Hypotension artérielle perdialyse : “Le point de vue du cardiologue”

Nouméa 25 Avril 2022

Olivier Axler

Intradialytic hypotension in an otherwise stable patient

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Kidney replacement therapy (dialysis) in acute kidney injury: Metabolic and hemodynamic considerations

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Contributor Disclosures

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Introduction

Hypotension fréquente pendant les hémodialyses

Chez certains patients, un remplissage vasculaire permet le départ de l'unité de dialyse sans problème

L'hypotension perdialyse peut réduire l'efficacité de la dialyse et contribue à la morbimortalité excessive associée à l'hémodialyse.

Plan

Etiologie, causes

Evaluation, diagnostic

Traitement, conduite à tenir

Prévention de l'hypotension perdialyse chez un patient stable par ailleurs

Mesure de la veine cave inférieure

Bonnes corrélations avec la pression auriculaire droite en ventilation spontanée chez des patients sans dilatation préalables cavités cardiaques droites de base, mais pas la volémie directement

Mesure diamètres en fin d'inspiration (min) et d'expiration (max) et de la variation respiratoire, en l'absence de ventilation excessive

Courbe d'apprentissage facile et rapide

GUIDELINES AND STANDARDS

Guidelines for the Echocardiographic Assessment of the Right Heart in Adults: A Report from the American Society of Echocardiography

Endorsed by the European Association of Echocardiography, a registered branch of the European Society of Cardiology, and the Canadian Society of Echocardiography

Lawrence G. Rudski, MD, FASE, Chair, Wyman W. Lai, MD, MPH, FASE, Jonathan Afilalo, MD, Msc, Lanqi Hua, RDCS, FASE, Mark D. Handschumacher, BSc, Krishnaswamy Chandrasekaran, MD, FASE, Scott D. Solomon, MD, Eric K. Louie, MD, and Nelson B. Schiller, MD, *Montreal, Quebec, Canada; New York, New York; Boston, Massachusetts; Phoenix, Arizona; London, United Kingdom; San Francisco, California*

(J Am Soc Echocardiogr 2010;23:685-713.)

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(J Am Soc Echocardiogr 2010;23:685-713.)

Table 3 Estimation of RA pressure on the basis of IVC diameter and collapse

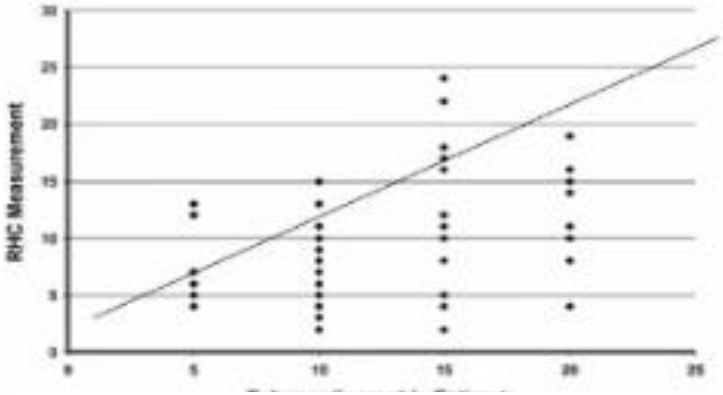
Variable	Normal (0-5 [3] mm Hg)	Intermediate (5-10 [8] mm Hg)		High (15 mm Hg)
IVC diameter	≤2.1 cm	≤2.1 cm	>2.1 cm	>2.1 cm
Collapse with sniff	>50%	<50%	>50%	<50%
Secondary indices of elevated RA pressure				• Restrictive filling • Tricuspid E/E′ > 6 • Diastolic flow predominance in hepatic veins (systolic filling fraction < 55%)

Ranges are provided for low and intermediate categories, but for simplicity, midrange values of 3 mm Hg for normal and 8 mm Hg for intermediate are suggested. Intermediate (8 mm Hg) RA pressures may be downgraded to normal (3 mm Hg) if no secondary indices of elevated RA pressure are present, upgraded to high if minimal collapse with sniff (<35%) and secondary indices of elevated RA pressure are present, or left at 8 mm Hg if uncertain.

Accuracy of Doppler Echocardiography in the Hemodynamic Assessment of Pulmonary Hypertension

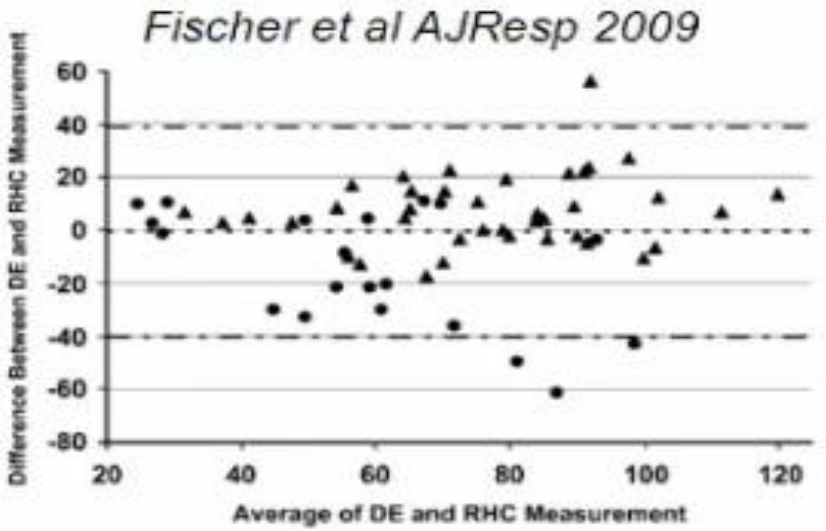
Micah R. Fisher[1*], Paul R. Forfia[2†], Elzbieta Chamera[2], Traci Housten-Harris[1], Hunter C. Champion[2], Reda E. Girgis[1], Mary C. Corretti[2], and Paul M. Hassoun[1]

[1]Division of Pulmonary and Critical Care Medicine; [2]Division of Cardiology, Department of Medicine, Johns Hopkins University, Baltimore, Maryland



POD echo vs KTD

Risque de surestimation POD



SPAP echo vs RHC

Week correlation SPAP vs RHC
r = 0.66, p < 0.001; n = 65

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UNIVERSITÉ de la NOUVELLE-CALÉDONIE

Veine cave inférieure en hémodialyse

A critical evaluation of ultrasound measurement of inferior vena cava diameter in assessing dry weight in normotensive and hypertensive hemodialysis patients.

Katzarski KS, Nisell J, Randmaa I, Danielsson A, Freyschuss U, Bergström J

Am J Kidney Dis. 1997;30(4):459.

The utility of measurement of the inferior vena cava diameter (IVCD) with ultrasound for the assessment of fluid status and posthemodialysis dry weight was studied in 35 hemodialysis (HD) patients, 17 with and 18 [illegible] dialysis-associated hypertension. In group B, BV and IVCD decreased in parallel during HD and increased during 2 hours after HD due to refilling of the intravascular space, indicating that changes in IVCD reflect changes in BV. In 8 patients studied twice, IVCD increased much more after a 3-hour HD session than after a 6-hour session. At the end of HD, several patients had IVCD below the reference range but IVCD increased during the following 1 to 2 hours, in some patients to values above the reference range. IVCD measured at the end or shortly after HD may therefore be misleading in assessing dry weight.

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Department of Clinical Science, Huddinge University Hospital, Karolinska Institute, Stockholm, Sweden.

VCI corrélée avec pression oreillette droite (POD) mais pas directement la volémie
Volume sanguin mesuré par albumine radiomarquée (ici en prédialyse, et par la variation de l'hématocrite en per et post dialyse on line »

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Department of Clinical Science, Huddinge University Hospital, Karolinska Institute, Stockholm, Sweden.

« Dans le groupe B (hypertendus), volume sanguin et le diamétre de la VCI (DVCI) diminuaient en parallèle *pendant* l'hémodialyse et augmentaient durant deux heures *après* HD en relation avec retour sang dans l'espace intra vasculaire indiquant que les changements du DVCI réflétaient ceux du volume sanguin»

