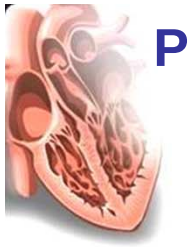

Management of Secondary Hypertension

2011. 04.16.

가톨릭의과대학
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임 상 현

FREQUENCY OF VARIOUS DIAGNOSES IN HYPERTENSIVE PATIENTS – 1980s

	PRIMARY CARE	REFERRAL
Essential	92-95%	89%
Chronic kidney dis	3-6%	5%
Renovascular dis	0.2-1.0%	4%
Pheochromocytoma	0.1-0.2%	0.2%
Aldosteronism	0.1-0.3%	0.5% (5-13) 2007
Cushing's syndrome	0.1-0.2%	0.2%
Coarctation	0.1-0.2%	1%
Oral contraceptives	0.2-1.0%	

Screening for Secondary Hypertension

- Poor response to therapy (resistant hypertension)
- Worsening of control in previously stable hypertensive patient
- Stage 3 hypertension (systolic blood pressure > 180 mm Hg or diastolic blood pressure >110 mm Hg)
- Onset of hypertension in persons younger than age 20 or older than age 50
- Significant hypertensive target organ damage
- Lack of family history of hypertension

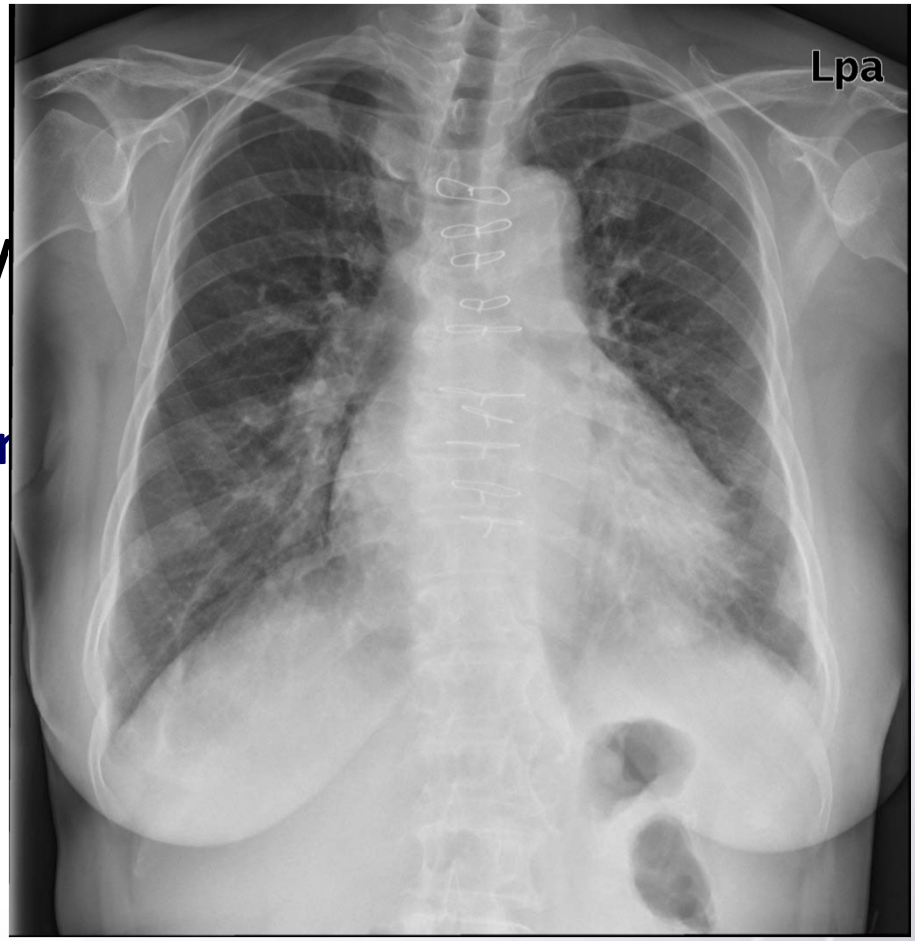
Case 1. (F/75)

- 갑작스런 호흡곤란
- P/Hx : HTN (10년) DM (2년)

  CABG : rima to LAD SV
- Medication

  : Aspirin 100mg, Candesartar

  Thiazide 25 mg, Metformin
- V/S: 170/100 mmHg-70/min
- BUN/Cr = 28.0/1.38 mg/dL
- Na/K = 140/5.0 mEq/L
- P/Ex : Both lower lung – rale



➔ Resistant Hypertension with Heart Failure

Abdominal Bruit ➔ R/O Renovascular Hypertension with pul. edema

Renovascular Hypertension (RVH)

Onset of HTN before the age of 30 years or severe HTN after the age of 55

Accelerated, resistant, or malignant HTN

Development of new azotemia or worsening renal function after use of an ACEi or ARB

