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Design, Development and Verification of a Dynamometer to Evaluate at Tissue Level Human Intestine Cells Contraction

Michela Pitto¹

¹ Università di Genova, Genova, Italy

Visceral Myopathy (aka VSCM or mCIPO) is a rare genetic disease and a monogenic mechano-biological disorder, caused by several genetic variants affecting contractile phenotype of the enteric smooth muscles. Currently, no pharmacological therapy exists for VSCM. To better understand VSCM and quantify contraction ability in relation to control subjects, a dynamometer was designed and implemented, including two different sensors: an isometric sensor to acquire the force generated, and an isotonic one to acquire the displacement during tissue contraction. The device operated on intestinal muscle tissues strips, from patients (VSCM) and controls (gastrointestinal disorders without motility issues), that were chemically stimulated to trigger the contraction. Data were recorded, analyzed and compared to control tissue activity. Results showed that the VSCM samples exhibited a statistically significant reduced contractile activity (in terms of force and displacement) in comparison to controls' cohort. This pilot study contributes to the understanding of VSCM. It represents the basis to provide possible new assays to advance in the diagnosis of such pathology and in the identification of new therapeutic solutions moving towards cellular activity investigations and off-label use of drugs to restore contractile activity.