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The utility of measurement of the inferior vena cava diameter (IVCD) with ultrasound for the assessment of fluid status and posthemodialysis dry weight was studied in 35 hemodialysis (HD) patients, 17 with and 18 without hypertension. In 17 patients (group A), IVCD was measured before and 35 to 40 minutes after HD, pre-HD blood volume (BV) was measured with radiolabeled albumin and post-HD BV was calculated from the change in hematocrit. In 18 patients (group B), IVCD was measured repeatedly during HD and 2 hours after HD. Changes in BV were recorded by monitoring of the hematocrit "on line." Body weight, blood pressure (BP), BV, and IVCD decreased in the entire population. In group A, BV was significantly larger in the hypertensive patients than in the normotensive patients, and it was correlated with the mean BP before and after HD. In the whole population, IVCD was larger in the hypertensive than in the normotensive patients before and after HD. These results confirm that extracellular fluid overload plays an important role in the pathogenesis of dialysis-associated hypertension. In group B, BV and IVCD decreased in parallel during HD and increased during 2 hours after HD due to refilling of the intravascular space, indicating that changes in IVCD reflect changes in BV. In 8 patients studied twice, IVCD increased much more after a 3-hour HD session than after a 6-hour session. At the end of HD, several patients had IVCD below the reference range but IVCD increased during the following 1 to 2 hours, in some patients to values above the reference range. IVCD measured at the end or shortly after HD may therefore be misleading in assessing dry weight.

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Conclusion :

DVCI mesuré en fin ou peu après l'HD peut donc ne pas être précis pour évaluer le poids sec (attendre 2h?)

Veine cave inférieure en hémodialyse

Inferior vena cava diameter and left atrial diameter measure volume but not dry weight.

Agarwal R, Bouldin JM, Light RP, Garg A

Clin J Am Soc Nephrol. 2011 May;6(5):1066-72. Epub 2011 Feb 17.

BACKGROUND AND OBJECTIVES: Hypervolemia is an important and modifiable cause of hypertension. Hypertension improves with probing dry weight, but its effect on echocardiographic measures of volume is unknown.

DESIGN, SETTING, PARTICIPANTS,&MEASUREMENTS: Shortly after dialysis, echocardiograms were obtained at baseline and longitudinally every 4 weeks on two occasions. Among 100 patients in the additional ultrafiltration group, 198 echocardiograms were performed; among 50 patients in the control group, 104 echocardiograms were performed.

RESULTS: Baseline inferior vena cava (IVC)(insp) diameter was approximately 5.1 mm/m(2); with ultrafiltration, change in IVC(insp) diameter was -0.95 mm/m(2) more compared with the control group at 4 weeks and -1.18 mm/m(2) more compared with the control group at 8 weeks. From baseline IVC(exp) diameter of approximately 8.2 mm/m(2), ultrafiltration-induced change at 4 weeks was -1.06 mm/m(2) more and at 8 weeks was -1.07 mm/m(2) more (P=0.044). From a baseline left atrial diameter of 2.1 cm/m(2), ultrafiltration-induced change at 4 weeks was -0.14 cm/m(2) more and at 8 weeks was -0.15 cm/m(2) more. At baseline, there was no relationship between interdialytic ambulatory BP and echocardiographic parameters of volume. The reduction in interdialytic ambulatory BP was also independent of change in the echocardiographic volume parameters.

CONCLUSIONS: The inferior vena cava and left atrial diameters are echocardiographic parameters that are responsive to probing dry weight; thus, they reflect excess volume. However, echocardiographic volume parameters are poor determinants of interdialytic BP, and their change does not predict the BP response to probing dry weight.

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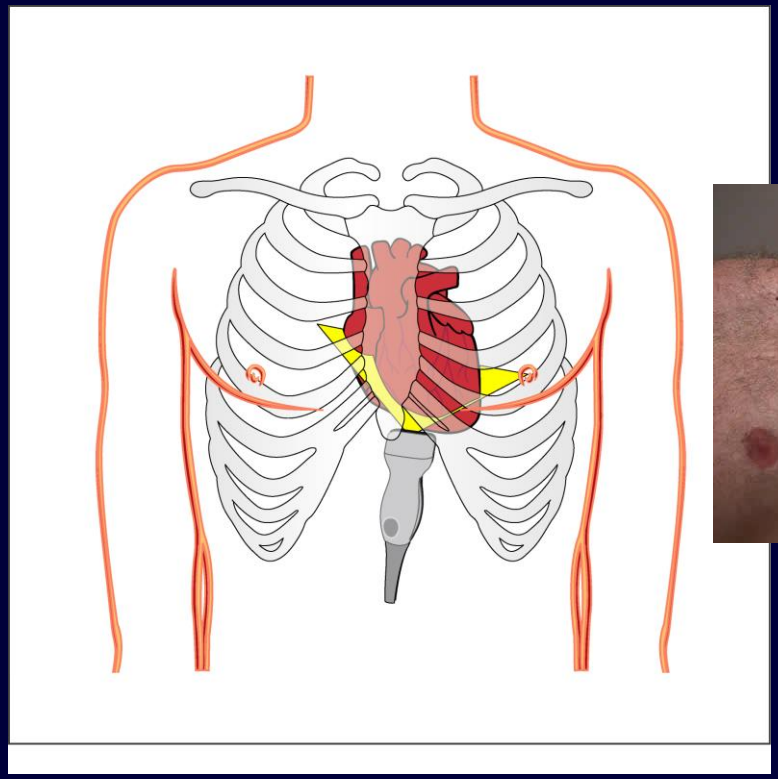
« Le diamétre de la VCI et de l'OG permettaient l'évaluation du poids sec, et donc reflétaient l'excès de volume sanguin, mais étaient de faibles prédicteurs de la PA interdialyse, et leurs changements ne prédisaient pas la réponse de la PA à l'évaluation du poids sec ».

