Introduction:
The mechanical properties of muscles such as tone, elasticity, and stiffness are often affected in chronic critical ill (CCI) patients. A hand-held device known as the MyotonPRO demonstrated acceptable relative and absolute reliability in a ward setting for patients with acute stroke [1]. The technology works on the principle of applying multiple short impulses over the muscle bulk via the testing probe. The aim of our study is to assess the feasibility of objective measurement of muscle tone in CCI patients with neurological dynamics and serum biomarkers.

Methods:
The study included 23 CCI patients with neurological disorders (stroke, traumatic brain injury, neurosurgical intervention for brain tumors) with more than a 3-weeks stay in ICU. Dynamic measurements of the muscle properties were taken on the deltoideus, brachioradialis, quadriceps femoris, gastrocnemius using the MyotonPRO. To identify the leading factor in impaired muscle tone also were measured neurological (S100, NSE), inflammatory (IL-6), bacterial load (PCT) biomarkers using Elecsys immunoassay and the serum level of microbial metabolites using GC-MS (Thermo Scientific).

Results:
All patients were divided into groups depending on positive and negative clinical dynamics. Significant differences were obtained in parameters characterizing changes in muscle tone of lower limbs - $F_{\text{gastrocnemius}}$ (tone) -15.5 vs 18.5 Hz, $R_{\text{quadriceps femoris}}$ (the mechanical stress relaxation time) - 16.5 vs 13.6 ms ($p < 0.01$, respectively). Some significant correlations between five parameters of muscle tone biomarkers and microbial metabolites were revealed.

Conclusion:
The results of a quantitative measurement of muscle tone objectively reflect the dynamics of neurological status, which in the future may be promising technique for the personalized approach CCI in patients.

References: