

FFR

un vrai plus pour guider l'angioplastie rénale?

P.Commeau

Polyclinique Les Fleurs
Ollioules

Conflit d'intérêt

- Cardiologue interventionnel
- Détenteur d'actions Edwards LS
- Consultant pour
 - Abbott
 - Cordis
 - Boston Scientific
 - Hexacath
 - Braun
 - Medtronic

ASTRAL Trial Schema

Diagnosis of significant ARVD
(Unilateral or Bilateral)
Revascularization not contraindicated

Uncertain whether to revascularize
Randomisation

Revascularization

with angioplasty and/or stent
(and medical treatment)

No revascularization

Medical Treatment only

Question principale à laquelle doit répondre

Quel est l'effet de la revascularisation rénale?

Devenir de la fonction rénale (1/créat)

Critères secondaires

- Survie
- MACE
- Contrôle de l'HTA
- FEVG (sous-étude)

RECRUTEMENT

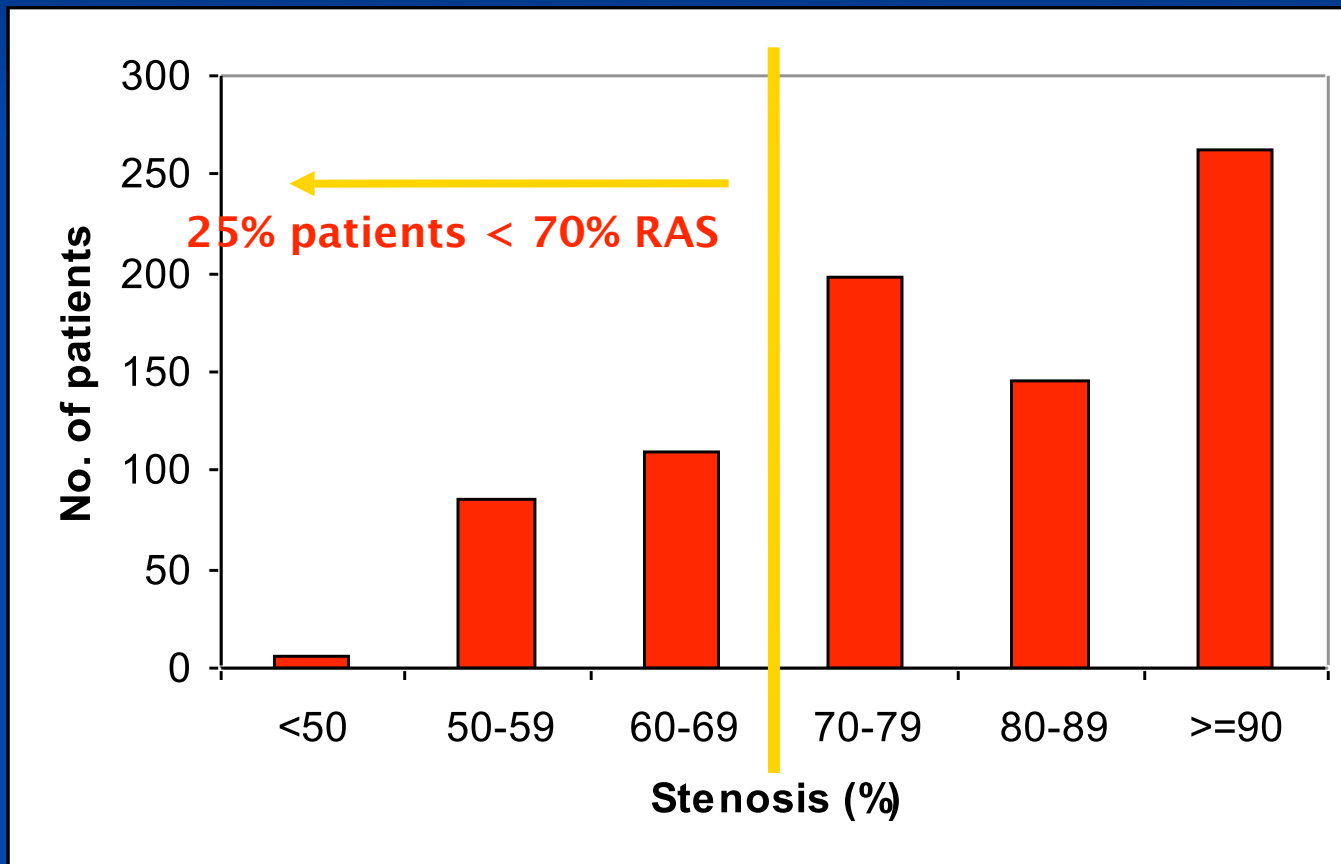
- Début 09/2000

RECRUTEMENT

- Début 09/2000
- 09/2000 – 10/2007, 806 patients randomisés dans 58 centres
- 14 patients / centre
- 2 patients / centre par / an

Pourcentage de sténose

Moyenne = 76% (écart: 20% - 100%)



Biais méthodologiques potentiels

- Patients inclus étaient ceux pour lesquels il n'y avait pas d'évidence forte de l'efficacité de la revascularisation
- Les autres, potentiellement répondeurs à l'angioplastie, n'étaient pas inclus....ce qui explique aussi la lenteur d'inclusion (exclusion des patients les + sévères porteurs des lésions les + serrées, IRA, OAP...)
- Recherche d'une amélioration de la Fx rénale chez des patients avec fonction rénale normale (40% de la population incluse..!)
- Progression de l'insuffisance rénale dans le groupe médical 10x plus faible qu'escomptée...suivi trop court et possible amélioration grâce aux anti-HTA et

ASTRAL

ASTRAL

■ Non!

ASTRAL

- Non!
- La clé du succès thérapeutique est la bonne indication !

ASTRAL

- Non!
- La clé du succès thérapeutique est la bonne indication !
- Qu'est ce que nous apprend ASTRAL ?
 - Le stenting rénal n'est pas indiqué pour préserver la Fx rénale des patients avec sténoses non significatives des artères rénales
 - S'il y a indication à stenter , il faut choisir son centre et sûrement éviter les centres

Comment faire....

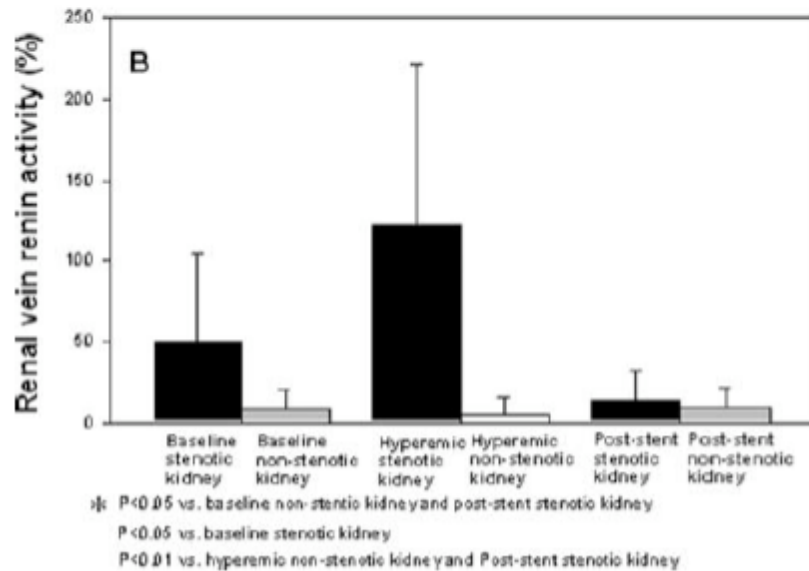
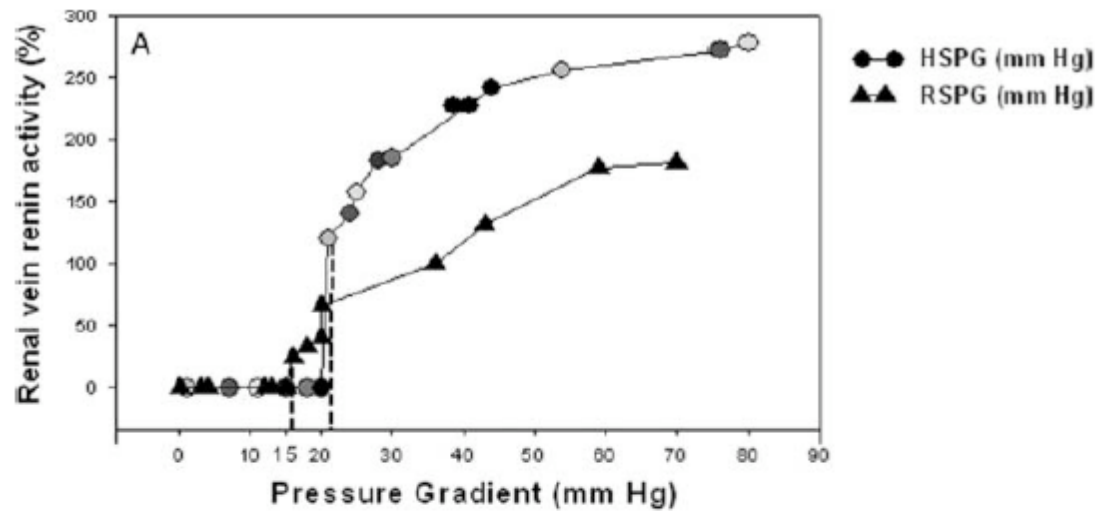
Comment faire....
FFR?

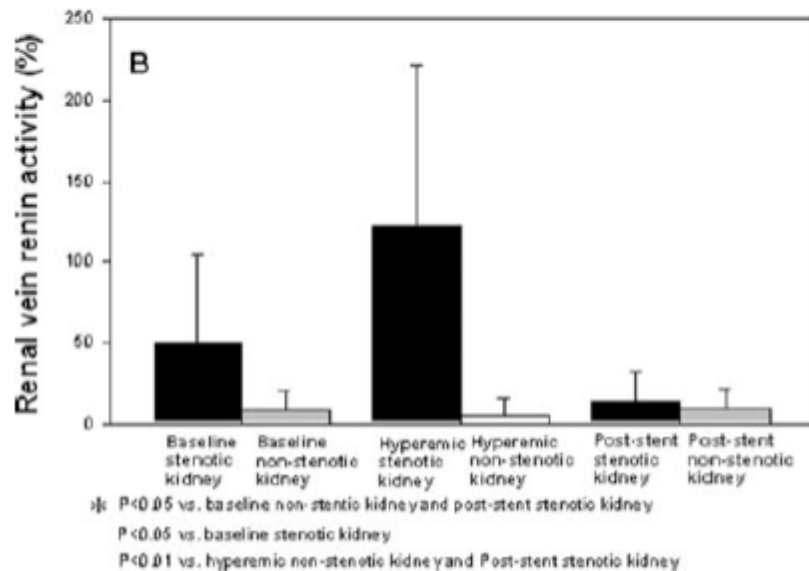
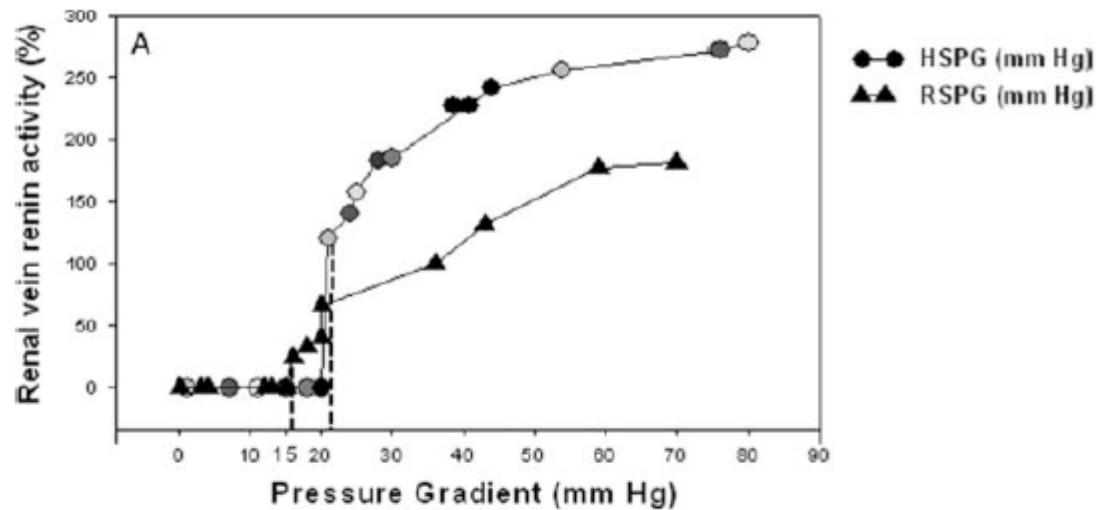
Physiological Assessment of Renal Artery Stenosis: Comparisons of Resting with Hyperemic Renal Pressure Measurements

