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Heart Kidney Interaction in Heart failure

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Introduction and Epidemiology

- Heart failure (HF) is a major health-care problem and the prognosis of affected patients is poor.
- HF often coexists with a number of comorbidities of which declining renal function is of particular importance.
- A loss of glomerular filtration rate, as in acute kidney injury (AKI) or chronic kidney disease (CKD), independently predicts mortality and accelerates the overall progression of cardiovascular disease and HF.
- about 40–50% of patients with HF have coexisting chronic renal dysfunction, defined as persistent glomerular filtration rate (GFR) <60 ml/min/1.73 m². Even slight reductions in GFR strongly affect all-cause mortality in patients with HF.

Introduction and Epidemiology

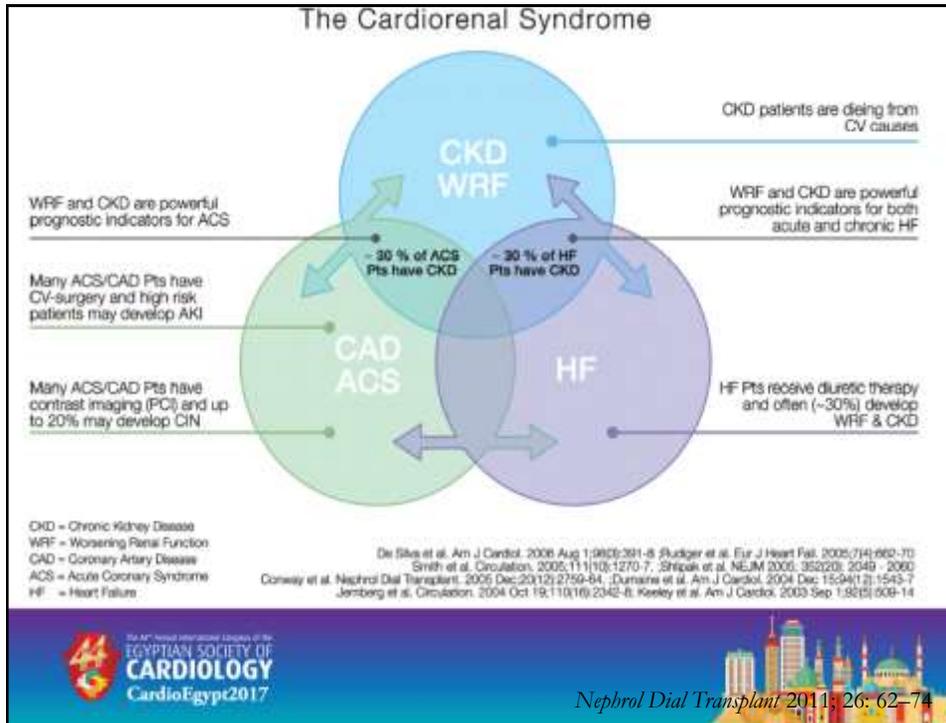
- Data from the USA show that >60% of patients with CKD have CVD, including HF, and that the degree of CVD correlates closely with CKD severity. Development of HF is often observed in patients with CKD, and the prevalence of HF increases significantly in cohorts with declining GFR.
- Importantly, cardiac and renal diseases interact in a **complex bidirectional and interdependent** manner in both **acute** and **chronic** settings



Introduction

- Recognition of the bi-directional links between cardiac and renal function, and the understanding that dysfunction of one organ affects the other, led to coining of the term cardio-renal syndrome.
- Although use of cardio-renal syndrome terminology is helpful when describing the interactions between the heart and kidneys, it is important to realize that the current classification of cardio-renal syndrome encompasses all forms of bi-directional links and is not specific for HF.

