View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by Crossref

Journal of Cardiovascular Magnetic Resonance

BioMed Central

Meeting abstract

Open Access

104 Reference values for cardiac index measured with magnetic resonance imaging in healthy subjects and comparison with patients with congestive heart failure

Marcus Carlsson*, Ruslana Andersson, Henrik Mosén, Bjorn Ekmehag and Hakan Arheden

Address: Department of Clinical Physiology, Lund, Sweden

* Corresponding author

from 11th Annual SCMR Scientific Sessions
Los Angeles, CA, USA. 1–3 February 2008

Published: 22 October 2008

Journal of Cardiovascular Magnetic Resonance 2008, **10**(Suppl 1):A5 doi:10.1186/1532-429X-10-S1-A5

This abstract is available from: http://jcmr-online.com/content/10/S1/A5

© 2008 Carlsson et al; licensee BioMed Central Ltd.

Introduction

Measurements of cardiac index (CI) are of interest in critically ill patients as well as in patients with chronicheart disease. Magnetic Resonance Imaging (MRI) has been proposed as the new reference method for cardiac output and cardiac index measurements, but reference values are still lacking.

Purpose

The purpose was therefore to compare CI in healthy subjects to patients with congestive heart failure and to obtain reference values for CI.

Methods

CI was measured in 124 healthy volunteers (40 ± 16 years, range 21–81 years, 48 females) and in 184 patients with congestive heart failure and ejection fraction (EF) below 40% (60 ± 13 years, range 24–85 years, 144 males). All subjects were imaged in the supine position with flow quantification of the ascending aorta during free breathing. Two MRI-scanners were used, a) 1.5 T Magnetom Vision (Siemens, Erlangen, Germany) and b) Philips Intera CV (Philips, Best, the Netherlands). Blood flow was measured through a plane perpendicular to the ascending aorta with ECG-triggered phase-encoded velocity-mapping sequences. Typical imaging parameters for Siemens Vision were: repetition time 40 ms, echo time 5 ms, slice thickness 8 mm, velocity encoding factor 150 cm/s. The time resolution was typically 40 ms. Velocity information was acquired by prospective ECG-triggering. Typical imaging parameters for Philips Intera were: repetition time 10 ms, echo time 6 ms, slices thickness 6 mm, velocity encoding 200 cm/s. The time resolution was typically 30 ms. Flow was measured using a freely available software (Segment 1.4 http://segment.heiberg.se) in healthy controls and by vendor provided software in patients, Argus for patients imaged by Siemens Vision and ViewForum for patients imaged by Philips Intera. 20 controls were analyzed by both ViewForum and Segment to calculate intermethod variability and 2 observers analyzed the flow data from 20 controls to calculate interobserver variability. CI is presented as mean ± SD.

Results

CI in patients with congestive heart failure (2.2 ± 0.5 l/min/m^2) was lower compared to the healthy population (3.2 ± 0.5 l/min/m^2, $p < 0.001$), Fig 1. In patients, CI was weakly related to decreasing EF ($r^2 = 0.11$, $p < 0.001$). In the normal population there was a slight decrease of CI with age (8 ml/min/m^2 per year, $r^2 = 0.07$, $p < 0.01$), Fig 2. CI in normals aged 20–29 years was 3.3 ± 0.4 l/min/m^2, in 30–39 years 3.2 ± 0.6 l/min/m^2, in 40–49 years 3.1 ± 0.5 l/min/m^2 and above 50 years CI was 3.0 ± 0.4 l/min/m^2. Cardiac index in males (3.2 ± 0.5 l/min/m^2) and females (3.1 ± 0.4 l/min/m^2) did not differ ($p = 0.24$). The interobserver variability of cardiac output measurements was 0.2 ± 0.2 l/min or 3 ± 4%. The intermethod variability of cardiac output measurements was 0.4 ± 0.1 l/min or 6

