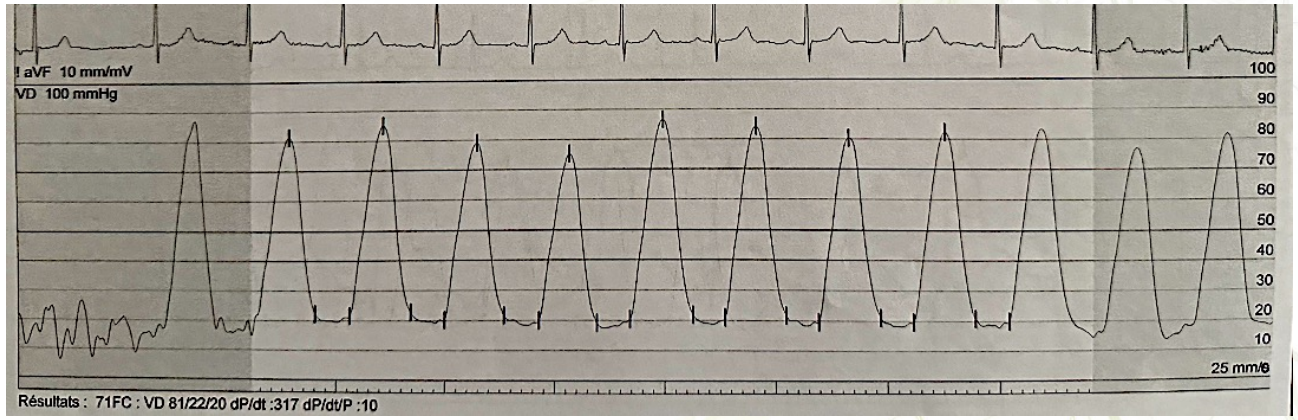
Résultats : 71FC : OD 17/16/15

Ventricule droit



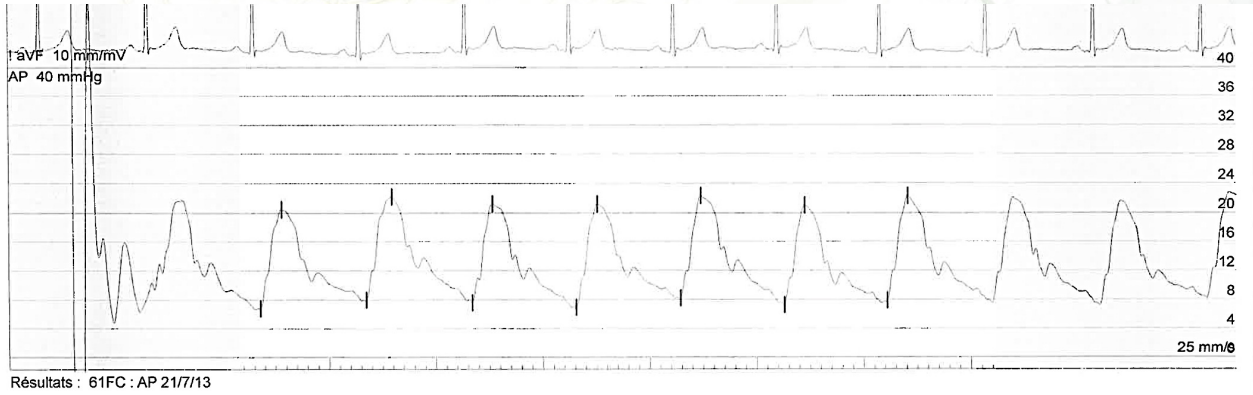
Non pathologique :

Pathologique :

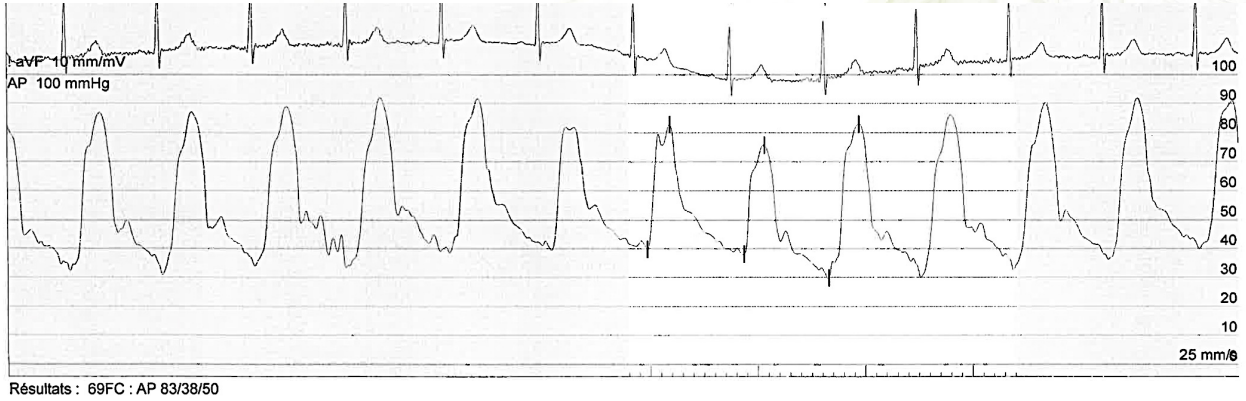


Artère pulmonaire

Non pathologique :