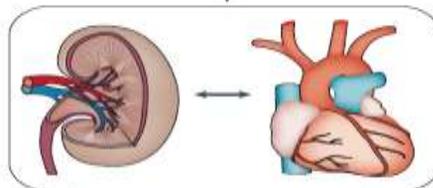




Overview of key cardio-renal interactions

Haemodynamic mechanisms

- Fluid overload and retention of salt and water
- Renal and cardiac congestion (renal venous hypertension)
- Limited organ perfusion (forward failure)
- Vasoconstriction in end organs



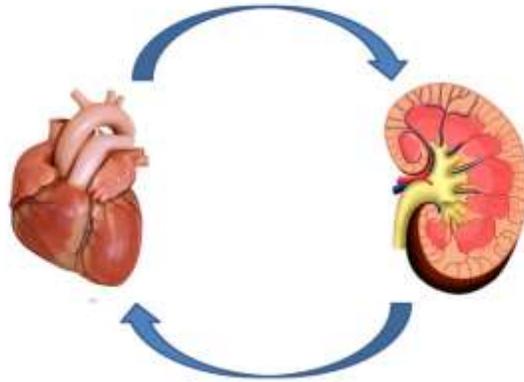
(Neuro)hormonal mechanisms

- Activation of the RAAS
- Activation of the sympathetic nervous system

Cardiovascular disease-associated mechanisms

- Chronic inflammation and activation of cellular immunity
- Malnutrition, cachexia and wasting
- Bone-mineral disorder
- Acid-base metabolism disorder
- Anaemia and cardio-renal anaemia

CARDIORENAL SYNDROME



Definitions of cardio-renal syndromes:

Type 1:
acute cardio-renal syndrome
Acute HF leading to AKI



Altered cardiac and/or renal haemodynamics might be of particular importance



Type 2:
chronic cardio-renal syndrome
Chronic HF leading to progressive and permanent CKD



Accelerated renal cell apoptosis and replacement fibrosis might be of particular importance



Type 3:
acute reno-cardiac syndrome
AKI causing acute HF



Salt and water imbalance, uraemia-induced effects and neuro-hormonal dysregulation might be key in this setting



Type 4:
chronic reno-cardiac syndrome
CKD leading to chronic HF and CKD progression



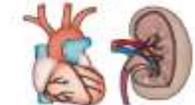
CKD-induced myopathy might be of particular importance in this setting



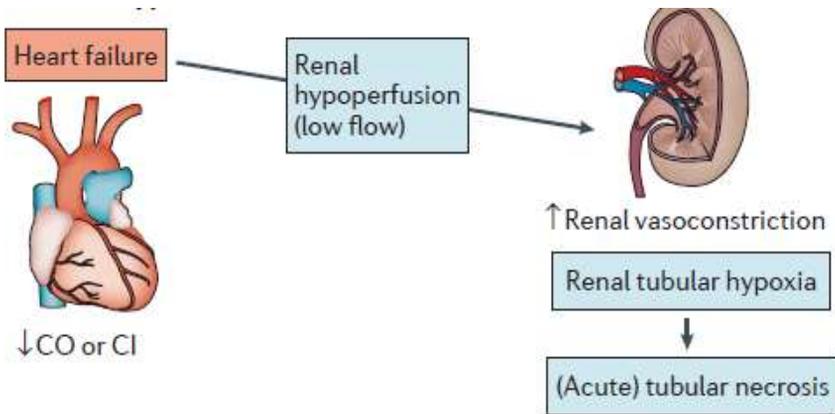
Type 5:
secondary cardio-renal syndrome

Systemic insult (e.g. in severe sepsis and/or septic shock)