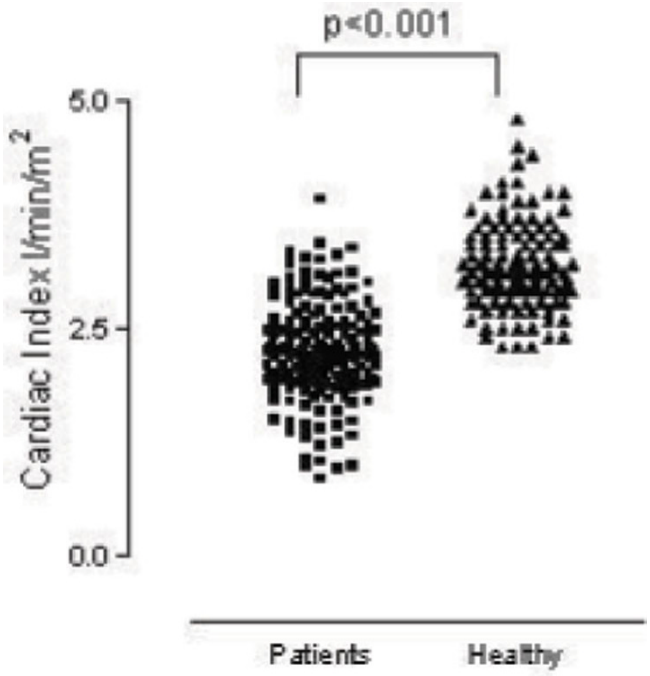

Figure 1
Cardiac index (CI) is lower in patients with congestive heart failure and depressed LV systolic function compared to healthy subjects.

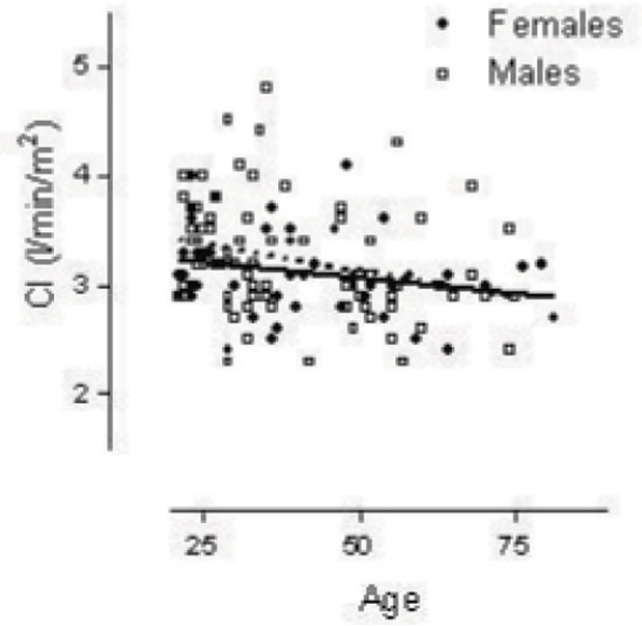

Figure 2
There is a decrease in CI in healthy subjects with age but CI does not differ between males and females.

± 3%, slightly larger values of cardiac output was seen with the commercial software (ViewForum) used for patients compared to the freely available software (Segment) used for normals.

Conclusion

CI is lower in patients with congestive heart failure and depressed left ventricular systolic function compared to healthy subjects. There is a decrease in CI in healthy subjects with age but CI does not differ between males and females. Values of CI over a wide age range have been established, this can be used as reference values for MRI.

Publish with **BioMed Central** and every scientist can read your work free of charge

"BioMed Central will be the most significant development for disseminating the results of biomedical research in our lifetime."

Sir Paul Nurse, Cancer Research UK

Your research papers will be:

- available free of charge to the entire biomedical community
- peer reviewed and published immediately upon acceptance
- cited in PubMed and archived on PubMed Central
- yours — you keep the copyright

Submit your manuscript here:
http://www.biomedcentral.com/info/publishing_adv.asp

BioMedcentral