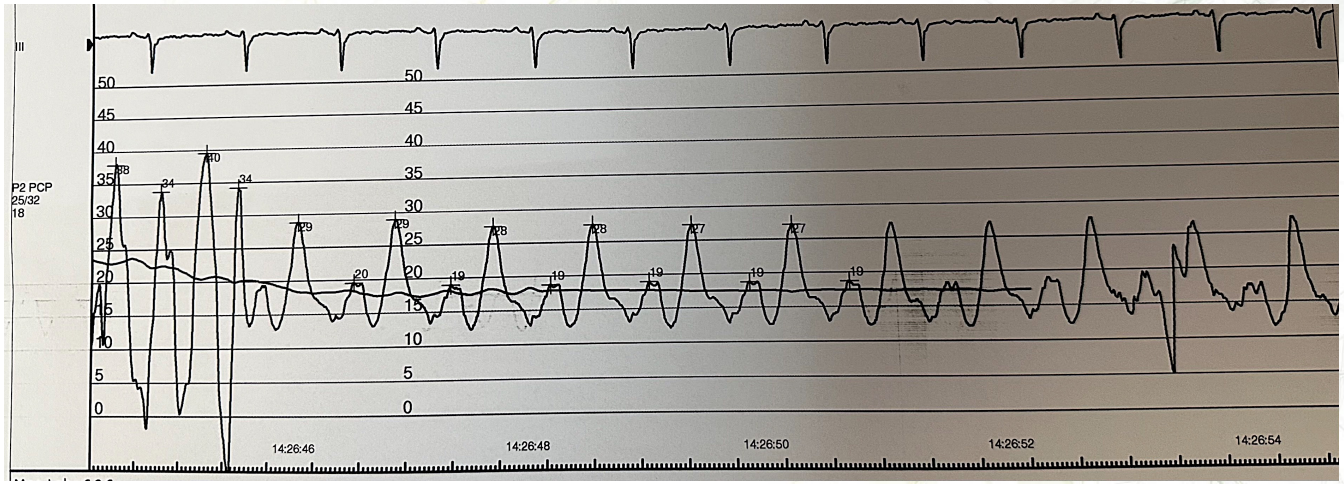


Pathologique :

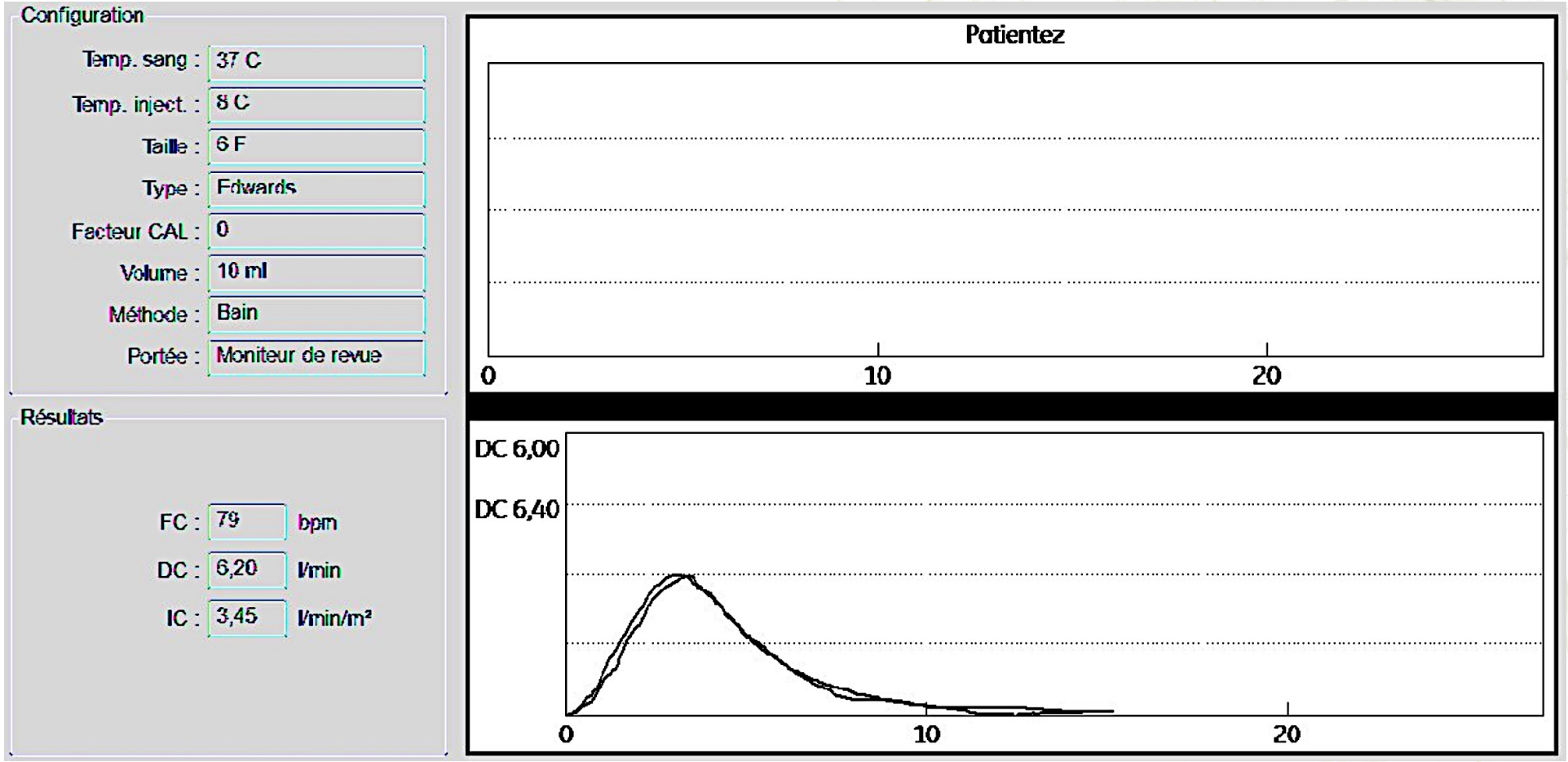


Pression capillaire

Pathologique :



Mesure du débit cardiaque



Les examens associés au cathétérisme cardiaque

1 **Test de vaso-réactivité au NO**

- Patient avec suspicion d'HTP du groupe 1
- Positif : Réduction des PAPm ≥ 10 mmHg **ET** PAPm ≤ 40 mmHg

2 **Test de remplissage « Fluid challenge »**

- Patient avec suspicion d'une composante post-capillaire
- Positif : 500 mL de sérum salé sur 5-10 min → Pcap ≥ 18 mmHg

3 **Oxymétries étagées**

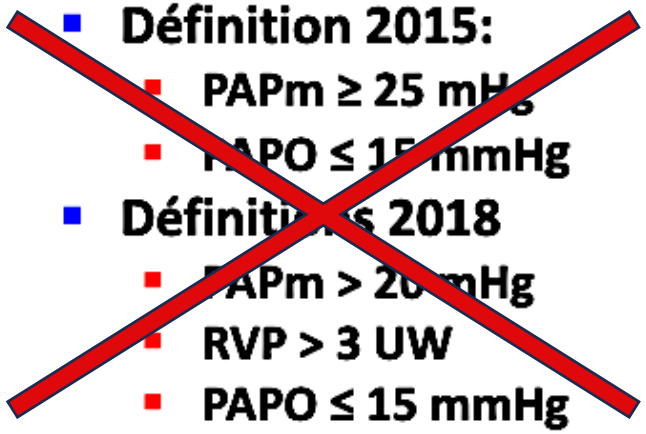
Les normes au KT en 2024 → ESC 2022

- <u>Hypertension pulmonaire</u> : PAPm > **20** mmHg

- <u>Pré-capillaire</u> :
  - RVP > **2** UW
  - Pcap < 15 mmHg

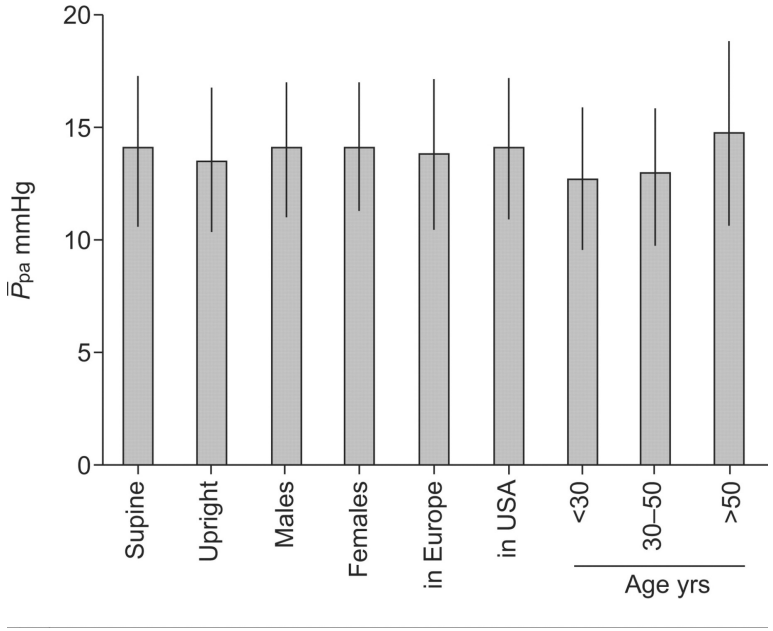
- <u>Post-capillaire</u> :
  - RVP ≤ **2** UW
  - Pcap ≥ 15 mmHg