Nikhil Kapoor,¹ MD, Ibrahim Fahsah,¹ MD, Rehan Karim,¹ MD, Anthony J. Jevans,² PhD, and Massoud A. Leesar,^{1*} MD

Objectives: We compared resting and hyperemic pressure gradients induced by intra-renal papaverine for the assessment of renal artery stenosis (RAS). We also investigated the incidence of the QT interval prolongation and ventricular arrhythmias. **Background:** In the coronary circulation, maximal hyperemia is essential in determining the significance of a stenosis. In the renal circulation, the role of maximal hyperemia for the assessment of RAS has not been established. **Methods:** In 55 patients with RAS (67 RAS), resting P_d/P_a ratio (the ratio between distal renal pressure to the aortic pressure), renal fractional flow reserve (FFR), and resting and hyperemic systolic gradients (RSG and HSG, respectively) were measured with a pressure guidewire. In a subset of 16 patients, renal vein renin activity (RVRA) was measured. **Results:** HSG was significantly greater than RSG (20 ± 14 mm Hg vs. 9.0 ± 13 mm Hg, respectively; $P < 0.001$). Renal FFR was significantly lower than baseline P_d/P_a ratio (0.91 ± 0.06 vs. 0.94 ± 0.06 vs. respectively; $P < 0.001$). RVRA increased from $50 \pm 66\%$ at rest to $122 \pm 112\%$ at hyperemia, $P < 0.01$. At HSG of 21 mm Hg or renal FFR of 0.90, RVRA increased markedly (120%), but RVRA increased modestly (18%) when RSG was 16 mm Hg or resting P_d/P_a ratio was 0.93. The corrected QT intervals at baseline vs. hyperemia were not significantly different (433 ± 26 vs. 436 ± 25 msec, respectively; $P = \text{NS}$); no episodes of ventricular arrhythmias were noted. **Conclusions:** Renin production, an index of renal ischemia, was markedly greater at hyperemia than at rest, suggesting that RAS, with either an HSG of 21 mm Hg or a renal FFR of 0.90, can be considered a hemodynamically significant stenosis. Intrarenal papaverine neither prolonged the QT interval nor induced ventricular arrhythmias and the safety of which will need to be corroborated in a large study. © 2010 Wiley-Liss, Inc.

Key words: peripheral vascular disease; quantitative vascular angiography; hemodynamics





Sténose hémodynamique si gradient en hyperhémie > 21 mmHg ou FFR < 0.90

Predicting Blood Pressure Improvement in Hypertensive Patients After Renal Artery Stent Placement:

- Etude FFR chez 17 patients avec HTA réfractaire et sténose unilatérale artère rénale modérée à sévère
- 10 patients « FFR » normale ($>0,8$)
- FwUp : 10 ± 3 mois
- Groupe FFR $< 0,8$ vs Groupe FFR $>0,8$
 - Amélioration de la PA 86% vs 30 % ($p =$

Prediction of Hypertension Improvement After Stenting of Renal Artery Stenosis

Comparative Accuracy of Translesional Pressure Gradients, Intravascular Ultrasound, and Angiography

Massoud A. Leesar, MD,* Jai Varma, MD,* Adam Shapira, MD,* Ibrahim Fahsah, MD,* Seyed T. Raza, MD,† Ziad Elghoul, MD,* Anthony C. Leonard, PhD,‡ Karthikeyan Meganathan, MS,‡ Sohail Ikram, MD*

Louisville, Kentucky; and Cincinnati, Ohio

Objectives	We investigated the comparative accuracy of renal translesional pressure gradients (TPG), intravascular ultrasound (IVUS), and angiographic parameters in predicting hypertension improvement after stenting of renal artery stenosis (RAS).
Background	The degree of RAS that justifies stenting is unknown.
Methods	In 62 patients with RAS, TPG (resting and hyperemic systolic gradient [HSG], fractional flow reserve, and mean gradient) were measured by a pressure guidewire; IVUS and angiographic parameters (minimum lumen area and diameter, area stenosis, and diameter stenosis) were measured by quantitative analyses.
Results	The HSG had a larger area under the curve than most other parameters and an HSG ≥ 21 mm Hg had the highest sensitivity, specificity, and accuracy (82%, 84%, and 84%, respectively) in predicting hypertension improvement after stenting of RAS. The average IVUS area stenosis was markedly greater in RAS with an HSG ≥ 21 mm Hg versus < 21 mm Hg (78% vs. 38%, respectively; $p < 0.001$). After stenting, hypertension improved in 84% of patients with an HSG ≥ 21 mm Hg ($n = 36$) versus 36% of patients with an HSG < 21 mm Hg ($n = 26$) at 12 months, $p < 0.01$; the number of antihypertensive medications was significantly lower in patients with an HSG ≥ 21 mm Hg versus < 21 mm Hg (2.30 ± 0.90 vs. 3.40 ± 0.50 , respectively; $p < 0.01$). By multivariable analysis, HSG was the only independent predictor of hypertension improvement (odds ratio: 1.39; 95% confidence interval: 1.05 to 1.65; $p = 0.013$).
Conclusions	An HSG ≥ 21 mm Hg provided the highest accuracy in predicting hypertension improvement after stenting of RAS, suggesting that an HSG ≥ 21 mm Hg is indicative of significant RAS. (J Am Coll Cardiol 2009;53:2363–71) © 2009 by the American College of Cardiology Foundation

