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The aim of this study is to establish a reliable tool of reproducible assessment of muscle strength in children affected by Duchenne Muscular Dystrophy (DMD) which will be selected for mesoangioblasts transplantation. We have developed a potential treatment for DMD based on infusion of cells (mesoangioblasts) from a healthy donor capable. The results of the current functional study will hopefully establish reliable qualitative and quantitative tool to assess results of a future cell therapy clinical trial with mesoangioblasts. This is a single centre, prospective, non-randomised, study of validation of outcome measures on 30 ambulant patients aged 5–12 years old affected by DMD including a cohort of 15 healthy aged matched males. We perform 2 days evaluation each 3 month for 1 year. During each assessment the following outcome measures are applied to DMD subjects: North Star Scale and 6 min walking test during the first day; quantitative assessment using the Kin Com 125 machine during the second day. The controls subjects will perform quantitative assessment twice in a year. Twice during this evaluation year patients perform spirometry, cardiac assessment and lower limb MRI. We divided the patients into three subgroups of age (5–7 years, 8–9 years, 10–12 years). The results of this preliminary part of the study show specific correlation between functional and quantitative tests in stronger children. Kin Com measurements correlate appropriately with functional tests for 10- to 12-years-old DMD boys, while show a major variability in muscle strength for 8- to 9-years-old DMD boys. The comparison with healthy subjects showed a difference of muscle strength that increases with age. This preliminary study demonstrates that our assessment may represent a useful tool to monitor the progress of DMD in ambulant children to determine the pre-transplantation story of the children who will be later treated with mesoangioblasts.

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#### P4.36

##### Upper limb evaluation in non-ambulatory patients with neuromuscular disorders

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Disease progression in children with neuromuscular disorder is frequently assessed by the 6-min walk test, that classically constitutes the clinical primary outcome of therapeutic trials. There is currently no validated and standardized method to assess upper limb function in non-ambulatory patients, which constitutes a major challenge for therapeutic trials.

Upper limb evaluation may be assessed either by direct muscular strength measurement, or by clinical scale, by questionnaire, or by clinical test that still have to be standardized and validated.

The aim of ULENAP (Upper Limb Evaluation in Non-Ambulatory Patients) is to study these different approaches on a group of 100 non-ambulatory patients with neuromuscular disorders. In each patient, strength of pinch, grip, hand flexion and extension is per-

formed on both limbs. In addition, limb function is evaluated through a hand function questionnaire, motor function measurement (MFM), taping, and a recently developed device to measure the ability of patients to hit two targets with fingers, the moviplate. Patients from the five participating sites will be followed up during 1 year in order to define the test which is the most sensitive to change.

Here, we present the feasibility and reproducibility of these different approaches, and the correlations that may be observed between strength and functional outcome measures.

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#### P4.37

##### Characterization of pulmonary function in patients with Duchenne muscular dystrophy

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Decline in skeletal muscle function in Duchenne Muscular Dystrophy (DMD) contributes to restrictive lung disease, chronic respiratory failure, poor cough and increased risk of pneumonia. These pulmonary complications cause the early morbidity and mortality in patients with DMD. Consequently, pulmonary function data in DMD patients provides important information and may provide clinically relevant measures for intervention studies testing the efficacy of emerging therapies for DMD. A decline in forced vital capacity (FVC) is observed in the second decade in DMD often leading the decline in pulmonary status and the initiation of non-invasive ventilation and assisted airway clearance devices. However, there is still a shortage of natural history data that describe and correlate the evolution of pulmonary function parameters beyond FVC, such as peak expiratory flow (PEF). *Methods:* Pulmonary function test (PFT) data was obtained prospectively from 62 DMD patients (age range 5–24 years) enrolled in an IRB-approved natural history study at the Children's Hospital of Philadelphia from 2005 to 2009. Data was collected by trained physical therapists. Spirometry flow-loops from all subjects was reviewed by a pediatric pulmonologist (OHM) and only data that met American Thoracic Society guidelines was included in the analysis. Both cross-sectional and longitudinal data were analyzed. Statistical analysis will be performed to describe and correlate the evolution of PEF and FVC as absolute values and as a percent of predicted. Use of steroid medication was also analyzed. *Results:* A predictable decline in both FVC and PEF % predicted was demonstrated from age 13 years onward. PEF % predicted was generally lower than the FVC % predicted up to age 13 years. *Conclusion:* Data from this study will assist in the selection of pulmonary function parameters that may capture an early decline in DMD and may serve as efficacy endpoints in clinical studies.

