Non-invasive measurement of mitochondrial function in vivo in septic patients (a pilot study)

No registrations found.

Ethical review	Positive opinion
Status	Recruitment stopped
Health condition type	-
Study type	Observational non invasive

Summary

ID

NL-OMON23630

Source
Nationaal Trial Register

Brief title
NIMFO

Health condition

COVID-19, sepsis

Sponsors and support

Primary sponsor: Not applicable
Source(s) of monetary or material Support: Not applicable

Intervention

Outcome measures

Primary outcome

Mitochondrial oxygen disappearance rate (ODR)

Secondary outcome

Cellular oxygen availability in skin (mitoPO2 in mmHg)
Mitochondrial function in platelets
Mitochondrial DNA in plasma as a marker of mitochondrial damage
Microvascular blood flow measured by O2C
Mitochondrial function in peripheral blood mononuclear cells

Study description

Background summary

Measuring mitochondrial oxygen tension is possible with a novel technique developed by our lab. Demonstrating the possibility of measuring mitochondrial oxygen tension (mitoPO2) and oxygen disappearance rate (ODR) in critical ill patients is a necessary step in the development of a new clinical monitor for mitochondrial function in critical ill patients. There are increasing indications that mitochondrial dysfunction plays a role in the pathogenesis of multi-organ failure as consequence of severe infection and sepsis. In experimental endotoxemia in rat and healthy volunteers a decrease of cellular oxygen metabolism was measured with this new technique. Translating these insights from animal experiments into human studies and clinical practice has been hampered by technical difficulties and limitations. A non-invasive measurement technique of mitochondrial oxygen tension and mitochondrial function during severe infection or sepsis is needed. In this pilot study we want to research difference in mitoPO2 and ODR in critical ill COVID-19 patients and healthy controls.

Study objective

Septic patients have a different oxygen disappearance rate compared to controls

Study design

Patients:
First measurement: within 72 hours of admission, second measurement 7 days after the first measurement.

On the measurement day:
- Registration of length, weight, age, sex, medical history (haematological diagnosis, cardiopulmonary disease and diabetes), local characteristics of measurement site, medication use, APACHE scores and quick SOFA score and presence of suspected infection.
- Local blood flow of the skin will be measured by laser Doppler (O2C) this is a non-invasive measurement. The laser Doppler flow will be measured during the non-invasive mitochondrial function measurement.
- Ten minutes before the baseline measurement, the ALA plaster will be removed. The probe of the COMET monitor will be placed on the skin of sternum.
- A dynamic cellular oxygen measurement consists of a series of 120 samples acquired at a

rate of 1 sample per second. First stable baseline cellular oxygen is recorded for about 20 seconds. Subsequently light pressure will be applied by hand onto the sensor (and hence the measurement site to close the local micro vascularization) for 30 seconds. After these 30 seconds the pressure will be relieved and restoration of blood flow and cellular re-oxygenation will be measured during an additional 45 seconds.
- A blood sample (10 ml) is retrieved from the patient at the end of the measurement and brought to the laboratory of Anaesthesiology for subsequent determination of mitochondrial function in platelets and peripheral blood mononuclear cells and mitochondrial DNA in plasma.
- After each COMET measurement the skin exposed to ALA will be covered with a lightproof plaster for 24 hours.
- The local site on the sternum will be checked the day after each measurement by the intensive care nurse, if blasters or skin damage are seen the investigator will be notified

Healthy volunteers:
One measurement.
- Registration of length, weight, age, sex, medical history ,medication use
- Local blood flow of the skin will be measured by laser Doppler (O2C) this is a non-invasive measurement. The laser Doppler flow will be measured during the non-invasive mitochondrial function measurement. Concomitant sternal capillary refill time will be measured.
- Ten minutes before the baseline measurement, the ALA plaster will be removed. The probe of the COMET monitor will be placed on the skin of sternum.
- A dynamic cellular oxygen measurement consists of a series of 120 samples acquired at a rate of 1 sample per second. First stable baseline cellular oxygen is recorded for about 20 seconds. Subsequently light pressure will be applied by hand onto the sensor (and hence the measurement site to close the local micro vascularization) for 30 seconds. After these 30 seconds the pressure will be relieved and restoration of blood flow and cellular re-oxygenation will be measured during an additional 45 seconds.
- A blood sample (10 ml) is retrieved from the patient at the end of the measurement and brought to the laboratory of Anaesthesiology for subsequent determination of mitochondrial function in platelets and peripheral blood mononuclear cells and mitochondrial DNA in plasma.
- After each COMET measurement the skin exposed to ALA will be covered with a lightproof plaster for 24 hours.
- The local site on the sternum will be checked the day after each measurement by the intensive care nurse, if blasters or skin damage are seen the investigator will be notified

Contacts

Public
Erasmus Medical Center
Lucia Streng

0615162574

Scientific
Erasmus Medical Center
Lucia Streng

0615162574

Eligibility criteria

Inclusion criteria

Intensive care patients:
In order to be eligible to participate in this study, a subject must meet the following criteria:

• 18-90 years of age
• Admission to intensive care ward within 72 hours before inclusion.

Aged and gender matched healthy controls:
• 18-90 years of age
• No relevant comorbidities (ASA I/II)
• Matched in age (±5 years) and gender to one of the participants in the COVID 19 group.

Exclusion criteria

A potential subject who meets any of the following criteria will be excluded from participation in this study:
• Mentally disabled
• Porphyria
• Presence of mitochondrial disease

Healthy controls group:
• Presence of COVID-19//sepsis related complains or symptoms
• Presence of COVID-19/sepsis symptoms or complains, or a positive COVID-19 test less than one month ago
• COVID-19 vaccination less than two weeks ago

Study design

Design

Study type:	Observational non invasive
Intervention model:	Other
Allocation:	N/A: single arm study
Masking:	Open (masking not used)
Control:	N/A , unknown

Recruitment

NL

Recruitment status:	Recruitment stopped
Start date (anticipated):	13-11-2017
Enrollment:	45
Type:	Actual

IPD sharing statement

Plan to share IPD: Undecided

Ethics review

Positive opinion

Date:	22-07-2021
Application type:	First submission

Study registrations

Followed up by the following (possibly more current) registration

ID: 55883
Bron: ToetsingOnline
Titel:

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
NTR-new	NL9631
CCMO	NL58587.078.16
OMON	NL-OMON55883

Study results