MUSCLE-LOCALIZED BIOELECTRICAL CHANGES OVER A GIRO D'ITALIA PRO RACE

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Background. Giro d'Italia is one of the most prestigious and demanding multistage races included in the professional cycling Tour. It is difficult to intervene systematically in this group of subjects to assess the adaptations to such intense competitions (Marra et al., 2014). In this context, muscle-localized bioelectrical impedance vector analysis (ML-BIVA) is a novel methodology for assessing the hydration status and cellular integrity of muscles (Cebrián-Ponce et al., 2021). The purposes of this study were to analyse possible bioelectrical inter-limb differences and to assess the bioelectrical muscle changes over the 3 weeks of Giro d'Italia.

Research methods. 9 professional cyclists (27.9 ± 2.4 years; 181.4 ± 6.1 cm; 70.5 ± 6.1 kg) completed ML-BIVA assessments in both quadriceps, hamstrings and calves at three different checkpoints: one day before the start of Giro (PRE), on the first resting day (MID), and on the final day of the race (POST). A tetra-polar phase-sensitive BIA at 50 kHz was used to measure height-adjusted resistance (R/h), height-adjusted reactance (Xc/h), height-adjusted impedance (Z/h) and phase angle (PhA). Hotelling's T2 test determined differences in the complex vector through the 95% confidence and tolerance intervals.

Results and discussion. There were no significant differences in the complex vector in any of the three muscles analysed, when comparing to the contra-lateral side, in any of the three checkpoints. Therefore, there was a complete bioelectrical inter-limb symmetry in this group of subjects. Neither quadriceps nor hamstrings experienced any significant bioelectrical adaptation in the complex vector over the race. However, the calves did report significant changes all over the race, since there was a significant shortening of the vector at MID (T2 = 60.4; $p < 0.001$), and a posterior significant lengthening at POST (T2 = 11; $p < 0.001$), but below the baseline values (T2 = 12.1; $p < 0.001$). Such vector behaviour could be an indicator that the caves were the most severely affected muscle in the first half of the race, with a fluid gain and a muscle damage, while in the second half they got partially recovered.

Conclusions. ML-BIVA did not detect any intra-limb imbalances, unsurprisingly since it is expected a great symmetry in elite cycling. On the other hand, ML-BIVA in the calves detected adaptations to the strenuous race through complex vector bioelectrical changes. These changes should be further explored along with other methods to assess muscle adaptations to exercise, e.g. with haematological extractions.

References

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