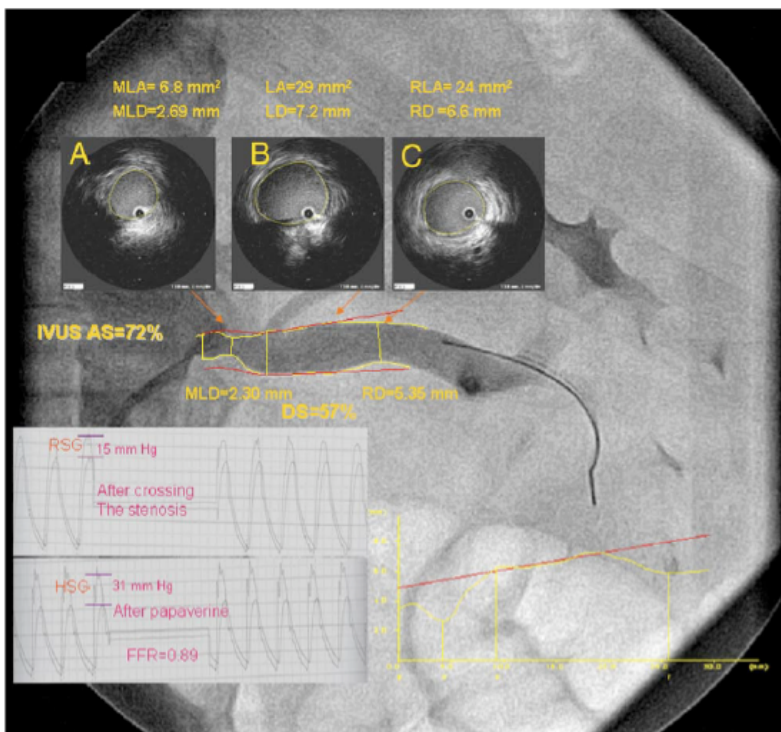


Figure 1 A Representative Example of Quantitative Renal Angiography, IVUS Analysis, and TPG Is Shown In a Study Patient With RAS

- Gradient de pression de 21 mmhg:
 - Meilleur paramètre pour prédire la réponse tensionnelle
 - Sensibilité 82% et spécificité 84%
 - Amélioration du profil

Translesional Pressure Gradients to Predict Blood Pressure Response After Renal Artery Stenting in Patients With Renovascular Hypertension

Fabio Mangiacapra, MD; Catalina Trana, MD; Giovanna Sarno, MD, PhD;
Giedrius Davidavicius, MD, PhD; Marcin Protasiewicz, MD; Olivier Muller, MD, PhD;
Argyrios Ntalianis, MD, PhD; Nerijus Misonis, MD; Bruno Van Vlem, MD, PhD;
Guy R. Heyndrickx, MD, PhD; Bernard De Bruyne, MD, PhD

Background—In previous studies on the effect of renal stenting on arterial hypertension, patients were selected mainly on the basis of angiographic parameters of the renal artery stenosis. The aim of the present study was to evaluate whether translesional pressure gradients could identify the patients with renal artery stenosis who might benefit from stenting.

Methods and Results—A total of 53 consecutive hypertensive patients with unilateral RAS scheduled for renal artery intervention were recruited. Transstenotic pressure gradients were measured at baseline and during maximal hyperemia, before renal artery stenting. Twenty-four-hour ambulatory blood pressure measurements were performed in all patients before and 3 months after the intervention. Average reductions in systolic blood pressure and diastolic blood pressure at follow-up were -20 ± 30 mm Hg and -2 ± 12 mm Hg, respectively. At multivariate analysis, dopamine-induced mean gradient was the only independent predictor of the variations of both systolic blood pressure (regression coefficient = -4.03 , standard error = 1.11 ; $P < 0.001$) and diastolic blood pressure (regression coefficient = -3.11 , standard error = 1.20 ; $P = 0.009$). Patients who showed a decline in systolic blood pressure from the baseline value > 20 mm Hg were considered as “responders.” The optimal cutoff for identification of “responders” was a dopamine-induced mean gradient ≥ 20 mm Hg (area under the curve, 0.77 ; 95% confidence interval, 0.64 to 0.90 ; $P = 0.001$).

Conclusions—A dopamine-induced mean pressure gradient of ≥ 20 mm Hg is highly predictive of arterial hypertension improvement after renal stenting, and therefore this measurement is useful for appropriate selection of patients with arterial hypertension. (*Circ Cardiovasc Interv.* 2010;3:537-542.)