Mesure de la veine cave inférieure en vue sous xyphoidienne

- Marqueur sonde à gauche
- Sonde dans région xyphoide, dirigée au maximum vers le haut et la gauche pour la vue du coeur
- et vers l'épaule droite le long du auvent costal droit pour la vue de la VCI



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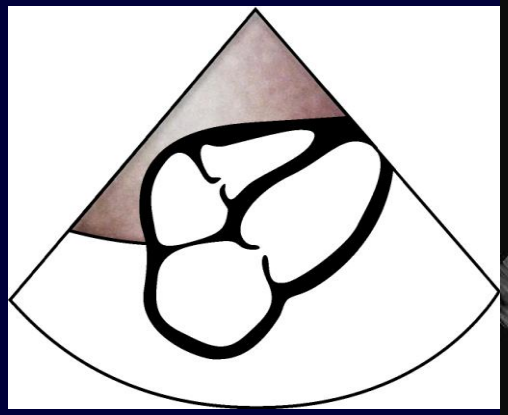
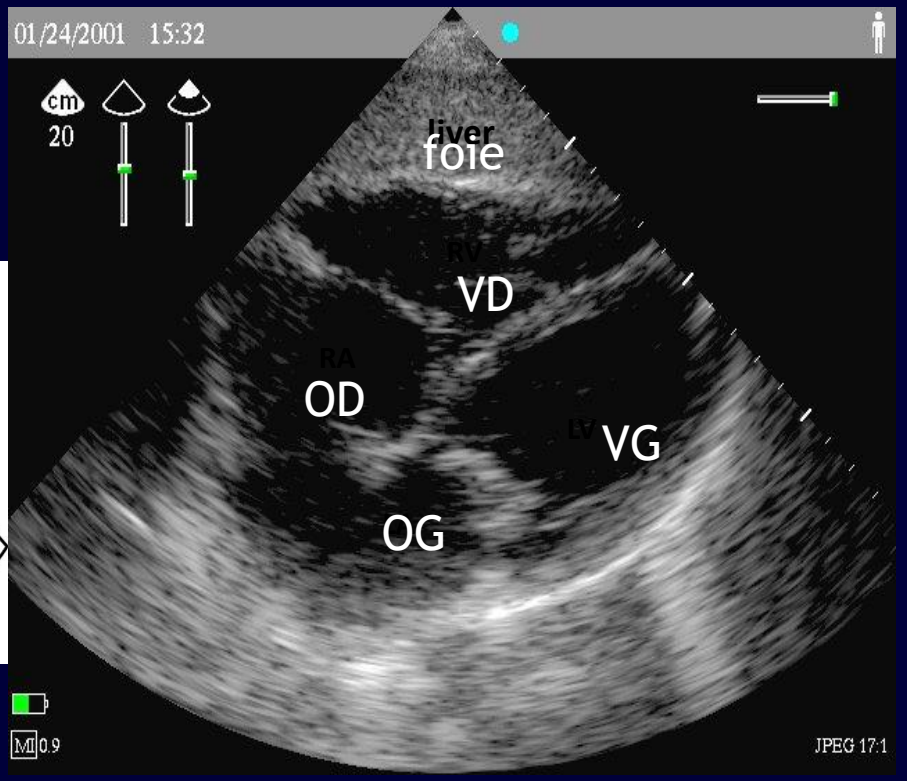
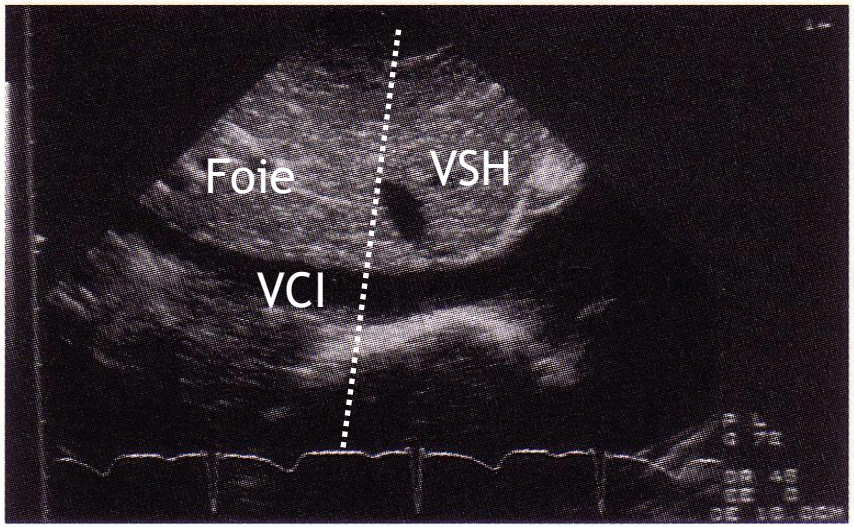


