

revealed tracheal compression by brachiocephalic artery. He became stable after his trachea was stented by T-shaped silicon tube. 5 months later, he was re-admitted to our hospital because of massive bleeding from trachea due to tracheal-brachiocephalic artery fistula. Emergency operation was performed and his life was saved. **Conclusion:** We propose that neuromuscular patients, with or without tracheotomy, should be evaluated for TCBA when following respiratory problems or symptoms occur: stridor, asphyxia, artificial ventilation failure, difficulty in sputum suction

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P4.19

Multiple aortic aneurysms in a patient with Becker muscular dystrophy

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Introduction: Cardio-vascular complications in patients with muscular dystrophies include congestive heart failure, dilated cardiomyopathy, arrhythmias, and heart blocks. Aortic aneurysms have been rarely reported. We now report a patient with Becker muscular dystrophy, who presented with multiple aortic aneurysm with fatal outcome with pathological findings. **Objectives** To report aortic aneurysm as a possible cause of death in patients of muscular dystrophy with autopsy findings and etiological considerations. **Methods:** A case report with genetic and autopsy pathological examinations. **Results:** A 60 year-old male patient developed muscle weakness and atrophy at the age of 16. His younger brother presented with similar symptoms and diagnosed as Becker Muscular dystrophy by genetic examination. The patient's muscle weakness and atrophy progressed, and heart failure ensued, which was controlled with ACE-I. He complained severe back pain at the age of 58. Enhanced CT study revealed multiple aortic aneurysms. Aortic aneurysms were observed with control of blood pressure. Patient's status excluded any surgical intervention including aortic reconstruction. After 2 years a patient died of rupture of abdominal aneurysm. Autopsy revealed multiple aortic aneurysms including thoracic and abdominal regions. **Conclusions:** Rupture of aortic aneurysm has been rarely reported during the course of muscular dystrophies. Radiology examinations in the presented case suggested paraspinal tumors as differential diagnosis. Autopsy examination revealed the final diagnosis. Sudden death cases of muscular dystrophies may include mortality with aortic aneurysm. Etiological correlation between aortic aneurysms and Becker muscular dystrophy is uncertain.

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P4.20

Telomere length in exercised wild type and mdx mice

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The length of DNA telomeres is an important parameter of the proliferative potential of skeletal muscles. A telomere shortening has been reported in athletes suggesting that chronic endurance exercise may be seen as a stressor to skeletal muscle. In Duchenne muscular dystrophy (DMD) muscle, telomere shortening, resulting from contin-

uous muscle degeneration-regeneration cycles, is thought to contribute to premature senescence of satellite cells and the following ultimate failure of regenerative activity. In *mdx* muscle telomere shortening occurs in tibialis anterior (TA) muscle only in 600-day old animals, whereas in diaphragm muscle in 100- 600-day old mice.

We presently investigated whether telomere length is affected in *mdx* mouse muscles, in relation to morphological pattern and physical activity. To this aim, diaphragm and tibialis anterior muscles from 84-112-day old *mdx* mice were compared with samples from age-matched wild type mice. Exercised animals underwent a protocol of chronic treadmill running (8-10 weeks).

Our results confirmed an effect of exercise in healthy muscle showing a significant telomere shortening in exercised WT mice compared to sedentary animals in both muscles. Sedentary *mdx* mice showed a telomere shortening only in diaphragm muscle compared to WT. We confirmed that exercised *mdx* mice had a more compromised muscle architecture in both diaphragm and TA muscles compared to sedentary *mdx*, but this paralleled a lower telomere length only in diaphragm muscle. These results reinforce the assumption that telomere shortening can be involved in replicative senescence of satellite cells. Therefore the modulation of these events by the available compounds targeting telomere maintenance related proteins might represent a novel strategy for treatment of DMD and other muscular dystrophies.

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MUSCLE IMAGING; POSTER PRESENTATIONS

P4.21

MR imaging and spectroscopy of the brain in DMD

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About one third of boys with DMD shows cognitive impairment. This may be caused by the lack of dystrophin, but the mechanism remains to be clarified. Following successful restoration of in vivo dystrophin expression in human skeletal muscle, therapeutic trials with exon skipping are being planned. Whether treatments that improve muscle strength will be effective in brain is unknown. An imaging parameter that correlates with cognitive functioning would be very helpful.

We will present pilot data of magnetic resonance imaging (MRI) and spectroscopy studies of the brain in DMD boys that focus on structural, functional and metabolic parameters. High field strength quantitative MRI (3 Tesla) and MRS(7 Tesla) will be performed. The results will be correlated to healthy boys as well as to cognitive and behavioral functioning.

