

# Anaerobic threshold in patients with funnel chest

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- In patients with pectus excavatum the anaerobic threshold value is lower (

<b>Ethische beoordeling</b>	Positief advies
<b>Status</b>	Werving nog niet gestart
<b>Type aandoening</b>	-
<b>Onderzoekstype</b>	Observationeel onderzoek, zonder invasieve metingen

## Samenvatting

### ID

NL-OMON28687

### Bron

NTR

### Aandoening

Pectus excavatum  
Funnel chest  
Chest wall deformity  
Anaerobic threshold  
Exercise intolerance  
Right ventricle compression

### Ondersteuning

**Primaire sponsor:** Atrium Medical Centre Heerlen

**Overige ondersteuning:** Atrium Medical Centre Heerlen

### Onderzoeksproduct en/of interventie

### Uitkomstmaten

#### Primaire uitkomstmaten

- The anaerobic threshold is shown as percentage of the predicted VO<sub>2</sub>max.

# Toelichting onderzoek

## Achtergrond van het onderzoek

Pectus excavatum is a condition characterized by a dent in the chest wall, at the location of the 4th to the 7th rib, which usually has a funnel-like shape.

Pectus excavatum can be calculated by using the Haller index. The Haller index is the thorax transversal distance divided by the distance between sternum and spine. The distances are assessed on an X-ray. Normal Haller index is  $<2.5$ , all values above 2.5 are called pectus excavatum. However, the degree of symptoms is not determined by the Haller index.

Patients with a Haller index of 3.5 may have more symptoms than patients with an index of 5.5.

The shape of pectus excavatum is not always symmetrical. The deviation can be a severe deformity of the chest wall. The incidence is not fully known but it is expected that at least 1 in 1,000 born children has pectus excavatum. Usually boys are affected (85%) and pectus is more common in families with a member already familiar with pectus excavatum. If the deviation is seen at all after birth, then it is often not included in the medical record. That heredity plays a role in the occurrence of pectus excavatum is known, but the exact mechanism not entirely clear.

However, research shows that pectus excavatum is more common in hereditary syndromes such as Ehlers danlos-, marfan- or poland syndrome.

Usually the cosmetic aspect of pectus excavatum plays an important role in a surgical intervention, however because of the reduced space in the chest pressure is exerted on the right atrium and the right ventricle of the heart. This can result in cardio compression.

The chest wall is very flexible when patients are young , therefore the heart is able to divert, so no complaints arise.

However, as the patient gets older, the chest wall is less flexible and often creates a thoracic kyphosis by the collapse of the intervertebral discs, which gives even less deflection space. The resulting symptoms can also give a reason for surgical intervention.

These complaints are difficult to objectify. There are several markers that can give some information for this purpose, such as the aerobic capacity. The turning point from aerobic to anaerobic metabolism, also called "anaerobic threshold" (AT), could possibly give a good indication of physical problems. In multiple studies the

subject of aerobic capacity after performing a Nuss procedure is discussed, but not the AT.

The objective of this study is to demonstrate the influence of pectus excavatum on the anaerobic threshold during exercise. This could be an objective measurement of exercise intolerance. An objective measurement of exercise intolerance can later help in the decision for surgical treatment of pectus excavatum. Furthermore, the effect of a thorax correction on the AT can be examined.

### **Doel van het onderzoek**

- In patients with pectus excavatum the anaerobic threshold value is lower (<40% of predicted VO<sub>2</sub>max) than in people without pectus excavatum.
- After surgical correction of the thoracic wall the anaerobic threshold will rise above 40% of the predicted VO<sub>2</sub>max

### **Onderzoeksopzet**

- Preoperatively
- 3 months
- 1 year

### **Onderzoeksproduct en/of interventie**

All patients, whom qualify for a Nuss procedure, are asked to participate in this study. These are patients between the ages of 18 and 40. During outpatient consultation patients receive information about the study, or will be contacted by phone at least one week before surgery. After the time for consideration patients will have to decide whether they want to participate or not. The pectus operations can not be performed immediately so the patients will have more than five days to consider their participation. All patients will be planned for the Nuss procedure regardless of their choice to participate in the study. The preoperative investigations are completed and a bicycle test with determination of the AT is performed on the day of surgery.

The AT will be measured, in collaboration with the Department for pulmonology, before thoracic correction. Patients have to do a maximum effort bicycle test during which the AT can be seen. This test will be done a second time 3 months after

the operation and a third time 1 year after the operation, so patients have had more time to recover.

Then all values will be compared. The AT is determined by means of the maximal oxygen uptake (VO<sub>2</sub> max). The cut-off value for normal AT is > 40% of the predicted VO<sub>2</sub> max. All values of the test will be obtained non-invasively. The gold standard for the AT determination is described as drawing arterial blood and determining the actual lactate value at different times during the test. However, the AT can be accurately determined non-invasively (V-slope) in patients with cardiopulmonary disease. Because the non-invasive AT determination is similar to the gold standard and an invasive measurement would be an additional burden for the patient the V-slope method according to Wasserman, which is VO<sub>2</sub> versus VCO<sub>2</sub>, is used. If the AT is above 40% of the predicted VO<sub>2</sub>max the AT then can be called normal.

## Contactpersonen

### Publiek

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## Deelname eisen

## **Belangrijkste voorwaarden om deel te mogen nemen (Inclusiecriteria)**

- Age between 18 and 40 years
- Scheduled for Nuss procedure
- Haller index  $>2,5$
- Effort related complaints:
  - Exercise intolerance
  - chest pain
  - poor stamina
  - shortness of breath

## **Belangrijkste redenen om niet deel te kunnen nemen (Exclusiecriteria)**

- Severe lung disease
- Preexisting heart disease
- Not able to do a cycle exercise test

Absolute contra-indications for exercise test:

- Acute myocardial infarction
- Unstable angina
- Syncope
- Active endocarditis
- Acute myocarditis
- Symptomatic severe aortic stenosis
- Uncontrolled heart failure

- Acute pulmonary embolus or infarction
- Thrombosis of lower extremities
- Suspected aortic dissection
- Uncontrolled asthma
- Pulmonary edema
- Saturation in rest  $\leq 85\%$
- Respiratory failure
- Acute nonpulmonary disorder that may affect exercise performance
- Non-cooperative patient

## Onderzoeksopzet

### Opzet

Type:	Observationeel onderzoek, zonder invasieve metingen
Onderzoeksmodel:	Anders
Toewijzing:	N.v.t. / één studie arm
Blinding:	Open / niet geblindeerd
Controle:	N.v.t. / onbekend

### Deelname

Nederland	
Status:	Werving nog niet gestart
(Verwachte) startdatum:	04-05-2015
Aantal proefpersonen:	27
Type:	Verwachte startdatum

## Ethische beoordeling

Positief advies

Datum: 29-04-2015  
Soort: Eerste indiening

## Registraties

### Opgevolgd door onderstaande (mogelijk meer actuele) registratie

ID: 42298  
Bron: ToetsingOnline  
Titel:

### Andere (mogelijk minder actuele) registraties in dit register

Geen registraties gevonden.

### In overige registers

Register	ID
NTR-new	NL5042
NTR-old	NTR5181
CCMO	NL51528.096.15
OMON	NL-OMON42298

## Resultaten

### Samenvatting resultaten

N/A