Key Words: renal hypertension ■ renal artery stenosis ■ renal artery stent ■ renal pressure gradients

Translesional Pressure Gradients to Predict Blood Pressure Response After Renal Artery

- 53 patients porteurs RAS programmés pour angioplastie.
- Analyse multivariée :
 - hyperhémie en FFR = seul facteur prédictif d'amélioration du profil tensionnel ($P=0.009$).
- Seuil sous dopamine = gradient ≥ 20 mm Hg ($P=0.001$).
- Gradient sous dopamine en FFR Rénal de ≥ 20

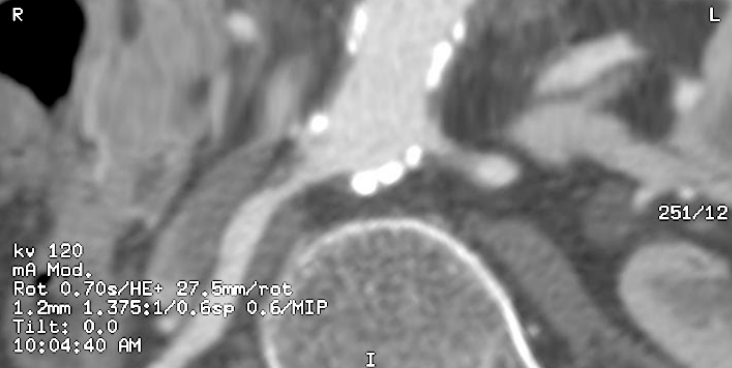
HTA réfractaire

- Femme 69 ans
- HTA sous quadrithérapie
 - Périndopril 10 mg/j
 - Amlodipine 10 mg/j
 - Bisoprolol 10 mg/j
 - Hydrochlorothiazide 25 mg/j
- PA moyenne sous MAPA : 160 mm Hg
- Clcr : 45 ml/mn
- Doppler : suspicion de lésion rénale droite

Curved
Ex: 31745 S
Se: 2 +c
Artère rénale droite Angle: -213.0

Centre Saint Yves
RIO YOLANDE
F 68 A10001583812
DoB: Sep 21 1943
Ex: Mar 17 2012

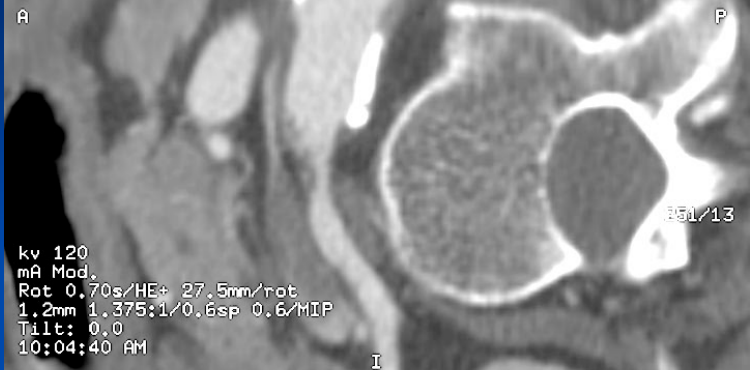
DFOV 11.0 cm
STND



Curved
Ex: 31745 S
Se: 2 +c
Artère rénale droite Angle: -269.0

Centre Saint Yves
RIO YOLANDE
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Ex: Mar 17 2012

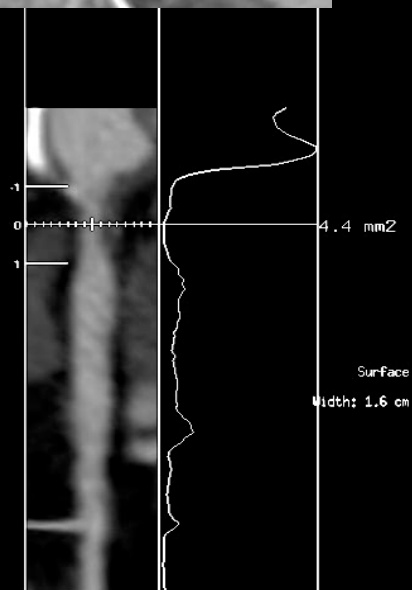
DFOV 11.9 cm
STND



Ex: 31745 H
Se: 2 +c
Artère rénale droite Angle: 0.0

Centre Saint Yves
RIO YOLANDE
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DoB: Sep 21 1943
Ex: Mar 17 2012