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P4.22

Quantitative analysis of muscle wasting in Duchenne muscular dystrophy by a new computed tomography method

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Recently the therapies for muscular disorders are being developed. However, the method to measure muscle volume has not been established in determining the effect of therapeutic intervention. We have developed a new method for evaluating muscle volume using CT. We defined estimated muscle volume at a given CT slice level of the thigh as muscle volume index (MVI), and the ratio of MVI to total volume within the range of interest as % muscle volume index (%MVI). The purpose of this study is to confirm the validity of this method by investigating the relationship between functional stage and the new indices, and describing muscle damage progression by the indices. We calculated MVI and %MVI by means of making the histogram of CT value and applying the formula for correcting partial volume effect. A study in 21 patients with Duchenne muscular dystrophy (DMD) showed that MVI and %MVI at the maximum circumference level of the thigh were significantly correlated with functional stage (Ueda). The transitional change in MVI and %MVI was significantly regressed to an exponential function $Y = Ae^{-rX}$. This result is accord with those of previous study as to change in serum CK in DMD. This implies that the rate of DMD muscle degradation might depend on the amount of existing muscle. This method is useful in assessing natural clinical course of disease and the efficacy of therapeutic interventions.

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P4.23

Non uniform fatty infiltration distribution of skeletal muscle tissue in facioscapulohumeral dystrophy

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Introduction: Facioscapulohumeral dystrophy (FSHD) is the third most common genetic muscular dystrophy. It is characterized by an uneven distribution of affected and unaffected muscles. We questioned if a similar heterogeneity exists within muscles. We used MRI techniques to quantify fatty infiltration over the length of thigh muscles of FSHD patients. **Methods:** 22 genetically proven FSHD patients were examined on a Siemens Trio 3T system. During the experiment multiple slices of multi-echo MR images were acquired covering between 59 and 83 mm of the upper leg. Signal decay by T2 relaxation in these images was fitted to a biexponential function with fixed relaxation rates for muscle and fat tissue (Kan et al, 2009). From the fit a degree of fatty infiltration was determined for each muscle and for each slice, which made it possible to study the degree of fatty infiltration over the length of the muscle. **Results:** A total of 272 thigh muscles were investigated of which 35 qualified as intermediately and showed progression of the disease over the length of the muscle. These muscles were selected for further analysis. For every muscle linear regression analysis was performed on the level of fatty infiltration over the length. The median slope over the investigated muscles was 0.05, indicating a 5% increase of fatty infiltration over a muscle length of 15 mm distal. The median R on the fatty infiltration over the length of these muscles was 0.93, signifying the linear fit to be a accurate representation of the actual data. **Conclusion:** We objectively proved that intermediate diseased muscle in FSHD patients are not homogeneously affected, as distal parts are more severely

infiltrated by fat than proximal parts. On average 5% more fatty infiltration was shown over a distance of 15 mm along the muscle.

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P4.24

Asymmetry of skeletal muscle involvement in facioscapulohumeral muscular dystrophy: a neuroimaging study

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Facioscapulohumeral muscular dystrophy (FSHD) is an autosomal dominant inherited disorder characterized by early involvement of facial and scapular muscles, with eventual spread to the pelvic and lower limb muscles. To evaluate the presence and distribution of skeletal muscle involvement, we studied five right-handed male patients with FSHD (19–74 years old) by whole-body neuroimaging. All patients showed truncation of 3.3-kb D4Z4 repeat sizes less than 35 kb on 4q35. Three patients had right-predominant upper limb muscle atrophy. Another 68-year-old patient had right-predominant atrophy of not only the upper limbs, but also the lower leg muscles. However, the degree of asymmetry was minimal in these four patients. Interestingly, the other 63-year-old patient showed hemiatrophy (atrophy only on the right side of the body). Muscle CT image at the shoulder level revealed atrophy of the right shoulder-girdle and greater pectoral muscles. On MRI, adipose tissue replacement of muscle was asymmetrically pronounced in the biceps and the triceps brachii, forearm, femoral, tibialis anterior, and calf muscles only on the right side. Neurological examinations including electromyography showed right-sided muscle weakness/atrophy. No central nervous system involvement was apparent. Although asymmetric muscle involvement is considered one of the characteristic clinical features of FSHD, hemiatrophy without contralateral involvement has not been reported previously in elderly patients with FSHD. The degree of asymmetry did not correlate with the number of D4Z4, disease duration, or age at onset. Asymmetry in FSHD might depend not only on the genetic predisposition of specific muscles to be more or less affected, but also on epigenetic factors, including mechanical handedness. Our findings suggest that FSHD is more clinically variable than previously thought.

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P4.25

Functional outcome measures in limb girdle muscular dystrophy 2I: Correlations with MRI

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Introduction: MRI is useful for diagnosis in muscular dystrophies and more recently has been considered as a potential outcome measure in clinical trials. Functional outcome measures have not been validated for use in LGMD 2I. We developed a series of functional outcome measures including timed tests, myometry, Adapted North