- <u>Mixte</u> :
  - RVP > **2** UW
  - Pcap ≥ 15 mmHg

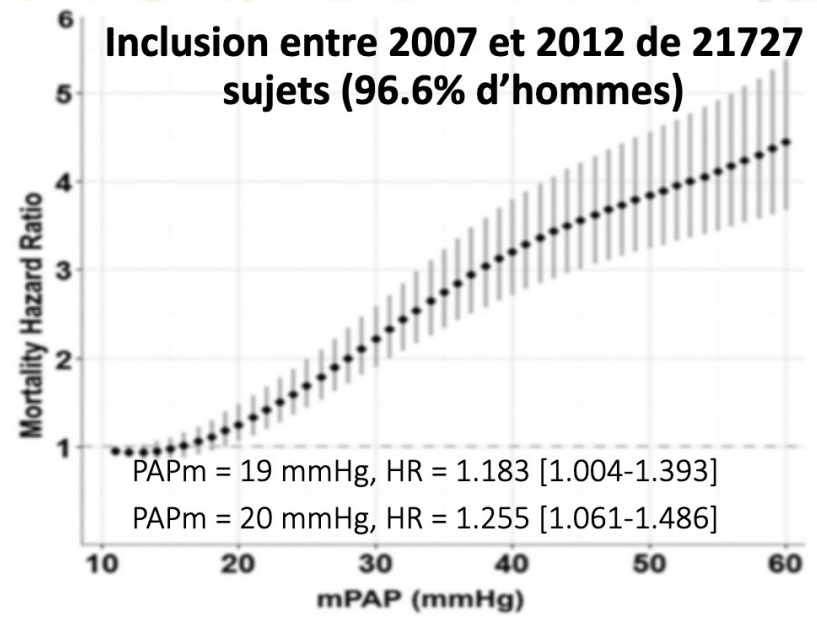


Pourquoi PAPm > 20 et plus 25 mmHg

- 25 mmHg → Date de 1973 et était empirique

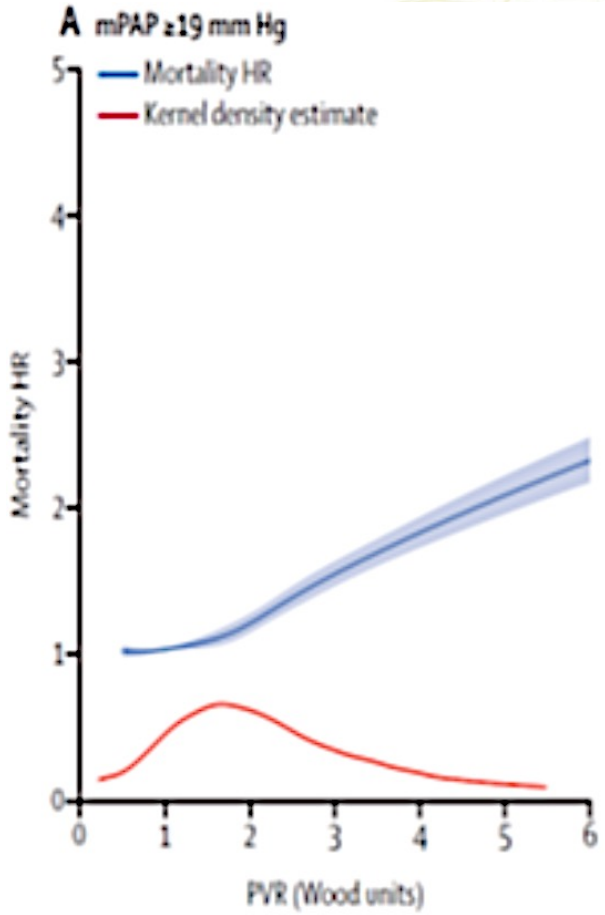


Kovacs G. Eur Respir J 2012



Maron BA. Circulation 2016

Pourquoi RVP < 2 et plus 3 UW



Maron BA. Lancet 2020

Pourquoi ça ne plaît pas aux cardiologues interventionnels ?

Coût VS cotation

81,67 euros

+ une salle de KT pendant 30 min

+ un médecin / 1 manip / 1 IDE

Code	Intitulé CCAM	Arbre	Tarif
EQQF006	**Mesure et enregistrement des pressions du coeur droit et de l'artère pulmonaire, sans injection de produit de contraste, par voie veineuse transcutanée**	4.1.2.1	96,00 € Remboursement

EQQF006 : 96 euros

Temps de procédure

DOSIMETRIE

Temps de scopie : 1,1 mn,

PDS cumulé : 163 µGy.m².