Unexplained atrophic kidney or size dicrepancy > 1.5 cm

Sudden, unexplained pulmonary edema

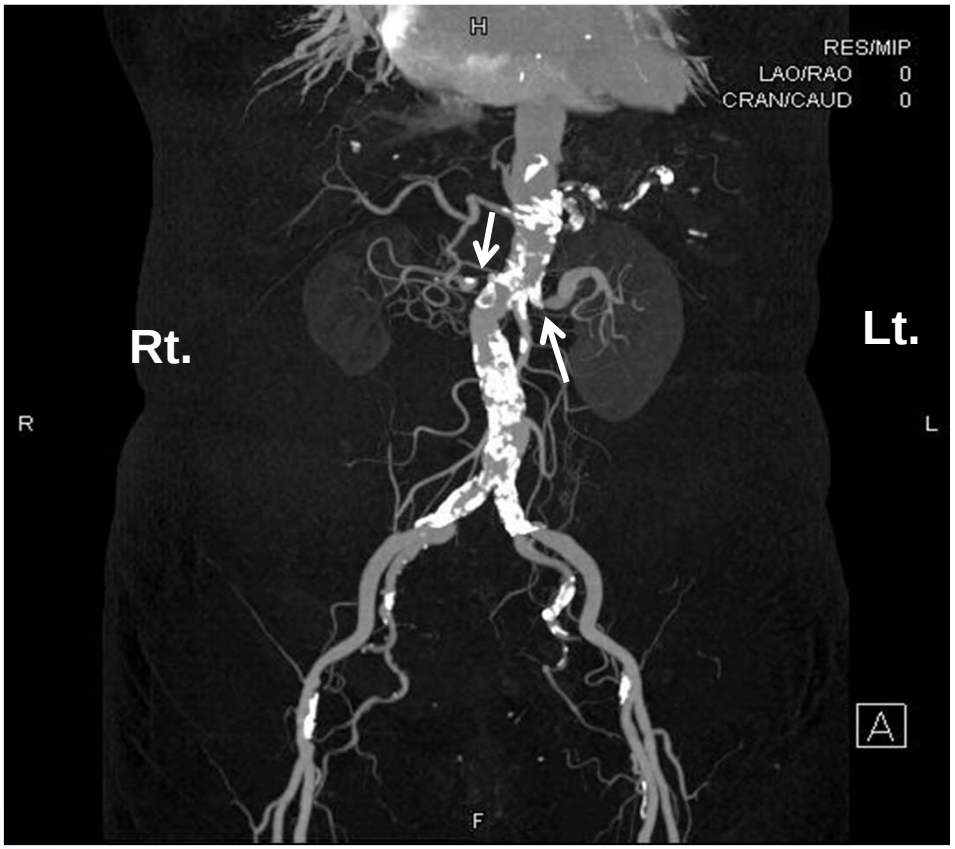
Morphologic diagnosis (Screening)

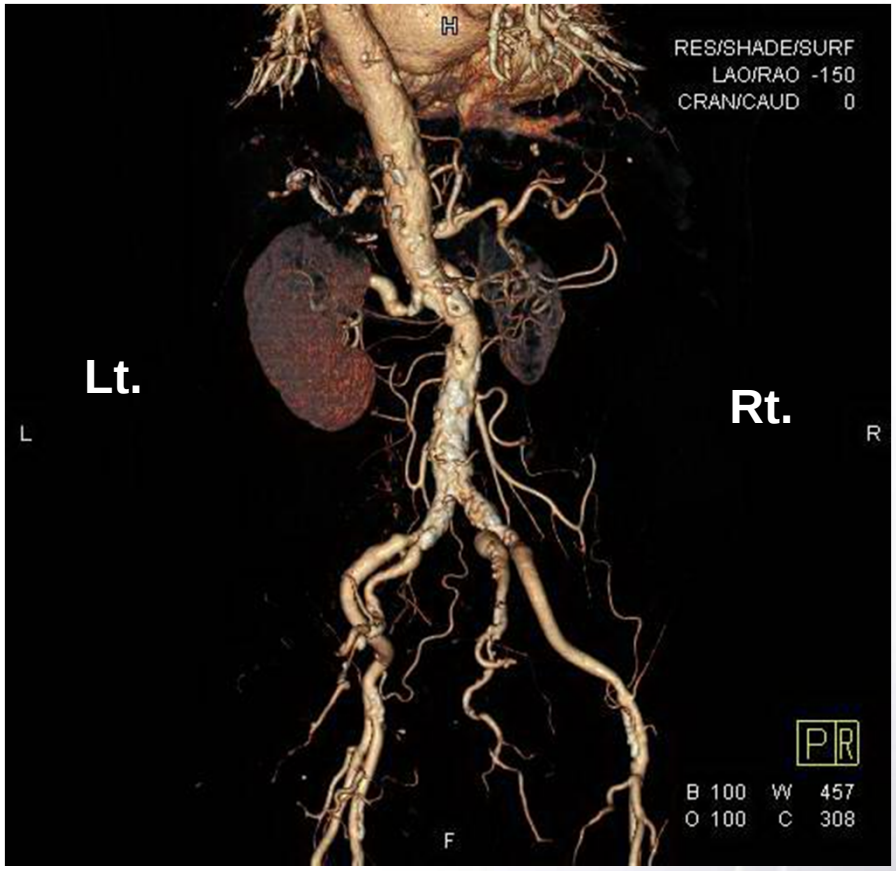
Functional diagnosis

- MRA, CTA
- Renal Doppler Ultrasound
- Captopril Renal Scan
- Captopril-Loaded PRA

Renal angiography or Split renal vein PRA

CT angiogram





Lt. Kidney : 10.8 cm

Rt. Kidney : 8.1 cm

A. Favorable Response After Revascularization

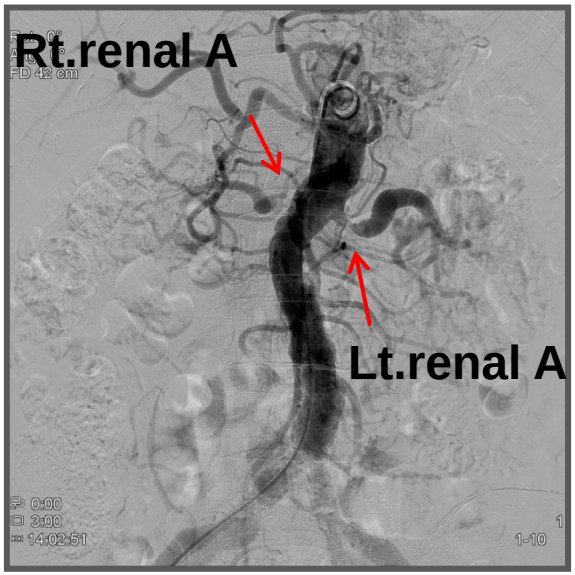
- **Recurrent "flash" pulmonary edema**
- **Renal A resistive index < 0.8**

