The impact of parenteral support on sleep and circadian rhythm in intestinal failure

A comprehensive analysis of sleep quality, quality of life and biochemical parameters

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Description of the initiative

Chronic intestinal failure (CIF) is a severe organ failure condition in which the remaining small intestine is insufficient or inefficient to absorb adequate amounts of nutrients and/or fluids. To sustain life, patients require intravenous supplementation of nutrients and/or fluids, which is also known as **parenteral support** (PS). Due to practical reasons, PS is **infused cyclic overnight at home** in most patients. These infusions have **a large impact on their sleep quality** as a consequence of nocturnal urinating, fear of catheter dislocation or occlusion and pump alarms. Despite this profound **burden and effect on well-being**, this aspect of PS has received limited scientific attention.

Planned activities & deliverables

This project aims to investigate the **impact of nocturnal PS on sleep quality, quality of life (QoL) and biochemical parameters** (including cortisol, melatonin and clock genes) in patients with CIF.

The primary objective (Part A, Figure 1) of this project is to assess the **sleep profile** of patients with CIF on nocturnal PS. We hypothesize that patients on nocturnal PS have lower sleep efficiency due to frequent awakenings, implying a higher arousal index. We also assume they do not reach stages of deep sleep on the nights with PS or, if they do, the duration of deep sleep stages is shorter. To study this, we will include 34 patients with CIF and 34 matched healthy controls (sex, age, BMI). Using **state of the art class II polysomnography** equipment, we will assess sleep quality at home and complement this with questionnaires on overall status and QoL.

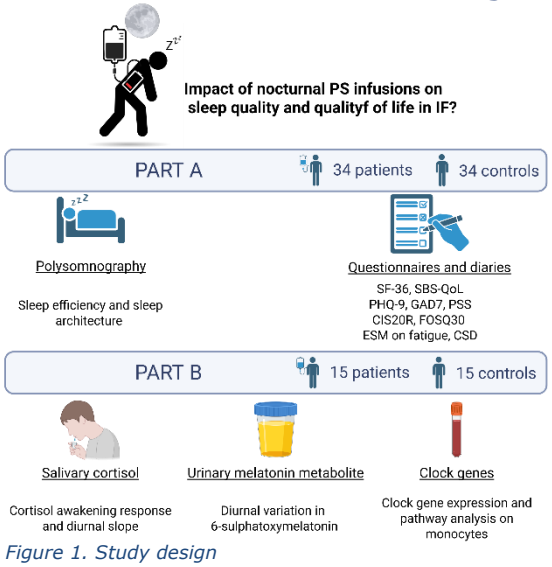


Figure 1. Study design

The secondary objective of this project is to investigate **chronodisruption** in this patient group (Part B, figure 1). We hypothesize that patients with CIF on PS are prone to chronodisruption because important mediators for internal clock synchronization are influenced by nocturnal PS infusions: patients experience frequent sleep disturbances and are in a continuous anabolic state through free access to standard food during the day and PS during the night. We hypothesize that patients receiving nighttime PS experience substantial and persistent chronodisruption, reflected through relevant alterations in circadian oscillating hormone levels and clock gene expression. To objectively measure this, we will measure **salivary cortisol, urinary melatonin metabolites and clock gene expression** from 15 patients and 15 controls that already participated in Part A.

Within 12 months, we will describe the outcomes on sleep quality and QoL (Part A). Within 24 months, the full analysis will be finished.

Resources & enablers

If awarded, the €40,000 will be used to purchase the polysomnography device (approximately €18,000) and to perform the associated sleep- and biochemical analyses. Funding for a PhD student to conduct this study has been applied for through the Flemish research organization 'Fonds Wetenschappelijk Onderzoek' (FWO). The outcome of this application is expected in September, however, if not awarded, back-up funding from previous commercial studies is available so this will not affect the feasibility of the project. For the analysis of the poly-somnography data, we will collaborate with prof. Alexandros Kalkanis an expert in sleep medicine.

Results, expected outcomes & impact

We will set up a c**omprehensive sleep study** which captures the **objective and subjective sleep quantity and quality** in patients with CIF on nocturnal PS, including its **effects on QoL and mental burden**. To our knowledge, this is the first study of its kind in patients with CIF. The results render more insight into the effect of sleep on chronodisruption and help optimize patient care.

Although patients receiving nocturnal PS have several risk factors for chronodisruption, it has never been investigated before in this patient group. In this pioneering project, we will provide the **first data on the role of chronodisruption** in patients with CIF by examining the rhythm of circadian oscillating hormones and direct assessment of clock gene expression. Based on these results, we can open the conversation in the field about the possibility of **switching to daytime PS infusions**.

☑ **Please tick to confirm the PEN letter of endorsement is attached. Incomplete submissions will not be considered.**