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## Case Report

# Use of Optokinetic Chart Stimulation to Restore Muscle Strength and Function in a Severely Disabled Bed Bound Multi-Morbidity Patient with a Combination of Systemic Lupus Erythematosus, Critical Care Myopathy and Diabetic Neuropathy: A Case Study

### Abstract

**Background and objective:** Multiple morbidities in critical care myopathy tend to lead to poor outcomes. The objective of this case report is to describe the remarkable recovery of a bed bound critical care myopathy patient with lupus, phalangeal amputations and diabetic neuropathy.

**Methodology:** An optokinetic chart was moved in front of the patient for 3 minutes laterally, then 3 minutes vertically and finally 3 minutes forwards and backwards. Sensory interaction for balance was added once patient could stand with assistance of one person.

**Results:** For 54 days before commencement of optokinetic chart stimulation the patient was bed bound and being fed by a nasogastric tube. She had no trunk control. The aggregate manual muscle strength was 0/5 with best strength of 1/5 only in bilateral shoulder and hip muscle groups. After treatment the patient fed herself independently and was mobile with a wheeled zimmer walking aid and assistance of one person. Her aggregate strength improved to 5/5. The Barthel Index improved from 0/100 to 75/100.

**Conclusion:** The multiple morbidities in this case report mitigated against natural recovery. Optokinetic chart stimulation needs further investigation as a multi-morbidity treatment in instances where severe deterioration of trunk control occurs.

## Introduction

Intensive care unit (ICU) acquired weakness is increasing due to the improvement in the ICU care of patients with sepsis or after cardiac or abdominal surgery [1]. When adjusted for age, the incidence of critical care polyneuropathy and or myopathy (CIPNM) is 4.2 per 100 000 people. 46.4 % of people with CIPNM are likely to end up with poor function as well as be discharged to a nursing home [2]. Up to 46 % of ICU admissions may develop CIPNM [3]. The main causes of CIPNM are severe sepsis and multi-organ failure [4,5]. Other causes are systemic inflammatory response syndrome (SIRS), hyperglycaemia, renal replacement therapy, and catecholamine administration [3].

Septic encephalopathy has been shown to precede neuromuscular signs [5]. Acquired sodium channelopathy is postulated to lead to nerve and muscle membrane inexcitability. Axonal nerve degeneration, muscle myosin loss and muscle necrosis occur. In

addition, microvascular and cytopathic hypoxic changes may disrupt energy supply and utilisation [6]. Impaired synthesis and degradation of myosin heavy chain (MyHC) has been implicated [7].

CIPNM strains the health economy through increased length of hospital stay (LOS) and rehabilitation [8]. The mean LOS is 76.2+28.1 days [9]. At present there are no specific rehabilitation interventions available to reduce the onset or impact of CIPNM [10]. It is therefore important to find preventative and rehabilitative interventions to address this problem. The aim of this case report is to add onto preliminary evidence for use of optokinetic chart stimulation in reversing the debilitating effects of CIPNM [11]. Optokinetic chart stimulation has successfully been used to treat dense muscle weakness in people with stroke [12], subdural haemorrhage (SDH) [13] and CIPNM [14].

## Case Presentation

This is a single case study in an in-patient trauma and orthopaedics



ward setting. Written informed consent was obtained from the patient in accordance with institutional review body guidelines for case reports.

### The case Study

A 58 year old patient was admitted to ITU with severe left knee septic arthritis that required 4 wash outs. After the washouts she was transferred to a trauma and orthopaedics ward. For 54 days, she remained bed bound, NG fed, unable to roll in bed and unable to move all her 4 limbs. She had no trunk control and could not sit even with maximum assistance of 2 people. She was referred to the author after these 54 days. By then her Oxford Scale totals scores (OST) for each side was 10/205 with an aggregate 0/5 with 1/5 only in bilateral shoulder and hip muscles. Her Barthel Index score was 0/100. She had also developed necrosis of her left foot toes, right hand index finger and right foot toes. These were amputated 4 weeks after the patient had begun optokinetic chart stimulation.

Her co-morbidities included left lower lobe pneumonia, systemic lupus erythematosus, dermatomyositis, none ST segment elevation myocardial infarction (NSTEMI) and multi-organ failure. The past medical history consisted of type II diabetes, rheumatoid arthritis, osteoarthritis and interstitial lung disease. Medications were prednisolone, tazocin, insulin, atorvastatin, bisoprolol, amlodipine, clopidogrel, sertraline, losartan, aspirin, pregabalin, ranitidine, calcichew, and ferrous fumarate.

### Intervention

An optokinetic chart was moved in front of the patient for 3 minutes laterally, then 3 minutes vertically and finally 3 minutes forwards and backwards. Sensory interaction for balance was added once patient could stand with assistance of one person. Patient was then mobilised with a wheeled zimmer walking (WZF) aid as she made progress.

### Results

The patient was discharged to her own home able to feed herself independently. She was mobile with a WZF and assistance of one person. Manual muscle strength improved from an aggregate 0/5 to an aggregate 5/5. **Table 1** gives the detailed outcomes. The OST post-treatment scores were out of 190 as a result of aforementioned amputations of some digits.

### Discussion

The multi-morbidities of this case study and her physical state at the commencement of optokinetic chart stimulation (OKCS)

**Table 1:** Pre-treatment and post-treatment outcomes in the 58year old critical care myopathy patient.

Pre-treatment	Post-treatment after 9 weeks	
Right side OST	10/205	176/190
Left side OST	10/205	176/190
Barthel Index	0/100	75/100

OST: Oxford Score Totals

mitigated against impairment and functional recovery. Healthcare professionals asked the author if this was not a futile exercise. “Do you think she will ever walk again?” was a question thrown quite often. The patient did not believe that the intervention would work. The case study confirms what has been noted in earlier work when the author rehabilitated bed bound patients with CIPNM [11,14].

OKCS works on input-processor network recovery [12,15] which then allows recovery of innervation of motor output organs. This starts with restoration of biochemical processes by re-innervation of muscles so that synthesis of (MyHC) [7] can be normalised. In isolation, this case report is limited by lack of control and uncertainty over what the natural course of events would have been if OKCS had not been commenced. However a story is beginning to emerge when all 3 cases are taken together hence further controlled studies are recommended for future research.

### Conclusion

Optokinetic chart stimulation is a potential neuro-modulating rehabilitation intervention. It aids in the restoration of muscle strength and function in complex multi-morbidity patients without being at the mercy of natural recovery. However progression to randomised controlled trials is needed to prove efficacy.

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### Conflict of interest

The author hereby declares no conflict of interest and states that this entire written work is his sole responsibility.

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