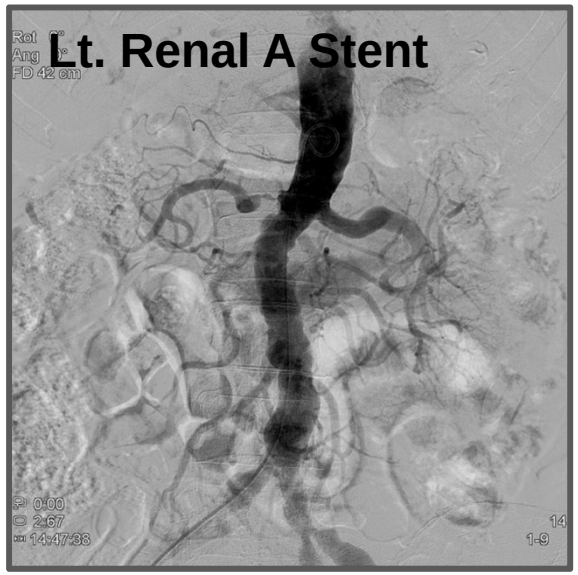
  by Doppler ultrasonography
- **Progressive, ongoing decline in renal function**
- **Recent dialysis** in a patient with suspected ischemic nephropathy
- **Acute, reversible increase in serum creatinine level after ACEi or ARB**
- **Resistant hypertension despite an appropriate 3-drug regimen**

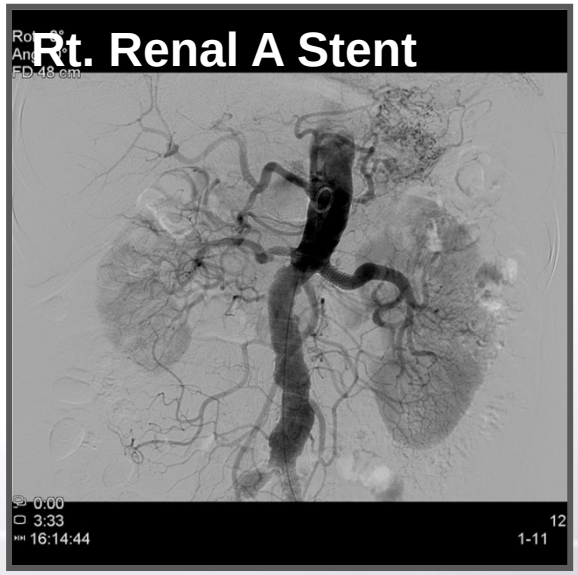
B. No Favorable Response After Revascularization ➔ Medical

- BP <140/90 mm Hg on <3 antihypertensive drugs
- Normal renal function
- Renal A resistive index ≥ 0.8 by Doppler ultrasonography
- History or clinical evidence of cholesterol embolization
- Heavy proteinuria (>1 g/d) or >10 Years' history of hypertension
- **Unilateral small kidney (<7.5 cm) or Renal artery stenosis <70%**

PTRA (Percutaneous Transluminal Renal Angioplasty)



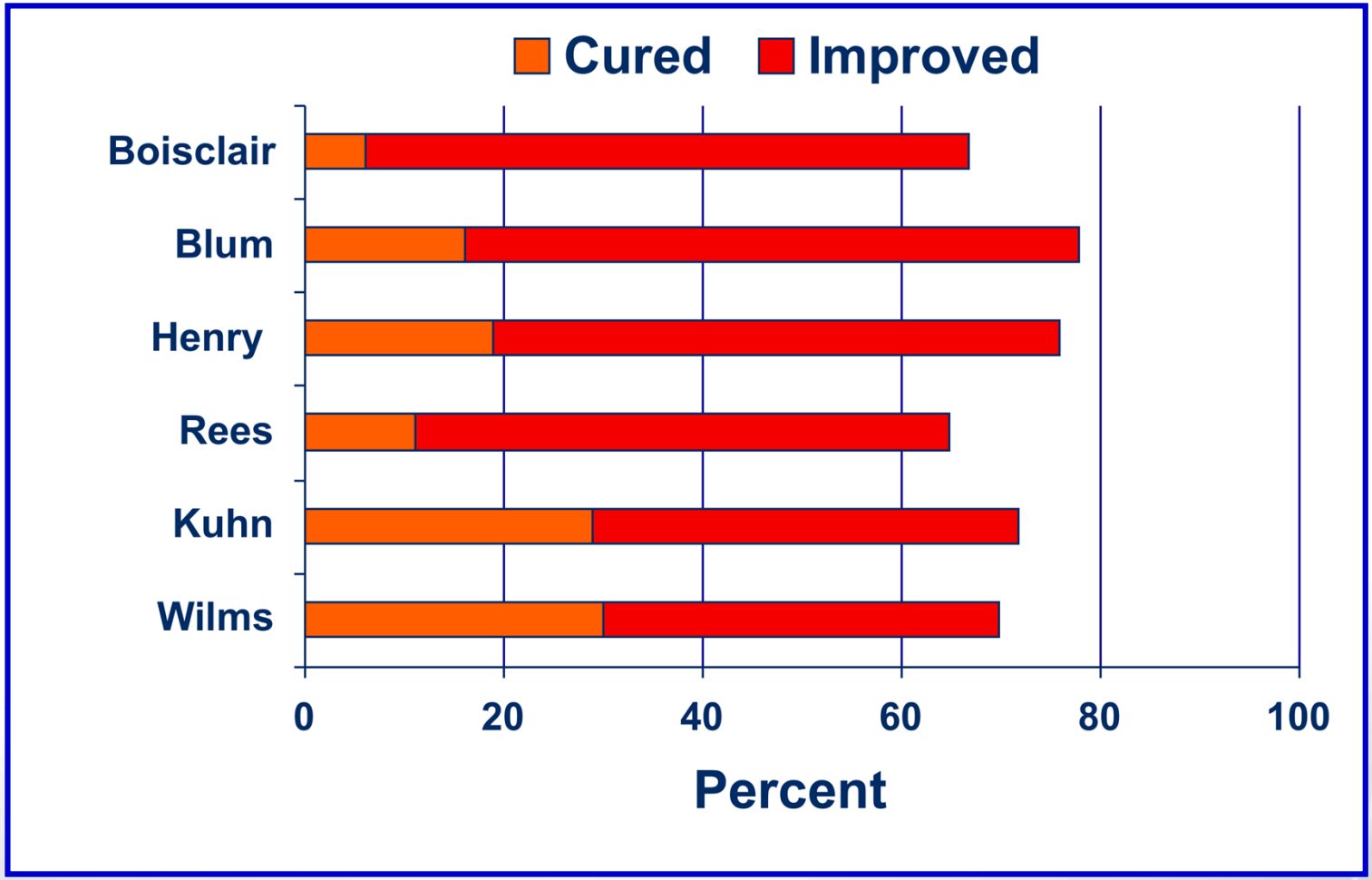




Post-Stent

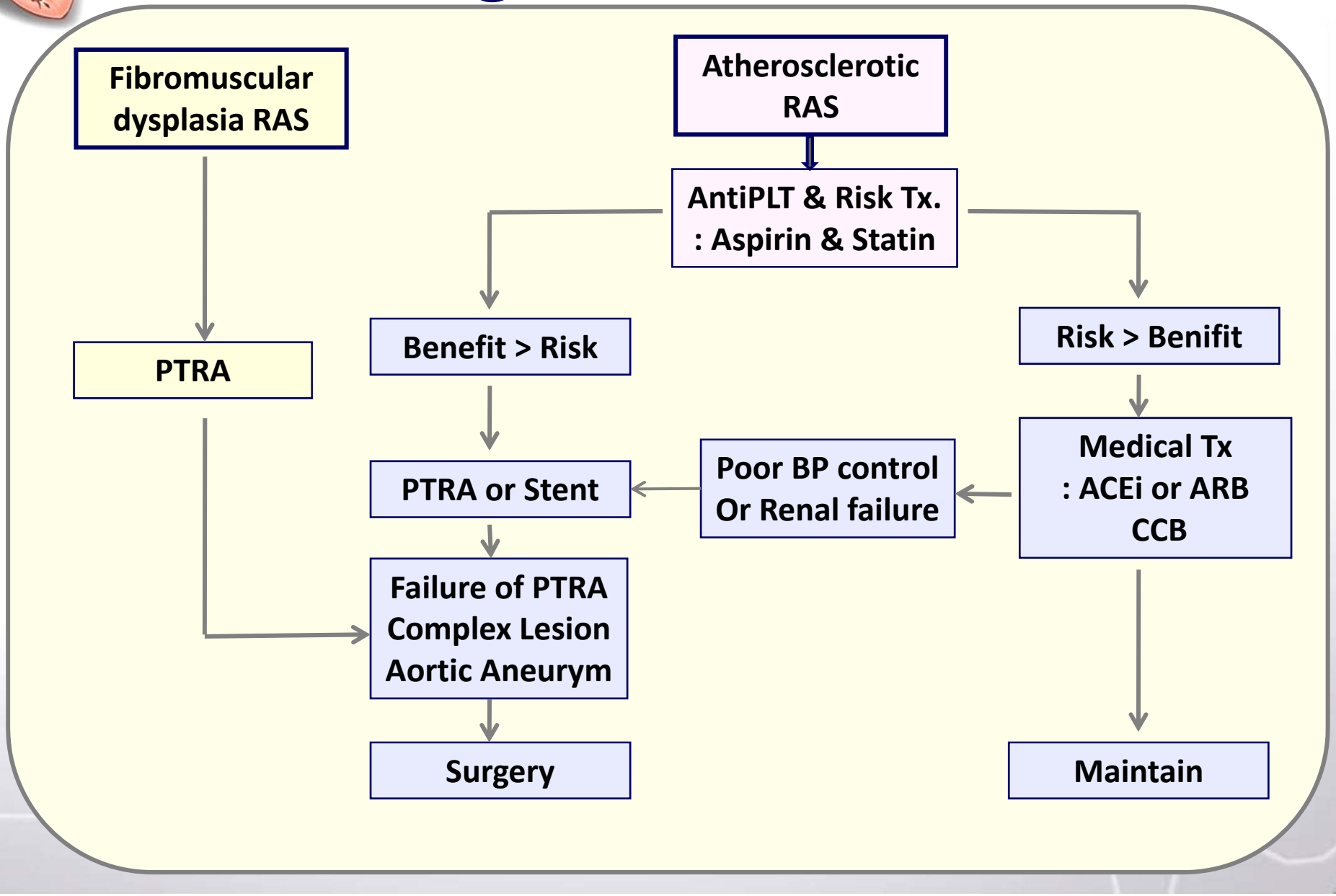
F/U BP
: 130/80 mmHg
: BUN/Cr
= 22.0/1.1 mg/dL
Na/K
= 141/4.2 mEq/L

BP response after renal A. stent



Leertouwer TC, et al. Radiology 2000;216:78-85.

