

Trial Description

Title

Determination of blood volume and hemoglobin mass using the optimised carbon monoxide rebreathing method in clinical patients - cardiac failure or situation post cardiac transplant

Trial Acronym

[---]*

URL of the trial

[---]*

Brief Summary in Lay Language

Regulation of fluid balance is of major importance in patients with chronic cardiac failure with reduced systolic function. Total blood volume plays a special role here as it can be further differentiated into its components plasma volume and red cell volume. The implications of plasma volume are not fully understood, especially when regarding situations with coexistent anemia (meaning a Hemoglobin concentration below a certain threshold, e.g. 13.0 g/dl for males according to the WHO definition).

Anemia of patients with cardiac failure is associated with increased mortality and reduced physical performance.

As Hb is a concentration value, depending on plasma volume, aim of this study is to determine total hemoglobin mass, or red cell volume, respectively in a direct ways to better understand regulation of blood volume and erythropoiesis.

Various methods exist to determine these parameters, the majority time consuming and partly depend on application of radioactive tracers. The so called optimized CO rebreathing method is a method to determine the parameters within one our. Its application in clinical patients was approved by the local board's ethics committee in 2006.

Our current goal is to use the methods in patients with chronic cardiac failure or with situation post heart transplant and compare these groups with healthy controls to better understand regulation of blood volume when ventricular function is reduce. We aim at paying special attention to anemia, as the occurrence of anemia in this patient group is not fully understood and might also due to hemodilution due to an increase plasma volume. Moreover, our study aims at adapting the formulas on which the CO-rebreathing method is based to the special cardiovascular situation of patients with cardiac failure in order to provide a suitable routine tool for blood volume detection in this clinical group.

Arm 3 added MitraClip group (University Freiburg Ethics board approval 31/14, Act 171480)

Brief Summary in Scientific Language

With our study we are aiming to understand anemia in patients with chronic heart failure better. As conventional parameters of FBC (e.g. hemoglobin concentration) may be affected by hemodilution e.g. through an expanded plasma volume, we



aim at measuring the vascular parameters in absolute terms (total hemoglobin mass of the body). The optimised CO-rebreathing be a suitable tool for determination of Hb mass, however, it results might be affected by cardiovascular properties of the patient.

Our goal with this study is to apply this method to a collective of heart failure patients in order to learn about the applicability of this methods in this patient group, to understand origin of anemia in this group better and to study the influence of physical activity on the measures provided above.

Do you plan to share individual participant data with other researchers?

[---]*

Description IPD sharing plan

[---]*

Organizational Data

- DRKS-ID: **DRKS00006078**
- Date of Registration in DRKS: **2014/05/09**
- Date of Registration in Partner Registry or other Primary Registry: [---]*
- Investigator Sponsored/Initiated Trial (IST/IIT): **yes**
- Ethics Approval/Approval of the Ethics Committee: **Approved**
- (leading) Ethics Committee Nr.: **31/14 , Ethik-Kommission der Albert-Ludwigs-Universität Freiburg**

Secondary IDs

Health condition or Problem studied

- ICD10: **I50.1 - Left ventricular failure**
- ICD10: **D63.8 - Anaemia in other chronic diseases classified elsewhere**

Interventions/Observational Groups

- Arm 1: **Key population (cross-sectional study part): chronic cardiac failure with at least mildly reduced systolic LV-function ($EF \leq 45\%$), of various etiologie, e.g. ischemic, dilated, inflammatory. Or normal LV-function in patients s/p heart transplant in stable cardiovascular situation.**

In addition to the standard therapy, one determination of hemoglobin mass through the optimised CO-rebreathing method will be conducted.

- Arm 2: **Physical activity group (longitudinal study): as above but with physical activity of at least 150min / wk (e.g. through participating in cardiac sports group, or home based training e.g. strolling, nordic walking).**

In addition to the standard therapy, serial determinations of hemoglobin mass through the optimised CO-rebreathing method will be conducted.

- Arm 3: **MitraClip group. Measurement of the study parameters in a subgroup of CHF patients with severe mitral regurgitation after decision for Mitraclip procedure.**

Characteristics

- Study Type: **Non-interventional**
- Study Type Non-Interventional: **Other**
- Allocation: **Other**
- Blinding: [---]*
- Who is blinded: [---]*
- Control: **Other**
- Purpose: **Basic research/physiological study**
- Assignment: **Other**
- Phase: **N/A**
- Off-label use (Zulassungsüberschreitende Anwendung eines Arzneimittels): **N/A**

Primary Outcome

Hemoglobin mass measured using the optimised carbon monoxide rebreathing method in patients with different stages of left ventricular failure

Secondary Outcome

- **Influence of physical activity on hemoglobin mass.**
- **Relation between hemoglobin mass and FBC, Iron status**

Countries of recruitment

- **DE Germany**

Locations of Recruitment

- **University Medical Center Kardiologie/Bewegungsmedizin, Freiburg im Breisgau**

Recruitment

- Planned/Actual: **Actual**
- (Anticipated or Actual) Date of First Enrollment: **2014/05/01**
- Target Sample Size: **150**
- Monocenter/Multicenter trial: **Monocenter trial**
- National/International: **National**

Inclusion Criteria

- Gender: **Both, male and female**
- Minimum Age: **18 Years**
- Maximum Age: **no maximum age**

Additional Inclusion Criteria

Main study population (cross-sectional analysis): chronic cardiac failure with at least a moderately reduced LV function (EF<45%), of various origin, e.g. ischemic, dilated, inflammatory. Or preserved LV function when situation post heart transplant.

Physical activity group (longitudinal analysis): as above but with a weekly physical activity of at least 150min, e.g. through participation in cardiac sports group, nordic walking, strolling

Exclusion criteria

- patients with acute coronary syndrome without intervention - life expectation of less than one year because of a non-cardial disease - current oncologic disease - acute infection (e.g. pneumonia) - evidence for acute transplant failure - chronic inflammatory diseases - relevant chronic kidney disease of non cardiac origin - anemia of origin other than cardiac e.g. chronic intestinal hemorrhage - [♀Hb] < 8g/dl - current use of erythropoietic growth factors - patients featuring a lung function that does not allow participation in a rebreathing procedure from a clinical aspect - people that cannot participate in the study because of a lack of compliance, based on the judgement of the study doctors - chronic alcohol or drug abuse - those who are not able or not willing to give an informed consent to participate in the study

Addresses

■ Primary Sponsor

**Universitätsklinik Freiburg Institut für Arbeits- und Bewegungsmedizin
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Sources of Monetary or Material Support

■ **Institutional budget, no external funding (budget of sponsor/PI)**

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URL: [---]*

Status

■ Recruitment Status: **Recruiting complete, follow-up continuing**

■ Study Closing (LPLV): [---]*

Trial Publications, Results and other documents

- Abstract **Abstract DGK 2015: Hb mass in in relation to cause of cardiac failure**
- Paper **Fachpublikation: "Applying the Optimized CO Rebreathing Method for Measuring Blood Volumes and Hemoglobin Mass in Heart Failure Patients", Ahlgrim et al., Frontiers in Physiology, 2018**
- Paper **Increased Red Cell Volume Is a Relevant Contributing Factor to an Expanded Blood Volume in Compensated Systolic Chronic Heart Failure, Ahlgrim et al., J Card Fail, 20202020,**

* *This entry means the parameter is not applicable or has not been set.*

*** *This entry means that data is not displayed due to insufficient data privacy clearing.*