DOSIMETRIE

Temps de scopie : 5,1 mn,

PDS cumulé : 246 µGy.m².

DOSIMETRIE

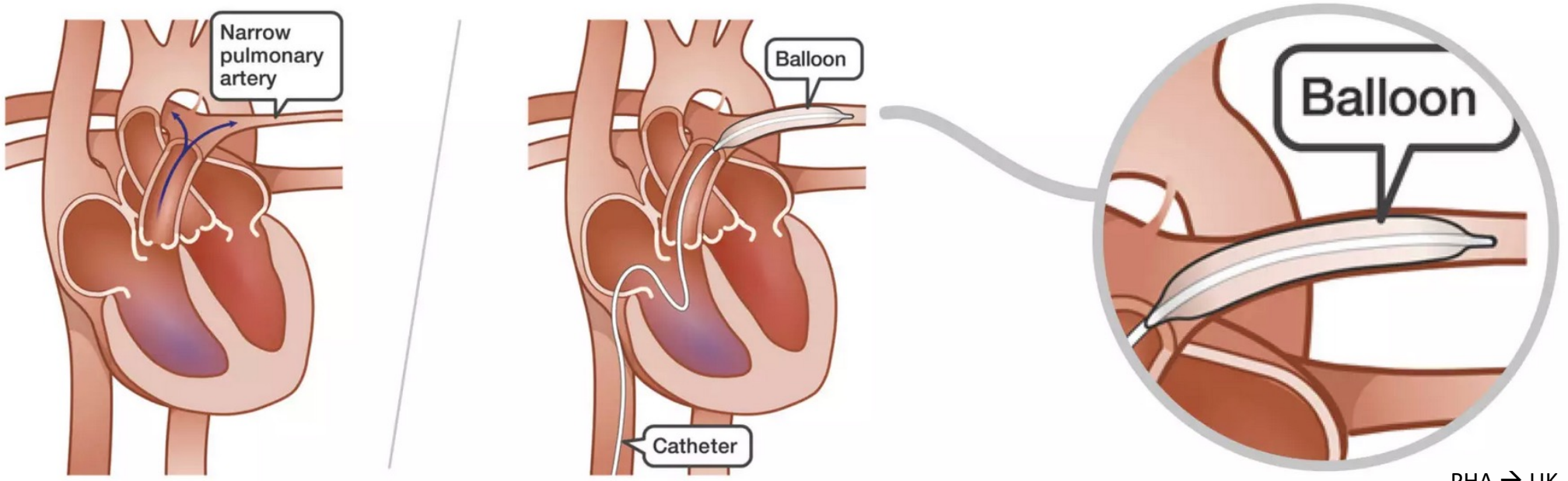
Temps de scopie : 16 mn,

PDS cumulé : 1048 cGy.cm².

Comment la rendre intéressante ?

L’angioplastie pulmonaire

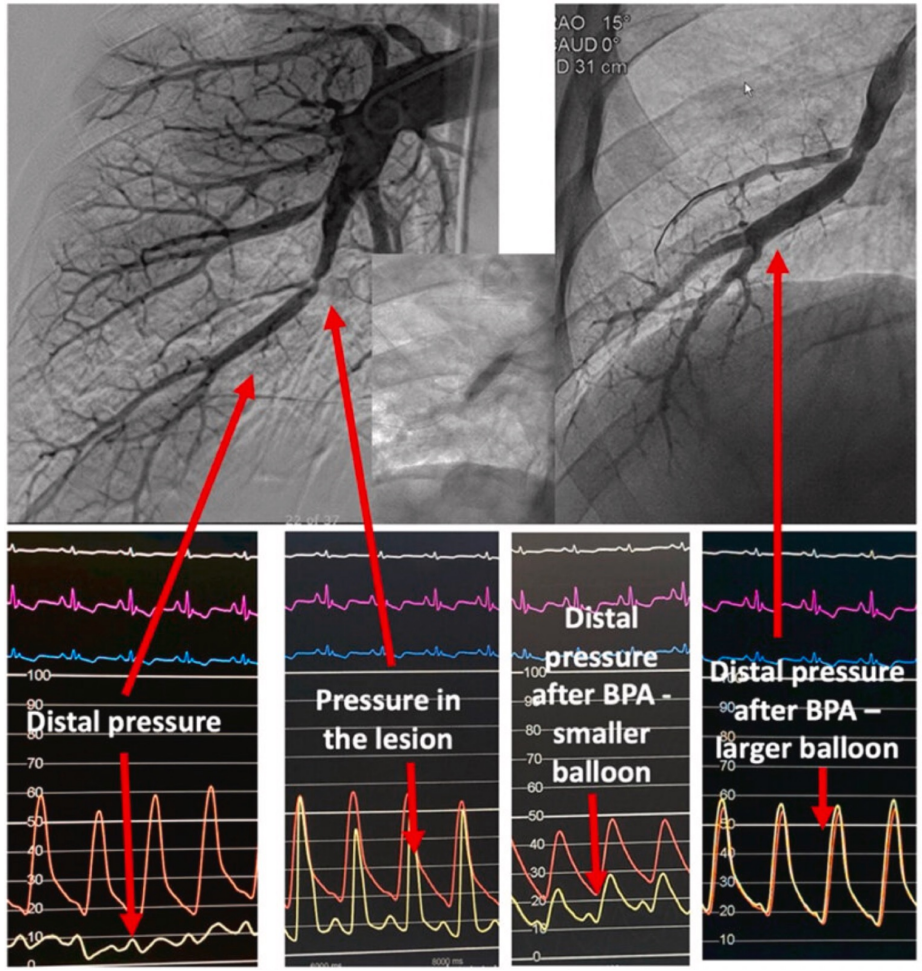
- L’angioplastie pulmonaire pour les HTP du groupe 4 (post-embolique)