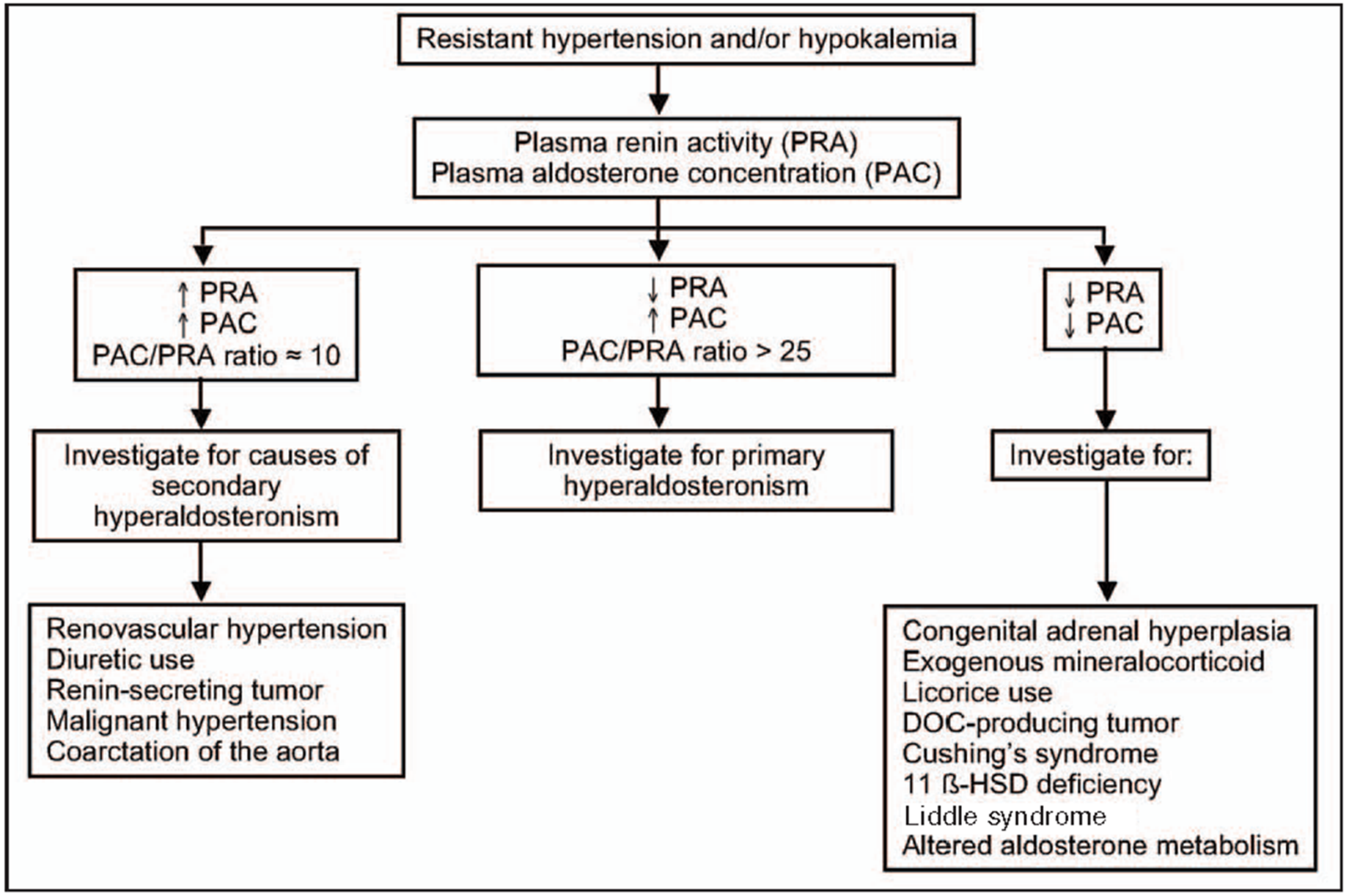
Management of RVH

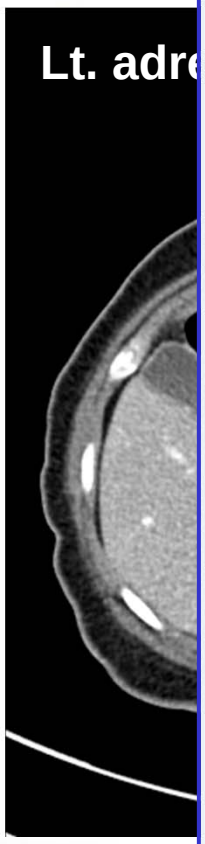


Case 2 (55/F)

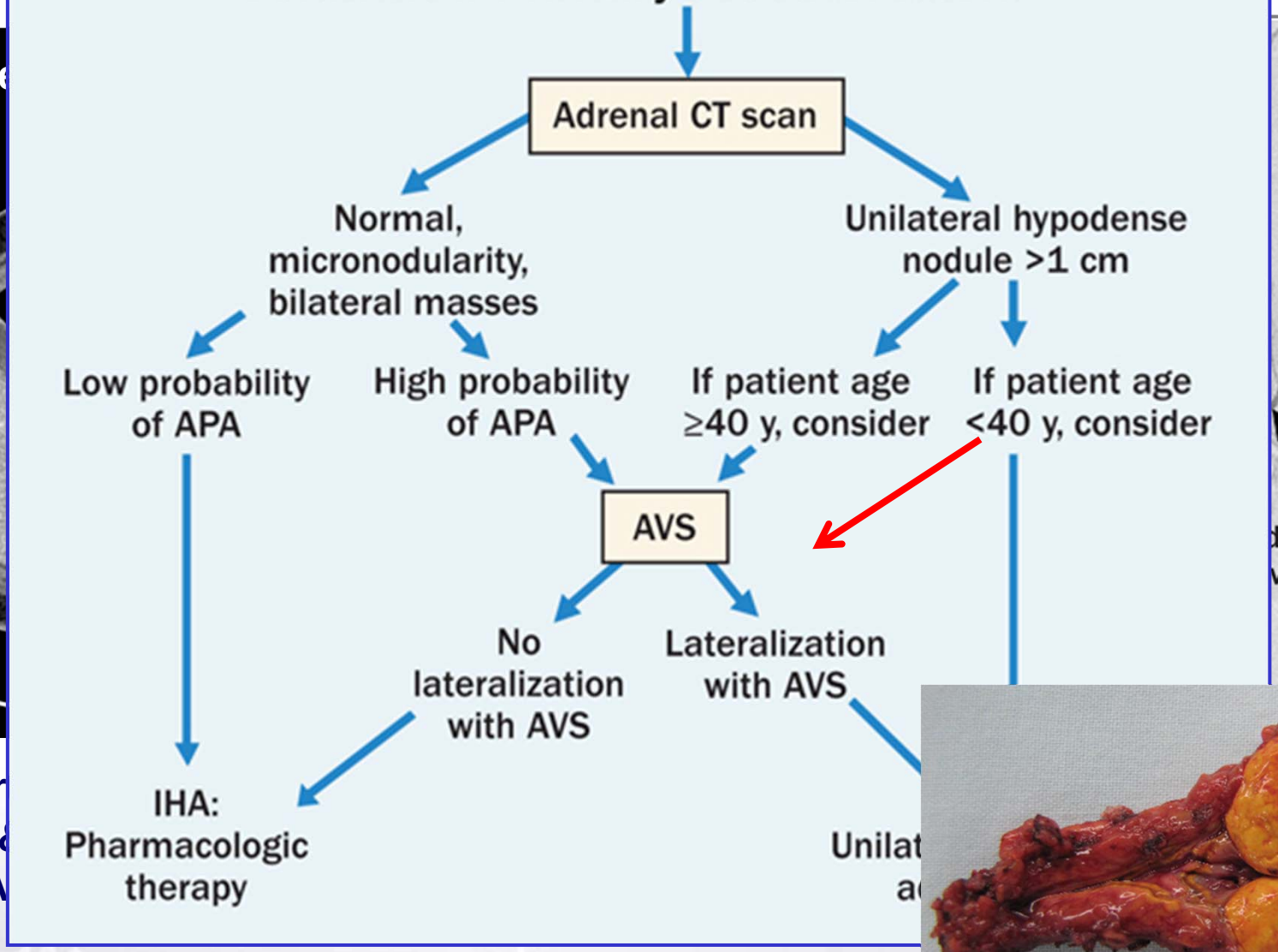
- **5년 전 고혈압 진단받고 CCB & ARB복용하던 자 로 혈압 조절도 안되고 무력감으로 내원.**
- **V/S: 160/100 mmHg-80/min**
- **BUN/Cr =17.2/1.07 mg/dL**
- **Na/K = 144/2.8 mEq/L**