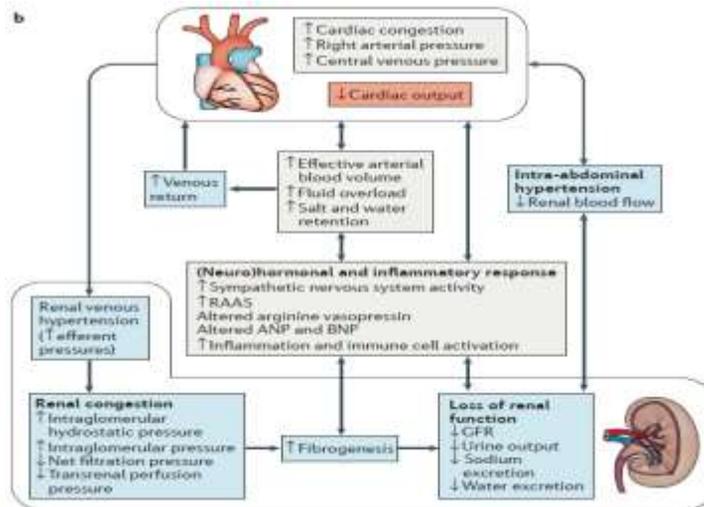
Microcirculatory dysfunction, altered innate and adaptive immune responses and cytokine release, and other effects result in simultaneous organ injury

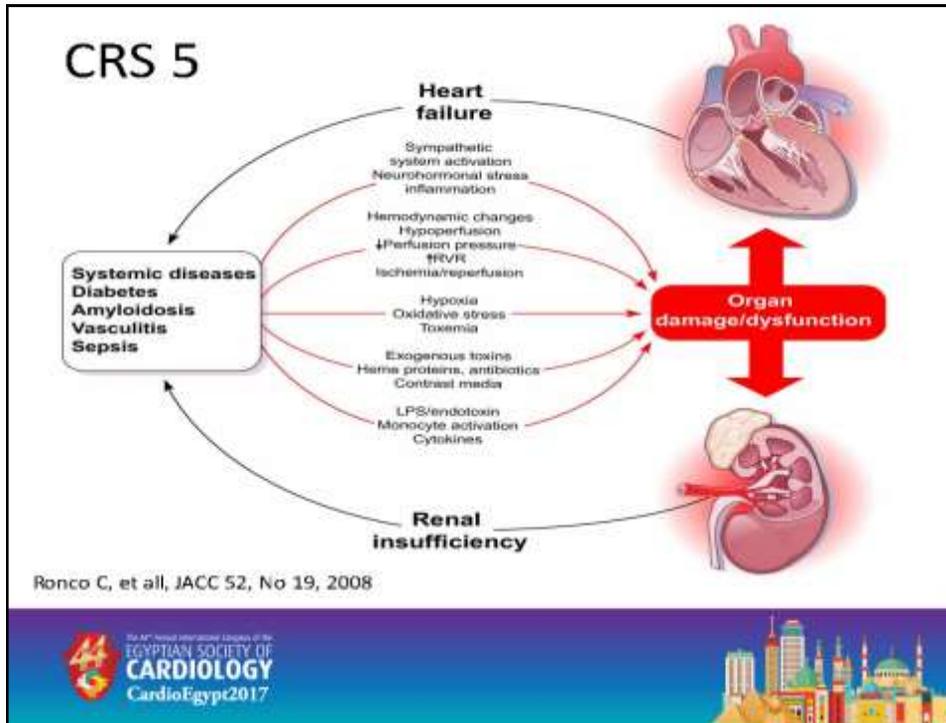


Traditional hypothesis of cardio-renal interactions



Traditional hypothesis of cardio-renal interactions





Summary and Take home message

- The care of patients with coexisting HF and kidney disease is a major medical challenge in both the acute and chronic settings.
- This challenge will become even more evident in the future with the increasing incidence of both disorders.
- From a pathophysiological perspective, the heart and the kidneys share a number of pathways that are intrinsically linked to each other.
- These include altered haemodynamics and fluid overload leading to renal venous congestion, a profound imbalance with regard to hormonal and sympatho-adrenergic status, mechanisms induced by malnutrition and cachexia, and CVD-associated risk factors.

Summary and Take home message

- patients with HF and renal dysfunction should be treated early by multidisciplinary teams involving specialists in cardiology and nephrology. This interdisciplinary approach demands bi-directional professional interactions between respective specialties and the formation of new collaborations.



THANK YOU

