



# **Value of the Valsalva Maneuver in the diagnosis of left ventricular failure during acute exacerbation of chronic obstructive pulmonary disease**

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# Introduction

Left ventricular failure (LVF) is a common cause of acute exacerbation of chronic obstructive pulmonary disease (AECOPD).

This association is frequently underestimated with regard to the difficulty of clinical diagnosis .

We expect that Valsalva Maneuver (VM) could be useful in this issue.

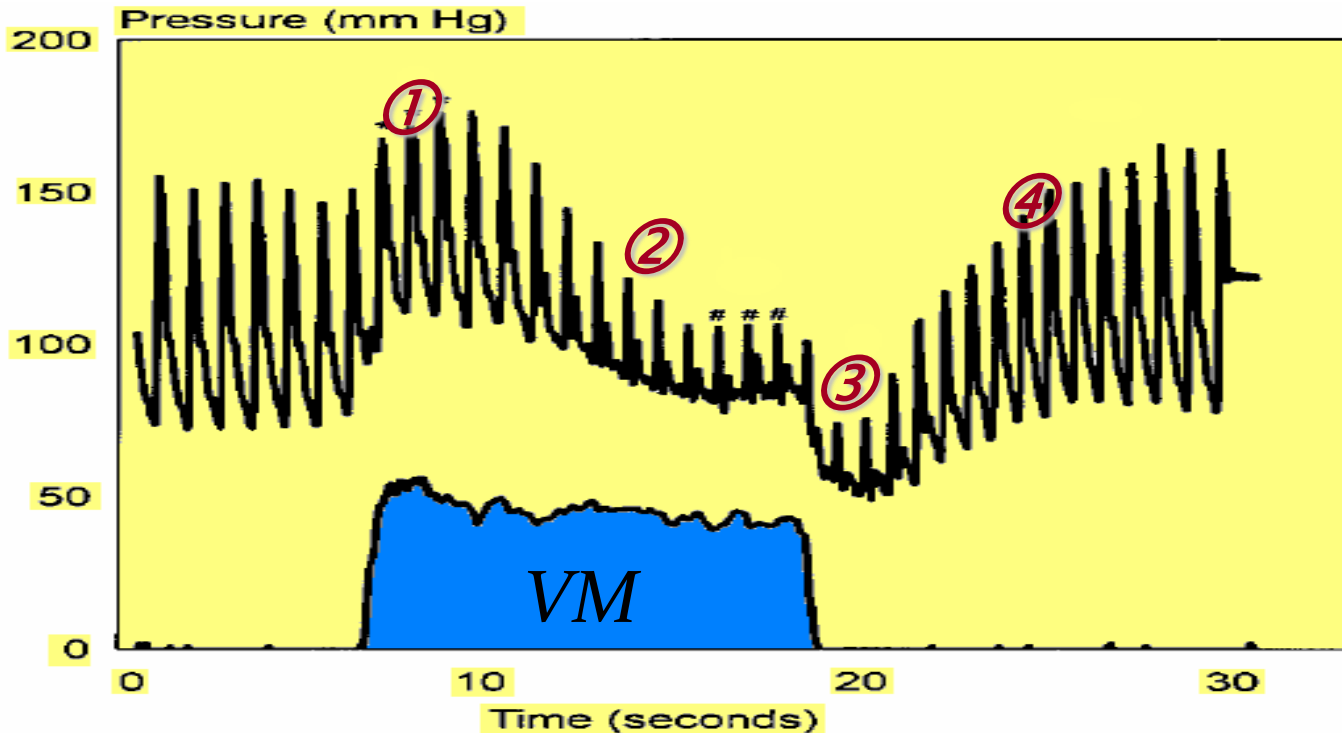
# Valsalva Maneuver

## Definition

Described for the first time by the Italian pathologist *ANTONIO MARIA Valsalva* (1666-1723).

It consists on a forced expiration with closed airway (mouth and nose closed) to increase the pressure in the Eustachian tube.