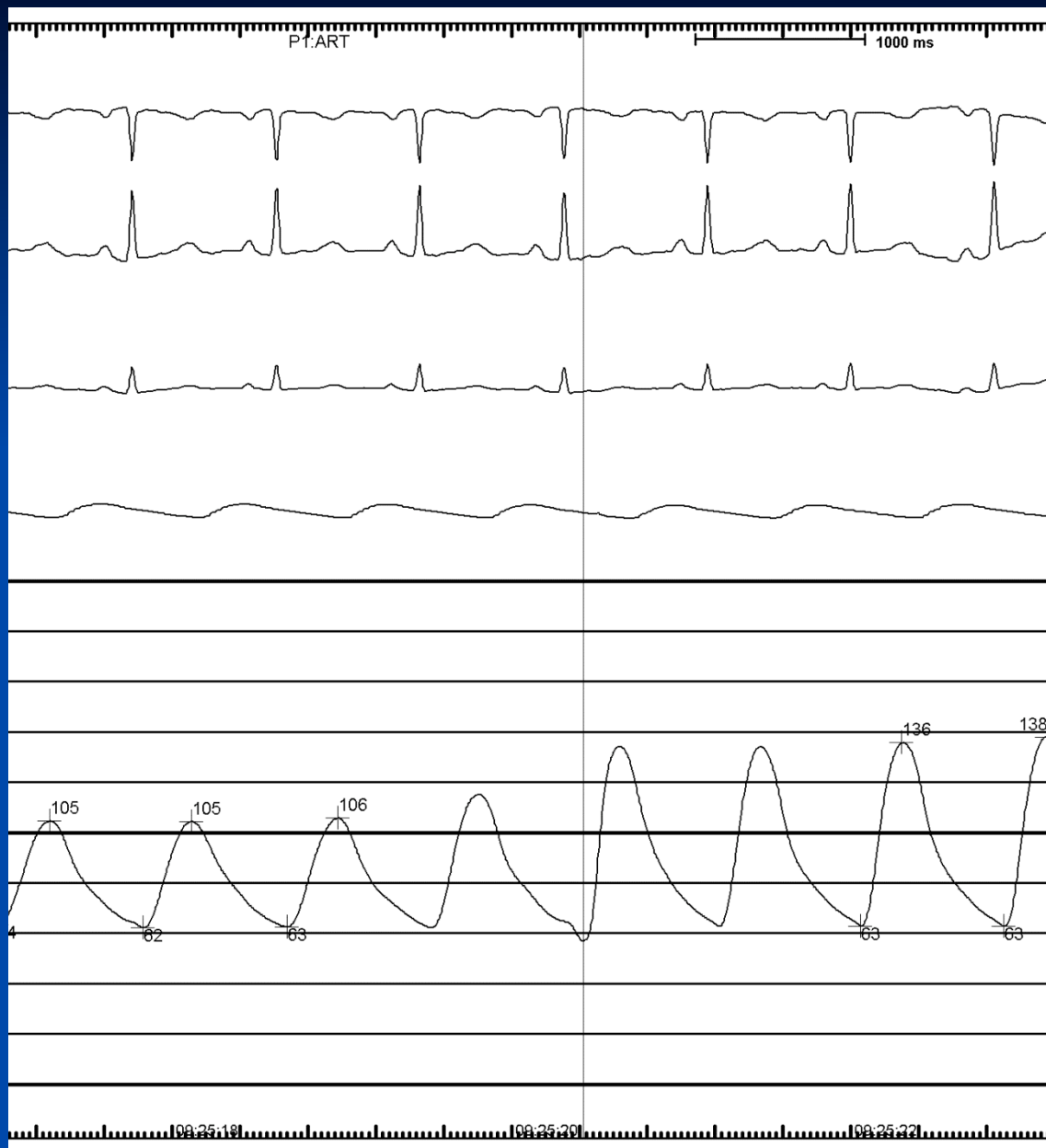
DFOV 6.0 cm
STND











Temps

0:04

FFR **0,89**

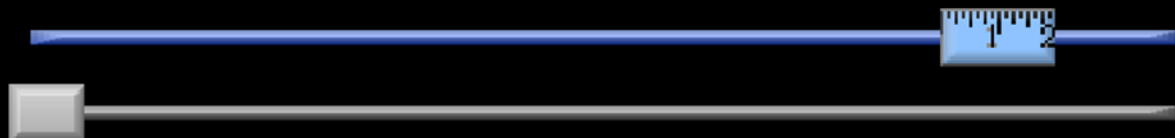
Pd/Pa **0,89**

Pa:iPa **102:152**

Pd:iPd **91:133**

HR **62**

Liste des prises	FFR
14:19:51	0,89
14:20:42	0,99
14:25:23	0,78
14:31:14	0,74
14:35:05	0,76
14:38:30	0,79
15:09:22	0,91



