

La Marato de TV3 funds new ICFO-Parc Tauli project

Medical photonics to improve COVID 19 patients' journey from intensive care to rehabilitation

June 14, 2021

In 2020, the Fundacio La Marato de TV3 focused fundraising efforts on the COVID-19 pandemic to add resources to progress in the research that will improve the quality and life expectancy of the people that it has affected. Researchers from ICFO and Corporacio Sanitaria Parc Tauli de Sabadell have been awarded a new project through this initiative where medical photonics technologies will be used to improve the understanding of the pathway to personalized ICU management and rehabilitation for COVID-19 patients. This new phase is especially important now that successful vaccination campaigns are allowing a shift in focus to the quality of life of survivors who number in the tens of thousands around the word.

Because of its exceptional versatility, precision, and non-invasive nature, photonics is playing an increasing role in medical techniques and practices, to the extent that today it is

considered a key enabling technology in developing healthcare in Europe. ICFO's Medical Optics group led by ICREA professor **Turgut Durduran** has been developing photonics-based technologies using near-infrared diffuse light for clinical applications with a large network of clinics in the Barcelona area and abroad.

During the COVID-19 pandemic, ICFO and clinicians at the hospital Consorci Corporacio Sanitaria Parc Tauli de Sabadell , led by **Dr. Jaume Mesquida**, have been using diffuse optical monitors to evaluate the microvascular health of COVID-19 patients, aiming to improve their care at the intensive units through two ongoing projects. In the first, are the large international clinical trial HEMOCOVID-19, and the European Commission funded project VASCOVID, which is developing a new device to be introduced to clinical practice.

ICU- acquired weakness and muscle atrophy

When critically ill COVID-19 patients are hospitalized and need to enter the ICU units, in many cases they require mechanical ventilation, sedation and neuromuscular blocking agents. Almost two-thirds of the patients undergoing long ICU stays develop muscle weakness. The syndrome, called ICU-acquired weakness, is caused by both the aggressive therapies and the severity of the disease itself.

In the ICU-acquired weakness syndrome, the resulting muscle atrophy can lead to long-term complications. Studies have shown that in more than half of these patients, these affectations persist even after one year. Patients experience symptoms as limiting fatigue and poor functional status that hinder their return to normal activities and severely affects their quality of life.

Helping to define personalized treatments

The ICFO - Parc Tauli project selected for funding from the Fundacio La Marato de TV3 aims to help clinicians in the management and recovery through rehabilitation of those patients. It has been seen that if standard rehabilitation programs start early, when the patients are still in the critical units, they can reduce the impact of the weakness. However, to discern among patients and correctly establish their needs, it is essential to detect those with higher risk or degree of muscle impairment at early stages.

Clinicians are currently using a physical examination to diagnose muscle weakness. Based on their previous experience monitoring long ICU patients with other illnesses, ICFO researchers believe that the abnormal values of the endothelial function might be key in detecting the ICU-acquired weakness. In this project, they will make use of non-invasive

near-infrared light to monitor the endothelial function, measuring the patients' blood flow, oxygenation and metabolism at the microvascular level. By using optical technologies such as near-infrared spectroscopy (NIRS) and diffuse correlation spectroscopy (DCS), they aim for early detection of the patients at higher risk of developing muscle weakness and help clinicians to define personalized rehabilitation strategies.

Endothelial and microvascular health is critical for the well-being of the patients, and these new emerging technologies will be relevant for saving lives, reducing mortality and improving the survivors quality of life.



ICREA Prof at ICFO Turgut Durduran