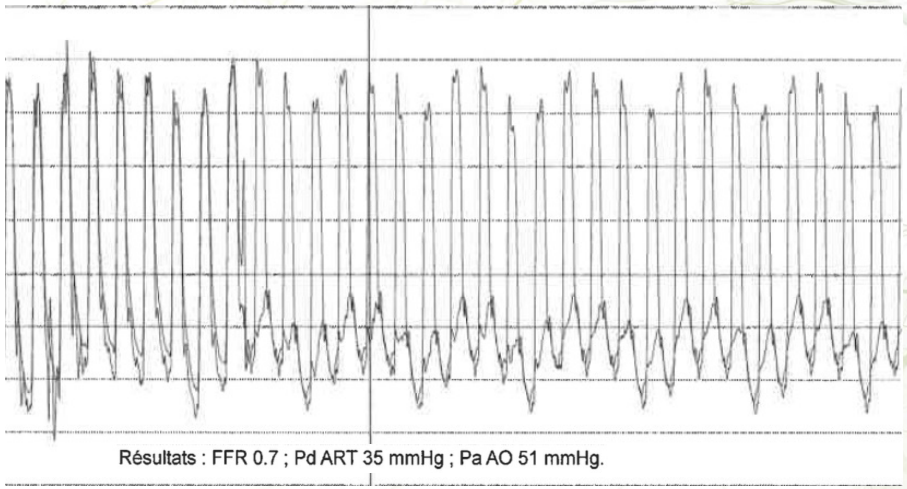
PHA → UK

FFR

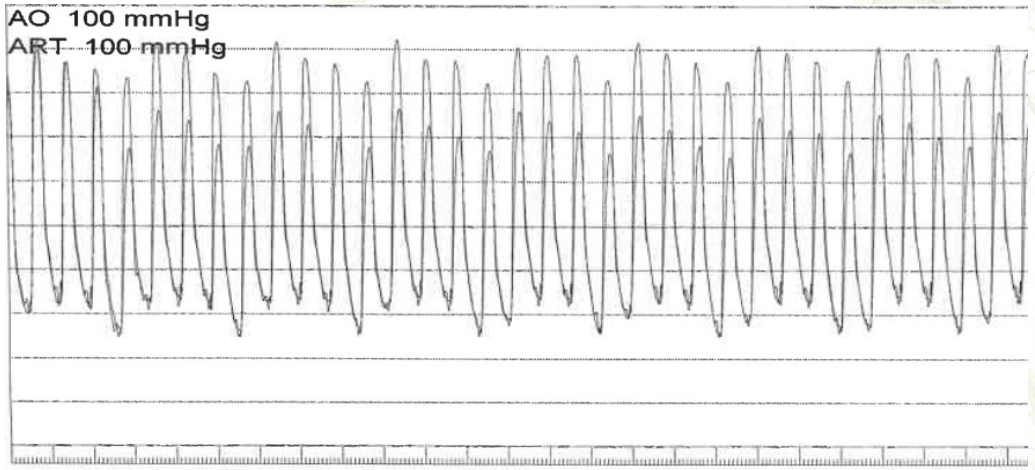
- FFR : Ratio de pression pulmonaire (Pd/Pp)