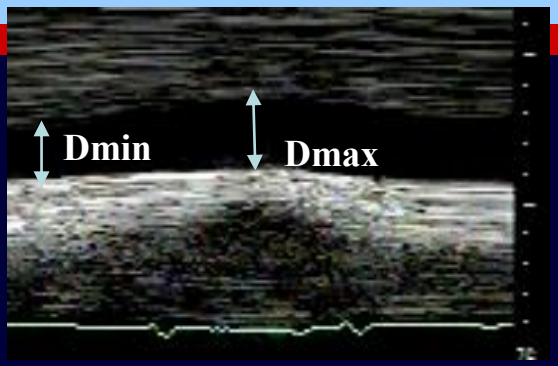


Première étape : vue du cœur en vue sous xyphoidienne, repèrant l'OD et la VCI s'abouchant dans l'OD

Mesure de la veine cave inférieure en vue sous xyphoidienne

VCI nle : (21 mm, 50%)





Vue en mode TM

VRVCI = $\frac{\text{Dmax} - \text{Dmin}}{\text{D Max}}$

Jue et al. J Am Soc, Echocardiogr 92

Lichtenstein et al, Réan Urg 94

Nagueh et al. Circulation, 96

Barbier et al ICM 04. Feissel et al, Chest 04, ICM 04.

1) POD
2) Prédiction réponse remplissage vasculaire

Deuxième étape : vue VCI repèrant l'OD et la VCI s'y abouchant dans l'OD

Renal venous congestion in PH-HFpEF

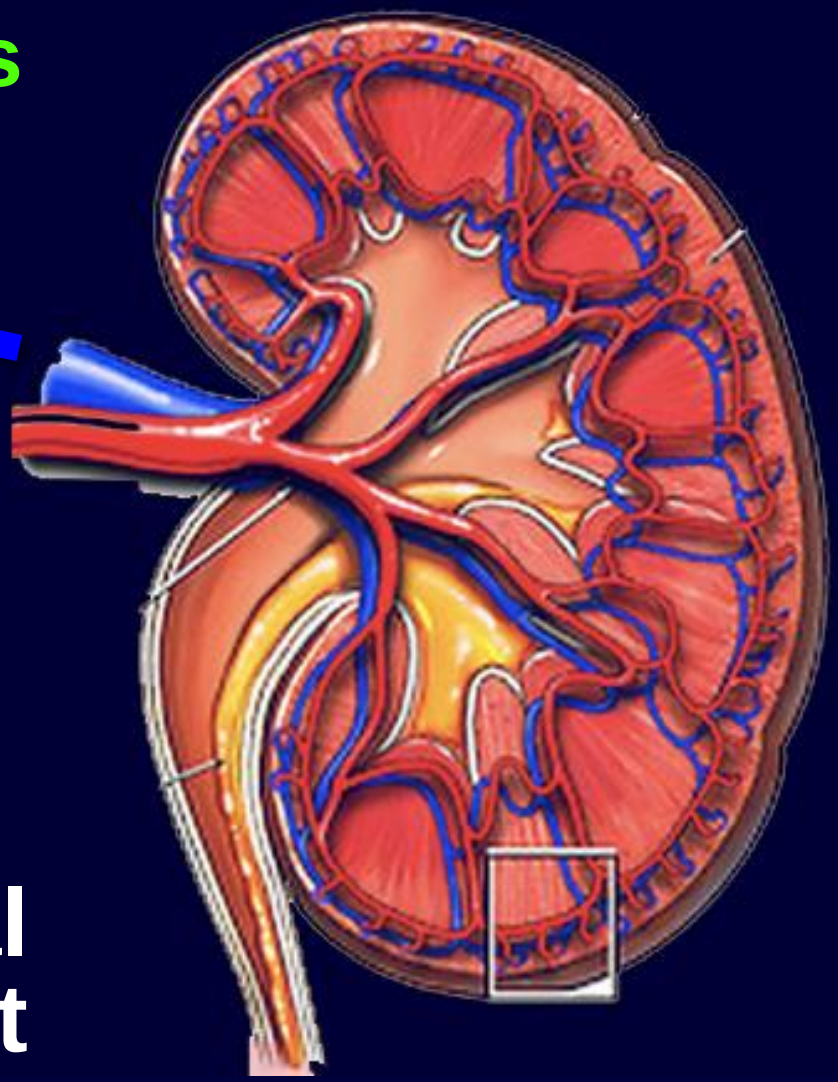
Many PH-HFpEF patients have RV failure:

⇧RA pressure = ⇧renal venous pressure

+

⇩CO = ⇩systemic BP ⇩renal blood flow

=⇩transrenal pressure gradient



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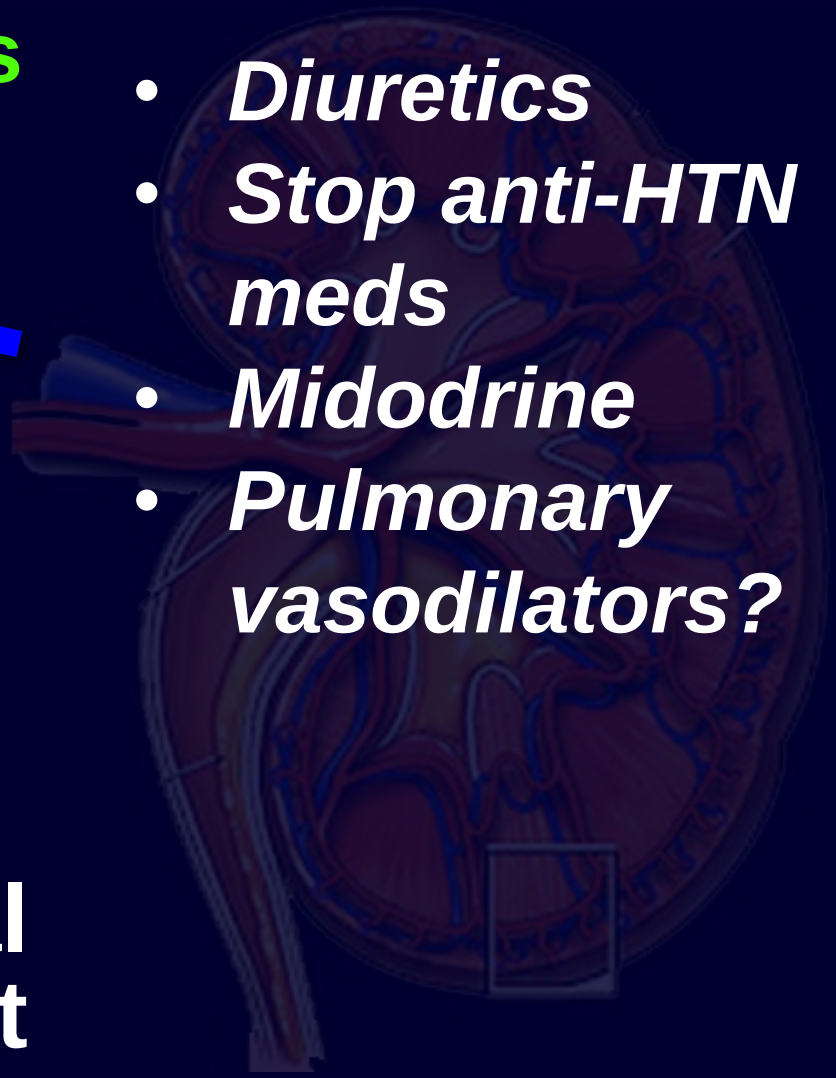

- ***Diuretics***
- ***Stop anti-HTN meds***
- ***Midodrine***
- ***Pulmonary vasodilators?***

Hypotension artérielle perdialyse

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