# Valsalva Maneuver (VM)



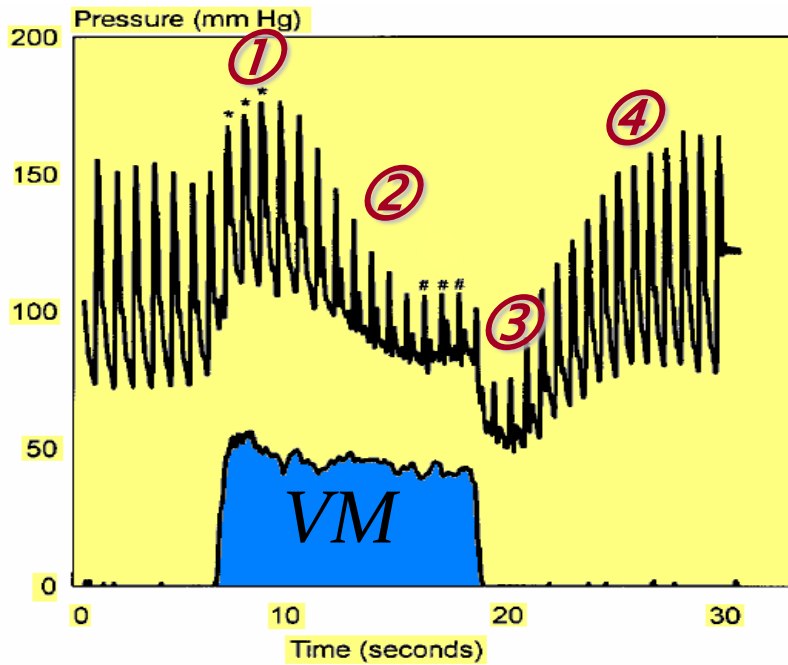
## Normal

Phase ①:  $\nearrow$  intra thoracic pressure and  $\nearrow$  of Blood pressure

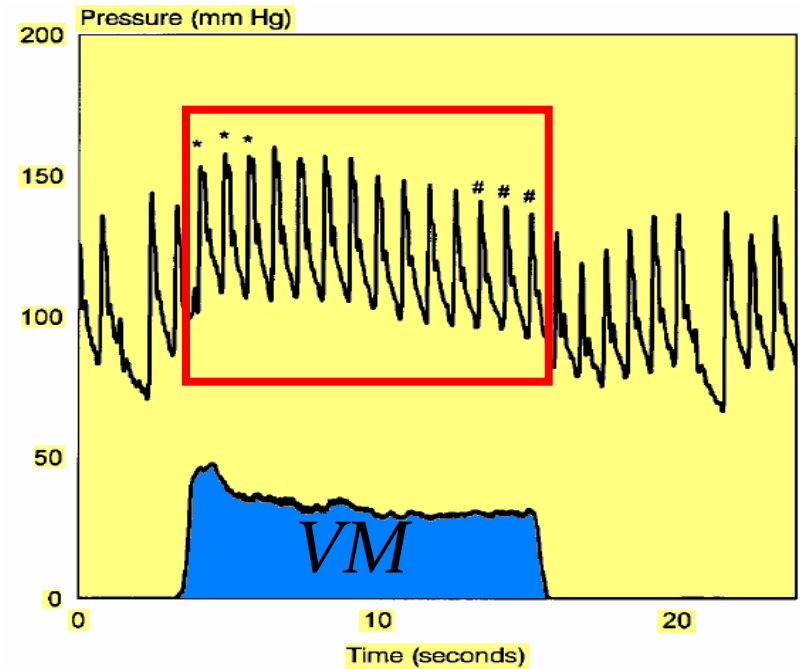
Phase ②:  $\searrow$  venous return and  $\searrow$  of Blood pressure