Bashir R. JACC 2023



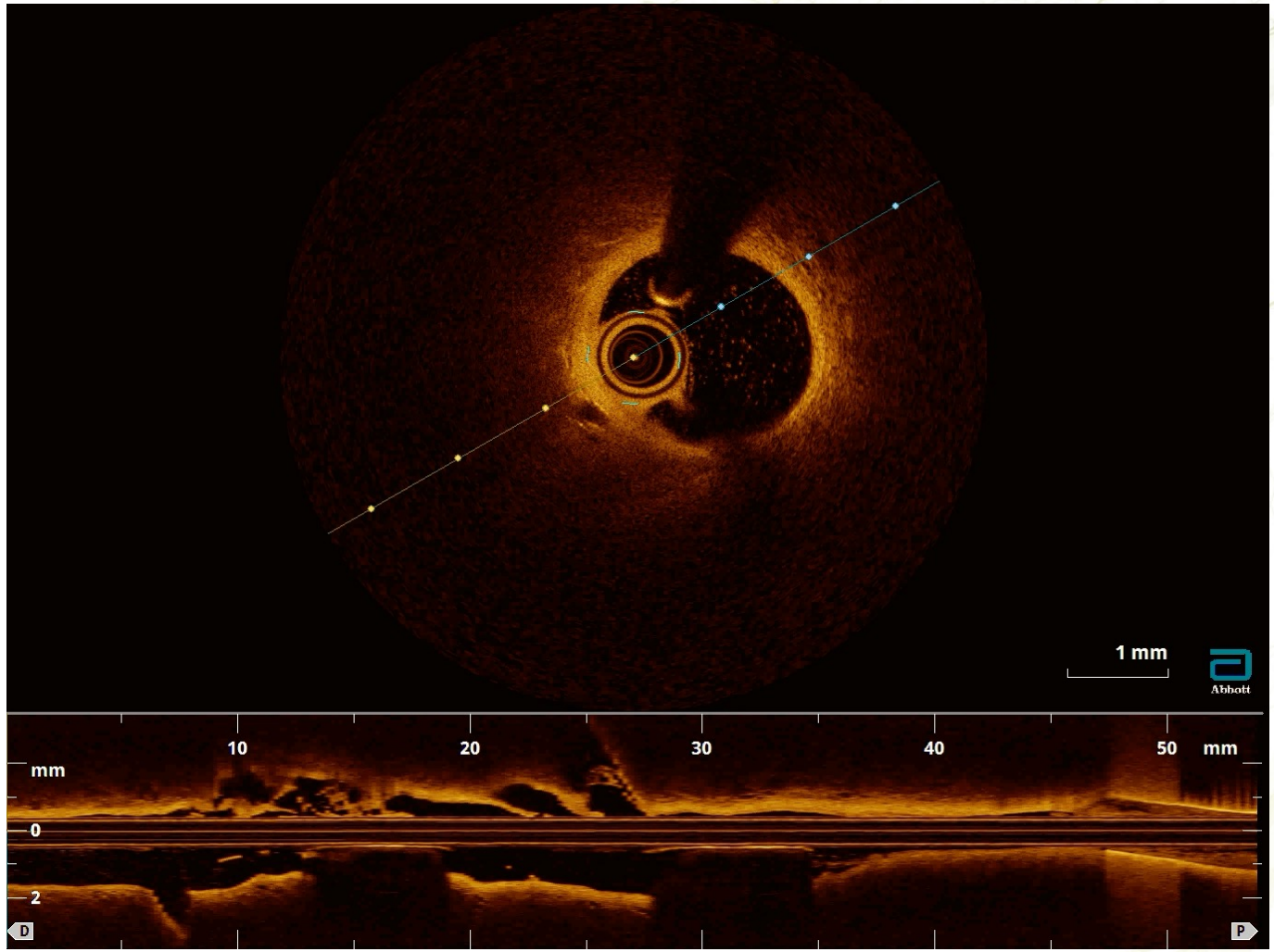
Résultats : FFR 0.7 ; Pd ART 35 mmHg ; Pa AO 51 mmHg.



Résultats : FFR 0.84 ; Pd ART 47 mmHg ; Pa AO 56 mmHg.

