Assessing RV Function

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Right Ventricle

Structure & Function

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RV Anatomy

three part structure

JA Voigt, University Leuven, Belgium
Ho, Heart 2006

Fibre Direction

epicardial
endocardial

RV

JU Voigt, University Leuven, Belgium
Ho, Heart 2006

RV Function

longitudinal vs. circumferential function

Peteresen, JACC 2007

RV Function

under normal conditions:

- pump for a low impedance circulation
  pumps against 1/6 of systemic resistance
  1/6 of LV mass, 3-4mm wall thickness
- EDV / ESV ca. 150 / 60 ml
  EF ca. 60%

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RV Function

afterload changes with exercise

athletes

non-athletes

A. La Gerche et al., J App Physiol 2010

RV Function

impairment due to:

- acute / chronic loading
  reduced function, dilatation, hypertrophy

- ischemia
  involved in 40-50% of inferior infarctions

- interventricular interaction
  LV elevated enddiast. pressures, constriction

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Right Ventricular Function

Does it matter ?

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Does RV Function Matter ?

univentricular heart, Fontan circulation

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Does RV Function Matter ?

RV function in heart failure patients

Study:
377 heart failure patients
NYHA II-IV
mean EF 22%
- right heart cath
- 17 9 months follow up

Ghio, JACC 2001

RV Function Matters !

RV function vs. outcome

Ghio, JACC 2001

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Right Ventricular Function

How to measure RV Function

Global Function

RV Function Assessment

gold standard: pressure-volume-loops
load dependence - always relate to load

Bleeker, Heart 2006

RV Function Assessment

EF as surrogate „gold standard“
by MRI

Alfakih, J MRI 2003

RV Function Assessment

3D echo

A La Gerche, Leuven

RV Function Assessment

3D echocardiography
RV reconstruction RV volume curve

A La Gerche, Leuven

RV Function Assessment

common problem: anterior wall

M. Amzulescu, Leuven
RV 3D Echocardiography

3D acquisition feasibility in a clinical study

- 32 patients with PHT (pre-selected for image quality)
  - 60% viability
- 20 normal volunteers (pre-selected for image quality)
  - 45% viability

3D acquisition feasible in a clinical study

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Jurcuţ et al., JASE 2011

RV Function Assessment

RV fractional area change

\[
\text{FAC} = \frac{A_{\text{sys}} - A_{\text{dias}}}{A_{\text{dias}}} = 42.8\% 
\]

RV fractional area change

normal range: 31 ... 60%

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RV Fractional Area Change

prognostic value

study:
- 416 pts
- 11 days post infarct
- multivariate analysis:
  - RV FAC independent predictor of mortality

RV Fractional Area Change

importance of image quality

oblique
- RV FAC: 29%

RV Fractional Area Change

correct
- RV FAC: 43%

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RV Function Assessment

"myocardial performance index" (Tei index)

Tei Index in RV dysfunction

JU Voigt, University Leuven, Belgium

Eidem, JASE 1998

Pseudonormalized Tei Index

Yoshifuku, AJC 2003
**RV Function Assessment**

tricuspid annular plane systolic excursion

**TAPSE vs. RVEF**

event free survival

140 pts.
EF < 35%
2 years follow up

**TAPSE = RV Function?**

changes after pulmonalis TEA

S. Giusca, Heart 2009

**RV Global Function Assessment**

echo parameters vs. EF by MRI

RV EF threshold 50%

RV EF threshold 30%

**How to measure RV Function?**

Regional Function

Pavlicek et al., EJE 2011
Strain Rate Imaging

Regional Differences in RV Function

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Load Dependence of Function Parameters

Describing Muscle Function

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RV Function Assessment

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Right ventricular function is complex and difficult to evaluate. RV ejection fraction may be estimated by MRI or Echo. Tei index and TAPSE are useful, but need caution.

Strain Rate imaging is a good tool to estimate regional RV function. Besides invasive gold standards, all parameters are subject to geometry and reflect loading conditions.

Further Reading


European Journal of Echocardiography, 2010; 11(6).