Phase ③: reflex vasodilatation

Phase ④: return to normal



*Normal*



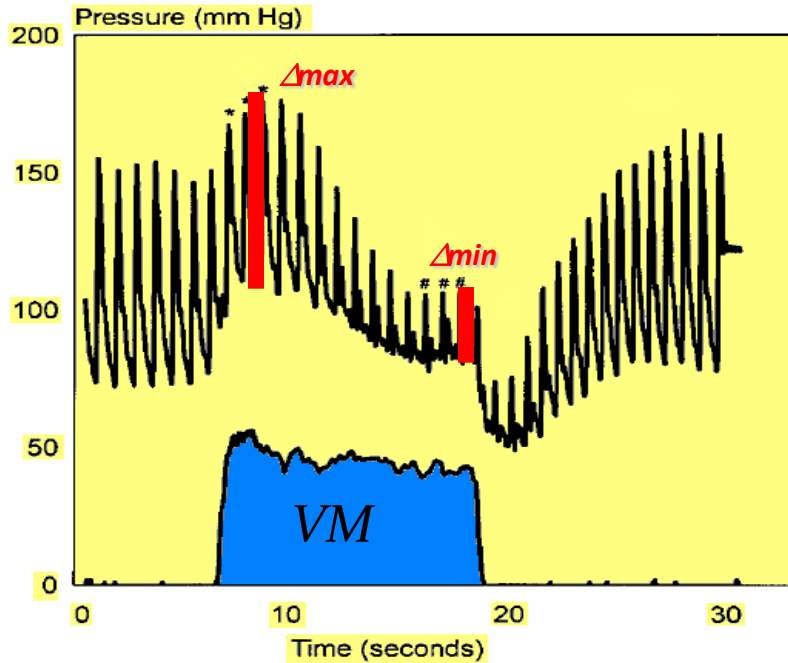
*Heart Failure*

*Phase ①: ↗ intra thoracic pressure and ↗ of Blood pressure*

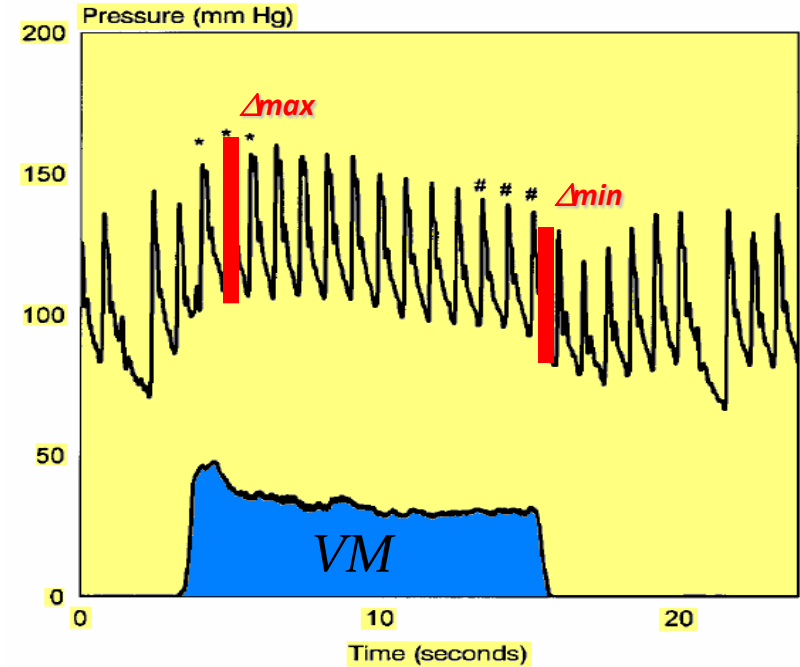
*Phase ②: ↘ venous return and ↘ of Blood pressure*

*Phase ③: reflex vasodilatation*

*Phase ④: return to normal*



*Normal*



*Heart failure*

***Pulse Amplitude Ratio  $PAR = \Delta_{min}/\Delta_{max}$***

***$PAR < 0.7$***

***$PAR > 0.7$***

# Purpose of the Study

Evaluation of the utility of the PAR under VM measured with the plethysmographic method (SaO<sub>2</sub> recording) in the diagnosis of LVF during AECOPD.

# Patients and methods

## Inclusion criteria

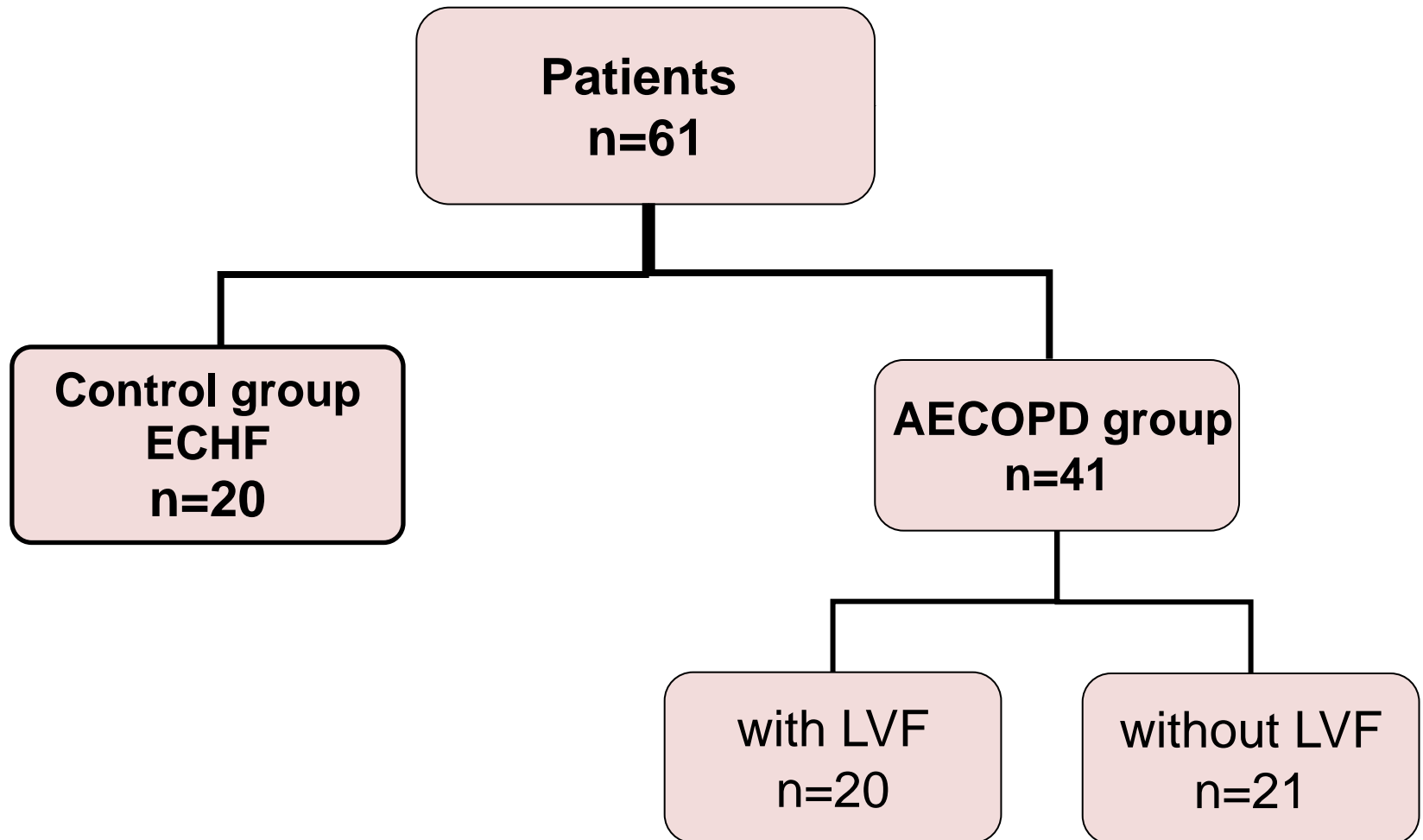
**AECOPD group** : patients admitted to the ED with an AECOPD defined as  $\text{SaO}_2 < 90\%$ ,  $\text{RR} > 25\text{c/min}$ ,  $\text{PaCO}_2 > 6\text{kPa}$  and  $\text{pH} < 7.35$ .

