Markers of Oxidative Stress from Supplemental Oxygen in critically-ill children

Published: 24-09-2021
Last updated: 06-04-2024

This study has two parts. The main objective of part 1 (in vivo) is todetermine changes in markers of oxidative stress in exhaled breath as a result of different short term oxygenation strategies (liberal versus conservative) . The main objective of...

Ethical review	Not approved
Status	Will not start
Health condition type	Viral infectious disorders
Study type	Interventional

Summary

ID

NL-OMON56664

Source
ToetsingOnline

Brief title
MOSSO2

Condition

- Viral infectious disorders
- Lower respiratory tract disorders (excl obstruction and infection)

Synonym
bronchiolitis, lower respiratory tract infection

Research involving
Human

Sponsors and support

Primary sponsor: Academisch Medisch Centrum
Source(s) of monetary or material Support: Ministerie van OC&W

Intervention

Keyword: Oxidative Stress, Oxygen, Pulmonary Ventilation, Volatile Organic Compounds

Outcome measures

Primary outcome

The main study parameters of part 1) are markers of oxidative stress as

measured by volatile organic compounds from exhaled breath in vivo. The main

study parameters of part 2) are markers of oxidative stress and cellular

injury in vitro.

Secondary outcome

na

Study description

Background summary

Severe viral lower respiratory tract infection (VLRTI) is the most common reason for pediatric intensive care unit admission and forms a major healthcare burden worldwide. Children with severe VLRTI are commonly treated with both non-invasive and invasive (mechanical ventilation) oxygen therapy due to hypoxia. However, optimal oxygen saturation targets in critically-ill children are currently unknown. In comparison, in adults there is also an ongoing debate regarding saturation targets and whether supplemental oxygen (hyperoxia) should be kept to a minimum (conservative oxygenation) or can be given more liberal. The basis for this discussion is that hyperoxia may increase the production of reactive oxygen species, which could induce oxidative stress and lung epithelial injury. At present, there is no evidence on whether or not conservative oxygenation can reduce oxidative stress compared to liberal oxygenation in children, in particular not in the setting of a pro-inflammatory pulmonary micro-environment (e.g. due to VLRTI). Measurement of volatile organic compounds in exhaled breath can be used as a non-invasive, easy obtainable marker for oxidative stress in vivo in patients receiving oxygen therapy. In addition, in vitro epithelial cell based systems can assess the effects of oxygen therapy on the lung micro-environment level.

In this study, short term conservative oxygenation is hypothesized to reduce

markers of oxidative stress in exhaled breath in comparison with short term liberal oxygenation. Secondly, as compared to hyperoxia, normoxic conditions is hypothesized to reduce oxidative stress and injury of lung epithelial cells in a pro-inflammatory micro-environment in vitro.

Study objective

This study has two parts. The main objective of part 1 (in vivo) is todetermine changes in markers of oxidative stress in exhaled breath as a result of different short term oxygenation strategies (liberal versus conservative) . The main objective of part 2 (in vitro) is to assess differences in makers of oxidative stress and lung epithelial cell injury after prolonged hyperoxic versus normoxic conditions in the setting of a pro-inflammatory micro-environment in vitro.

Study design

This will be a randomized cross-over study of two different short term oxygenation protocols (liberal and conservative) during ongoing mechanical ventilation as part of usual clinical care.

Intervention

No investigational product is administered. Two short term oxygenation protocols will be used during ongoing mechanical ventilation as part of usual clinical care.

Study burden and risks

Patients with VLRTI who will participate in this study will undergo two short term oxygenation protocols (3 hours) as an adaption of usual clinical care on two separate days. On both days, non-invasive exhaled breath samples will be collected five times, and on the third day one blind non-bronchoscopic lavage (mini-BAL) will be performed. Patients without VLRTI who will participate in this study will undergo one short term oxygenation protocol (3 hours) as an adaption of usual clinical care on a single day, upon which non-invasive exhaled breath samples will be collected five times.
The expected physical discomfort associated with participation in this study is minimal as patients will be sedated for the entire duration of the study protocol as part of usual clinical care. Therefore patients will be unaware of the study procedures. The risks with participation in this study are expected to be minimal, as the brief adaption of usual clinical care is not expected to have any detrimental or lasting effects on the patients. The study (non-invasive and single invasive) procedures used to obtain data are also expected to impose minimal risks. No direct benefit for the patient comes from participation in this study, however, it is expected that the results from this

study will benefit the specific patient population and future patients. As mechanical ventilation is not part of clinical care for non-critically ill children and data regarding critically-ill adults cannot be properly translated to children, it is imperative that this study is performed in this specific population. The risk and burden of participation in this study is expected to be minimal as compared to the risks and burden of usual clinical care for these patients.

Contacts

Public
Academisch Medisch Centrum

Meibergdreef 9
Amsterdam 1105 AZ
NL
Scientific
Academisch Medisch Centrum

Meibergdreef 9
Amsterdam 1105 AZ
NL

Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Children (2-11 years)
Babies and toddlers (28 days-23 months)
Newborns

Inclusion criteria

Main study population:
- Age below 24 months

- Proven VLRTI
- Endotracheal intubation
- Mechanical ventilation
- Informed consent obtained for the complete study protocol (3 days) of exposure to two different oxygen supplementation protocols on separate days combined with non-invasive exhaled-breath measurements and a single non-endoscopic bronchoalveolar lavage at the final day of study after confirmation of comprehension of the Dutch language

Non-infected control population:
- Age below 12 years
- Endotracheal intubation
- Mechanical ventilation
- No signs of infection (fever, temperature >38.5 C) and no respiratory symptoms (cough, wheeze, snotty) present at moment of intubation
- No reported respiratory symptoms in the last seven days prior to pediatric intensive care unit admission
- Informed consent obtained for the partial study protocol (1 day) of exposure to the liberal oxygenation protocol combined with non-invasive exhaled-breath measurements after confirmation of comprehension of the Dutch language

Exclusion criteria

Main study population:
- Age above 24 months
- Active infection with SARS-CoV-2
- Contra-indication for high flow or low flow oxygen supplementation (e.g. previous bleomycin treatment, carbon monoxide intoxication)
- No consent
- Receiving HFO
- Receiving nitric oxide treatment for pulmonary hypertension
- In need for specific oxygen saturation targets based on underlying congenital heart disease

Non-infected control population:
- Age above 12 years
- Proven ongoing pulmonary infection
- Symptoms of a present or recent infection (temperature >38.5 C) or respiratory symptoms (cough, wheeze, snotty) in the last seven days prior to pediatric intensive care unit admission.
- Contra-indication for high flow oxygen supplementation (e.g. previous bleomycin treatment)
- No consent

Study design

Design

Study type:	Interventional
Intervention model:	Crossover
Masking:	Open (masking not used)
Control:	Uncontrolled
Primary purpose:	Treatment

Recruitment

NL

Recruitment status:	Will not start
Enrollment:	32
Type:	Anticipated

Ethics review

Not approved

Date:	24-09-2021
Application type:	First submission
Review commission:	CCMO: Centrale Commissie Mensgebonden Onderzoek (Den Haag)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

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

No registrations found.

In other registers

Register	ID
CCMO	NL78024.000.21