Direct



Options

Enregistrer
l'image

Sélection
mode

Paramètres

Patient

Début

Lecture

Branchez la fiche de pression sur le PIM

FFR PIM

Durée de lecture

0:11

FFR **0,74**

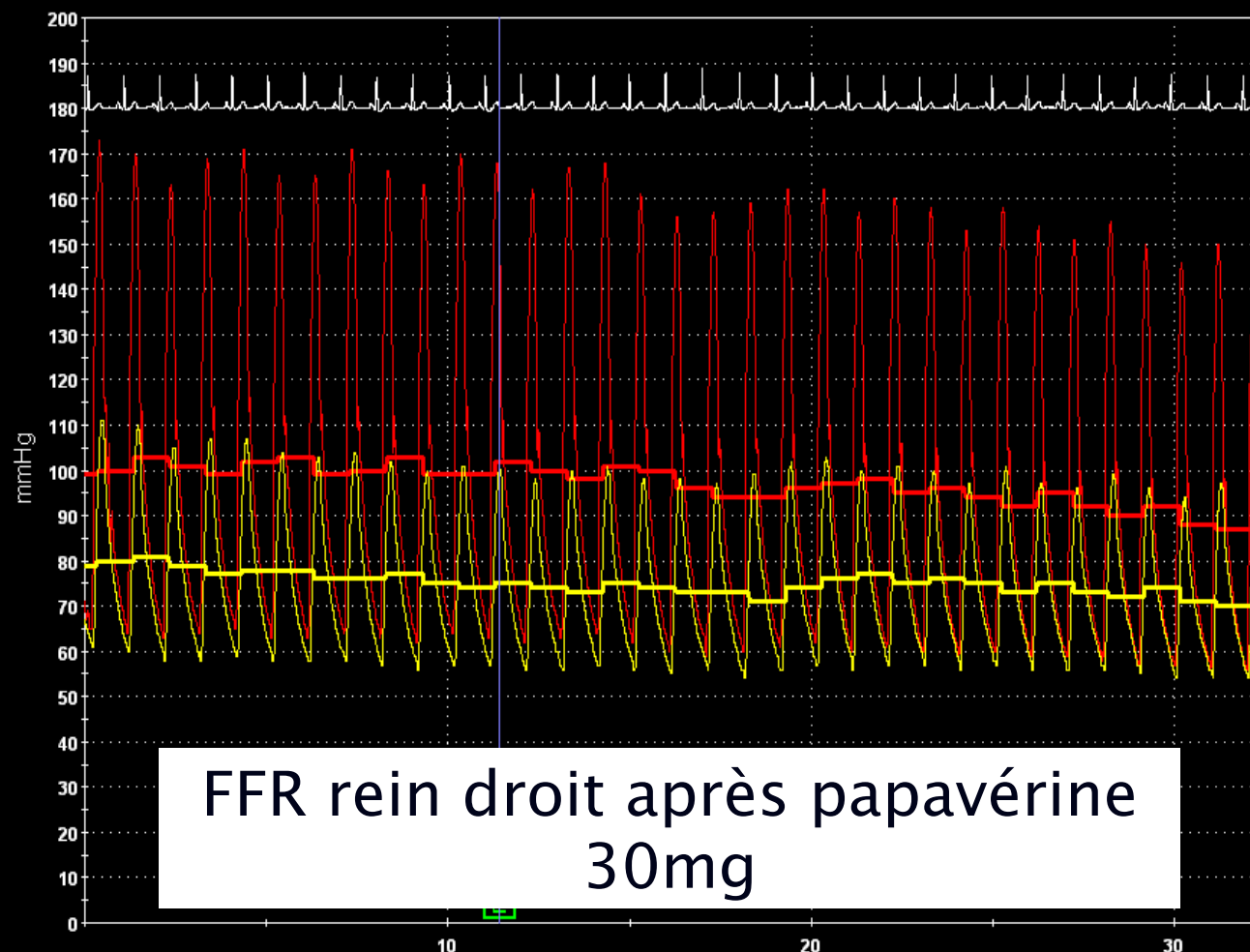
Pd/Pa **0,74**

Pa:iPa **102:156**

Pd:iPd **75:100**

HR **61**

Liste des prises	FFR
14:19:51	0,89
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14:25:23	0,78
14:31:14	0,74
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15:09:22	0,91



Options

Enregistrer
l'image

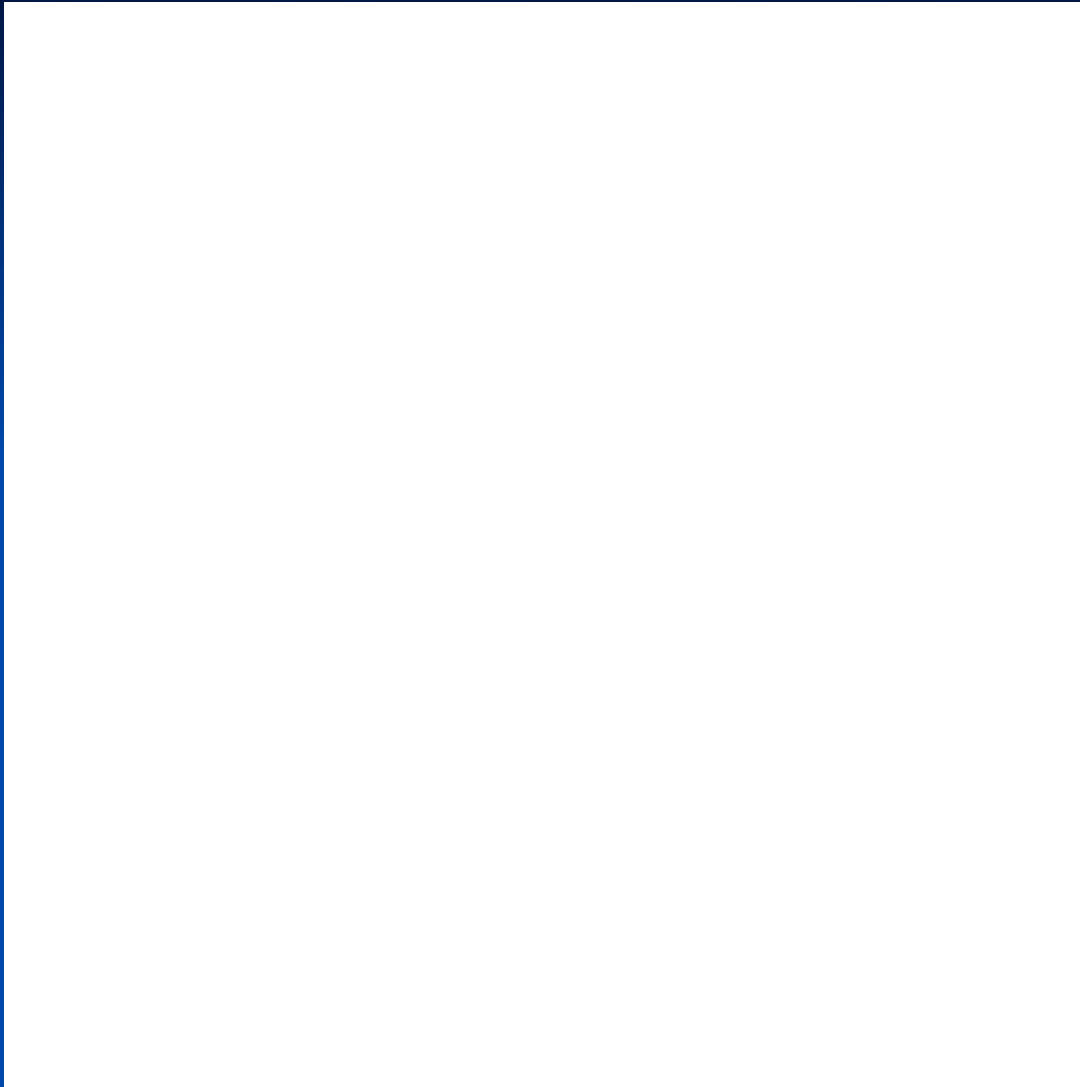
Paramètres

Patient

Début

Lecture

Sélection



Evolution

- Arrêt périndopril–amlodipine du fait d'épisodes d'hypotension orthostatique
- Fonction rénale stable à 1mois

Echappement tensionnel

- Patiente 60 ans
- HTA rénovasculaire sur dysplasie rénale droite en 2011
- Angioplastie au ballon simple. Évolution excellente

Echappement tensionnel

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- HTA rénovasculaire sur dysplasie rénale droite en 2011
- Angioplastie au ballon simple. Évolution excellente