**Control group** : non COPD patients admitted to the ED for exacerbation of known congestive heart failure (ECHF).

**LVF** : clinical expert assessment, BNP levels  $> 400\text{pg/ml}$  and echocardiography findings when available.



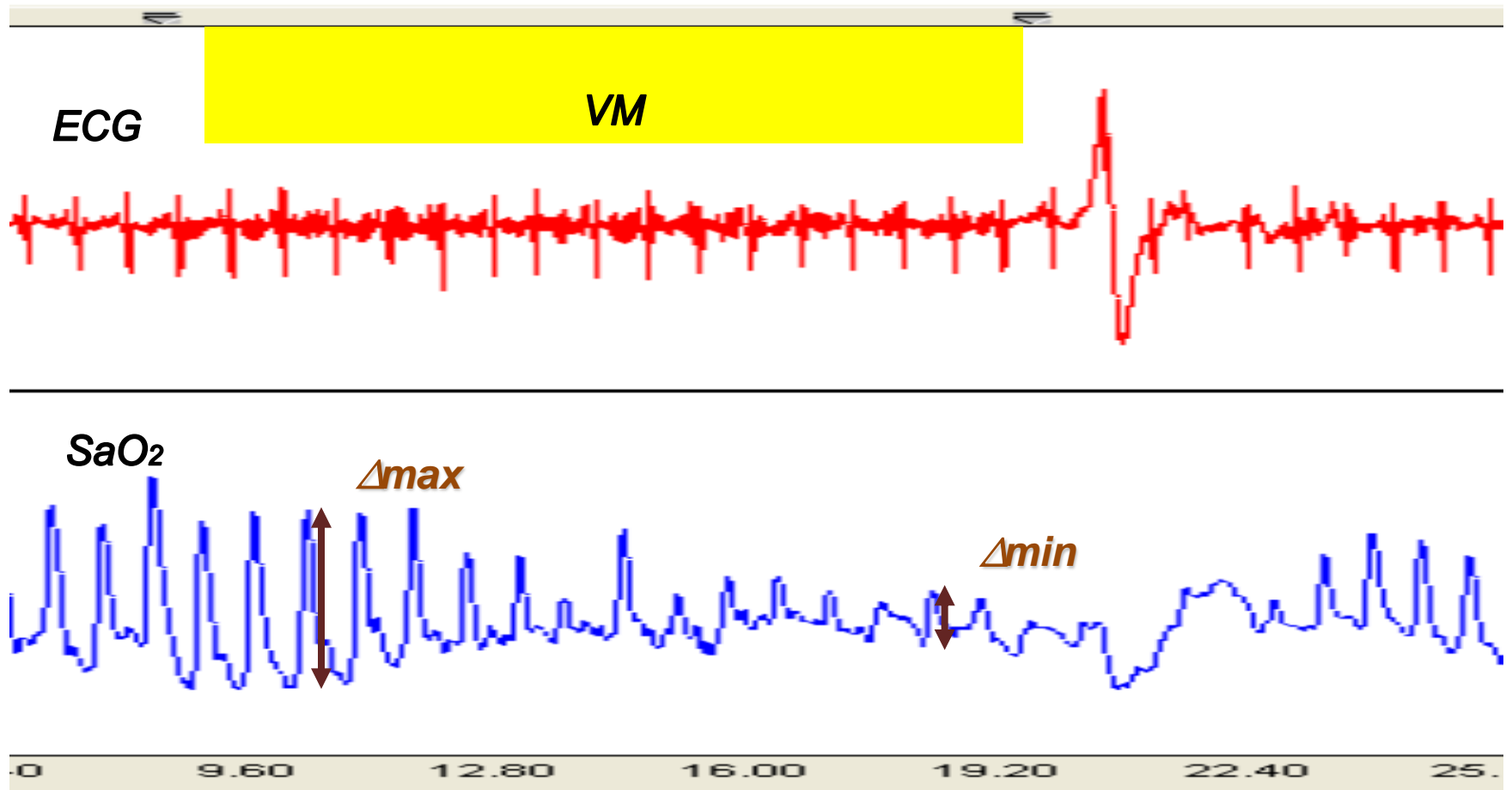
# Patients and methods



# Patients and methods

- VM was performed for all included patients. Duration **10 s**, plateau pressure **25 cmH<sub>2</sub>O**.
- Continuous measurement of SaO<sub>2</sub>, and pulse amplitude ratio (**PAR**) calculation (BIOPAC system).

# PAR measurement with BIOPAC system



# Patients and methods

## Data analysis

Comparison between CHF group and AECOPD group with and without LVF using standard statistic tests.