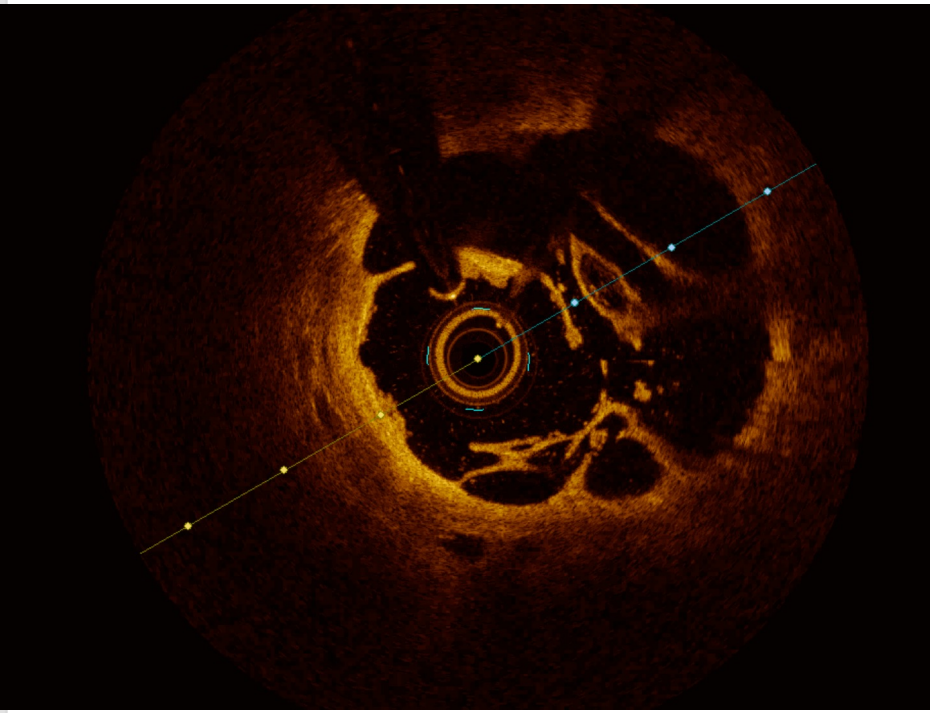
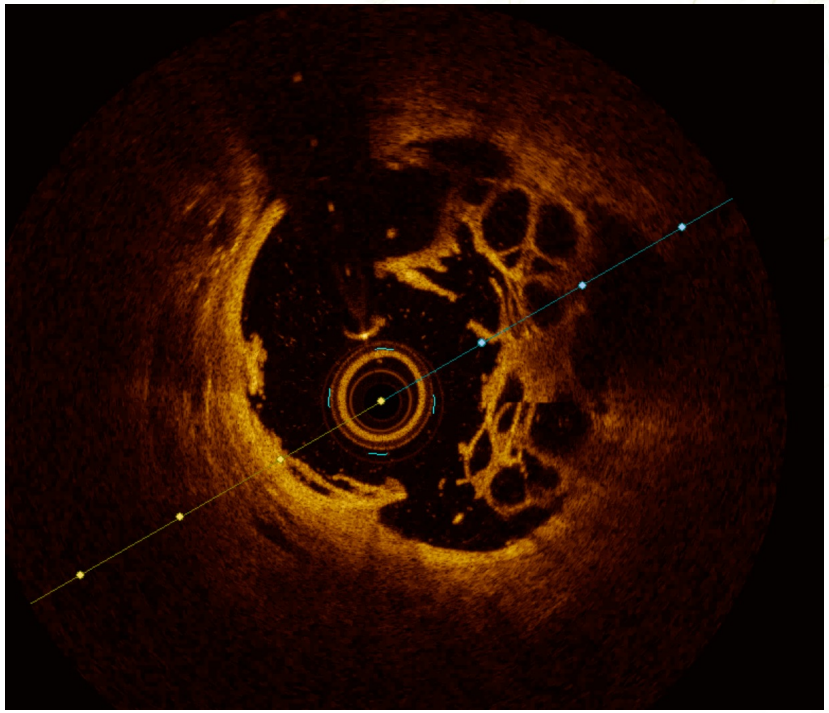
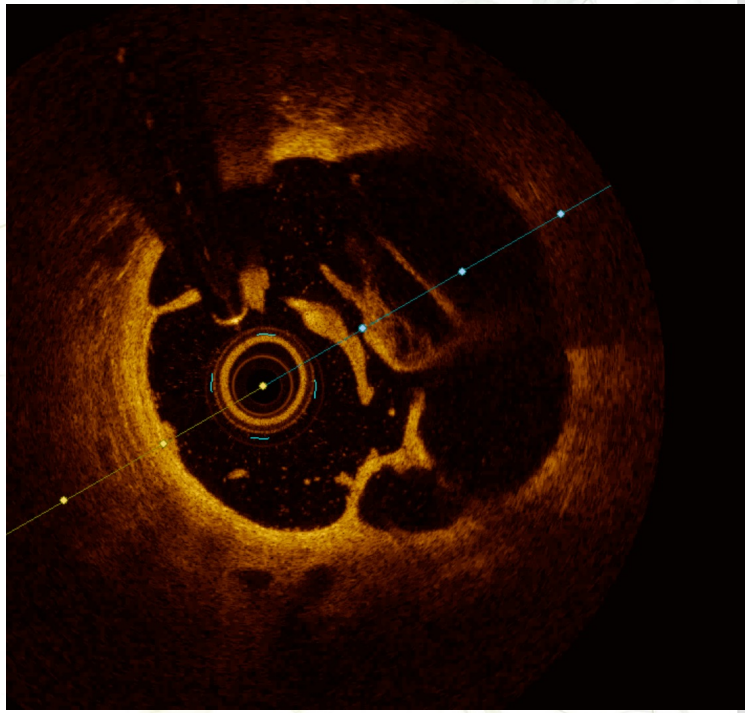
Comment la rendre intéressante

- Imagerie endovasculaire (OCT) : Avant angioplastie



Comment le rendre intéressant

- Imagerie endovasculaire (OCT) : Après angioplastie

JE VOUS REMERCIE POUR VOTRE ATTENTION