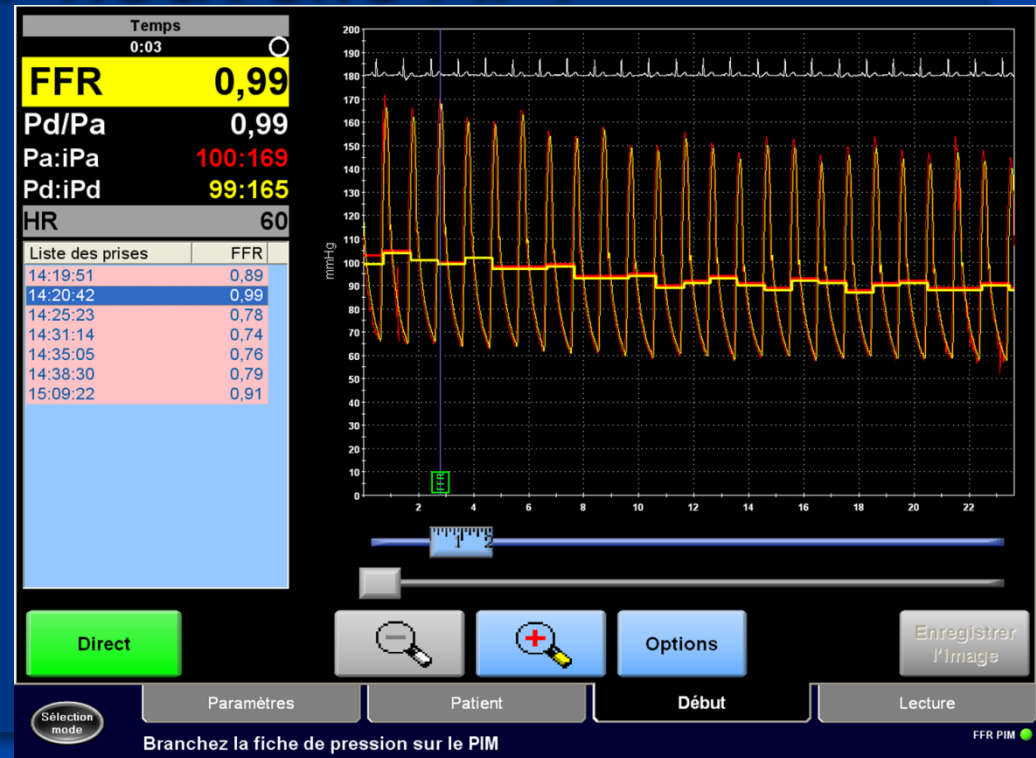


1 an plus tard...

- Récurrence de l'HTA
- Réadressée pour nouvelle APT

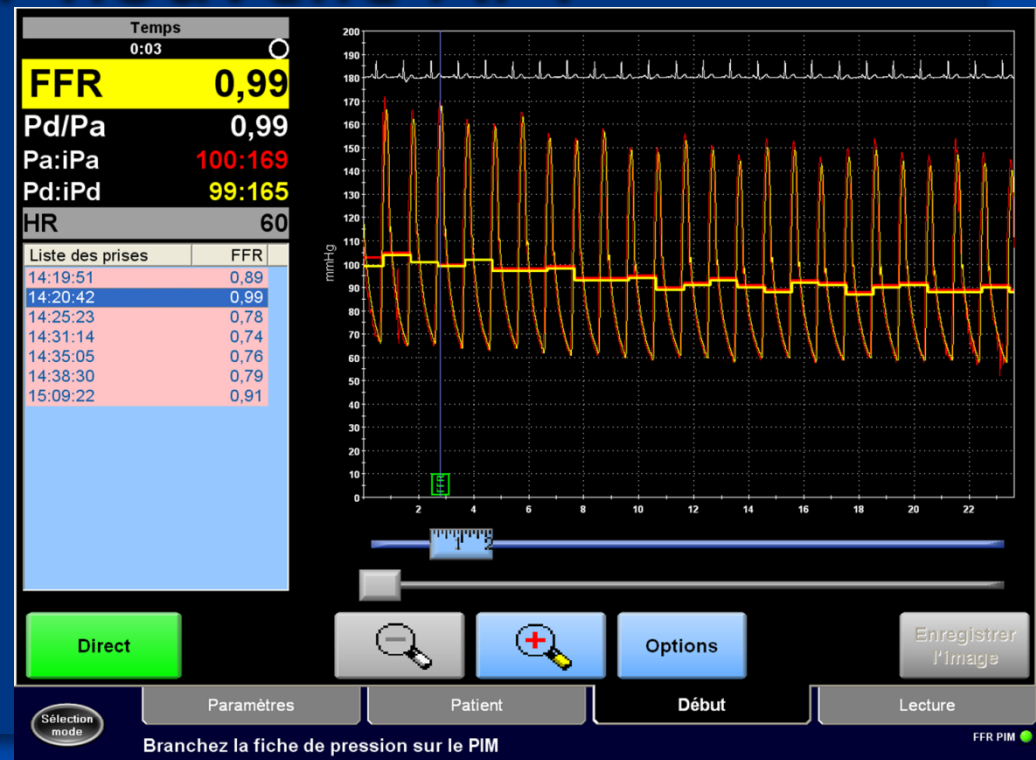
1 an plus tard...

- Récurrence de l'HTA
- Réadressée pour nouvelle APT



1 an plus tard...

- Récurrence de l'HTA
- Réadressée pour nouvelle APT





Projet de protocole RC

Armero – Commeau

- FFR pour sélectionner les patients bénéficiant du stenting rénal
- Population :
 - SAR unilatérale
 - Avec HTA résistante
 - Ou HTA avec IR modérée
 - Ou HTA avec aggravation de la fonction rénale après mise sous IEC

insuffisance

Artériographie
sélective rénale
bilatérale avec

Sténose
unilatérale >70%
et

Sténose non
significative au
QCA ou à la FFR

Sténose bilatérale
significative
ou
Impossibilité à un

Angioplastie
rénale avec pose
d'un **randomisation**

Traitement
médical

Exclusion

Traitement
médical

Critère Primaire

- **Composite :**
 - **contrôle tensionnel à 6 mois**
 - **ralentissement de la dégradation de la fonction rénale à 1 an**
 - **Diminution OAP flash**
 - **diminution du nbre d'hospitalisations pour insuffisance cardiaque, poussée hypertensive et MACCE.**