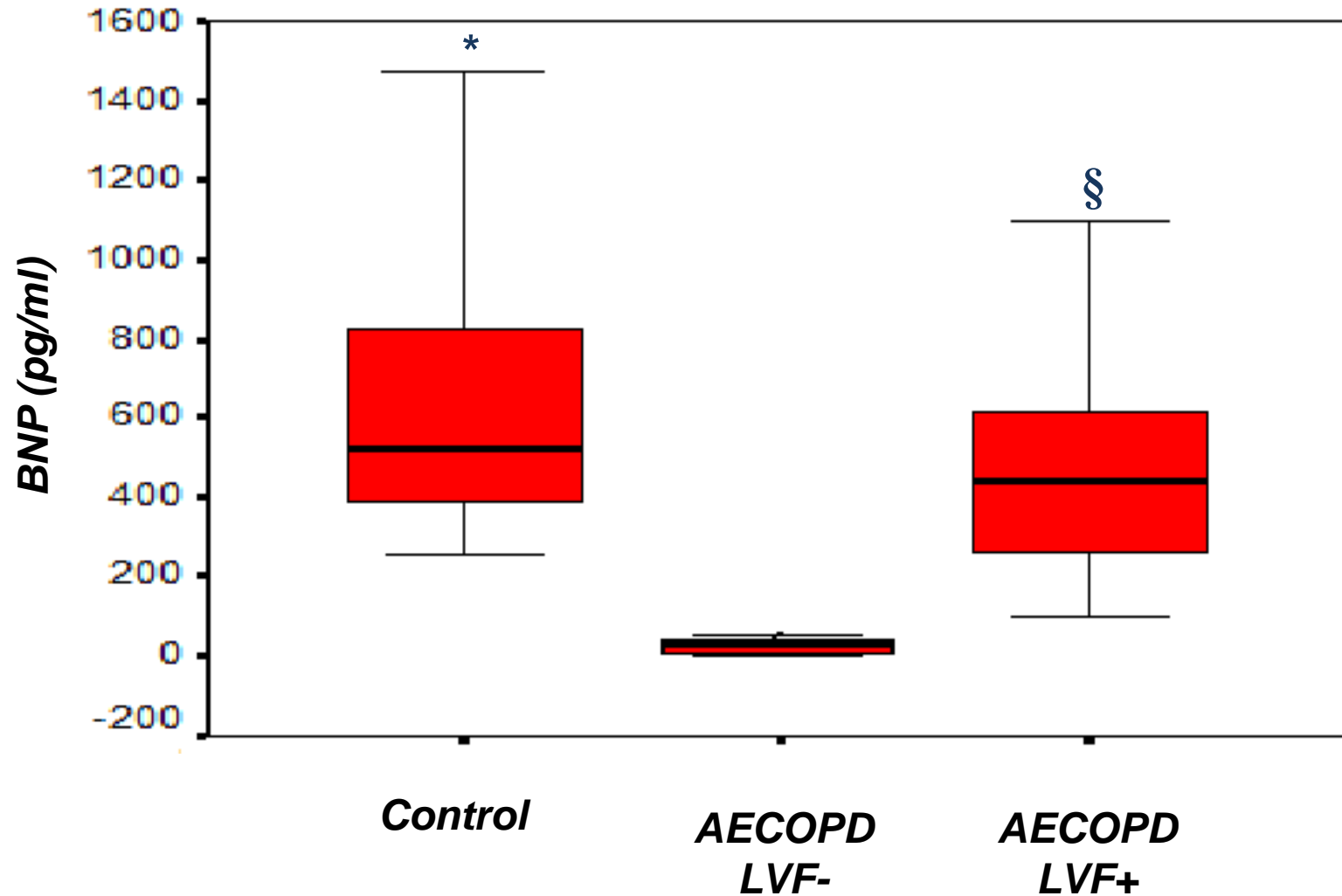
Correlation between PAR and BNP serum level.

# Results

	Control	AECOPD	
	ECHF n=21	with LVF n=20	without LVF n=21
<i>Age (year)</i>	<b>66 ±9</b>	<b>71 ±10</b>	<b>69 ±8</b>
<i>Sexe (F/H)</i>	<b>6/15</b>	<b>3/17</b>	<b>1/20</b>
<i>Dyspnea score</i>	<b>7±2</b>	<b>8±2</b>	<b>7±1</b>
<i>PaO<sub>2</sub> (kPa)</i>	<b>7.3±3.2</b>	<b>6.9±2.5</b>	<b>6.7±1.4</b>
<i>PaCO<sub>2</sub> (kPa)</i>	<b>5.3±3§</b>	<b>7.8±2</b>	<b>7.2±2</b>