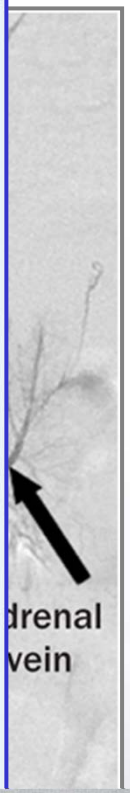
Screening test for Primary aldosteronism





Confirmed Primary Aldosteronism

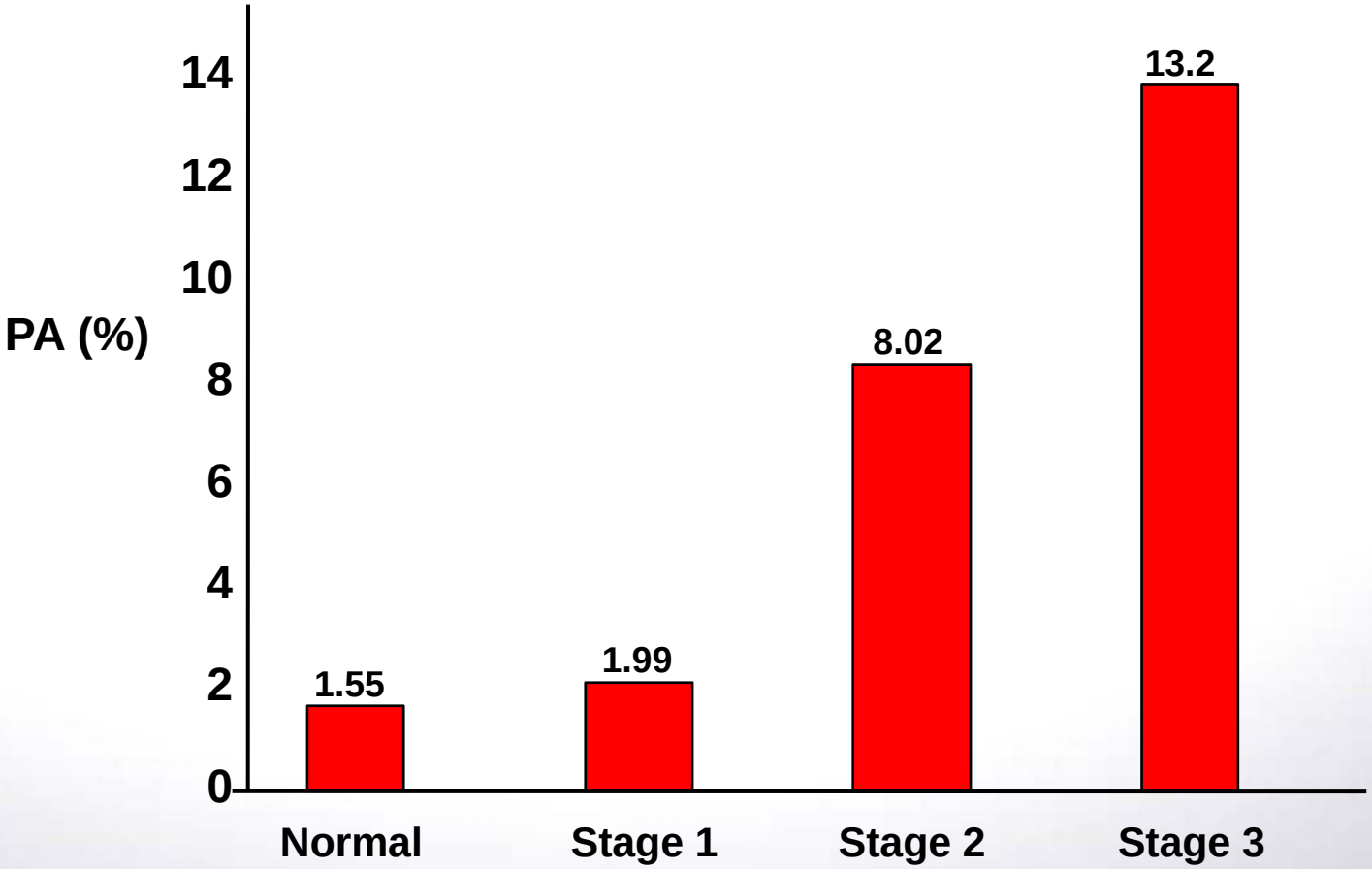




Cor
Lt. &
♣ A

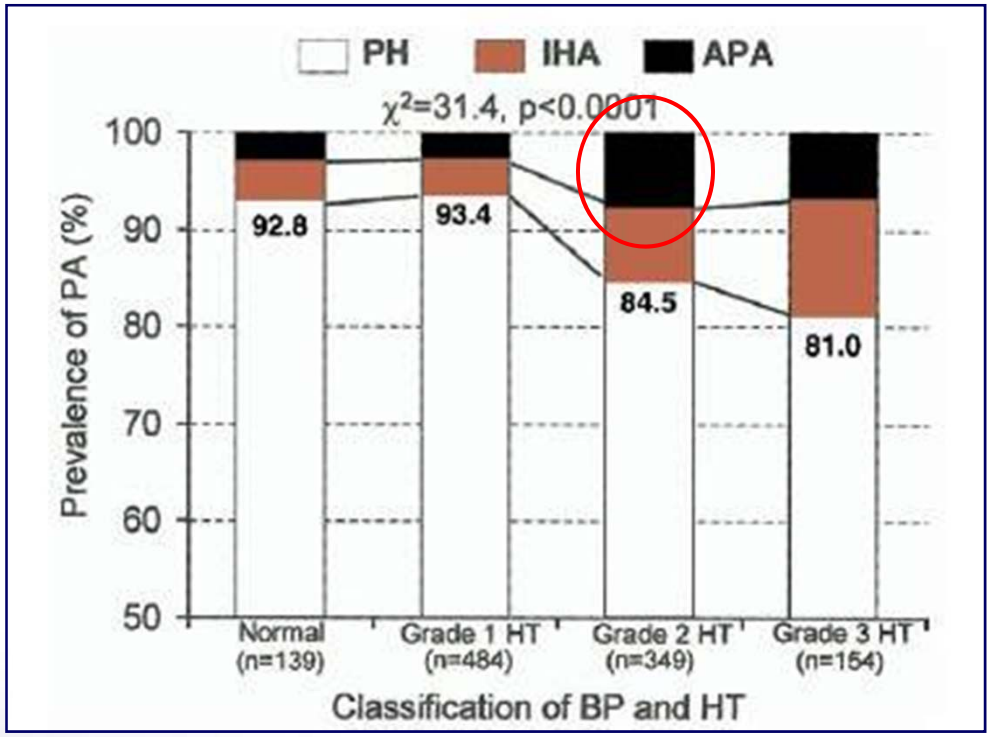
