

The suspected SARS-Cov-2 infection in a Charcot-Marie-Tooth patient undergoing postsurgical rehabilitation: the value of telerehabilitation for evaluation and continuing treatment

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We report, to the best of our knowledge, the first case of a probable COVID-19 infection in a 28-year-old man with Charcot-Marie-Tooth disease. The diagnosis was established through a remote interaction with the patient after early discharge from outpatient therapy due to upcoming traveling restrictions. The COVID-19 disease appeared mild, without major respiratory problems, and no obvious neuromuscular deterioration was reported or observed. Telerehabilitation provided an opportunity to continue with hand rehabilitation after tendon transfer surgery, perform an ad-hoc online evaluation, and advise the patient how to prevent the spread of infection and cope with restrictions limiting outpatient visits. This experience seems valuable for further development of telerehabilitation in anticipation of future pandemics or

adversarial events since it allows reaching out to patients unable to travel and overcomes the need for regular outpatient visits. *International Journal of Rehabilitation Research* XXX: 000–000 Copyright © 2020 Wolters Kluwer Health, Inc. All rights reserved.

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Introduction

The emergence of COVID-19 disease caused by the SARS-Cov-2 virus was proclaimed a ‘pandemic’ by the WHO on 11 March 2020 (Sohrabi *et al.*, 2020; WHO, 2020). As of this writing, more than 700 000 people around the world tested positive on the SARS-Cov-2 virus (Dey *et al.*, 2020). Only in Italy, more than 100 000 people were affected and that number is rapidly increasing (Remuzzi and Remuzzi, 2020). In Italy and other countries affected by this pandemic, cities have been on lockdown to reduce the spread of infection (Reluga, 2010). The consequences are overwhelming, including a sudden interruption of ‘standard’ rehabilitation for most patients, whether affected by SARS-Cov-2 or not.

Case report

We highlight here the first reported case of suspected COVID-19 infection in a patient with Charcot-Marie-Tooth (CMT) disease, the most common hereditary neuropathy (Carine *et al.*, 2016), and how a remote rehabilitation approach allowed monitoring, continued administration of physical therapy after hand surgery, and informal evaluation of the progress. A 28-year-old man affected by CMT1X, an X-linked form of CMT disease, underwent in December of 2019, a tendon transfer surgery in the left hand (from the superficial flexor of the ring finger to the thumb for improving opposition). Hand rehabilitation proceeded as planned three times a

week. The focus was on the recovery of the joint range of motion with passive and active exercises of the thumb and the ring finger and, progressively, the use of rubber band and Theraputty paste. Exercises were dosed to avoid overwork weakness, which can occur in this neuropathy (Vinci *et al.*, 2003; van Pomeran *et al.*, 2009; Prada *et al.*, 2018). Physiotherapy proceeded until 4 March 2020, when it was suspended because of the upcoming Italian lockdown date (March 9). At that time, all thumb movements were almost within normal limits and surgery scars were healed but the dexterity and strength were still lacking. In conversation with the patient on March 6, he reported that his wife began to show flu symptoms, fever, and mild cough. Two days later, he experienced a headache, constant leg pain, and fever (37.8°C). The next day fever increased (38.3°C) and the leg pain worsened over the next three days. He did not report any major respiratory symptoms. On March 10, he no longer had a fever, a mild cough remained, but he noted the loss of the smell and taste that persisted even when other symptoms resolved. The diagnosis of probable COVID-19 infection was made on clinical ground given the symptoms in the patient and his wife. The test on SARS-Cov-2 was not possible to perform at that time because of the pandemic situation. We continued physiotherapy through telerehabilitation 1 week after the symptoms resolved. We used noncommercial, publicly available software for audio and video conferencing. Total of eight remote sessions was

performed over 4 weeks, each lasting 1 hour. The first online evaluation of strength and dexterity in the hands and legs revealed no apparent deterioration (Thumb Opposition Test remained at seven and strength exercises were performed as before). Formal testing could not be done because no instruments (dexterity test, dynamometer) were available at home. The therapy was conducted under the guidance of a physiotherapist who instructed the patient to perform already learned and new exercises that were demonstrated through a video link. As the dexterity exercises, activities of daily living were used including tying shoelaces or cutting with a pair of scissors. Every week, the patient was asked to perform Thumb Opposition Test, exercises to infer the hand strength, and developed ad-hoc timed dexterity tests, such as tying shoelaces. Although not validated, these assessments along with patient observations were useful for monitoring the progress. Treatment is still ongoing, the patient is treated remotely twice a week and he will finish the physiotherapy at 16 sessions. Then, we will provide him with a link video of maintenance exercises. As soon as the COVID-19 emergency will be over, he will be assessed in our outpatient for hereditary neuropathies.

This suspected and probable COVID-19 infection in our patient affected by CMT1X did not cause any appreciable deterioration in the neuromuscular ability or worsening of the neuropathic deficits. Indeed, it is likely that more aggressive forms of COVID-19 disease may have more severe consequences, particularly in the CMT cases with pronounced neuromuscular impairments. Also, some patients with the CMT disease 1A may have a phrenic nerve neuropathy and already impaired respiratory functions (Sagliocco *et al.*, 2003; Spiesshoefer *et al.*, 2019). In such cases, the SARS-Cov-2 infection may have much worse outcomes. Telerehabilitation is currently an emerging and growing field (Parmanto and Saptono, 2009). Until now, the goals have been to reduce the costs (Anderson *et al.*, 2000), improve the quality of life of patients (Linder *et al.*, 2013; Hsieh *et al.*, 2018), and develop new technologies for patient evaluation and the management (Kvedar *et al.*, 2014). This case report demonstrates that remotely supervised home rehabilitation could be a solution when patients must be isolated, whether for infection or other condition, allowing continued rehabilitation despite social confinement. Telerehabilitation offers an opportunity for the future

development of novel 'at home strategies' that can be performed alone or under guidance. Moreover, it would be useful to develop tools for evaluation at home. These should be simple to use and easy to connect to a remote system capable of rapidly transferring data to rehabilitation professionals.

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Conflicts of interest

There are no conflicts of interest.

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