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Magnetic resonance imaging investigations in a murine model of Down syndrome: the Ts65Dn mouse

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Trisomy 21, or Down's syndrome, is the most common genetic cause of intellectual disability; moreover, DS patients suffer from muscle hypotonia and low muscle strength whose mechanisms are still unknown and only partially explained by intellectual disability. Genetic mouse models (e.g., the Ts65Dn mouse) may offer insights into the responsible mechanisms . Moreover, the Ts65Dn mouse show muscle weakness and share morphological similarities with sarcopenia of aging [1].

To characterize skeletal muscle in theTs65Dn model, we explored the hindlimb of young adult (6-month-old) mice in euploid (n=9, mean weight: 43.8±4.10 g) and trisomic (n=9, mean weight: 38.2±4.0 g) individuals by magnetic resonance imaging. Mice were imaged in a Bruker Tomograph at 4.7 Tesla using a RARE T2-weighed sequence (TR: 5000ms, TE: 56ms; spatial resolution 0.0182cm2 per pixel). Muscle cross sectional area was measured in a section taken at mid-femur in either hindlimbs and values averaged for further analysis. Results showed that mean hindlimbs muscle cross sectional area was larger in trisomic than in euploid mice (0.29±0.05 vs. 0.23±0.05 cm2, p=0.03 [t test]). Because of significant difference in body weight between euploid and trisomic mice (p=0.009), data were adjusted per body weight. Using adjusted data, a significant difference was still found between groups (euploid: 0.005±0.001; trisomic: 0.007±0.001 cm2/g body weight). It is concluded that young adult trisomic mice has increased apparent muscle mass in hindlimbs. Since trisomic Ts65Dn mice show reduced grip strength as well as running and swimming speed in the presence of roughly normal muscle biochemistry [2], possible structural and fiber-type changes in hindlimb muscles of these mice are under investigation to explain such a discrepancy.

References

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Keywords
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