F/U OPD, No med. 135/85 mmHg Na/K : 142/3.6 mEq/L

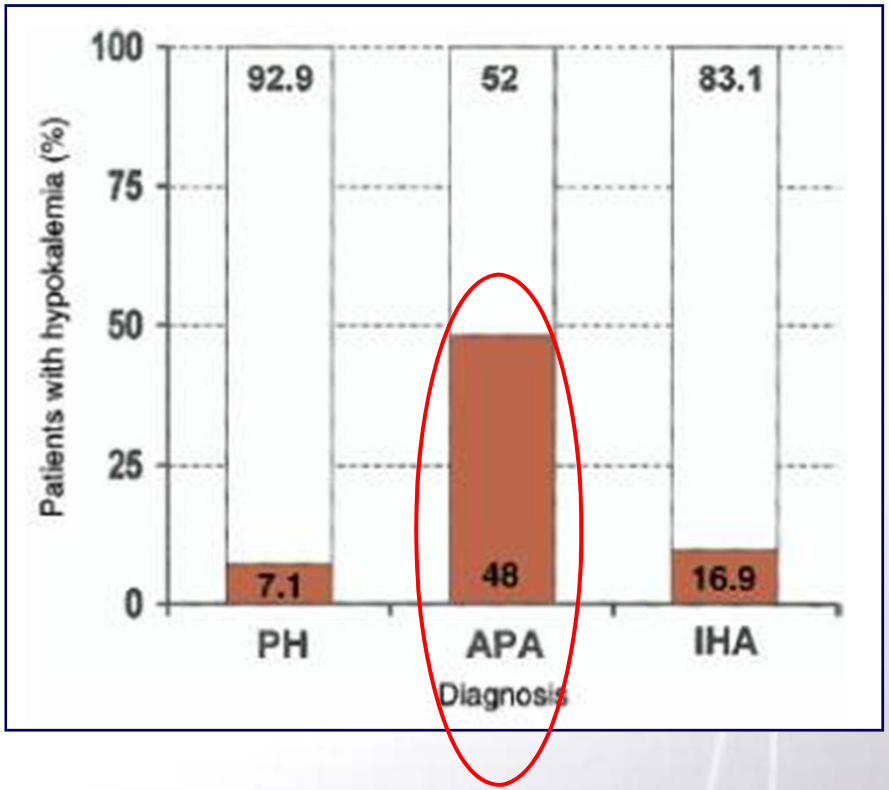
Primary Aldosteronism (PA)
: Incidence of Aldosteronism Increases with Hypertension Severity



Mosso L et al. Hypertension 2003; 42:161-5.

Prevalence of Primary Aldosteronism in 1,125 Hypertensive Patients

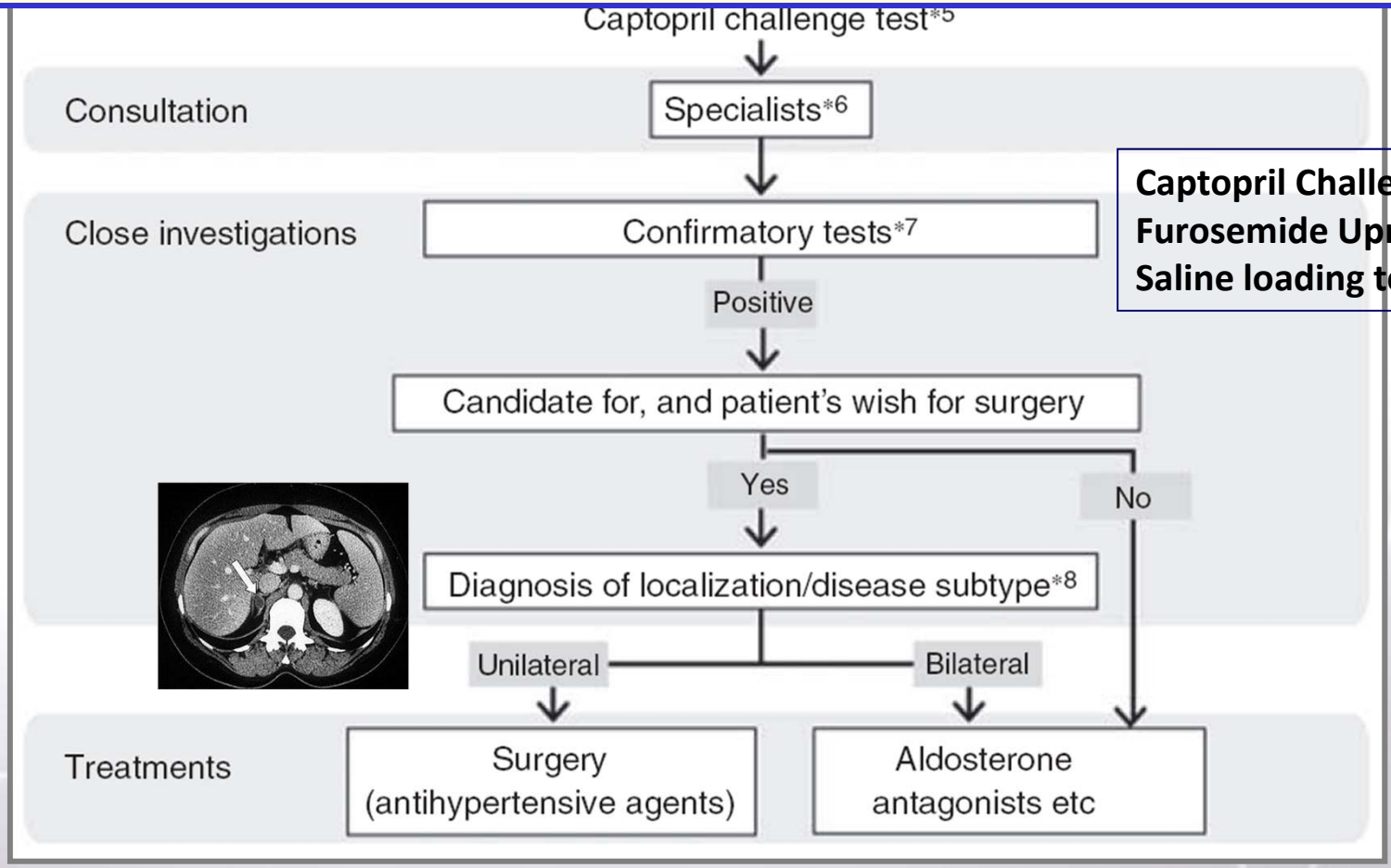




Rossi GP et al. JACC 2006;48:2293-300.

Primary Aldosteronism

Hypokalemia (including diuretic induced hypokalemia)
Grade II/III Hypertension (10%)
Resistant Hypertension (20%)
Adrenal Incidentaloma (30%)
Patients aged ≤ 40years with Target Organ Damage



Captopril Challenge
Furosemide Upright
Saline loading test

Findings of Secondary Causes

Findings on History, P/Ex and Lab.	Secondary Causes
Nocturia, edema	Renal parenchymal disease
↑ Serum creatinine concentration (≥ 0.5 to 1 mg/dL) after starting ACEi or ARB; Recent onset of elevated BP in older patients; epigastric or abdominal bruit	Renovascular disease
Fatigue; hypokalemia (not always present); lack of response to potassium supplementation	Primary aldosteronism
Flushing, Headaches, Labile BP, Orthostatic hypotension, Palpitations, Sweating, Syncope	**Pheochromocytoma**
Obesity; striae; muscle weakness; increased serum glucose level; fluid retention	**Cushing's syndrome**
Apneic events during sleep, Daytime sleepiness, Snoring	**Obstructive Sleep Apnea**
Arm to leg systolic blood pressure difference > 20 mm Hg, Delayed or absent femoral pulses, Murmur	**Coarctation of the aorta**

Most Common Causes of Secondary Hypertension by Age

Age groups	*Percentage of hypertension with an underlying cause*	*Most common etiologies†*
Children (birth to 12 years)	70 to 85	Renal parenchymal disease Coarctation of the aorta
Adolescents (12 to 18 years)	10 to 15	Renal parenchymal disease Coarctation of the aorta
Young adults (19 to 39 years)	5	Thyroid dysfunction Fibromuscular dysplasia Renal parenchymal disease
Middle-aged adults (40 to 64 years)	8 to 12	Aldosteronism Thyroid dysfunction Obstructive sleep apnea Cushing syndrome Pheochromocytoma
Older adults (65 years and older)	17	Atherosclerotic renal artery stenosis Renal failure Hypothyroidism

Conclusion

New HTN
: Younger or Older
: Severe or Accelerated
: Severe TOD

Sudden Uncontrolled HTN
Resistant HTN

➔History, P/Ex, Lab
➔ Age
➔ Screening

Thank you very much for your attention