§  $p < .0.01$  Control vs AECOPD

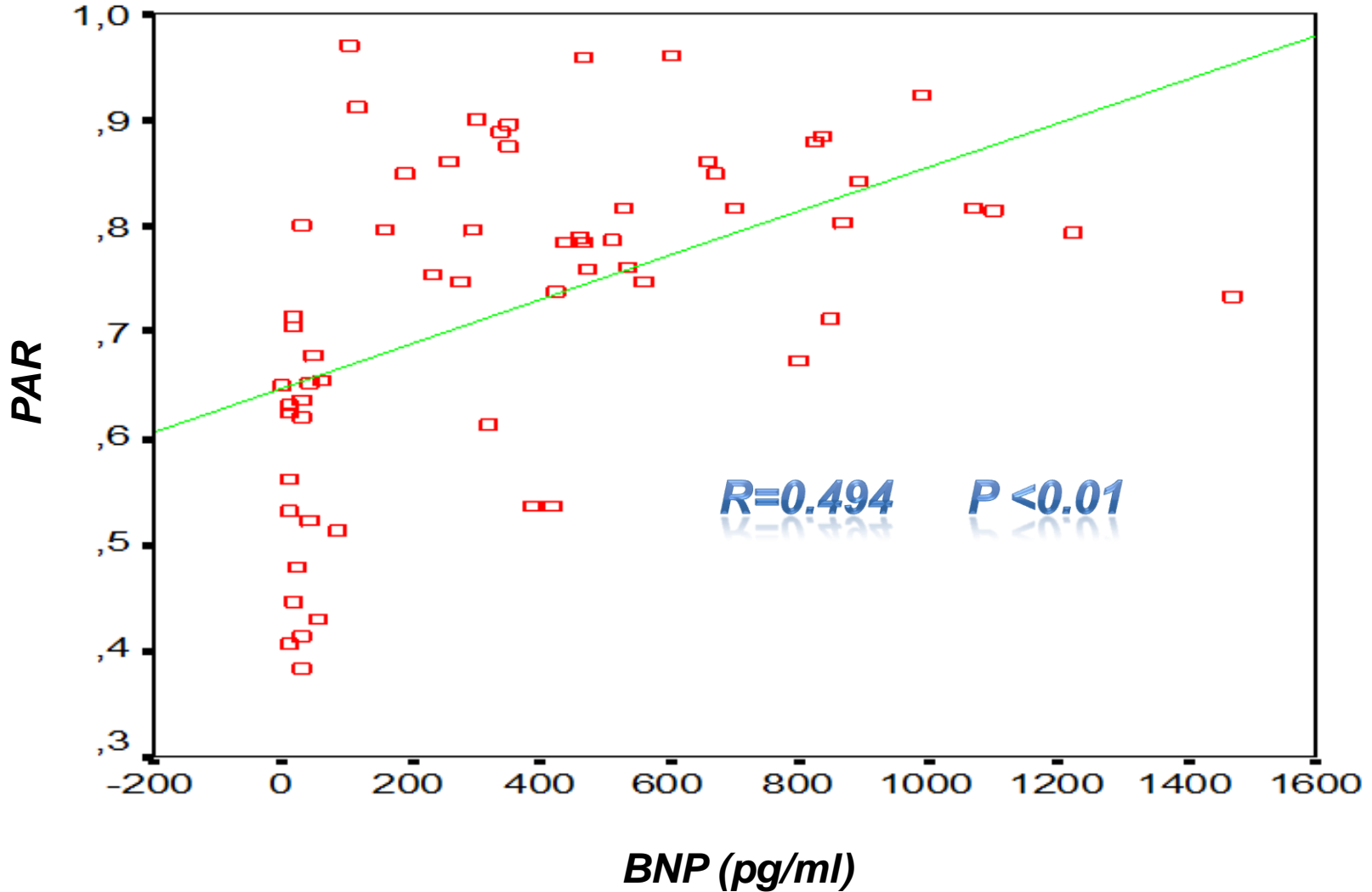
# Results



\*  $p < 0.001$  Control vs AECOPD LVF -

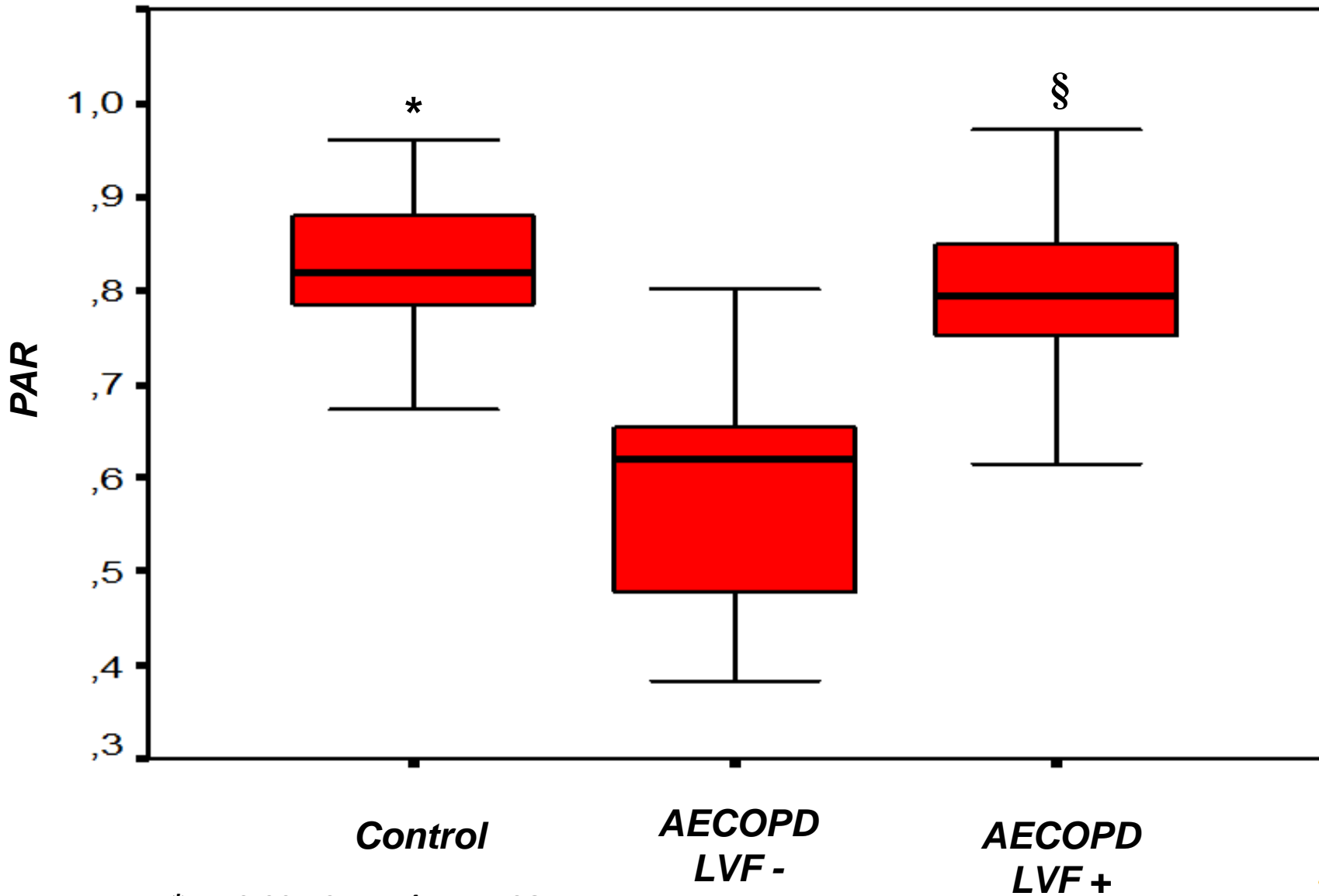
§  $p < 0.01$  AECOPD LVF- vs AECOPD LVF +

# Results



*Correlation between PAR and BNP*

# Results

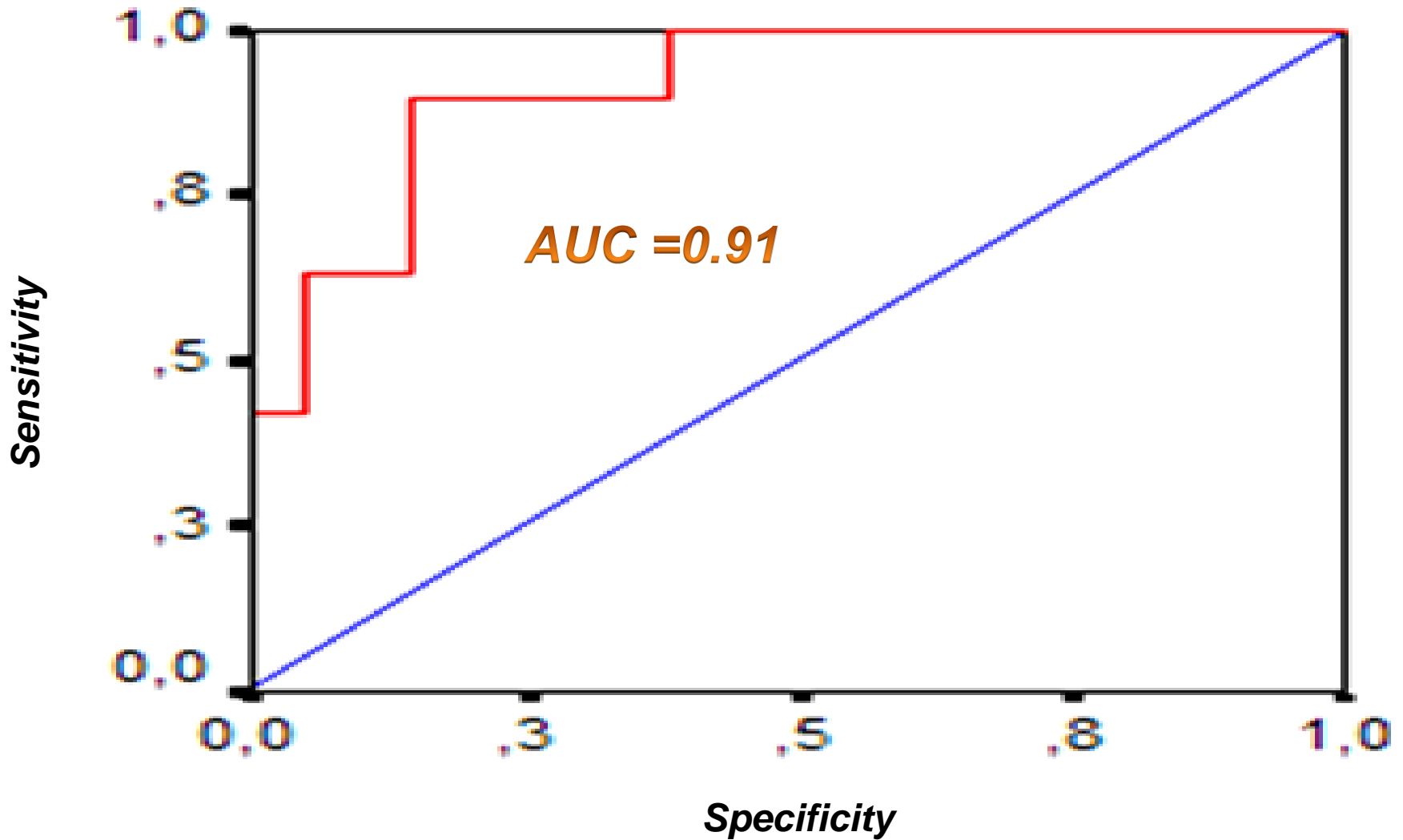


\*  $p < 0.001$  Control vs AECOPD LVF -

§  $P < 0.01$  AECOPD LVF- vs AECOPD LVF +



# Results



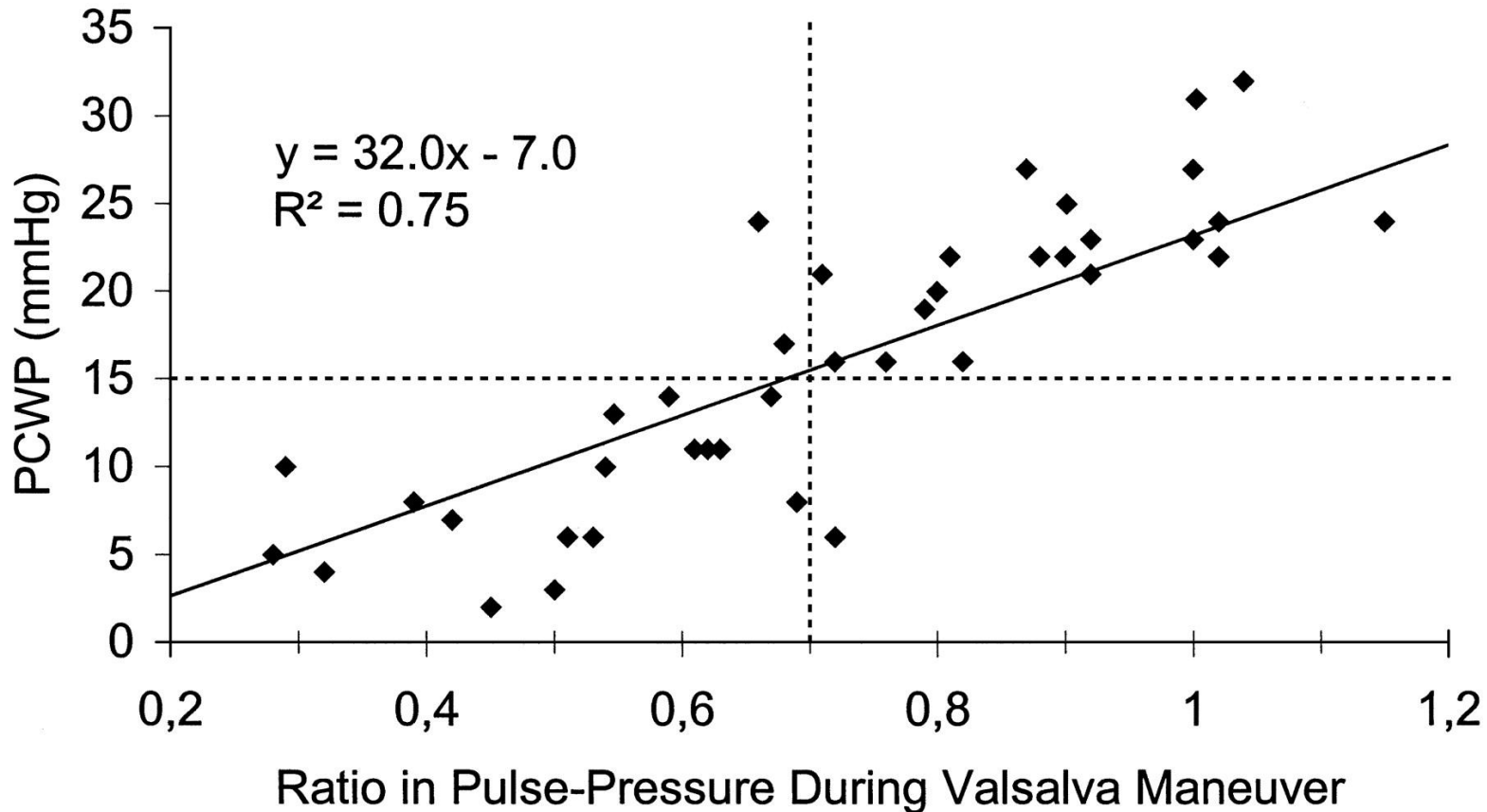
ROC curve

# Comments

**McIntyre, and al..**

*A noninvasive method of predicting pulmonary capillary wedge pressure.*

*N. Engl. J. Med. 327: 1715–1720,1992.*



# Comments

- There is a good correlation between **PAR** measured under VM with noninvasive **plethysmographic method** and **BNP** serum level.
- Measurement of **PAR** during VM could be helpful to the **diagnosis of LVF in AECOPD** admitted to the ED.



***Thank you for your attention***