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#### P4.38

##### Swallowing disorders in pediatric neuromuscular diseases: A pilot study

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**Aim:** The purpose of this study is to determine the swallowing disorders and the causes in neuromuscular diseases, to develop the appropriate management strategies in probable deficient. **Methods:** Average age of  $7.21 \pm 5.46$ , 14 patients which diagnosed by Medicine Faculty of Hacettepe University – Neurology Department included to this study. Patients have continuing or previously swallowing problems. Six patients (14.2%) were myotonic dystrophy, four patients (28.5%) were SMA, two patients (14.2%) fasciobulbar paralysis, two patients (14.2%) were DMD diagnosed. Subjects swallowing functions were evaluated by clinical swallowing test and videofluoroscopy. Peripheral oral functions oral and pharyngeal phases of swallowing were analysed in clinic test. In videofluoroscopy; lip closure, tongue–palate contact, tongue elevation, tongue base-pharyngeal wall contact, delay in swallowing reflex related to oral phase were evaluated. Airway closure, hyolaryngeal elevation, upper esophageal sphincter opening, penetration and aspiration related to pharyngeal phase were evaluated. Also residue and nasopharyngeal reflux were evaluated in oropharyngeal region. **Results:** In SMA and DMD groups; mainly oral phase, in fasciobulbar paralysis; deficiencies relating to pharyngeal phase occurs. Aspiration was seen in eight cases and penetration was seen in two cases. Five of aspiration was silent aspiration. Only at four of subjects aspiration sign was determined. Four of subjects were feeding non-oral. **Discussion:** In patients with neuromuscular disease, swallowing function is affected more often unlike known. Difficulties during oral intake could be one of the source of respiratory problems in the period ahead.

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#### **P4.39** **Assessment of tongue pressure during swallowing in patients with muscular dystrophies**

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In patients with muscular dystrophy, oro-dental abnormalities as well as weakness of oropharyngeal muscles can disturb swallowing function. To assess oral phase of swallowing function, we measured tongue pressure during swallowing in patients with muscular dystrophies by a newly developed sensor sheet. Participants were nine patients with myotonic dystrophy (DM), 11 patients with Duchenne muscular dystrophy (DMD) and 51 healthy controls. A T-shaped thin sensor sheet with five measuring points (three points in median line and two points on the posterior-lateral parts) was attached on the hard palate. Tongue pressure was recorded during swallowing of 10 ml water. In healthy controls, tongue pressure was generated firstly by close contact with anterior-median part, then the circumferential part and finally with the posterior-median part. Compared to healthy controls, the maximum tongue pressure was lower in both DM and DMD. In DM patients, the pressure on median line was particularly low. Some DM patients hardly contacted their tongue to the hard palate. In DMD patients, most parts of tongue simultaneously contacted to their hard plate and sequential pattern was disappeared. We assume that these results reflect functional and anatomical abnormality of these disorders; high arched palate and atrophic tongue in DM and low palate and macroglossia in DMD.

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## **DATABASES AND REGISTRIES; POSTER PRESENTATIONS**

### **P4.40**

#### **Database of wards for patients with muscular dystrophy in Japan**

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In Japan, there are 27 hospitals specializing in muscular dystrophy treatment, which belong to National Hospital Organization. We have been conducted survey of wards for inpatients with muscular dystrophy and other neuromuscular disorder in National Hospital Organization annually since 1999. We analyzed the database between 1999 and 2009. The database includes numbers of inpatients, age, diagnosis, respiratory condition, nutritional state, cause of death of each year, and so on. There were 2066–2193 inpatients each year. Numbers of inpatients with Duchenne muscular dystrophy (DMD) were 777–882 each year, which gradually decreased every year. Those with myotonic dystrophy (DM) were 327–411, which gradually increased every year. Those with spinal muscular atrophy were 56–73, which were almost constant during this period. Those with amyotrophic lateral sclerosis gradually increased from 29 to 109 every year. Mean age of inpatients in 1999 was 36.6 years old, and gradually increased to 44.6 years old in 2009. Mechanical ventilation introduction rate in 1999 was 37.9%, and gradually increased to 58.2% in 2009. Rate of oral nutritional supply of inpatients was 90% in 1999, and gradually decreased to 66.4% in 2009. During this period, 1186 patients died. This group included 371 DMD patients, 327 DM patients, and others. The highest frequent rate of cause of DMD patients death was heart failure, accounting for 49%. That of DM patients death was respiratory disorder such as respiratory failure and respiratory tract infectious disease, accounting for 55%. Aging and disease severity of inpatients have been progressed gradually. Social role of wards for patients with muscular dystrophy has been changing.

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### **P4.41**

#### **REMUDY – DMD/BMD patient registry in Japan**

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The development of orphan medicines presents many challenges. Clinical trials with new therapeutic strategies are now being planned for Duchenne and Becker muscular dystrophy (DMD/BMD), however, since adequate numbers of patients are needed to achieve significant results for clinical trials, patient registries are an important infrastructure all over the world, especially in the case of rare diseases such as DMD/BMD. We developed a registry of Japanese DMD/BMD patients on the national basis. The registry uses patient self-report system. The database includes clinical data and molecular genetic data. As of March 2010, 357 patients have been registered in the database. The main purpose of this registry is the effective recruitment of eligible patients for a clinical trial and may provide timely information to individual patients. The registry data gives us more detailed knowledge of natural history, epidemiology, and